N61165.AR.003820
CNC CHARLESTON
5090.3a

OIL WATER SEPARATOR DATA BINDER 1 CNC CHARLESTON SC
9/1/2000
NAVFAC SOUTHERN

Oil Water Separator Data
Charleston Naval Complex
Charleston, South Carolina

Binder 1

Prepared by
M.A. Hunt, P.E.
Southern Division,
Naval Facilities Engineering Command
North Charleston, South Carolina

September 2000

Scan
Oil/Water Separator Data
Binders 1-2-3

Compliance

OIL WATER SEPARATOR DATA

BINDER 1

CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

Revision No. 0

Prepared for and by:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina

September 2000

OIL WATER SEPARATOR DATA

BINDER 1

CHARLESTON NAVAL COMPLEX
CHARLESTON, SOUTH CAROLINA

Revision No. 0

Prepared for and by:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina

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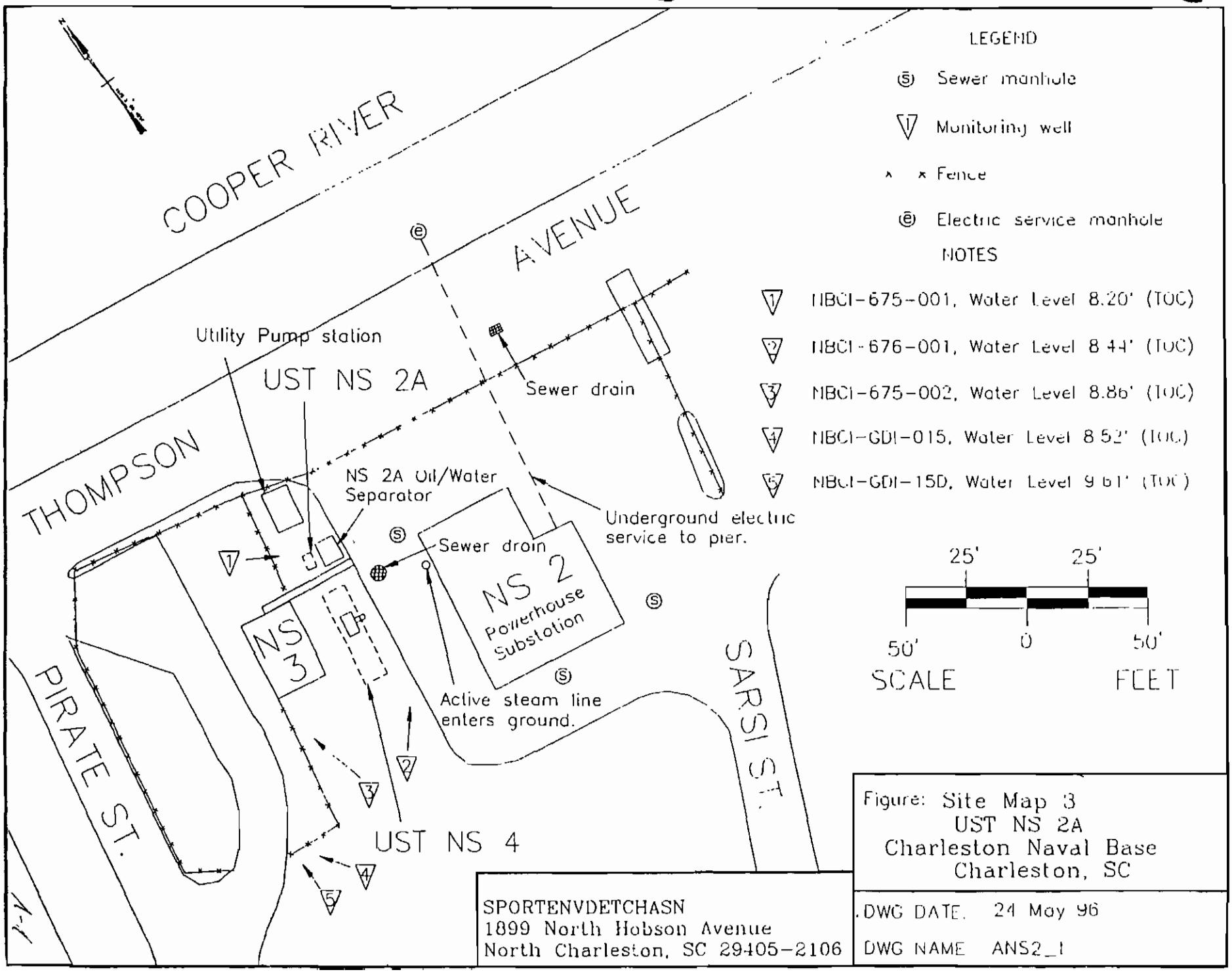
COOPER RIVER
AVENUE
THOMPSON
PIRATE ST.
SARSI ST.
UST NS 2A
Utility Pump station
NS 2A Oil/Water Separator
Sewer drain
Sewer drain
Underground electric service to pier.
NS 2
Powerhouse Substation
NS 3
Active steam line enters ground.
UST NS 4
LEGEND
Sewer manhole
Monitoring well
Fence
Electric service manhole
NOTES
1 NBCI-675-001, Water Level 8.20' (TOC)
2 NBCI-676-001, Water Level 8.44' (TOC)
3 NBCI-675-002, Water Level 8.86' (TOC)
4 NBCI-GDI-015, Water Level 8.52' (TOC)
5 NBCI-GDI-15D, Water Level 9.61' (TOC)
25' 25'
50' 0 50'
SCALE FEET
SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106
Figure: Site Map 3
UST NS 2A
Charleston Naval Base
Charleston, SC
DWG DATE 24 May 96
DWG NAME ANS2_1

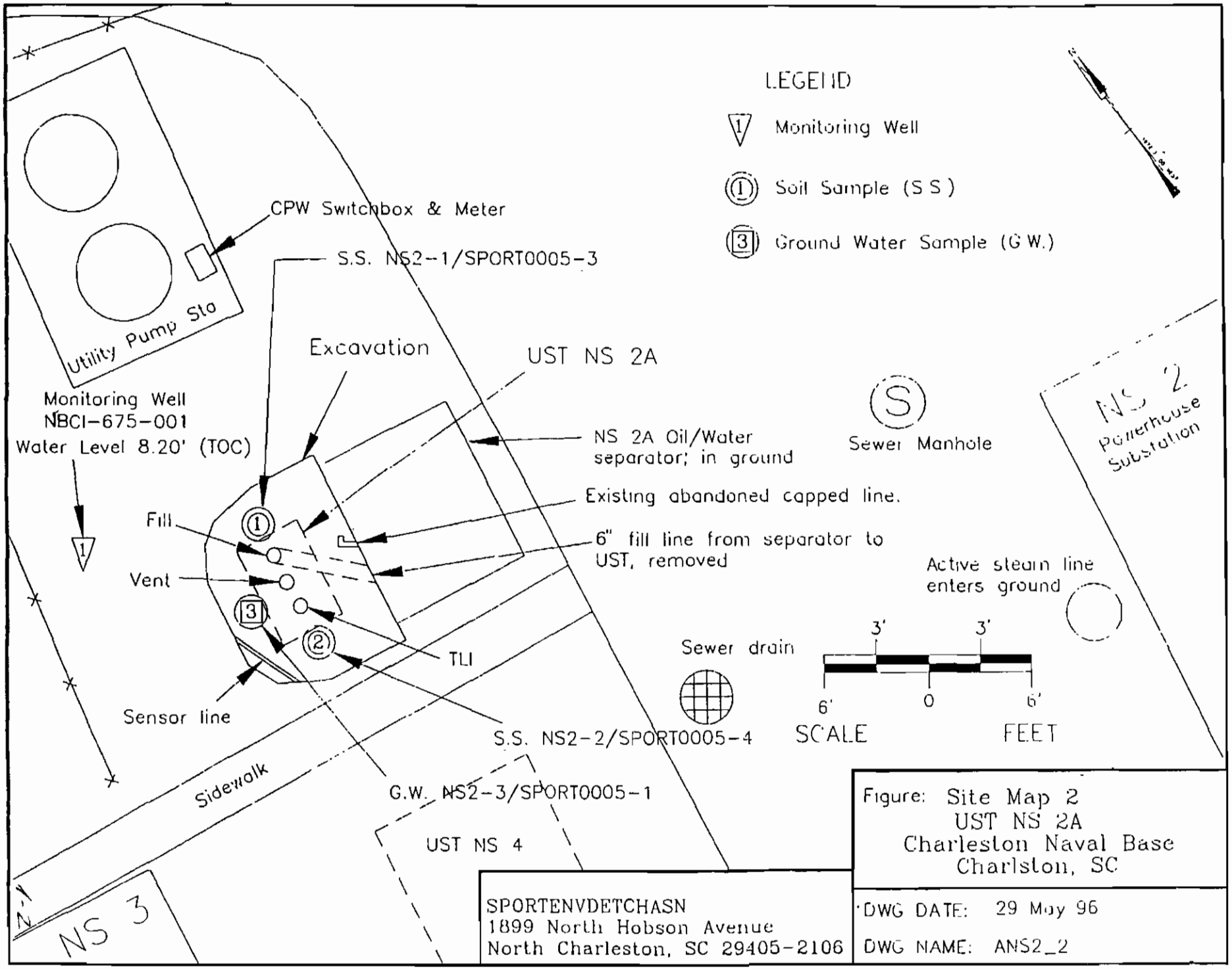

Figure: Site Map 2
UST NS 2A
Charleston Naval Base
Charlston, SC

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

DWG DATE: 29 May 96

DWG NAME: ANS2_2

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CERTIFICATE OF ANALYSIS

NS-2

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: April 19, 1996

Sample ID	: SPORT-0005-1
Lab ID	: 9604264-01
Matrix	: GroundH2O
Date Collected	: 04/12/96
Date Received	: 04/12/96
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.430	1.00	2.00	ug/l	1.0	RMB	04/17/96	1753	83505	1
Ethylbenzene	J	1.30	1.00	2.00	ug/l	1.0					
Toluene	U	0.240	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)		4.40	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene		16.3	5.00	10.0	ug/l	1.0	HNM	04/17/96	1726	83381	2
Acenaphthylene	U	0.00	5.00	10.0	ug/l	1.0					
Anthracene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(a)anthracene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(a)pyrene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(b)fluoranthene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(ghi)perylene	U	0.00	5.00	10.0	ug/l	1.0					
Benzo(k)fluoranthene	U	0.00	5.00	10.0	ug/l	1.0					
Chrysene	U	0.00	5.00	10.0	ug/l	1.0					
Dibenzo(a,h)anthracene	U	0.00	5.00	10.0	ug/l	1.0					
Fluoranthene	U	0.00	5.00	10.0	ug/l	1.0					
Fluorene	U	0.00	5.00	10.0	ug/l	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	5.00	10.0	ug/l	1.0					
Naphthalene	J	5.10	5.00	10.0	ug/l	1.0					
Phenanthrene	U	0.00	5.00	10.0	ug/l	1.0					
Pyrene	U	0.00	5.00	10.0	ug/l	1.0					
Metals Analysis											
Silver		0.818	0.0210	0.200	ug/l	1.0	NRM	04/16/96	0223	83314	N
Arsenic		3.62	0.380	3.00	ug/l	1.0					
Barium		35.7	0.0360	0.300	ug/l	1.0					

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04/19/96 14:15

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M-
Cadmium		0.550	0.0430	0.400	ug/l	1.0					
Chromium		10.3	0.390	3.00	ug/l	1.0					
Lead		8.29	0.0260	0.200	ug/l	1.0					
Selenium		2.03	0.240	2.00	ug/l	1.0					
Mercury	J	0.198	0.0148	0.500	ug/l	1.0	RMJ	04/16/96	1315	83358	N
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	0.160	1.67	10.0	mg/l	1.0	SDW	04/17/96	1430	83426	3

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	DDT	04/15/96	2230	83381	4
ICP Mass Spec	DVW	04/12/96	2030	83314	5
Mercury	RMJ	04/15/96	1730	83358	6

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	67.6	(43.0 - 108.)
Nitrobenzene-d5	M610	55.2	(35.0 - 111.)
p-Terphenyl-d14	M610	61.8	(33.0 - 125.)
Bromofluorobenzene	BTEX-8260	98.0	(80.0 - 128.)
Dibromofluoromethane	BTEX-8260	100.	(67.7 - 135.)
Toluene-d8	BTEX-8260	97.6	(76.8 - 122.)
Bromofluorobenzene	NAP-8260	98.0	(80.0 - 128.)
Dibromofluoromethane	NAP-8260	100.	(67.7 - 135.)
Toluene-d8	NAP-8260	97.6	(76.8 - 122.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 9070A
M 4	EPA 3510
M 5	EPA 3005

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Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-1

M = Method	Method-Description
M 6	EPA 7470

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

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Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-1

GEL Laboratory Certifications EPI Laboratory Certifications

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Analytical Report Specialist

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-3
Lab ID : 9604264-03
Matrix : Soil
Date Collected : 04/12/96
Date Received : 04/12/96
Priority : Rush
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.37	2.74	ug/kg	1.0	IGS	04/15/96	1058	83356	1
Ethylbenzene	U	0.00	1.37	2.74	ug/kg	1.0					
Toluene	U	1.07	1.37	2.74	ug/kg	1.0					
Xylenes (TOTAL)	J	1.44	1.37	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.37	2.74	ug/kg	1.0					
Organic Prep											
Evaporative Loss @ 105 C		27.0	1.00	1.00	wt%	1.0	TNF	04/15/96	1650	83344	2
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	226	452	ug/kg	1.0	HNM	04/18/96	1204	83382	3
Acenaphthylene	U	0.00	226	452	ug/kg	1.0					
Anthracene	U	0.00	226	452	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	226	452	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	226	452	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	226	452	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	226	452	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	226	452	ug/kg	1.0					
Chrysene	U	0.00	226	452	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	226	452	ug/kg	1.0					
Fluoranthene	U	0.00	226	452	ug/kg	1.0					
Fluorene	U	0.00	226	452	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	226	452	ug/kg	1.0					
Naphthalene	U	0.00	226	452	ug/kg	1.0					
Phenanthrene	U	0.00	226	452	ug/kg	1.0					
Pyrene	U	0.00	226	452	ug/kg	1.0					
Metals Analysis											
Mercury	I	0.00501	0.00323	0.200	mg/kg	1.0	RMJ	04/17/96	1948	83362	N

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Silver	U	-74.0	171	685	ug/kg	1.0	NRM	04/17/96	2042	83446	4
Arsenic		5330	127	685	ug/kg	1.0	NRM	04/17/96	2042	83446	4
Barium		14900	4.54	685	ug/kg	1.0					
Cadmium	J	166	6.64	343	ug/kg	1.0					
Chromium		195000	40.8	685	ug/kg	1.0					
Lead		7350	77.4	343	ug/kg	1.0					
Selenium		890	98.0	343	ug/kg	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		429	13.7	50.0	mg/kg	1.0	SDW	04/17/96	1000	83428	5

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	GWL	04/15/96	2100	83382	2
Mercury	RMJ	04/16/96	1800	83362	6
TRACE	DVW	04/16/96	2150	83446	7

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	91.0	(30.0 - 115.)
Nitrobenzene-d5	M610	71.8	(23.0 - 120.)
p-Terphenyl-d14	M610	84.8	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	118.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	120.	(74.0 - 128.)
Toluene-d8	BTEX-8260	99.9	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	118.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	120.	(74.0 - 128.)
Toluene-d8	NAP-8260	99.9	(53.4 - 163.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 3550
M 3	EPA 8270

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Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-3

M = Method	Method-Description
M 4	EPA 6010A
M 5	EPA 9071
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-3

GEL Laboratory Certifications		EPI Laboratory Certifications	
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

ce: NPWC00196 Report Date: April 19, 1996

Sample ID	: SPORT-0005-4
Lab ID	: 9604264-04
Matrix	: Soil
Date Collected	: 04/12/96
Date Received	: 04/12/96
Priority	: Rush
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.14	2.28	ug/kg	1.0	JGS	04/15/96	1630	83356	1
Ethylbenzene	U	0.00	1.14	2.28	ug/kg	1.0					
Toluene	U	0.809	1.14	2.28	ug/kg	1.0					
Xylenes (TOTAL)	U	0.969	1.14	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.14	2.28	ug/kg	1.0					
Organic Prep											
Evaporative Loss @ 105 C		12.0	1.00	1.00	wt%	1.0	TNF	04/15/96	1650	83344	2
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	1880	3760	ug/kg	10.	HNM	04/17/96	1438	83382	3
Acenaphthylene	U	0.00	1880	3760	ug/kg	10.					
Anthracene	U	0.00	1880	3760	ug/kg	10.					
Benzo(a)anthracene	U	0.00	1880	3760	ug/kg	10.					
Benzo(a)pyrene	U	0.00	1880	3760	ug/kg	10.					
Benzo(b)fluoranthene	U	0.00	1880	3760	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	1880	3760	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1880	3760	ug/kg	10.					
Chrysene	U	0.00	1880	3760	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	1880	3760	ug/kg	10.					
Fluoranthene	U	0.00	1880	3760	ug/kg	10.					
Fluorene	U	0.00	1880	3760	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1880	3760	ug/kg	10.					
Naphthalene	U	0.00	1880	3760	ug/kg	10.					
Phenanthrene	U	0.00	1880	3760	ug/kg	10.					
Pyrene	U	0.00	1880	3760	ug/kg	10.					
Metals Analysis											
Mercury	J	0.00823	0.00259	0.200	mg/kg	1.0	RMT	04/17/96	1950	83362	N

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-4

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Silver	U	-5.58	130	521	ug/kg	1.0	NRM	04/17/96	2046	83446	4
Arsenic		3640	96.9	521	ug/kg	1.0	NRM	04/17/96	2046	83446	4
Barium		48200	3.45	521	ug/kg	1.0					
Cadmium	J	65.3	5.05	261	ug/kg	1.0					
Chromium		39400	31.1	521	ug/kg	1.0					
Lead		14800	58.9	261	ug/kg	1.0					
Selenium		632	74.5	261	ug/kg	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		291	11.4	50.0	mg/kg	1.0	SDW	04/17/96	1000	83428	5

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	GWL	04/15/96	2100	83382	2
Mercury	RMJ	04/16/96	1800	83362	6
TRACE	DVW	04/16/96	2150	83446	7

Comments:
A dilution was required for Extractable Organics due to matrix interference. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	106.	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	120.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	113.	(74.0 - 128.)
Toluene-d8	BTEX-8260	102.	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	120.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	113.	(74.0 - 128.)
Toluene-d8	NAP-8260	102.	(53.4 - 163.)

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GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-4

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 3550
M 3	EPA 8270
M 4	EPA 6010A
M 5	EPA 9071
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934

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GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: April 19, 1996

Sample ID : SPORT-0005-4

GEL Laboratory Certifications		EPI Laboratory Certifications	
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Analytical Report Specialist

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VI. PIPING INFORMATION

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6
A. Construction Material	Steel					
B. Distance from UST to Dispenser	6'					
C. Number of Dispensers	1 See note 1					
D. Type of System P/S	See note 1					
E. Was Piping Removed from the Ground? Y/N	Y					
F Visible Corrosion or Pitting Y/N	Y					
G. Visible Holes Y/N	N					
H Age	Unk.					

Note 1: UST NS3-1 was a gravity fed holding tank for an oil water separator.

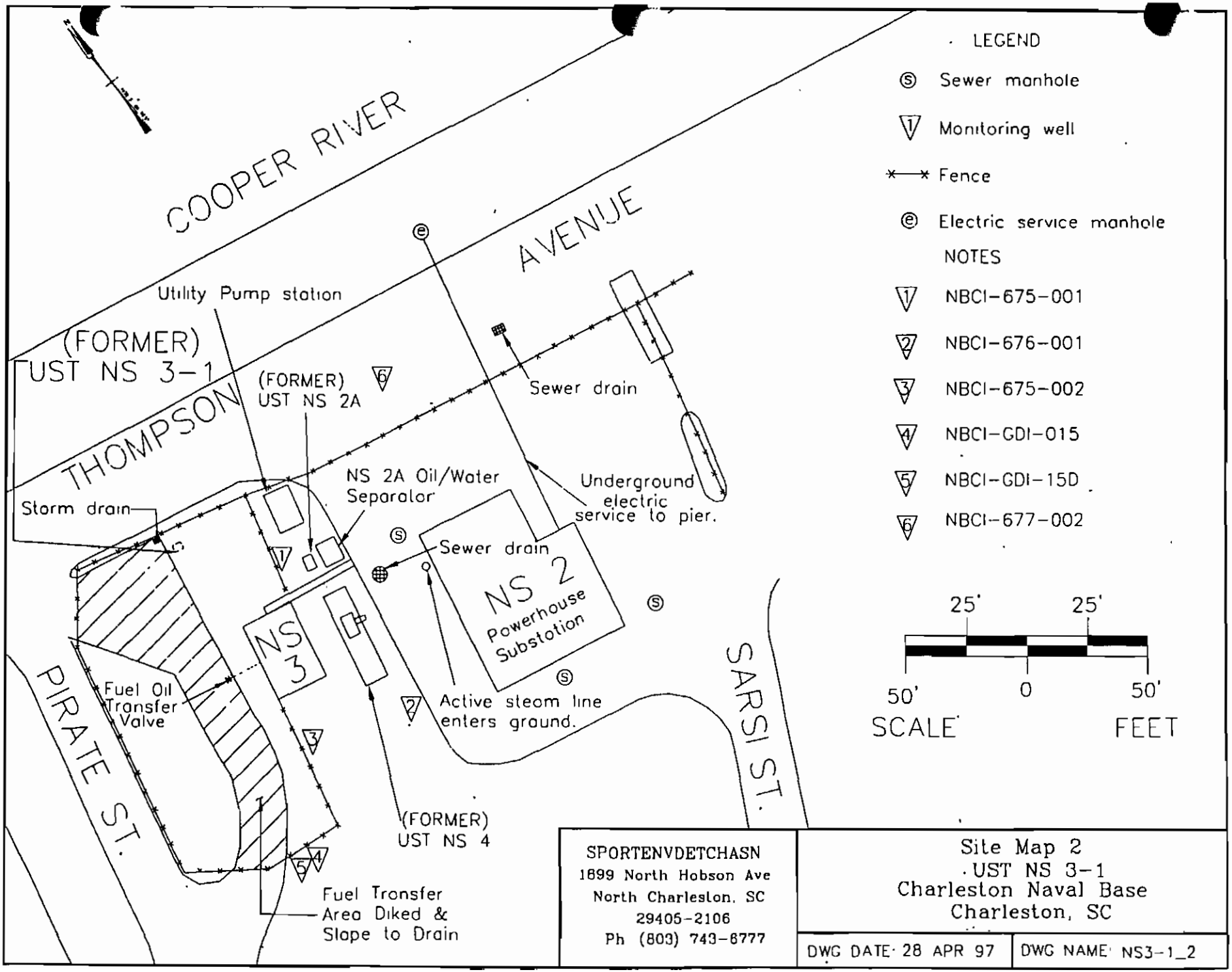
I If any corrosion, pitting, or holes were observed, describe the location and extent for each line.

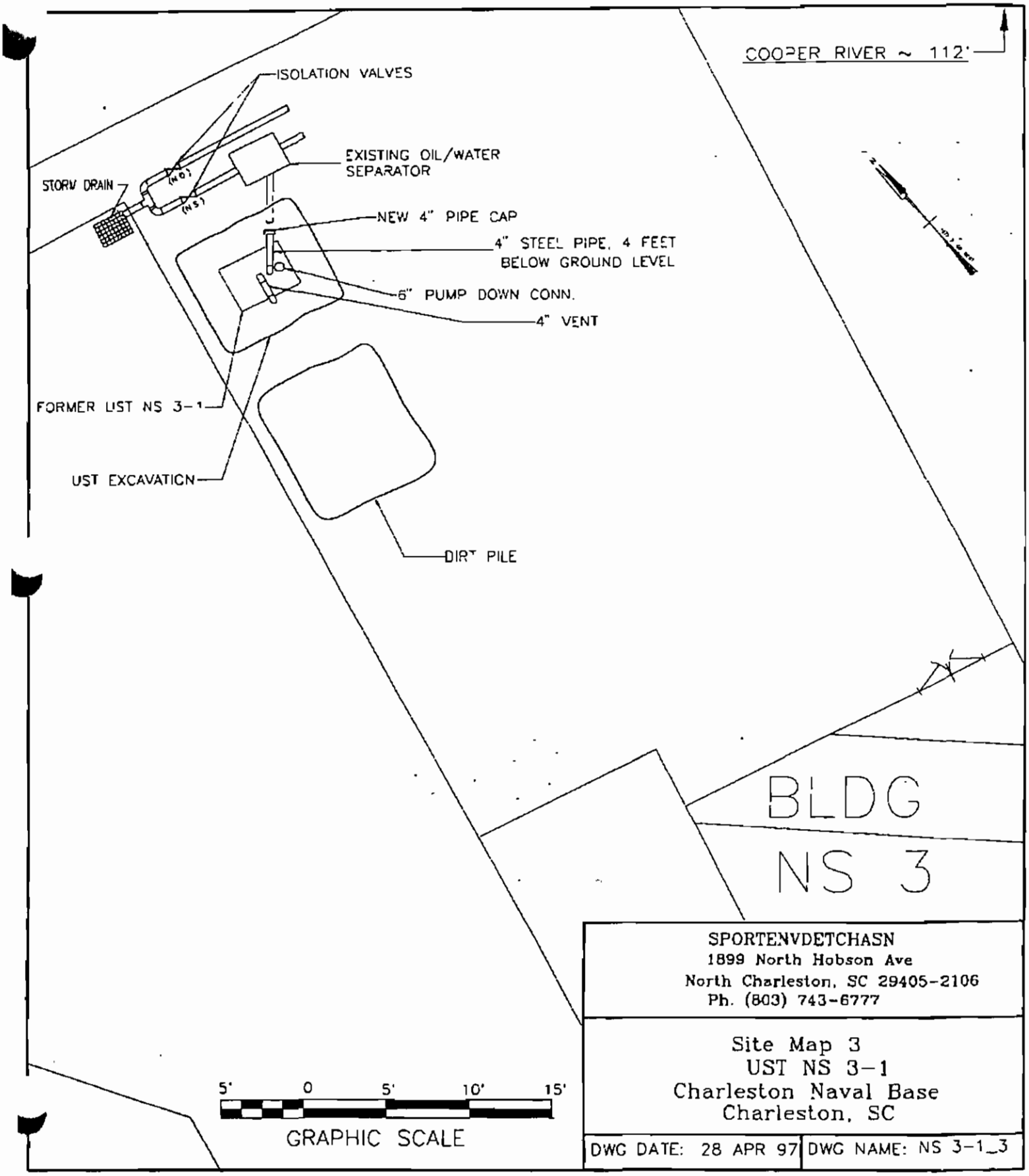
The piping had mild corrosion and pitting throughout its length, but no holes were found.

VII. BRIEF SITE DESCRIPTION AND HISTORY

UST NS 3-1 was a waste oil holding tank for an oil water separator on the grounds of Building NS3 on Naval Base Charleston. The building was a fuel pumping transfer station. The fuel transfer area was diked and sloped towards a storm drain in the east corner. The storm drain was connected to the storm sewer by two sets of valves and piping. The valves directed the storm water runoff either directly to the storm sewer during normal operations or through the oil water separator to the storm sewer in the case of a spill at the fuel transfer area.

Building NS 3 is a former pump house. The site is located near Area of Concern (AOC) 675, Fuel Storage tank NS-4; and AOC 677, the Grounds of Building NS-2. These sites are under investigation by the Navy and will be assessed as part of the Navy's Resource Conservation and Recovery Act (RCRA) Facility Investigation.

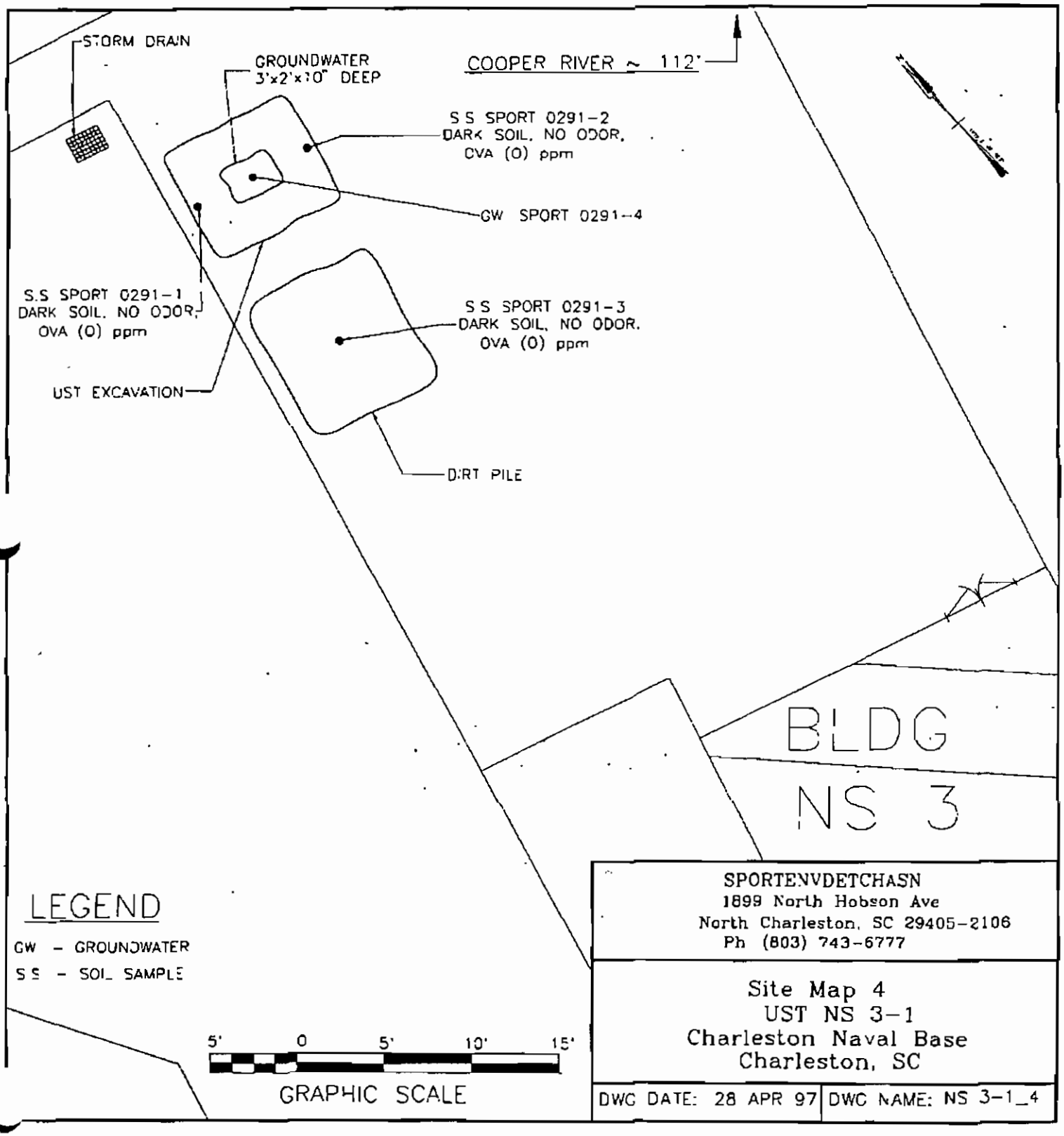

COOPER RIVER
AVENUE
THOMPSON
PIRATE ST.
SARSI ST.
(FORMER)
UST NS 3-1
Utility Pump station
(FORMER)
UST NS 2A
Sewer drain
NS 2A Oil/Water
Separator
Underground
electric
service to pier.
Storm drain
Sewer drain
NS 2
Powerhouse
Substation
NS
3
Fuel Oil
Transfer
Valve
Active steam line
enters ground.
(FORMER)
UST NS 4
Fuel Transfer
Area Diked &
Slope to Drain
LEGEND
Sewer manhole
Monitoring well
Fence
Electric service manhole
NOTES
NBCI-675-001
NBCI-676-001
NBCI-675-002
NBCI-GDI-015
NBCI-GDI-15D
NBCI-677-002
25'
25'
50'
0
50'
SCALE
FEET
SPORTENVDETCHASN
1899 North Hobson Ave
North Charleston, SC
29405-2106
Ph (803) 743-6777
Site Map 2
UST NS 3-1
Charleston Naval Base
Charleston, SC
DWG DATE: 28 APR 97
DWG NAME: NS3-1_2



SPORTENVDETCHASN
1899 North Hobson Ave
North Charleston, SC 29405-2106
Ph. (803) 743-6777

Site Map 3
UST NS 3-1
Charleston Naval Base
Charleston, SC

DWG DATE: 28 APR 97 | DWG NAME: NS 3-1_3



SPORTENVDETCHASN
1899 North Hobson Ave
North Charleston, SC 29405-2106
Ph (803) 743-6777

Site Map 4
UST NS 3-1
Charleston Naval Base
Charleston, SC

DWG DATE: 28 APR 97 | DWG NAME: NS 3-1_4

0 FM 1959
OUSTON, TX 77034
(3) 922-7000 Tel
(3) 481-0069 Fax

Chain of Custody Record

Document 05103-3001/3001 Delivery order # 0295

Anacon Log Number: 1187

Contact Person: Veronica Greene

Phone Number: (803) 743-5519

Fax Number: (803) 743-1475

Due Date: 4-21-95

Turn Around Time: 7 DAYS

Charleston Naval Shipyard
t: Code 106.2 Bldg. 76
1351 First Street
Charleston, SC 29408-2020

8/01
10/31/32

Delivered By:

Custody Seal (Y/N):

Sample Temperature:

Sampled By: Biel (Please Print)

Type of Analysis Requested

Lab Nr.	Sample Matrix	Date/Time Collected	Number of Containers	Client Sample ID	Arsenic	Cadmium	Chromium	Lead	Total Halogens (Tox)	PCB's	Flashpt.	pH	TCLP Benzene	TCLP Arsenic	TCLP Barium	TCLP Cadmium	TCLP Chromium	TCLP Lead	TCLP Mercury	TCLP Silver	Remarks/ Preservatives
7017	WATER	4-13-95/1020	2	5054 UST00052	✓	✓	✓	✓	✓	✓	✓	✓									
6177	Oil	4-13-95/0830	2	5055 UST00049						✓			✓	✓	✓	✓	✓	✓	✓	✓	

No preservative added to samples for metals parameters. Preservative added by Anacon
P.M. Dan
4-14-95

UST00050

UST00050

Relinquished By: W.D. Vogel	Date: 4/13/95	Time: 1110	Relinquished By:		Date: 4-0-95	Time: 1615	
Accepted By: RM Rogers	Date: 4-13-95	Time: 1110	Accepted By: P.M. Dan		Date: 4-14-95	Time: 1100	
Relinquished By:	Date: 4-13-95	Time: 1540	Relinquished By:		Date:	Time:	
Accepted By:	Date: 4-13-95	Time: 1541	Accepted By:		Date:	Time:	

acon, Inc.
0 FM 1959
uston, Tx 77034
3)922-7000

N53-1

ANACON, INC.
M 1959
STON, TX 77034
(713) 922-7000

5054.XLS

ANALYTICAL AND CONSULTING LABORATORIES
Environmental, Chemical, and Petroleum

Charleston Naval SHYD
Environmental Office
Code 106.2, Bldg 76
Charleston, SC 29408

ANACON NO.	11878
DATE COLLECTED	4/13/95
DATE RECEIVED	4/14/95
DATE OF REPORT	4/28/95
DELIVERY ORDER	0295
DOCUMENT NO	5103-3001/3002
Contract No. N00612-93-D-T128	

Sample ID 5054 — Sample Matrix Aqueous liquid

	Parameter	Method number	Date analyzed	Analyzed by	Reporting Limit mg/l	Result mg/l
1	Arsenic	200.7	4/19/95	MB	0.05	<0.05
2	Chromium	200.7	4/19/95	MB	0.05	<0.05
3	Cadmium	200.7	4/19/95	MB	0.05	<0.05
4	Lead	200.7	4/19/95	MB	0.05	<0.05
5	TOX	9040	4/27/95	SB	1.0	7.8

QA/QC Officer Tim Corum — Tim Corum

Lab Manager — Ted Yen

1-20

5054-FL.XLS

ANACON, INC.
0 FM 1959
OUSTON, TX 77034
(713) 922-7000

ANALYTICAL AND CONSULTING LABORATORIES
Environmental, Chemical, and Petroleum

Charleston Naval SHYD
Environmental Office
Code 106.2, Bldg 76
Charleston, SC 29408

ANACON NO.	11878
DATE COLLECTED	4/13/95
DATE RECEIVED	4/14/95
DATE OF REPORT	4/28/95
DELIVERY ORDER	0295
DOCUMENT NO	5103-3001/3002
Contract No. N00612-93-D-T128	

Sample ID 5054 Sample Matrix Aqueous liquid

FLASH POINT

Parameter	METHOD	Result degree F
Flash Point	1010	>200
pH	9040	9.5

QA/QC Officer Tim Corum
Tim Corum

Lab Manager
Ted Yen

1-28

NACON, INC.
1959
ON, TX 77034
(713) 922-7000

:5054-PCB.XLS

ANALYTICAL AND CONSULTING LABORATORIES
Environmental, Chemical, and Petroleum

Charleston Naval SHYD
Environmental Office
Code 106.2, Bldg 76
Charleston, SC 29408

ANACON NO.	11878
DATE COLLECTED	4/13/95
DATE RECEIVED	4/14/95
DATE OF REPORT	4/28/95
DELIVERY ORDER	0295
DOCUMENT NO	5103-3001/3002
Contract No. N00612-93-D-T128	

SAMPLE ID 5054 Sample Matrix Aqueous liquid

PCB ANALYSIS

Parameter	CAS #	Report limit, mg/l	Result, mg/l
AROCLOR-1016	12674-11-2	0.10	< 0.10
AROCLOR-1221	11104-28-2	0.10	< 0.10
AROCLOR-1232	11141-16-5	0.10	< 0.10
AROCLOR-1242	53469-21-9	0.10	< 0.10
AROCLOR-1248	12672-29-6	0.10	< 0.10
AROCLOR-1254	11097-69-1	0.10	< 0.10
AROCLOR-1260	11096-82-5	0.10	< 0.10

Method	608
Date Extracted	4/19/95
Date Concentrated	4/19/95
Date Analyzed	4/20/95
Analyzed by	LG

QA/QC Manager Tim Corum PMD
Tim Corum

Lab Manager
Ted Yen

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997 NS-3

Sample ID : SPORT0291-1
Lab ID : 9701179-01
Matrix : Soil
Date Collected : 01/10/97
Date Received : 01/10/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	01/15/97	1956	96314	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene		2.58	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	165	330	ug/kg	1.0	JCB	01/14/97	2019	96115	2
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	165	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	U	0.00	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene	J	310	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene	U	0.00	165	330	ug/kg	1.0					
Pyrene	J	248	165	330	ug/kg	1.0					
Metals Analysis											
Mercury		0.323	0.00221	0.200	mg/kg	1.0	RMJ	01/15/97	1031	96172	N
Silver	U	13.2	40.4	952	ug/kg	2.0	NRM	01/15/97	1044	96155	
Arsenic		3050	263	952	ug/kg	2.0					

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874'
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		12900	23.5	952	ug/kg	2.0					
Cadmium	J	199	19.9	476	ug/kg	2.0	NRM	01/15/97	1044	96155	3
Chromium		18400	59.1	952	ug/kg	2.0					
Lead		15700	130	476	ug/kg	2.0					
Selenium		487	217	476	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	-80.0	10.0	50.0	mg/kg	1.0	SLR	01/14/97	1200	96153	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	MS	01/13/97	1600	96115	5
Mercury	CRB	01/14/97	1900	96172	6
TRACE	CRB	01/14/97	1400	96155	7

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	78.2	(30.0 - 115.)
Nitrobenzene-d5	M610	64.2	(23.0 - 120.)
p-Terphenyl-d14	M610	75.6	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	129.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	111.	(63.4 - 136.)
Toluene-d8	BTEX-8260	119.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	129.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	111.	(63.4 - 136.)
Toluene-d8	NAP-8260	119.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-1

M = Method	Method-Description
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
ndicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
indicates that the analyte was not detected at a concentration greater than the detection limit.
indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	231	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-2
Lab ID : 9701179-02
Matrix : Soil
Date Collected : 01/10/97
Date Received : 01/10/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	01/16/97	1140	96314	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.250	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	163	330	ug/kg	1.0	JCB	01/15/97	1656	96115	2
Acenaphthylene	U	0.00	163	330	ug/kg	1.0					
Anthracene	U	0.00	163	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	163	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	163	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	163	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	163	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	163	330	ug/kg	1.0					
Chrysene	U	0.00	163	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	163	330	ug/kg	1.0					
Fluoranthene	U	0.00	163	330	ug/kg	1.0					
Fluorene	U	0.00	163	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	163	330	ug/kg	1.0					
Naphthalene	U	0.00	163	330	ug/kg	1.0					
Phenanthrene	U	0.00	163	330	ug/kg	1.0					
Pyrene	U	0.00	163	330	ug/kg	1.0					
Metals Analysis											
Mercury		0.260	0.00229	0.200	mg/kg	1.0	RMJ	01/15/97	1034	96172	N
Silver	U	21.4	40.0	944	ug/kg	2.0	NRM	01/15/97	1049	96155	
Arsenic		3490	260	944	ug/kg	2.0					

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87[illegible]
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: January 21, 1997 |

Sample ID : SPORT0291-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		12600	23.3	944	ug/kg	2.0					
Cadmium	J	226	19.7	472	ug/kg	2.0	NRM	01/15/97	1049	96155	3
Chromium		17800	58.6	944	ug/kg	2.0					
Lead		20500	129	472	ug/kg	2.0					
Selenium		609	215	472	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		290	10.0	50.0	mg/kg	1.0	SLR	01/14/97	1200	96153	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	MS	01/13/97	1600	96115	5
Mercury	CRB	01/14/97	1900	96172	6
TRACE	CRB	01/14/97	1400	96155	7

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	77.9	(30.0 - 115.)
Nitrobenzene-d5	M610	68.5	(23.0 - 120.)
p-Terphenyl-d14	M610	79.7	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	124.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	112.	(63.4 - 136.)
Toluene-d8	BTEX-8260	117.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	124.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	112.	(63.4 - 136.)
Toluene-d8	NAP-8260	117.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550

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Laboratory Certifications

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FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-2

M = Method	Method-Description
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID	: SPORT0291-3
Lab ID	: 9701179-03
Matrix	: Soil
Date Collected	: 01/10/97
Date Received	: 01/10/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	01/16/97	1211	96314	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.405	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	662	1320	ug/kg	4.0	JCB	01/14/97	2127	96115	2
Acenaphthylene	U	0.00	662	1320	ug/kg	4.0					
Anthracene	U	0.00	662	1320	ug/kg	4.0					
Benzo(a)anthracene	U	0.00	662	1320	ug/kg	4.0					
Benzo(a)pyrene	U	0.00	662	1320	ug/kg	4.0					
Benzo(b)fluoranthene	U	0.00	662	1320	ug/kg	4.0					
Benzo(ghi)perylene	U	0.00	662	1320	ug/kg	4.0					
Benzo(k)fluoranthene	U	0.00	662	1320	ug/kg	4.0					
Chrysene	U	0.00	662	1320	ug/kg	4.0					
Dibenzo(a,h)anthracene	U	0.00	662	1320	ug/kg	4.0					
Fluoranthene	U	0.00	662	1320	ug/kg	4.0					
Fluorene	U	0.00	662	1320	ug/kg	4.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	662	1320	ug/kg	4.0					
Naphthalene	U	0.00	662	1320	ug/kg	4.0					
Phenanthrene	U	0.00	662	1320	ug/kg	4.0					
Pyrene	U	0.00	662	1320	ug/kg	4.0					
Metals Analysis											
Mercury	J	0.0937	0.00232	0.200	mg/kg	1.0	RMJ	01/15/97	1036	96172	N
Silver	U	-7.44	41.6	980	ug/kg	2.0	NRM	01/15/97	1053	96155	3
Arsenic		4070	270	980	ug/kg	2.0					

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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		11500	24.2	980	ug/kg	2.0					
Cadmium	J	142	20.5	490	ug/kg	2.0	NRM	01/15/97	1053	96155	3
Chromium		14400	60.9	980	ug/kg	2.0					
Lead		8630	134	490	ug/kg	2.0					
Selenium		499	223	490	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		820	10.0	50.0	mg/kg	1.0	SLR	01/14/97	1200	96153	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	MS	01/13/97	1600	96115	5
Mercury	CRB	01/14/97	1900	96172	6
TRACE	CRB	01/14/97	1400	96155	7

Comments:
Volatile Organics contained matrix interferences.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	94.2	(30.0 - 115.)
Nitrobenzene-d5	M610	63.0	(23.0 - 120.)
p-Terphenyl-d14	M610	93.4	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	121.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	108.	(63.4 - 136.)
Toluene-d8	BTEX-8260	115.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	121.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	108.	(63.4 - 136.)
Toluene-d8	NAP-8260	115.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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FL	E87156/87294	E87472/3
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-3

M = Method	Method-Description
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
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STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 22, 1997

Sample ID	: SPORT0291-4
Lab ID	: 9701179-04
Matrix	: GroundH2O
Date Collected	: 01/10/97
Date Received	: 01/10/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	RMB	01/17/97	1729	96414	1
Ethylbenzene	U	0.00	1.00	2.00	ug/l	1.0					
Toluene		7.40	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	6.75	13.5	ug/l	1.0	RLC	01/21/97	1221	96454	2
Acenaphthylene	U	0.00	6.75	13.5	ug/l	1.0					
Anthracene	U	0.00	6.75	13.5	ug/l	1.0					
Benzo(a)anthracene	U	0.00	6.75	13.5	ug/l	1.0					
Benzo(a)pyrene	U	0.270	6.75	13.5	ug/l	1.0					
Benzo(b)fluoranthene	U	0.486	6.75	13.5	ug/l	1.0					
Benzo(ghi)perylene	U	0.00	6.75	13.5	ug/l	1.0					
Benzo(k)fluoranthene	U	0.00	6.75	13.5	ug/l	1.0					
Chrysene	U	0.00	6.75	13.5	ug/l	1.0					
Dibenzo(a,h)anthracene	U	0.00	6.75	13.5	ug/l	1.0					
Fluoranthene	U	1.22	6.75	13.5	ug/l	1.0					
Fluorene	U	0.00	6.75	13.5	ug/l	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	6.75	13.5	ug/l	1.0					
Naphthalene	U	0.00	6.75	13.5	ug/l	1.0					
Phenanthrene	U	0.00	6.75	13.5	ug/l	1.0					
Pyrene	U	0.824	6.75	13.5	ug/l	1.0					
Metals Analysis											
Mercury		14.7	0.0592	0.800	ug/l	1.0	RMJ	01/15/97	1453	96184	N
Silver	J	3.69	0.424	10.0	ug/l	1.0	NRM	01/15/97	1147	96152	3
Arsenic		411	2.76	10.0	ug/l	1.0					

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SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 22, 1997

Sample ID : SPORT0291-4

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		1510	0.247	10.0	ug/l	1.0					
Cadmium		70.8	0.209	5.00	ug/l	1.0	NRM	01/15/97	1147	96152	3
Chromium		1470	0.621	10.0	ug/l	1.0					
Lead		1850	1.36	5.00	ug/l	1.0					
Selenium	U	-6.21	2.28	5.00	ug/l	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		2.78	2.00	2.00	mg/l	1.0	SLR	01/16/97	1100	96358	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	TSD	01/17/97	1100	96454	5
Mercury	RMJ	01/14/97	1700	96184	6
TRACE	FGD	01/14/97	1300	96152	7

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	65.2	(43.0 - 108.)
Nitrobenzene-d5	M610	0.00*	(35.0 - 111.)
p-Terphenyl-d14	M610	52.6	(33.0 - 125.)
Bromofluorobenzene	BTEX-8260	92.4	(73.8 - 128.)
Dibromofluoromethane	BTEX-8260	78.8	(63.9 - 139.)
Toluene-d8	BTEX-8260	111.	(77.1 - 121.)
Bromofluorobenzene	NAP-8260	92.4	(73.8 - 128.)
Dibromofluoromethane	NAP-8260	78.8	(63.9 - 139.)
Toluene-d8	NAP-8260	111.	(77.1 - 121.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9070A
M 5	EPA 3510

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FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 22, 1997

Sample ID : SPORT0291-4

M = Method	Method-Description
M 6	EPA 7470
M 7	EPA 3005

Notes:
The qualifiers in this report are defined as follows:
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' indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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STATE	GEL	EPI
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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID	: SPORT0291-5
Lab ID	: 9701179-05
Matrix	: GroundH2O
Date Collected	: 01/10/97
Date Received	: 01/10/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	RMB	01/16/97	2028	96414	1
Ethylbenzene	U	0.00	1.00	2.00	ug/l	1.0					
Toluene	U	0.00	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	95.2	(73.8 - 128.)
Dibromofluoromethane	BTEX-8260	92.8	(63.9 - 139.)
Toluene-d8	BTEX-8260	108.	(77.1 - 121.)
Bromofluorobenzene	NAP-8260	95.2	(73.8 - 128.)
Dibromofluoromethane	NAP-8260	92.8	(63.9 - 139.)
Toluene-d8	NAP-8260	108.	(77.1 - 121.)

M = Method	Method-Description
M 1	EPA 8260

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8.
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-5

M = Method	Method-Description

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID	: SPORT0291-6
Lab ID	: 9701179-06
Matrix	: Soil
Date Collected	: 01/10/97
Date Received	: 01/10/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JGS	01/16/97	1344	96314	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.250	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	113.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	108.	(63.4 - 136.)
Toluene-d8	BTEX-8260	110.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	113.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	108.	(63.4 - 136.)
Toluene-d8	NAP-8260	110.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: January 21, 1997

Sample ID : SPORT0291-6

M = Method	Method-Description

Notes:
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10.3 AOC 675, Fuel Oil Storage, (Facility NS-4); AOC 676, Former Incinerator (Building NS-2); and AOC 677, Grounds, (Building NS-2)

AOC 675 is a 25,000-gallon UST (Facility NS-4), installed in 1952. A 495-gallon oil/water separator is located north of this UST. This UST stored fuel oil for a boiler house (Building NS-2) built in 1958. No. 5 fuel oil was used until 1991; from 1991 on, the UST stored cleaner-burning No. 2 fuel oil. The AOC 675 area was also used to refuel seaplanes, and petroleum contamination may have resulted from this activity. Actual dates of seaplane operations are unknown, but this activity was discontinued in the mid 1950s.

Former UST NS2A was an unregulated 560 gallon underground waste oil holding tank for an oil/water separator. It was located in a grass covered patch of ground between Buildings NS 2 and NS 3. This tank was closed by removal in April 1996. During removal it was noted that the tank was intact with no holes or pitting. The oil/water separator which was associated with the waste oil UST and is currently identified as NS 2A is located immediately east of the former waste oil UST. The oil/waste separator was left in place and its lines were plugged and capped.

Former UST NS 3-1 was a 280 gallon waste oil holding tank and oil/water separator located just north of Building NS 3. Building NS 3 is a former fuel pumping transfer station located just west of NS 4. The fuel transfer area was diked and sloped towards a storm drain in the east corner. The storm drain was connected to the storm sewer by two sets of valves and piping. The valves directed the storm water runoff directly to the storm sewer during normal operations or through the oil/water separator to the storm sewer in the event of a spill in the fuel transfer area.

AOC 676 is the location of a former incinerator which operated near the current location of Building NS-2. The incinerator was used during the 1940s: it is shown on base maps from 1947 to 1955. No records exist concerning its design, operation, or demolition. The materials burned

in the incinerator are unknown but may have included flammable hazardous materials (paints, solvents, and waste oils), as well as paper, wood, and general trash.

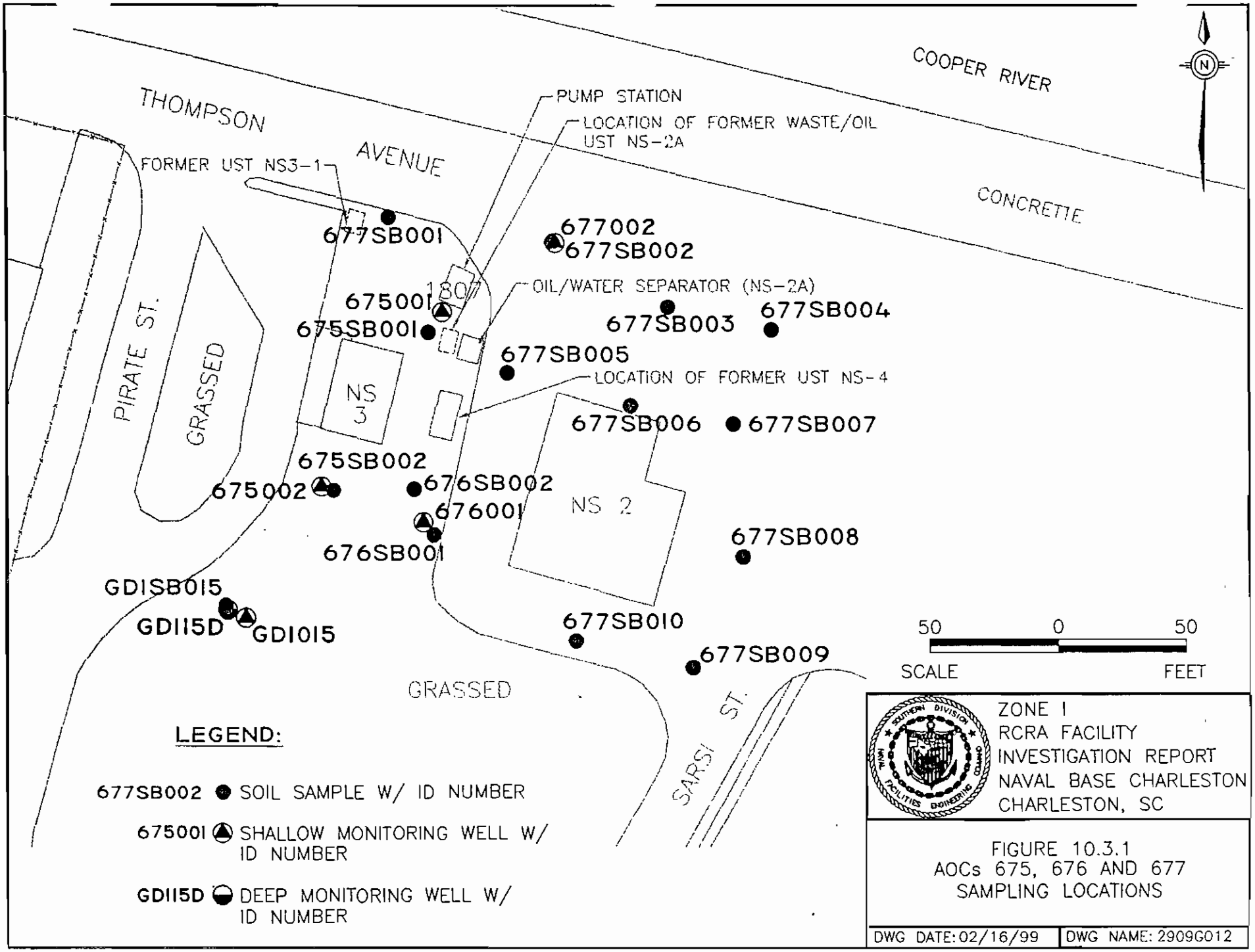
AOC 677 consists of the grounds surrounding Building NS-2, a boiler house. The facility was built in 1958; in 1977, the boilers were replaced with newer ones. There is a documented history of fuel oil spills at this site, ranging in size from 3 to 500 gallons. Fuel for the boilers were stored in the nearby 25,000-gallon UST at Facility NS-4 (AOC 675) as described above. Prior to 1979 the sump pump for the boilers discharged to the base storm sewer system. After 1979, the sump pump discharged to the sanitary sewer system via an oil/water separator. In 1990, the boilers at were connected to the basewide steam system to provide backup power for the central power plant.

Materials of concern at AOCs 675 and 677 include residual fuel, diesel fuel, aviation gasoline, and lead as an additive in the fuel. Materials of concern at AOC 676 include ash potentially high in metals, and petroleum products. Potential receptors include future users involved in invasive and noninvasive activities. The ecology of the Cooper River is also a potential receptor.

To fulfill CSI objectives for AOCs 675 and 676, and RFI objectives for AOC 677, soil, sediment, and groundwater were sampled in accordance with the approved final RFI work plan and Section 3 of this report.

10.3.1 Soil Sampling and Analysis

Soil was sampled in one round at the combined AOCs from the locations shown on Figure 10.3.1. The approved final RFI work plan proposed 13 soil borings, with samples collected from the upper- and lower-intervals. During the field investigation, 14 soil borings were advanced. Upper-interval samples were collected at all borings; however, only eight lower-interval samples were collected


COOPER RIVER
THOMPSON AVENUE
CONCRETTE
PUMP STATION
LOCATION OF FORMER WASTE/OIL UST NS-2A
FORMER UST NS3-1
677SB001
677002
677SB002
OIL/WATER SEPARATOR (NS-2A)
675001
675SB001
677SB003
677SB004
677SB005
LOCATION OF FORMER UST NS-4
PIRATE ST.
GRASSED
NS 3
677SB006
677SB007
675SB002
675002
676SB002
676001
676SB001
NS 2
677SB008
GDISB015
GDI15D
GDI015
677SB010
677SB009
GRASSED
SARSI ST.
50 0 50
SCALE FEET
LEGEND:
677SB002 SOIL SAMPLE W/ ID NUMBER
675001 SHALLOW MONITORING WELL W/ ID NUMBER
GDI15D DEEP MONITORING WELL W/ ID NUMBER
ZONE I
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC
FIGURE 10.3.1
AOCs 675, 676 AND 677
SAMPLING LOCATIONS
DWG DATE: 02/16/99
DWG NAME: 2909G012

because the water table was encountered at less than 5 feet bgs. All samples were analyzed for VOCs, SVOCs, pesticides/PCBs, cyanide, and metals. Samples from AOC 677 were also analyzed for organotins. One upper-interval sample from AOC 677 (677SB01001) was analyzed for physical parameters. Three samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters (except that duplicate sample 677CB01001 was not analyzed for cyanide). Table 10.3.1 summarizes soil sampling at the combined AOCs.

Grid soil samples GDISB01501 and GDISB01502 were collected in the area of the combined AOCs and analyzed for the standard suite of parameters. Results of these analyses are discussed together with analytical results for the combined AOCs.

Table 10.3.1
AOCs 675/676/677
Soil Sampling Summary

Sampling Round	Sampling Date	Samples Collected	Sample Analyses	Comments
1	02/21/95 02/27/95 02/28/95	Upper - 14 (13)	Standard Suite, Organotins	Organotins were collected on nine upper-interval samples (677SB00201 through 677SB01001) for site characterization.
		Lower - 8 (13)	Standard Suite, Organotins	Six lower-interval samples were not collected due to a water table at less than 5 feet bgs. Organotins were collected on six lower-interval samples (677SB00202, 677SB00302, 677SB00402, 677SB00602, 677SB00702, and 677SB00902) for site characterization.
		Duplicate - 3	Appendix IX	677CB00101/677CB00201/677CB01001*
2	09/07/95	Upper - 1	Physical Parameters	Sample for physical parameters collected at boring location 677SB01001.

Notes:
( ) = Parenthesis indicate number of samples proposed in the RFI work plan.
* = 677CB01001 was not analyzed for cyanide.
Standard Suite = VOCs, SVOCs, metals, cyanide, pesticides, and PCBs at DQO Level III.
Appendix IX = Standard Suite, plus hex-chrome, dioxins, herbicides, and OP pesticides at DQO Level IV.
Physical parameters analyses included CEC, chloride, sulfur, ammonia, nitrate/nitrite, phosphorus, TOC and total moisture.

10.3.2 Nature and Extent of Contamination in Soil

Organic compound analytical results for soil are summarized in Table 10.3.2. Inorganic compound analytical results are summarized in Table 10.3.3. Table 10.3.4 summarizes all analytes detected in soil at AOCs 675/676/677. Appendix D contains the complete analytical data report for all samples collected in Zone I.

Volatile Organic Compounds in Soil

Three VOCs were detected in soil samples at the combined AOCs. Acetone, acetonitrile, and toluene were detected in surface and subsurface soil samples at concentrations far below their RBCs and SSLs.

Table 10.3.2
AOCs 675/676/677
Organic Compound Analytical Results for Soil (μg/kg)

Parameter	Sample Interval	Detection Frequency	Detection Range	Mean	RBC (upper) SSL (lower)	Number of Samples Exceeding RBC or SSL
Volatile Organic Compounds						
Acetone	Upper	3/14	32.0 - 72.0	52.0	780,000	0
	Lower	4/8	17.0 - 200	76.8	8,000	0
Acetonitrile	Upper	1/14	100	100	47,000	0
	Lower	2/8	81.0 - 150	116	440	0
Toluene	Upper	10/14	1.0 - 6.0	2.7	1,600,000	0
	Lower	5/8	2.0 - 23.0	10.8	6,000	0
Semivolatile Organic Compounds						
BEQs	Upper	3/14	0.047 - 478	161	87	1
	Lower	3/8	17.5 - 252	118	1600	0
Benzo(a)anthracene	Upper	2/14	41.0 - 720	381	870	0
	Lower	3/8	53.0 - 480	228	800	0
Benzo(a)pyrene	Upper	1/14	330	330	87	1
	Lower	2/8	51.0 - 180	116	4,000	0
Benzo(b)fluoranthene	Upper	1/14	670	670	870	0
	Lower	3/8	110 - 220	163	2,500	0
Benzo(k)fluoranthene	Upper	1/14	840	840	8,700	0
	Lower	3/8	110 - 190	147	25,000	0
Chrysene	Upper	3/14	44.0 - 640	244	87,000	0
	Lower	3/8	62.0 - 420	204	80,000	0

Table 10.3.2
AOCs 675/676/677
Organic Compound Analytical Results for Soil (μg/kg)

Parameter	Sample Interval	Detection Frequency	Detection Range	Mean	RBC (upper) SSL (lower)	Number of Samples Exceeding RBC or SSL
Dibenzofuran	Upper	0/14	ND	ND	31,000	0
	Lower	1/8	1,800	1,800	6,800	0
1-Methylnaphthalene	Upper	1/14	210	210	310,000	0
	Lower	1/8	1,700	1,700	72,000	0
2-Methylnaphthalene	Upper	1/14	200	200	310,000	0
	Lower	1/8	1,900	1,900	230,000	0
Acenaphthene	Upper	2/14	99.0 - 110	105	470,000	0
	Lower	1/8	2,300	2,300	290,000	0
Anthracene	Upper	1/14	110	110	2,300,000	0
	Lower	2/8	72.0 - 930	501	5,900,000	0
Di-n-butylphthalate	Upper	1/14	35.0	35.0	780,000	0
	Lower	0/8	ND	ND	2,300,000	0
Fluoranthene	Upper	3/14	41.0 - 1,000	364	310,000	0
	Lower	7/8	34.0 - 2,800	491	2,100,000	0
Fluorene	Upper	0/14	ND	ND	310,000	0
	Lower	1/8	2,200	2,200	280,000	0
Naphthalene	Upper	2/14	52.0 - 2,200	1,130	310,000	0
	Lower	1/8	5,900	5,900	42,000	0
Phenanthrene	Upper	1/14	55.0	55.0	230,000	0
	Lower	2/8	110 - 6,200	3,160	660,000	0
Pyrene	Upper	3/14	42.0 - 810	304	230,000	0
	Lower	6/8	95.0 - 1,900	409	2,100,000	0
bis(2-Ethylhexyl)phthalate	Upper	1/14	84.0	84.0	46,000	0
	Lower	0/8	ND	ND	1,800,000	0
Pesticides/PCBs						
4,4'-DDD	Upper	5/14	2.0 - 34.0	16.2	2,700	0
	Lower	5/8	7.6 - 500	130	8,000	0
4,4'-DDE	Upper	3/14	7.3 - 38.0	18.2	1,900	0
	Lower	5/8	19.0 - 240	65.4	27,000	0
4,4'-DDT	Upper	2/14	4.0 - 24.0	14.0	1,900	0
	Lower	2/8	22.0 - 71.0	46.5	16,000	0
Chlordane	Upper	2/14	6.0 - 7.6	6.8	1,800	0
	Lower	0/8	ND	ND	5,000	0
Endrin	Upper	1/14	2.8	2.8	2,300	0
	Lower	0/8	ND	ND	500	0
Endrin aldehyde	Upper	3/14	1.4 - 1.6	1.5	2,300	0
	Lower	0/8	ND	ND	340	0
beta-BHC	Upper	1/14	1.3	1.3	350	0
	Lower	0/8	ND	ND	1.3	0

Table 10.3.2
AOCs 675/676/677
Organic Compound Analytical Results for Soil (μg/kg)

Parameter	Sample Interval	Detection Frequency	Detection Range	Mean	RBC (upper) SSL (lower)	Number of Samples Exceeding RBC or SSL
gamma-BHC (Lindane)	Upper	1/14	1.2	1.2	490	0
	Lower	0/8	ND	ND	4.5	0
delta-BHC	Upper	1/14	1.1	1.1	350	0
	Lower	0/8	ND	ND	1.8	0
Heptachlor epoxide	Upper	2/14	1.4 - 3.0	2.2	70	0
	Lower	0/8	ND	ND	330	0
Aroclor-1260	Upper	1/14	61.0	61.0	320	0
	Lower	0/8	ND	ND	1,000	0
Dioxin Compounds and Organotins						
TEQs	Upper	3/3	1.12E-03 - 2.02E-03	1.55E-03	0.0043	0
	Lower	0/0	NA	NA	1.6	0
123678-HxCDD	Upper	1/3	1.09E-03	1.09E-03	0.043	0
	Lower	0/0	NA	NA	4.1	0
123789-HxCDD	Upper	1/3	9.2E-04	9.2E-04	0.043	0
	Lower	0/0	NA	NA	4.1	0
1234678-HpCDD	Upper	3/3	0.0448 - 0.0956	0.0621	0.43	0
	Lower	0/0	NA	NA	108	0
OCDD	Upper	3/3	0.399 - 0.926	0.599	4.3	0
	Lower	0/0	NA	NA	1,080	0
123478-HxCDF	Upper	1/3	2.06E-03	2.06E-03	0.043	0
	Lower	0/0	NA	NA	216	0
123678-HxCDF	Upper	1/3	8.4E-04	8.4E-04	0.043	0
	Lower	0/0	NA	NA	216	0
234678-HxCDF	Upper	1/3	8.6E-04	8.6E-04	0.043	0
	Lower	0/0	NA	NA	216	0
1234678-HpCDF	Upper	3/3	7.6E-03 - 0.0166	0.0119	0.43	0
	Lower	0/0	NA	NA	54	0
OCDF	Upper	3/3	0.0108 - 0.0215	0.0167	4.3	0
	Lower	0/0	NA	NA	540	0
Tetrabutyltin	Upper	1/9	25.28	25.28	2,300	0
	Lower	0/6	ND	ND	NL	0

Notes:
NA = Not Applicable/Not Available/Not Analyzed
ND = Not Detected/Not Determined
NL = Not Listed
μg/kg = micrograms per kilogram
See Table 5.5 for organic compound screening concentrations and their sources.

Table 10.3.3
AOCs 675/676/677
Inorganic Compound Analytical Results for Soil (mg/kg)

Parameter	Sample Interval	Detection Frequency	Detection Range	Mean	Background Concentration	RBC (upper) SSL (lower)	Number of Samples Exceeding: RBC & Background (upper) or SSL & Background (lower)
Aluminum (Al)	Upper	14/14	4,310 - 11,800	7,720	27,400	7,800	0
	Lower	8/8	7,110 - 24,900	13,700	18,900	560,000	0
Antimony (Sb)	Upper	2/14	6.0 - 6.6	6.3	ND	3.1	2
	Lower	3/8	5.3 - 9.2	7.3	ND	2.7	3
Arsenic (As)	Upper	5/14	3.1 - 5.4	4.2	21.6	0.43	0
	Lower	8/8	4.7 - 14.4	9.2	6.45	15	0
Barium (Ba)	Upper	14/14	6.0 - 25.7	17.4	54.2	550	0
	Lower	8/8	18.4 - 33.0	22.3	36.0	820	0
Beryllium (Be)	Upper	5/14	0.21 - 0.98	0.54	0.95	16	0
	Lower	7/8	0.35 - 1.1	0.71	0.67	32	0
Cadmium (Cd)	Upper	2/14	0.53 - 0.72	0.63	0.61	7.8	0
	Lower	2/8	0.18 - 1.2	0.69	0.54	4.0	0
Calcium (Ca)	Upper	14/14	4,840 - 71,400	28,700	NL	NL	NA
	Lower	8/8	9,250 - 235,000	65,100	NL	NL	NA
Chromium (Total) (Cr)	Upper	14/14	9.7 - 70.5	30.0	34.5	39	2
	Lower	8/8	20.7 - 46.1	32.5	51.3	19	0
Chromium (Hexavalent)	Upper	1/3	0.426	0.426	ND	39	0
	Lower	0/0	NA	NA	ND	19	0
Cobalt (Co)	Upper	13/14	1.4 - 4.4	2.3	5.80	470	0
	Lower	8/8	2.0 - 7.4	4.3	3.48	990	0
Copper (Cu)	Upper	14/14	1.6 - 26.6	9.3	240	310	0
	Lower	8/8	7.3 - 278	43.0	11.5	5,600	0

Table 10.3.3
AOCs 675/676/677
Inorganic Compound Analytical Results for Soil (mg/kg)

Parameter	Sample Interval	Detection Frequency	Detection Range	Mean	Background Concentration	RBC (upper) SSL (lower)	Number of Samples Exceeding: RBC & Background (upper) or SSL & Background (lower)
Iron (Fe)	Upper	14/14	2,670 - 8,870	5,210	NL	NL	NA
	Lower	8/8	6,970 - 24,600	12,300	NL	NL	NA
Lead (Pb)	Upper	14/14	3.6 - 42.4	15.0	203	400	0
	Lower	8/8	6.5 - 20.2	13.6	12.3	400	0
Magnesium (Mn)	Upper	14/14	507 - 2,400	1,260	NL	NL	NA
	Lower	8/8	2,160 - 6,030	3,370	NL	NL	NA
Manganese (Mn)	Upper	14/14	18.8 - 1,420	147	419	160	1
	Lower	8/8	73.0 - 188	113	118	480	0
Mercury (Hg)	Upper	1/14	0.11	0.11	0.47	2.3	0
	Lower	1/8	0.20	0.20	ND	1.0	0
Nickel (Ni)	Upper	14/14	2.7 - 20.9	7.45	23.9	160	0
	Lower	8/8	6.9 - 21.1	10.9	15.7	65	0
Potassium (K)	Upper	4/14	226 - 974	643	NL	NL	NA
	Lower	8/8	952 - 2,620	1,480	NL	NL	NA
Selenium (Se)	Upper	4/14	0.64 - 0.97	0.78	1.49	39	0
	Lower	6/8	0.52 - 2.1	1.16	1.77	2.6	0
Sodium (Na)	Upper	13/14	101 - 1,200	410	NL	NL	NA
	Lower	8/8	579 - 2,010	1,020	NL	NL	NA
Thallium (Tl)	Upper	4/14	0.31 - 0.42	0.36	ND	0.55	0
	Lower	4/8	0.34 - 0.57	0.47	ND	0.36	3
Tin (Sn)	Upper	3/14	1.0 - 2.4	1.7	7.50	4,700	0
	Lower	3/8	10.6 - 11.2	10.9	ND	5,500	0
Vanadium (V)	Upper	14/14	6.7 - 176	38.3	113	55	2
	Lower	8/8	18.0 - 57.1	30.5	38.1	3,000	0

Table 10.3.3
AOCs 675/676/677
Inorganic Compound Analytical Results for Soil (mg/kg)

Parameter	Sample Interval	Detection Frequency	Detection Range	Mean	Background Concentration	RBC (upper) SSL (lower)	Number of Samples Exceeding: RBC & Background (upper) or SSL & Background (lower)
Zinc (Zn)	Upper	14/14	6.2 - 130	34.8	206	2,300	0
	Lower	8/8	29.2 - 76.7	44.4	36.2	6,200	0

Notes:
NA = Not Applicable/Not Available
ND = Not Detected/Not Determined
NL = Not Listed
mg/kg = milligrams per kilogram
See Table 5.6 for inorganic compound screening concentrations and their sources.

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Volatile Organic Compounds (µg/kg)							
Acetone	676SB001	ND	780000	NA	17	8000	NA
	677SB002	32			26		
	677SB004	ND			64		
	677SB006	72			200		
	677SB010	52			NT		
Acetonitrile (methyl cyanide)	677SB004	ND	47000	NA	81	440	NA
	677SB006	100			150		
2-Butanone (MEK)	677SB004	ND	4700000	NA	46	3900	NA
	677SB009	ND			40		
Propionitrile (ethyl cyanide)	677SB004	ND	47000	NA	780	440	NA
Toluene	675SB001	3	1600000	NA	NT	6000	NA
	676SB001	1			19		
	676SB002	6			ND		
	677SB001	1			NT		
	677SB002	5			23		
	677SB003	2			ND		
	677SB004	ND			2		
	677SB006	3			6		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Toluene (Continued)	677SB008	2			NT		
	677SB009	2			4		
	677SB010	2			NT		
Semivolatile Organic Compounds (μg/kg)							
Acenaphthene	677SB006	99	470000	NA	ND	290000	NA
	677SB009	ND			2300		
	677SB010	110			NT		
Anthracene	677SB004	ND	2300000	NA	72	5900000	NA
	677SB006	110			ND		
	677SB009	ND			930		
Benzo(a)pyrene Equivalents (BEQs)	676SB001	4.14	87	NA	17.5	1600	NA
	677SB004	ND			84.0		
	677SB006	478			ND		
	677SB009	ND			2.52		
	677SB010	0.047			ND		
Benzo(a)anthracene	676SB001	41	870	NA	53	800	NA
	677SB004	ND			150		
	677SB006	720			ND		
	677SB009	ND			480		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Benzo(a)pyrene	677SB004	ND	87	NA	51	4000	NA
	677SB006	330			ND		
	677SB009	ND			180		
Benzo(b)fluoranthene	676SB001	ND	870	NA	110	2500	NA
	677SB004	ND			160		
	677SB006	670			ND		
	677SB009	ND			220		
Benzo(k)fluoranthene	676SB001	ND	8700	NA	110	25000	NA
	677SB004	ND			190		
	677SB006	840			ND		
	677SB009	ND			140		
Chrysene	676SB001	44	87000	NA	62	80000	NA
	677SB004	ND			130		
	677SB006	640			ND		
	677SB009	ND			420		
	677CB010	47			NT		
Dibenzofuran	677SB009	ND	31000	NA	1800	6800	NA
Di-n-butylphthalate	677SB005	35	780000	NA	NT	2300000	NA
bis(2-Ethylhexyl)phthalate (BEHP)	677SB007	84	46000	NA	ND	1800000	NA

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Fluoranthene	676SB001	51	310000	NA	150	2100000	NA
	676SB002	ND			34		
	677SB003	ND			64		
	677SB004	ND			260		
	677SB006	1000			68		
	677SB007	ND			58		
	677SB009	ND			2800		
	677SB010	41			NT		
Fluorene	677SB009	ND	310000	NA	2200	280000	NA
1-Methylnaphthalene	677SB009	ND	310000	NA	1700	72000	NA
	677SB010	210			NT		
2-Methylnaphthalene	677SB009	ND	310000	NA	1900	230000	NA
	677SB010	200			NT		
Naphthalene	677SB006	52	310000	NA	ND	42000	NA
	677SB009	ND			5900		
	677SB010	2200			NT		
Phenanthrene	677SB004	ND	230000	NA	110	660000	NA
	677SB006	55			ND		
	677SB009	ND			6200		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Pyrene	676SB001	42	230000	NA	130	2100000	NA
	676SB002	ND			35		
	677SB003	ND			59		
	677SB004	ND			240		
	677SB006	810			ND		
	677SB007	ND			56		
	677SB009	ND			1900		
	677SB010	61			NT		
Pesticides/PCBs (µg/kg)							
Aroclor-1260	675SB001	61	320	NA	NT	1000	NA
beta-BHC (beta-HCH)	675SB002	1.3	350	NA	NT	1.3	NA
delta-BHC (delta-HCH)	676SB002	1.1	350	NA	ND	1.8	NA
gamma-BHC (Lindane)	675SB001	1.2	490	NA	NT	4.5	NA
Chlordane	675SB002	7.6	1800	NA	NT	5000	
	676SB001	6.0			ND		
4,4'-DDD	675SB002	2	2700	NA	NT	8000	NA
	676SB001	ND			40		
	676SB002	ND			89		
	677SB002	6.7			ND		
	677SB003	ND			7.6		
	677SB004	ND			500		
	677SB006	34			ND		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
4,4'-DDD (Continued)	677SB007	ND			14		
	677SB009	7.5			ND		
	677SB010	31			NT		
4,4'-DDE	676SB001	ND	1900	NA	46	27000	NA
	677SB002	ND			13		
	677SB003	ND			13		
	677SB004	ND			240		
	677SB006	9.2			ND		
	677SB007	ND			15		
	677SB009	7.3			ND		
	677SB010	38			NT		
4,4'-DDT	676SB002	ND	1900	NA	71	16000	NA
	677SB004	ND			22		
	677SB006	4			ND		
	677SB007	24			ND		
Endrin	677SB009	2.8	2300	NA	ND	500	NA
Endrin aldehyde	675SB002	1.4	2300	NA	NT	340	NA
	676SB001	1.4			ND		
	677SB001	1.6			NT		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Heptachlor epoxide	675SB002	3	70	NA	NT	330	NA
	676SB001	1.4			ND		
Organotin (µg/kg)							
Tetrabutyltin	677SB006	25.28	2300	NA	NT	NA	NA
Dioxin Compounds (ng/kg)							
2,3,7,8-TCDD equivalents (TEQs)	676SB001	1.51	4.3	NA	NT	1600	NA
	676SB002	2.02			NT		
	677SB010	1.12			NT		
123678-HxCDD	676SB001	1.086	43		NT	4100	
123789-HxCDD	676SB001	0.92	43		NT	4100	
1234678-HpCDD	676SB001	44.778	430		NT	108000	
	676SB002	95.58			NT		
	677SB010	45.92			NT		
OCDD	676SB001	399.06	4300		NT	1080000	
	676SB002	926.32			NT		
	677SB010	474.47			NT		
123478-HxCDF	676SB001	2.063	43		NT	216000	
123678-HxCDF	676SB001	0.837	43		NT	216000	
234678-HxCDF	676SB001	0.863	43		NT	216000	

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
1234678-HpCDF	676SB001	7,609	430		NT	54000	
	676SB002	11.432			NT		
	677SB010	16.634			NT		
OCDF	676SB001	10.7	4300		NT	540000	
	676SB002	21.5			NT		
	677SB010	17.8			NT		
Inorganics (mg/kg)							
Aluminum (Al)	675SB001	11800	7800	27400	NT	560000	18900
	675SB002	8480			NT		
	676SB001	10300			13700		
	676SB002	9070			17300		
	677SB001	9860			NT		
	677SB002	7480			7780		
	677SB003	4310			15900		
	677SB004	5620			7110		
	677SB005	7120			NT		
	677SB006	8140			24900		
	677SB007	6210			9720		
	677SB008	7870			NT		
	677SB009	6500			13500		
	677SB010	6080			NT		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Antimony (Sb)	677SB003	ND	3.1	ND	9.2	2.7	ND
	677SB006	6.6			7.5		
	677SB009	ND			5.3		
	677SB010	6			NT		
Arsenic (As)	676SB001	4.8	0.43	21.6	7.7	15	6.45
	676SB002	4			14.4		
	677SB002	ND			10.9		
	677SB003	ND			10.4		
	677SB004	ND			5.3		
	677SB005	3.7			NT		
	677SB006	5.4			13.7		
	677SB007	ND			4.7		
	677SB009	ND			6.4		
	677SB010	3.1			NT		
Barium (Ba)	675SB001	25.7	550	54.2	NT	820	36
	675SB002	16.3			NT		
	676SB001	25.4			19.8		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Barium (Ba) (Continued)	676SB002	15.95			21.2		
	677SB001	19.9			NT		
	677SB002	12.9			19.5		
	677SB003	6.1			19.8		
	677SB004	6			19		
	677SB005	17.1			NT		
	677SB006	23			33		
	677SB007	22.6			18.4		
	677SB008	16.6			NT		
	677SB009	17.7			27.5		
	677SB010	20.2			NT		
Beryllium (Be)	675SB001	0.52	16	0.95	NT	32	0.67
	676SB001	0.98			0.65		
	676SB002	0.62			0.89		
	677SB001	0.37			NT		
	677SB002	ND			0.53		
	677SB003	ND			0.85		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Beryllium (Be) (Continued)	677SB004	ND			0.35		
	677SB005	0.21			NT		
	677SB006	ND			1.1		
	677SB009	ND			0.62		
Cadmium (Cd)	676SB002	0.53	7.8	0.61	ND	4	0.54
	677SB002	ND			1.2		
	677SB004	ND			0.18		
	677SB006	0.72			ND		
Chromium (Cr) (total)	675SB001	70.5	39	34.5	NT	19	51.3
	675SB002	22.4			NT		
	676SB001	24.3			28.5		
	676SB002	18.35			32.2		
	677SB001	31.2			NT		
	677SB002	63.7			46.1		
	677SB003	22.4			32.3		
	677SB004	9.7			20.7		
	677SB005	21.8			NT		
	677SB006	22.5			42.5		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Chromium (Cr) (total) (Continued)	677SB007	35.7			32		
	677SB008	33.5			NT		
	677SB009	19.3			25.4		
	677SB010	24.6			NT		
Chromium (Cr6) (hexavalent)	676CB001	0.01	39	ND	NT	19	ND
	676CB002	0.01			NT		
	677CB010	0.01			NT		
Cobalt (Co)	675SB001	4.4	470	5.8	NT	990	3.48
	675SB002	1.5			NT		
	676SB001	1.75			3.9		
	676SB002	1.85			5.4		
	677SB001	2.2			NT		
	677SB002	ND			2.5		
	677SB003	1.9			5.4		
	677SB004	1.4			2		
	677SB005	1.4			NT		
	677SB006	2.5			7.4		
	677SB007	3.5			3.8		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Cobalt (Co) (Continued)	677SB008	3.5			NT		
	677SB009	1.8			3.6		
	677SB010	2.35			NT		
Copper (Cu)	675SB001	26.6	310	240	NT	5600	11.5
	675SB002	26.5			NT		
	676SB001	17.05			9.2		
	676SB002	10.45			8.4		
	677SB001	14.5			NT		
	677SB002	3.8			278		
	677SB003	1.7			9.9		
	677SB004	1.6			10		
	677SB005	6.7			NT		
	677SB006	6			14		
	677SB007	2			7.3		
	677SB008	5.6			NT		
	677SB009	3			7.5		
	677SB010	4.5			NT		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Lead (Pb)	675SB001	6.4	400	203	NT	400	12.3
	675SB002	37.1			NT		
	676SB001	42.4			10.9		
	676SB002	21.65			9.7		
	677SB001	18.2			NT		
	677SB002	6.3			19.9		
	677SB003	6.4			9.7		
	677SB004	3.6			14.6		
	677SB005	9.1			NT		
	677SB006	18.4			20.2		
	677SB007	6.4			6.5		
	677SB008	10.3			NT		
	677SB009	15.9			17.3		
	677SB010	7.3			NT		
Manganese (Mn)	675SB001	1420	160	419	NT	480	118
	675SB002	40.3			NT		
	676SB001	58.1			106		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Manganese (Mn) (Continued)	676SB002	31.2			124		
	677SB001	61.2			NT		
	677SB002	28.5			75.9		
	677SB003	50.6			167		
	677SB004	18.8			73		
	677SB005	75.7			NT		
	677SB006	58.2			188		
	677SB007	88.8			82.1		
	677SB008	34.1			NT		
	677SB009	34.3			85.1		
	677SB010	57.2			NT		
Mercury (Hg)	676SB001	0.11	2.3	0.47	ND	1	ND
	677SB006	ND			0.2		
Nickel (Ni)	675SB001	11.9	160	23.9	NT	65	15.7
	675SB002	10.6			NT		
	676SB001	20.85			10.6		
	676SB002	13.5			10.7		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Nickel (Ni) (Continued)	677SB001	8.5			NT		
	677SB002	2.8			21.1		
	677SB003	2.9			10.8		
	677SB004	2.7			8.4		
	677SB005	6.6			NT		
	677SB006	7.3			9.1		
	677SB007	3.6			9.4		
	677SB008	4			NT		
	677SB009	2.9			6.9		
	677SB010	6.6			NT		
Selenium (Se)	675SB002	0.68	39	1.49	NT	2.6	1.77
	676SB001	0.64			ND		
	676SB002	ND			0.98		
	677SB002	ND			2.1		
	677SB003	ND			0.78		
	677SB004	ND			1.1		
	677SB006	0.85			1.45		
	677SB007	ND			0.52		
	677SB010	0.97			NT		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Thallium (Tl)	676SB002	0.42	0.55	ND	0.57	0.36	ND
	677SB003	ND			0.52		
	677SB006	ND			0.45		
	677SB007	ND			0.34		
	677SB008	0.31			NT		
	677SB009	0.36			ND		
	677SB010	0.33			NT		
Tin (Sn)	675SB002	2.4	4700	7.5	ND	5500	ND
	676SB001	1.8			ND		
	677SB002	ND			11		
	677SB003	ND			11.2		
	677SB006	ND			10.6		
	677SB007	1			ND		
Vanadium (V)	675SB001	47	55	113	NT	3000	38.1
	675SB002	37.1			NT		
	676SB001	176			28.4		
	676SB002	125.5			36.3		
	677SB001	34.9			NT		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Vanadium (V) (Continued)	677SB002	10.9			27.6		
	677SB003	6.7			32.9		
	677SB004	7.5			18		
	677SB005	19.9			NT		
	677SB006	17.7			57.1		
	677SB007	9.5			20.4		
	677SB008	13.7			NT		
	677SB009	13			23.4		
	677SB010	17			NT		
Zinc (Zn)	675SB001	51.9	2300	206	NT	6200	36.2
	675SB002	66.7			NT		
	676SB001	81.55			54.7		
	676SB002	32.05			36.6		
	677SB001	130			NT		
	677SB002	8.7			76.7		
	677SB003	6.7			38.2		
	677SB004	6.2			39.5		
	677SB005	23.1			NT		

Table 10.3.4
AOCs 675/676/677
Analytes Detected in Surface and Subsurface Soil

Parameter	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil-to-Groundwater SSL* (DAF=10)	Subsurface Background
Zinc (Zn) (Continued)	677SB006	26.5			46.3		
	677SB007	7.2			29.2		
	677SB008	16.8			NT		
	677SB009	7.8			33.7		
	677SB010	21.25			NT		

Notes:
a = Background value for non clay samples
* = Residential RBCs (THQ=0.1) were used as a reference concentration for upper-interval samples. Generic soil-to groundwater SSLs (DAF=10) from *Soil Screening Guidance: Technical Background Document* (USEPA, 1996b) were used as a reference concentration for lower-interval samples
Bold concentrations exceed the RBCs, SSL, and the zone background
All background values for Zone I are based on twice the means of the grid sample concentrations.
DAF = Diluation attenuation factor
NA = Not applicable/not available
ND = Not detected
NT = Not taken
RBC = Risk-based concentration
SSL = Soil screening level
THQ = Target hazard quotient
µg/kg = Micrograms per kilogram
mg/kg = milligrams per kilogtam

The VOCs acetone and toluene were also detected at grid soil boring GDISB015. Acetone was detected at 43 μg/kg and toluene was detected at 3 μg/kg in surface soil sample GDISB01501. Acetone and toluene were also detected in subsurface soil sample GDISB01502 at concentrations of 48 μg/kg and 21 μg/kg, respectively. These detections were far below the corresponding RBCs or SSLs.

Semivolatile Organic Compounds in Soil

Fifteen SVOCs were detected in surface soil samples at the combined AOCs. Benzo(a)pyrene exceeded its RBC in sample 677SB00601 (330 μg/kg). All other surface SVOC detections were far below their respective RBCs. Fifteen SVOCs were also detected in the subsurface samples, all at levels far below their SSLs.

No SVOCs were detected in surface soil at grid soil boring GDISB015, but nine SVOCs were detected in subsurface grid-based sample GDISB01502: anthracene (160 μg/kg), benzo(a)anthracene (130 μg/kg), benzo(a)pyrene (52 μg/kg), benzo(b)fluoranthene (120μg/kg), benzo(k)fluoranthene (130 μg/kg), chrysene (140 μg/kg), di-n-butylphthalate (82 μg/kg), fluoranthene (650 μg/kg), and pyrene (450 μg/kg). All SVOC concentrations were far below their SSLs.

In accordance with recent cPAH guidance and Section 7 of this report, BEQs were calculated for cPAHs at the combined AOCs. The calculated BEQ of 478 μg/kg for surface soil sample 677SB00601 exceeded the benzo(a)pyrene residential soil RBC of 87 μg/kg. Calculated BEQs for subsurface soil samples ranged from 17.5 μg/kg to 252 μg/kg, which is below the SSL of 1600 μg/kg.

Pesticides and PCBs in Soil

Ten pesticides were detected in surface soil at the combined AOCs. Three pesticides were detected in the subsurface soil. No surface or subsurface soil pesticide concentration exceeded its RBC or SSL. One PCB, Aroclor-1260, was detected in surface soil at a concentration far below its RBC. No PCBs were detected in the subsurface soil.

One pesticide, endrin aldehyde (2.6 μg/kg), was detected in grid-based surface soil sample GDISB01501. This concentration is far below the RBC. Four pesticides were detected in grid-based subsurface soil sample GDISB01502: endosulfan sulfate (2.9 μg/kg), dieldrin (8.3 μg/kg), 4,4'-DDD (76 μg/kg), and 4,4'-DDE (32 μg/kg). Of these only dieldrin exceeded its SSL.

Other Organic Compounds in Soil

Dioxin compounds were detected in all three of the surface soil samples collected for dioxins. In accordance with recent dioxin guidance and Section 7 of this report, TEQs were calculated. The resulting TEQ range of 1.12E-03 μg/kg to 2.02E-03 μg/kg is below the RBC of 4.3E-03 μg/kg.

The organotin tetrabutylin was detected in surface soil at a concentration far below its RBC.

Inorganics in Soil

Twenty-three metals and hex-chrome were detected in surface soil at the combined AOCs. Concentrations of four metals exceeded their respective RBCs and surface soil background concentrations: antimony [677SB00601 (6.6 mg/kg) and 677SB01001 (6.0 mg/kg)]; total chromium [675SB00101 (70.5 mg/kg), 677SB00201 (63.7 mg/kg)]; manganese [675SB00101 (1,420 mg/kg)]; and vanadium [676SB00101 (176 mg/kg) and 676SB00201 (125.5 mg/kg)].

Twenty-three metals were detected in subsurface soil samples at the combined AOCs. Concentrations of two subsurface metals exceeded their respective RBCs and subsurface soil background concentrations: antimony [677SB00302 (9.2 mg/kg), 677SB00602 (7.5 mg/kg), and 677SB00902 (5.3 mg/kg)]; and thallium [676SB00202 (0.57 mg/kg), 677SB00302 (0.52 mg/kg), and 677SB00602 (0.45 mg/kg)].

Sixteen metals were detected in grid-based surface soil sample GDISB01501. Eighteen metals were detected in grid-based subsurface soil sample GDISB00802. No surface or subsurface metal concentration at these grid-based locations exceeded its RBC or SSL.

10.3.3 Groundwater Sampling and Analysis

The approved final RFI work plan proposed five shallow monitoring wells associated with the combined AOCs. Four monitoring wells were installed and sampled. Subsurface objects and boulders prevented installation of the fifth well. Groundwater was sampled in four rounds at AOCs 675/676/677, as summarized in Table 10.3.5. Monitoring well locations are shown on Figure 10.3.1.

The shallow monitoring wells were installed at 12.5 ft bgs in the upper sand layer of the Wando Formation. All wells were installed in accordance with Section 3.2.3 of this report.

Table 10.3.5
AOCs 675/676/677
Groundwater Sampling Summary

Sampling Round	Sampling Date	Wells Sampled	Sample Analyses	Comments
1	06/01/95	675001	Standard Suite, organotins, chloride, TDS, sulfate	677002 also sampled for herbicides, dioxin, hex-chrome, and OP pesticides
		675002		
	06/05/95	676001		
	06/06/95	677002		
2	01/15/96	675001	Metals, cyanide, pesticides, PCBs, SVOCs	
		675002	Metals, cyanide, pesticides, PCBs, SVOCs, TPH-DRO, TPH-GRO	
		676001	Metals, cyanide, pesticides, PCBs	
		677002	Metals, cyanide, pesticides, PCBs, dioxin	
3	06/03/96	675001	Metals, cyanide, pesticides, PCBs, SVOCs	
		675002	Metals, cyanide, pesticides, PCBs, SVOCs, TPH-DRO, TPH-GRO	
	06/04/96	676001	Metals, cyanide, pesticides, PCBs	
	06/06/96	677002	Metals, cyanide, pesticides, PCBs, dioxin	
4	09/13/96	675001	Metals, cyanide, pesticides, PCBs, SVOCs, TPH-DRO, TPH-GRO	
		675002	Metals, cyanide, pesticides, PCBs, SVOCs, TPH-DRO, TPH-GRO	
	09/12/96	676002	Metals, cyanide, pesticides, PCBs	
	09/10/96	677002	Metals, cyanide, pesticides, PCBs, dioxin, herbicides, chloride, sulfate, TDS	

Note:
Standard Suite = VOCs, SVOCs, metals, cyanide, pesticides, and PCBs at DQO Level III.

In the first round, the wells were sampled and analyzed for VOCs, SVOCs, metals, cyanide, pesticides, PCBs, organotins, chloride, sulfate, and TDS at DQO Level III. To further characterize the groundwater dioxins, herbicides, OP pesticides, and hexavalent chromium analyses were added to sample 677GW00201. All samples from rounds two, three, and four were analyzed for cyanides, metals, pesticides, and PCBs. Table 10.3.5 shows the selected samples analyzed for SVOCs, TPH-DRO/GRO, dioxins, chloride, sulfate, VOCs, and TDS.

Groundwater samples were also collected from a shallow/deep grid monitoring well pair (GDI015/GDI15D) located near AOCs 675/676/677. Both of these wells were sampled during all four sampling events and the samples analyzed for the standard suite of parameters, plus chloride, sulfate, and TDS. Results of these analyses are presented in Appendix D and are discussed below together with groundwater analytical results for the combined AOCs.

10.3.4 Nature and Extent of Contamination in Groundwater

Table 10.3.6 summarizes groundwater organic analytical results for combined AOCs. Table 10.3.7 summarizes groundwater inorganic analytical results. Table 10.3.8 summarizes all analytes detected in shallow groundwater at AOCs 675/676/677. Appendix D contains complete analytical data for all samples collected in Zone I.

Volatile Organic Compounds in Groundwater

One VOC, carbon disulfide, was detected during the first sampling round at well 676001 (1.0 μg/L). No other groundwater VOCs were detected during any of the sampling rounds.

No VOCs were detected in groundwater samples from grid-based wells GDI015 and GDI15D.

Semivolatile Organic Compounds in Groundwater

As many as eleven SVOCs were detected in groundwater during the four sampling rounds. Dibenzofuran slightly exceeded its tap-water RBC during the second and third sampling rounds at well 675002 (3 μg/L and 4 μg/L, respectively). Dimethoate exceeded its tap-water RBC at well 675002 (2 μg/L) during the first sampling round. All other groundwater SVOC concentrations were far below their respective tap-water RBCs.

Table 10.3.6
AOCs 675/676/677
Organic Compound Analysis Results for Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap-water RBC/MCL	Number of Samples Exceeding RBC or MCL
Volatile Organic Compounds						
Carbon disulfide	First	1/4	1.0	1.0	100/NL	0
	Second	0/0	NA	NA		0
	Third	0/0	NA	NA		0
	Fourth	0/1	ND	ND		0
Semivolatile Organic Compounds						
1-Methylnaphthalene	First	2/4	7.0 - 17.0	12.0	150/NL	0
	Second	0/0	NA	NA		0
	Third	0/0	NA	NA		0
	Fourth	0/0	NA	NA		0
2-Methylnaphthalene	First	1/4	5.0	5.0	150/NL	0
	Second	1/2	3.0	3.0		0
	Third	2/2	2.0 - 2.0	2.0		0
	Fourth	0/3	ND	ND		0
Acenaphthene	First	2/4	1.0 - 3.0	2.0	220/NL	0
	Second	2/2	2.0 - 2.0	2.0		0
	Third	2/2	1.0 - 3.0	2.0		0
	Fourth	2/3	2.0 - 3.0	2.5		0
Benzoic acid	First	0/4	ND	ND	15,000/NL	0
	Second	0/2	ND	ND		0
	Third	0/2	ND	ND		0
	Fourth	1/3	4.0	4.0		0
Butylbenzylphthalate	First	0/4	ND	ND	730/NL	0
	Second	0/2	ND	ND		0
	Third	0/2	ND	ND		0
	Fourth	1/3	12.0	12.0		0
Dibenzofuran	First	2/4	1.0 - 1.0	1.0	2.4/NL	0
	Second	1/2	3.0	3.0		1
	Third	1/2	4.0	4.0		1
	Fourth	1/3	2.0	2.0		0
Di-n-butylphthalate	First	1/4	5.0	5.0	370/NL	0
	Second	0/2	ND	ND		0
	Third	0/2	ND	ND		0
	Fourth	0/3	ND	ND		0
Dimethoate	First	1/4	2.0	2.0	0.73/NL	1
	Second	0/0	NA	NA		0
	Third	0/0	NA	NA		0
	Fourth	0/0	NA	NA		0

Table 10.3.6
AOCs 675/676/677
Organic Compound Analysis Results for Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap-water RBC/MCL	Number of Samples Exceeding RBC or MCL
Fluorene	First	1/4	1.0	1.0	150/NL	0
	Second	1/2	5.0	5.0		0
	Third	1/2	8.0	8.0		0
	Fourth	1/3	5.0	5.0		0
Naphthalene	First	1/4	1.0	1.0	150/NL	0
	Second	0/2	ND	ND		0
	Third	1/2	1.0	1.0		0
	Fourth	0/3	ND	ND		0
Phenanthrene	First	0/4	ND	ND	110/NL	0
	Second	1/2	2.0	2.0		0
	Third	1/2	2.0	2.0		0
	Fourth	1/3	2.0	2.0		0
TPH-DRO						
Naphtha C6-C12	First	0/0	NA	NA	NA	0
	Second	0/1	ND	ND	NA	0
	Third	0/1	ND	ND	NA	0
	Fourth	1/2	10,200	10,200	NA	0
TPH-GRO						
Gasoline	First	0/0	NA	NA	NA	0
	Second	1/1	115	115	NA	0
	Third	1/1	7.7	7.7	NA	0
	Fourth	1/2	77	77	NA	0
Herbicides						
2,4-D	First	1/1	0.18	0.18	6.1/70	0
	Second	0/0	NA	NA		0
	Third	0/0	NA	NA		0
	Fourth	0/1	ND	ND		0
Organotins, Dioxins, & Furans						
TEQs	First	1/1	3.95E-07	3.95E-07	4.5E-07/3E-05	0
	Second	0/1	ND	ND		0
	Third	0/1	ND	ND		0
	Fourth	0/1	ND	ND		0
1234678-HpCDD	First	1/1	2.47E-06	2.47E-06	4.5E-05/NL	0
	Second	0/1	ND	ND		0
	Third	0/1	ND	ND		0
	Fourth	0/1	ND	ND		0

Table 10.3.6
AOCs 675/676/677
Organic Compound Analysis Results for Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap-water RBC/MCL	Number of Samples Exceeding RBC or MCL
OCDD	First	1/1	8.79E-06	8.79E-06	4.5E-04/NL	0
	Second	0/1	ND	ND		0
	Third	0/1	ND	ND		0
	Fourth	0/1	ND	ND		0
123789-HxCDF	First	1/1	3.44E-06	3.44E-06	4.5E-06/NL	0
	Second	0/1	ND	ND		0
	Third	0/1	ND	ND		0
	Fourth	0/1	ND	ND		0
1234678-HpCDF	First	1/1	1.71E-06	1.71E-06	4.5E-05/NL	0
	Second	0/1	ND	ND		0
	Third	0/1	ND	ND		0
	Fourth	0/1	ND	ND		0
OCDF	First	1/1	7.61E-07	7.61E-07	4.5E-04/NL	0
	Second	0/1	ND	ND		0
	Third	0/1	ND	ND		0
	Fourth	0/1	ND	ND		0

Notes:
NA = Not Applicable/Not Available/Not Analyzed
ND = Not Detected
NL = Not Listed
μg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
See Table 5.5 for organic compound screening concentrations and their sources.

Table 10.3.7
AOCs 675/676/677
Inorganic Analysis Results for Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap-water RBC/MCL	Shallow Groundwater Background	Number of Samples Exceeding Lower of RBC or MCL and Background
Aluminum (Al)	First	0/4	ND	ND	3,700/NL	1,440	0
	Second	2/4	28.2 - 29.5	28.9			0
	Third	0/4	ND	ND			0
	Fourth	0/4	ND	ND			0
Arsenic (As)	First	0/4	ND	ND	0.045/50	23.0	0
	Second	0/4	ND	ND			0
	Third	1/4	6.1	6.1			0
	Fourth	1/4	7.1	7.1			0
Barium (Ba)	First	4/4	21.9 - 40.1	32.6	260/2,000	110	0
	Second	4/4	18.5 - 61.1	35.7			0
	Third	0/4	ND	ND			0
	Fourth	4/4	14.8 - 73.4	43.3			0
Beryllium (Be)	First	0/4	ND	ND	7.30/4	1.1	0
	Second	0/4	ND	ND			0
	Third	0/4	ND	ND			0
	Fourth	4/4	0.31 - 0.70	0.43			0
Cadmium (Cd)	First	4/4	0.30 - 1.1	0.50	1.80/5	NA	0
	Second	0/4	ND	ND			0
	Third	0/4	ND	ND			0
	Fourth	0/4	ND	ND			0
Calcium (Ca)	First	4/4	132,000-526,000	243,000	NL/NL	NL	NA
	Second	4/4	121,000 - 241,000	183,000			NA
	Third	4/4	109,000 - 428,000	231,000			NA
	Fourth	4/4	162,000 - 310,000	245,000			NA
Chromium (Cr)	First	4/4	1.1 - 3.1	1.7	18/100	14.3	0
	Second	1/4	5.4	5.4			0
	Third	0/4	ND	ND			0
	Fourth	1/4	8.6	8.6			0
Cobalt (Co)	First	0/4	ND	ND	220/NL	2.2	0
	Second	0/4	ND	ND			0
	Third	0/4	ND	ND			0
	Fourth	1/4	1.2	1.2			0
Copper (Cu)	First	0/4	ND	ND	150/1,300	4.4	0
	Second	1/4	3.0	3.0			0
	Third	0/4	ND	ND			0
	Fourth	0/4	ND	ND			0
Iron (Fe)	First	3/4	544 -14,700	5,710	NL/NL	NL	NA
	Second	3/4	3,820 - 5,100	4,640			NA
	Third	4/4	1,490 - 16,400	6,400			NA
	Fourth	3/4	65.8 - 13,800	5,660			NA
Lead (Pb)	First	3/4	2.7 - 3.9	3.2	15/15	4.4	0
	Second	0/4	ND	ND			0
	Third	0/4	ND	ND			0
	Fourth	2/4	1.9 - 4.0	3.0			0

Table 10.3.7
AOCs 675/676/677
Inorganic Analysis Results for Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap-water RBC/MCL	Shallow Groundwater Background	Number of Samples Exceeding Lower of RBC or MCL and Background
Magnesium (Mg)	First	4/4	23,000 - 647,000	211,000	NL/NL	NL	NA
	Second	4/4	20,300 - 508,000	158,000			NA
	Third	4/4	19,500 - 407,000	145,000			NA
	Fourth	4/4	14,100 - 418,000	130,000			NA
Manganese (Mn)	First	4/4	13.4 - 1,690	496	73/NL	5,430	0
	Second	4/4	8.3 - 301	168			0
	Third	4/4	77.8 - 1,080	434			0
	Fourth	4/4	19.8 - 382	139			0
Nickel (Ni)	First	0/4	ND	ND	73/100	13.3	0
	Second	0/4	ND	ND			0
	Third	2/4	1.8 - 1.8	1.8			0
	Fourth	2/4	1.3 - 4.2	2.8			0
Potassium (K)	First	4/4	26,800 - 320,000	128,000	NL/NL	NL	NA
	Second	4/4	17,500 - 324,000	104,000			NA
	Third	4/4	18,400 - 167,000	70,300			NA
	Fourth	4/4	5,470 - 216,000	69,500			NA
Selenium (Se)	First	0/4	ND	ND	18/50	ND	0
	Second	0/4	ND	ND			0
	Third	0/4	ND	ND			0
	Fourth	1/4	4.4	4.4			0
Sodium (Na)	First	4/4	98,000 - 4,210,000	1,420,000	NL/NL	NL	NA
	Second	4/4	82,700 - 5,320,000	1,670,000			NA
	Third	2/4	585,000 - 1,080,000	832,500			NA
	Fourth	4/4	15,100 - 4,190,000	1,230,000			NA
Thallium (Ti)	First	0/4	ND	ND	0.26/2	2	0
	Second	0/4	ND	ND			0
	Third	0/4	ND	ND			0
	Fourth	1/4	4.6	4.6			1
Vanadium (V)	First	4/4	1.6 - 5.7	2.8	26/NL	14.0	0
	Second	4/4	1.1 - 15.1	5.6			0
	Third	0/4	ND	ND			0
	Fourth	1/4	13.8	13.8			0
Zinc (Zn)	First	2/4	4.7 - 10.2	7.5	1,100/NL	24.4	0
	Second	0/4	ND	ND			0
	Third	0/4	ND	ND			0
	Fourth	0/4	ND	ND			0

Notes:
NA = Not Applicable/Not Available
ND = Not Detected
NL = Not Listed
μg/L = micrograms per liter
See Table 5.6 for inorganic screening concentrations and their sources.

Table 10.3.8
AOCs 675/676/677
Analytes Detected in Shallow Groundwater (μg/L)

Parameter	Location	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Tap-water RBC*	MCL/SMCL*	Shallow Background
Volatile Organic Compounds (μg/L)								
Carbon disulfide	676GW001	1	NT	NT	NT	100	NA	NA
Semivolatile Organic Compounds (μg/L)								
Acenaphthene	675GW001	3	2	1	ND	220	NA	NA
	675GW002	1	2	3	3			
	676GW001	ND	NT	NT	2			
Benzoic acid	675GW002	ND	ND	ND	4	15000	NA	NA
Butylbenzylphthalate	676GW001	ND	NT	NT	12	730	NA	NA
Dibenzofuran	675GW001	1	ND	ND	ND	2.4	NA	
	675GW002	1	3	4	2			
Di-n-butylphthalate	676GW001	5	NT	NT	ND	370	NA	NA
Fluorene	675GW002	1	5	8	5	150	NA	NA
1-Methylnaphthalene	675GW001	7	NT	NT	NT	150	NA	NA
	675GW002	17	NT	NT	NT			
2-Methylnaphthalene	675GW001	ND	3	2	ND	150	NA	NA
	675GW002	5	ND	2	ND			
Naphthalene	675GW002	1	ND	1	ND	150	NA	NA
Phenanthrene	675GW002	ND	2	2	2	110	NA	NA
Organophosphate Pesticides (μg/L)								
Dimethoate	675GW002	2	NT	NT	NT	0.73	NA	NA
Herbicides (μg/L)								
2,4-D	677GW002	0.18	NT	NT	ND	6.1	70	NA

Table 10.3.8
AOCs 675/676/677
Analytes Detected in Shallow Groundwater (μg/L)

Parameter	Location	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Tap-water RBC*	MCL/SMCL*	Shallow Background
TPH-DRO (mg/L)								
Naptha C6 - C12	675GW002	NT	ND	ND	10200	NA	NA	NA
TPH-GRO (mg/L)								
Gasoline	675GW002	NT	115	7.7	77	NA	NA	NA
Dioxin Compounds (pg/L)								
2,3,7,8-TCDD equivalents (TEQs)	677GW001	0.395	ND	ND	ND	0.45	30	NA
1234678-HpCDD	677GW002	2.467	ND	ND	ND	45	NA	NA
OCDD	677GW002	8.794	ND	ND	ND	450	NA	NA
123789-HxCDF	677GW002	3.437	ND	ND	ND	4.5	NA	NA
1234678-HpCDF	677GW002	1.712	ND	ND	ND	45	NA	NA
OCDF	677GW002	0.761	ND	ND	ND	450	NA	NA
Inorganics (μg/L)								
Aluminum (Al)	675GW001	ND	28.2	ND	ND	3700	NL	1440
	676GW001	ND	29.5	ND	ND			
Arsenic (As)	675GW002	ND	ND	ND	7.1	0.045	50	23
	677GW002	ND	ND	6.1	ND			
Barium (Ba)	675GW001	21.9	18.5	ND	14.8	260	2000	110
	675GW002	38.1	36	ND	73.4			
	676GW001	30.3	27.3	ND	27.7			
	677GW002	40.1	61.1	ND	57.3			

Table 10.3.8
AOCs 675/676/677
Analytes Detected in Shallow Groundwater (μg/L)

Parameter	Location	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Tap-water RBC*	MCL/SMCL*	Shallow Background
Beryllium (Be)	675GW001	ND	ND	ND	0.31	7.3	4	1.1
	675GW002	ND	ND	ND	0.36			
	676GW001	ND	ND	ND	0.34			
	677GW002	ND	ND	ND	0.7			
Cadmium (Cd)	675GW001	0.3	ND	ND	ND	1.8	5	NA
	675GW002	0.3	ND	ND	ND			
	676GW001	0.3	ND	ND	ND			
	677GW002	1.1	ND	ND	ND			
Chromium (Cr) (total)	675GW001	1.4	ND	ND	ND	18	100	14.3
	675GW002	1.3	ND	ND	ND			
	676GW001	1.1	ND	ND	ND			
	677GW002	3.1	5.4	ND	8.6			
Cobalt (Co)	677GW002	ND	ND	ND	1.2	220	NL	2.2
Copper (Cu)	675GW002	ND	3	ND	ND	150	1300	4.4
Lead (Pb)	675GW001	3.9	ND	ND	4	15	15	4.4
	675GW002	2.7	ND	ND	1.9			
	677GW002	3	ND	ND	ND			
Manganese (Mn)	675GW001	228	262	246	19.8	73	NL	5430
	675GW002	51.9	99.7	77.8	131			
	676GW001	13.4	8.3	331	22.9			
	677GW002	1690	301	1080	382			

Table 10.3.8
AOCs 675/676/677
Analytes Detected in Shallow Groundwater (μg/L)

Parameter	Location	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Tap-water RBC*	MCL/SMCL*	Shallow Background
Nickel (Ni)	675GW001	ND	ND	ND	4.2	73	100	13.3
	676GW001	ND	ND	1.8	1.3			
	677GW002	ND	ND	1.8	ND			
Selenium (Se)	677GW002	ND	ND	ND	4.4	18	50	ND
Thallium (Tl)	677GW002	ND	ND	ND	4.6	0.26	2	6.6
Vanadium (V)	675GW001	2	1.9	ND	ND	26	NL	14
	675GW002	2	1.1	ND	ND			
	676GW001	1.6	4.1	ND	ND			
	677GW002	5.7	15.1	ND	13.8			
Zinc (Zn)	675GW001	4.7	ND	ND	ND	1100	NL	24.4
	675GW002	10.2	ND	ND	ND			

Notes:
* = Tap-water RBCs (THQ=0.1) from *Risk-Based Concentration Table* (USEPA, October 22, 1997), and MCLs/SMCLs from *Drinking Water Regulations and Health Advisories* (USEPA, 1996e)
1 = Calculated from methods described in USEPA Interim *Supplemental Guidance to RAGS: Human Health Risk Assessment*, Bulletin 2 (USEPA, 1995c)
Bold concentrations exceed the RBCs, SSL, and the zone background
All background values for Zone I are based on twice the means of the grid sample concentrations. Background values for the groundwater are based on two sampling rounds in two wells at each depth.

Three SVOCs were detected during the four sampling rounds at shallow grid-based well GDI015. Diethylphthalate was detected during the second sampling round at 2.0 μg/L. Acenaphthene was detected during the third and fourth sampling rounds at 3.0 μg/L and 4.0 μg/L, respectively. Benzoic acid was detected during the fourth sampling round at 1.0 μg/L. Two SVOCs were detected at deep grid-well GDI15D. Diethylphthalate was detected during the second sampling round at 2.0 μg/L. Benzoic acid was detected during the fourth sampling round at 1.0 μg/L. Diethylphthalate was not detected in wells at the combined AOC. All shallow and deep grid-based groundwater SVOCs were far below their respective tap-water RBCs.

Total Petroleum Hydrocarbons in Groundwater

Beginning with the second round of sampling, groundwater samples from monitoring well 675002 were analyzed for TPH DRO and TPH GRO. Gasoline was detected in this well during the second-, third-, and fourth-sampling rounds at 115 μg/L, 7.7 μg/L, and 77 μg/L, respectively. Naphtha C6-C12 was also detected at this well at 10,200 μg/L in the fourth-sampling round. Monitoring well 675001 was sampled for TPH DRO and TPH GRO during the fourth-sampling round. No petroleum hydrocarbons were detected in these analytical results.

In addition to sampling for petroleum hydrocarbons, a free product sample was collected from monitoring well 675002 during the third sampling round. This sample was analyzed for VOCs, SVOCs, TPH DRO, and TPH GRO. Two VOCs were detected in the free product sample: carbon disulfide (4,400 μg/L) above its tap-water RBC (100 μg/L); and chloroform (1,300 μg/L), above its tap-water RBC and MCL (100 μg/L). Six SVOCs were detected in the free product sample. The tap-water RBCs for 2-methylnaphthalene, fluorene, fluoranthene, and phenanthrene (150 μg/L for each) were exceeded at 280,000 μg/L, 300,000 μg/L, 91,000 μg/L, and 380,000 μg/L, respectively. The tap-water RBC for acenaphthene (220 μg/L) was exceeded at 97,000 μg/L. The tap-water RBC for pyrene (110 μg/L) was exceeded at 65,000 μg/L.

Gasoline was also detected in the free product sample from 675002 at 1,100,000 μg/L.

Pesticides and PCBs in Groundwater

No pesticides or PCBs were detected in groundwater samples from the combined AOC wells.

Two pesticides were detected in the first-round groundwater sample from shallow grid well GDI015: methyl parathion (0.24 μg/L), below its tap-water RBC; and beta BHC (0.1 μg/L), above its tap-water RBC. No pesticides were detected in subsequent sampling rounds at GDI015, and no PCBs were detected in any groundwater samples at GDI015. No pesticides or PCBs were detected in samples from deep grid well GDI15D.

Other Organic Compounds in Groundwater

The herbicide 2,4-D was detected in the first sampling round from monitoring well 677002 (0.18 μg/L) at a concentration far below its tap-water RBC (6.1 μg/L).

In accordance with recent dioxin guidance and Section 7 of this report, a TEQ of 3.95E-07 μg/L was calculated for dioxins in sample 67700201. This concentration is below the tap-water RBC for 2,3,7,8-TCDD (4.5E-07 μg/L). No other groundwater samples at the combined AOCs or grid-based wells GDI015/GDI15D were analyzed for dioxin.

Inorganics in Groundwater

Twenty metals were detected in groundwater in the four sampling rounds at the combined AOCs. Thallium (4.6 μg/L) exceeded its tap-water RBC, MCL, and shallow groundwater background concentration in fourth-round sample 67700204. All other metal concentrations were below their respective tap-water RBCs, MCLs, and shallow background concentrations.

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Sixteen metals were detected in groundwater samples from shallow grid-based well GDI015 in the four sampling rounds. Antimony (5.5 μg/L) exceeded its tap-water RBC in the second-round sample results, but was below its MCL. All other metal concentrations from GDI015 were far below their respective tap-water RBCs, MCLs, or shallow background concentrations.

Twelve metals plus cyanide were detected in groundwater samples from deep grid-based well GDI15D in the four sampling rounds. Thallium (7.1 μg/L) exceeded its tap-water RBC, MCL, and shallow background concentration in the third-round sample results. All other metal concentrations from GDI15D were far below their respective tap-water RBCs, MCLs, and deep background concentrations.

10.3.5 Sediment Sampling and Analysis

The approved final RFI work plan proposed a sediment sample be collected from the area near the oil/water separator (adjacent to Facility NS-4) for TOC and grain size analysis. Sample 675M000101 was collected in the area described, from a shallow depression where precipitation runoff settles. In addition to TOC and grain size, this sample was also analyzed for the standard suite of parameters, plus organotins. Table 10.3.9 summarizes the sediment sampling event.

Table 10.3.9
AOCs 675, 676 and 677
Sediment Sampling Summary

Sampling Round	Sampling Date	Samples Collected	Sample Analyses	Comments
1	06/22/95	1 (1)	Standard Suite, Organotins, TOC, Grain Size	

Notes:
( ) = Parentheses indicate number of samples proposed in the final RFI work plan.
Standard Suite = VOCs, SVOCs, metals, cyanide, pesticides, and PCBs at DQO Level III.

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10.3.6 Nature and Extent of Contamination in Sediment

Table 10.3.10 summarizes the organic analytical results for sediment. Table 10.3.11 summarizes the inorganic analytical results for sediment. Analytes detected in the sediment are included in the Table 10.3.4 summary. The analytical results are included in Appendix D.

Table 10.3.10
AOCs 675/676/677
Organic Analytical Results for Sediment (µg/kg)

Parameter	Frequency of Frequency	Range of Detection	Mean of Detection
Volatile Organic Compounds			
Acetone	1/1	95.0	95.0
Semivolatile Organic Compounds			
Pyrene	1/1	730	730
bis(2-Ethylhexyl)phthalate (BEHP)	1/1	840	840
Pesticides and PCBs			
4,4'-DDD	1/1	6.5	6.5
4,4'-DDE	1/1	2.0	2.0
4,4'-DDT	1/1	2.8	2.8
Aldrin	1/1	0.34	0.34
Dieldrin	1/1	3.7	3.7
Endosulfan I	1/1	12.0	12.0
Endosulfan II	1/1	5.5	5.5
Endosulfan sulfate	1/1	2.0	2.0
Endrin	1/1	12.0	12.0
Endrin aldehyde	1/1	8.8	8.8
Heptachlor epoxide	1/1	4.0	4.0
Methoxychlor	1/1	6.6	6.6
alpha-BHC	1/1	0.59	0.59
gamma-BHC	1/1	1.2	1.2

Notes:
NL = Not Listed
NA = Not Applicable/Not Available/Not Analyzed
µg/kg = micrograms per kilogram

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Table 10.3.11
AOCs 675/676/677
Inorganic Analytical Results for Sediment (mg/kg)

Parameter	Frequency of Detection	Range of Detection	Mean of Detection
Aluminum (Al)	1/1	3,190	3,190
Antimony (Sb)	1/1	0.22	0.22
Arsenic (As)	1/1	0.52	0.52
Barium (Ba)	1/1	12.4	12.4
Calcium (Cd)	1/1	3,460	3,460
Chromium (Cr)	1/1	10.9	10.9
Cobalt (Co)	1/1	0.63	0.63
Copper (Cu)	1/1	14.9	14.9
Iron (Fe)	1/1	3,680	3,680
Lead(Pb)	1/1	30.1	30.1
Magnesium (Mg)	1/1	333	333
Manganese (Mn)	1/1	23.9	23.9
Nickel (Ni)	1/1	16.6	16.6
Potassium (K)	1/1	156	156
Sodium (Na)	1/1	276	276
Tin (Sn)	1/1	1.9	1.9
Zinc (Zn)	1/1	66.2	66.2

Notes:
NL = Not Listed
NA = Not Applicable/Not Available/Not Analyzed
mg/kg = milligrams per kilogram

Volatile Organic Compounds in Sediment

Acetone (95.0 μg/kg) was the only VOC detected in sediment sample 675M000101.

Semivolatile Organic Compounds in Sediment

Two SVOCs – pyrene (730 μg/kg) and bis(2-ethylhexyl)phthalate (840 μg/kg) – were detected in the sediment sample.

10.3.7.5 Fate and Transport Summary

Soil-to-Groundwater Pathway

Four inorganics are present in surface and subsurface soil at levels exceeding SSLs:

- Antimony exhibited non-spatially correlated detections at low concentrations in surface and subsurface soil. It was non-detect in groundwater.
- Chromium was widely detected in surface and subsurface soils, generally at concentrations below background. It was present in groundwater, but at levels below the RBC.
- Manganese was widely detected in surface and subsurface soils, generally at concentrations below the SSL. It was present in groundwater, but at levels below background.
- Thallium was sporadically detected in surface and subsurface soil at concentrations above the SSL, with relatively higher concentrations in the subsurface soil. It was present in groundwater at a concentration above the RBC and background.

Inorganics are not expected to be associated with past site activities, primarily petroleum storage and transfer.

- The distributions of constituents, both individually and relatively, do not show remarkable trends, and suggest an origin other than the site activities.
- The inconsistent, non-spatially correlated detections of antimony and thallium, and the widespread detections of chromium and manganese, do not summarily point to the site as the source, and may be indicative of non-native fill or natural sediment composition.

The pathway is valid for chromium, manganese, and thallium, but is expected to be significant only for thallium.

Groundwater RBC and Surface Water Pathway

Thallium and manganese were the only constituents above RBC in site groundwater.

- Manganese was widely detected for four sample rounds, but never exceeded the zone-specific background.
- Thallium was detected in only one well in the fourth-round, and was non-detect for the previous rounds.
- The presence of these constituents is not unexpected given soil concentrations. Manganese can be attributed to natural occurrence, but the persistence of thallium will need to be defined with further sampling.

Di-n-butylpthalate and copper were the only constituents detected in groundwater above surface water screening values.

- The Cooper River is immediately downgradient of the site, and therefore the pathway is valid from a flow standpoint.
- Both constituents were detected in a single well and only in one round (di-n-butylpthalate in the first and copper in the second). Both have been non-detect in groundwater since, and thus the pathway is considered invalid from a chemical standpoint.

Soil-to-Sediment Pathway

Pesticide and PCB results for sediment did not correlate well with surface soil results, while inorganic results did. These relationships may indicate a secondary source for sediment contamination within the drainage system, or indicate vestiges of typical pesticide application near where the sediment sample was collected.

Pesticides and PCBs in Sediment

Fourteen pesticides were detected in the sediment sample.

Inorganics in Sediment

Seventeen metals were detected in the sediment sample.

10.3.7 Fate and Transport Assessment for AOCs 675, 676, and 677

AOC 675 is located at Facility NS-4, and consists of a 25,000 gallon UST. This UST stored Number-five and Number-two fuel oil and began operations in 1952. After construction of nearby Building NS-2 (a boiler house) in 1958, Facility NS-4 provided fuel to boilers in this building. A 495 gallon oil/water separator is located north of this UST. Also, potential surface and subsurface petroleum contamination may have occurred from previous use of the AOC 675 area to refuel seaplanes. AOC 676 is the location of a former incinerator, which operated near the current location of Building NS-2. The incinerator was used during the 1940s, and no records exist concerning its design and operation. The types of materials burned in the incinerator are unknown, but may have included flammable hazardous materials (paints, solvents, waste oils), as well as paper, wood, and general trash. AOC 677 consists of the grounds surrounding Building NS-2. The original boilers housed in Building NS-2 were replaced with newer ones in 1977. Number-five fuel oil was used to fuel these boilers until 1991, when conversion was made to the cleaner burning number-two fuel oil. This fuel was stored in the nearby 25,000 gallon UST at Facility NS-4 (AOC 675). Prior to 1979 the sump pump for the boilers discharged to the base storm sewer system. After 1979, the sump pump discharged to the sanitary sewer system via an oil/water separator. There was a history of documented fuel oil spills at this site, ranging from 3 to 500 gallons in size.

Environmental media sampled as part of this investigation included surface soil, subsurface soil, sediment, and shallow groundwater. Potential migration pathways investigated for

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AOCs 675/676/677 are soil-to-groundwater, soil-to-sediment, groundwater migration to human receptors and to surface water, and emission of volatiles from soil-to-air.

10.3.7.1 Soil-to-Groundwater Cross-Media Transport

Tables 10.3.12 and 10.3.13 compare maximum detected organic and inorganic constituent concentrations, respectively, in surface and subsurface soil samples to risk-based soil screening levels considered protective of groundwater. Maximum concentrations in soil are compared to leachability-based generic SSLs. Soil background values for inorganics in Zone I were determined, but at the request of SCDHEC these were not considered during initial comparisons of maximum soil concentrations with SSLs. Generic SSLs are used to provide a conservative screen; leachate entering the aquifer is assumed to be diluted by a ratio of 10:1, with no attenuation of constituents in soil (DAF=10).

No inorganic constituents were detected in AOC 675/676/677 surface or subsurface soil at concentrations exceeding groundwater protection SSLs. Four inorganics – antimony, chromium, manganese, and thallium – were detected above applicable SSLs in surface and subsurface soil. Antimony was detected above its SSL in one of 14 surface soil samples and three of eight subsurface soil samples, with surface and subsurface exceedances coincident at only one location (676SB002). Figure 10.3.2 presents antimony concentrations detected at AOCs 675/676/677. Antimony was not detected in shallow groundwater. Chromium was widely detected in the surface and subsurface soil, exceeding the SSL in 13 of 14 surface samples and all eight subsurface samples. Only two samples exceeded the zone-specific background. Figure 10.3.3 presents chromium concentrations detected at AOCs 656/676/677. While chromium was present in shallow groundwater, it was at concentrations less than the RBC and background.. Manganese was also widely detected in soil, but exceeded the SSL in only one surface sample. Figure 10.3.4 presents

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Table 10.3.12
Organic Chemicals Detected in Surface Soil, Subsurface Soil, Sediment, and Shallow Groundwater
Comparison to Cross-Media SSLs, Tap-water RBCs, and Saltwater Surface Water Chronic Screening Levels
AOCs 675/676/677
Charleston Naval Complex
Charleston, South Carolina

Parameter	Maximum Concentration				Screening Concentration									
	Surface Soil	Subsurface Soil	Sediment	Shallow GW	Soil to GW SSL	Soil to Air SSL	Tap Water RBC	Saltwater Surf. Wtr. Chronic	Soil Units	Water Units	Leaching Potential	Volatil-ization Potential	Ground-water Migration Concern	Surface Water Migration Concern
Volatile Organic Compounds														
Acetone	72	200	95	ND	8000	1.0E+08	3700	NA	µG/KG	µG/L	NO	NO	NO	NO
Acetonitrile	100	150	ND	ND	440 a	NA	220	NA	µG/KG	µG/L	NO	NO	NO	NO
Carbon disulfide	ND	ND	ND	1	16000	720000	1000	NA	µG/KG	µG/L	NO	NO	NO	NO
Toluene	6	23	ND	ND	6000	650000	750	37	µG/KG	µG/L	NO	NO	NO	NO
Semivolatile Organic Compounds														
Acenaphthene	110	2300	ND	3	290000	NA	2200	9.7	µG/KG	µG/L	NO	NO	NO	NO
Anthracene	110	930	ND	ND	5900000	NA	11000	NA	µG/KG	µG/L	NO	NO	NO	NO
Benzoic acid	ND	ND	ND	4	200000	NA	150000	NA	µG/KG	µG/L	NO	NO	NO	NO
Benzo(a)pyrene Equivalents	478	252	ND	ND	1600 a	NA	0.0092	NA	µG/KG	µG/L	NO	NO	NO	NO
Benzo(a)anthracene c	720	480	ND	ND	800	NA	0.092	NA	µG/KG	µG/L	NO	NO	NO	NO
Benzo(a)pyrene c	330	180	ND	ND	4000	NA	0.0092	NA	µG/KG	µG/L	NO	NO	NO	NO
Benzo(b)fluoranthene c	670	220	ND	ND	2500	NA	0.092	NA	µG/KG	µG/L	NO	NO	NO	NO
Benzo(k)fluoranthene c	840	190	ND	ND	25000	NA	0.92	NA	µG/KG	µG/L	NO	NO	NO	NO
Chrysene c	640	420	ND	ND	80000	NA	9.2	NA	µG/KG	µG/L	NO	NO	NO	NO
Butylbenzylphthalate	ND	ND	ND	12	930000	930000	7300	29.4	µG/KG	µG/L	NO	NO	NO	NO
Dibenzofuran	ND	1800	ND	4	6800 a	120000	24	NA	µG/KG	µG/L	NO	NO	NO	NO
Di-n-butylphthalate	35	ND	ND	5	2300000	2300000	3700	3.4	µG/KG	µG/L	NO	NO	NO	YES
bis(2-Ethylhexyl)phthalate (BEHP) c	84	ND	840	ND	1800000	31000000	4.8	NA	µG/KG	µG/L	NO	NO	NO	NO
Fluoranthene	1000	2800	ND	ND	2100000	NA	1500	1.6	µG/KG	µG/L	NO	NO	NO	NO
Fluorene	ND	2200	ND	8	280000	NA	1500	NA	µG/KG	µG/L	NO	NO	NO	NO
1-Methylnaphthalene	210	1700	ND	17	72000 a	NA	1500	NA	µG/KG	µG/L	NO	NO	NO	NO
2-Methylnaphthalene	200	1900	ND	5	230000 a	NA	1500	23.5	µG/KG	µG/L	NO	NO	NO	NO
Naphthalene	2200	5900	ND	1	42000	NA	1500	23.5	µG/KG	µG/L	NO	NO	NO	NO
Phenanthrene	55	6200	ND	2	660000 a	NA	1100	NA	µG/KG	µG/L	NO	NO	NO	NO
Pyrene	810	1900	730	ND	2100000	NA	1100	NA	µG/KG	µG/L	NO	NO	NO	NO
Pesticides/PCBs														
Aldrin c	ND	ND	0.34	ND	230	3000	0.0039	0.13	µG/KG	µG/L	NO	NO	NO	NO
Aroclor-1260 c	61	ND	ND	ND	1000	1000	0.033	0.03	µG/KG	µG/L	NO	NO	NO	NO
alpha-BHC (alpha-HCH) c	ND	ND	0.59	ND	0.25	800	0.011	1400	µG/KG	µG/L	NO	NO	NO	NO
beta-BHC (beta-HCH) c	1.3	ND	ND	ND	1.3	1E+09	0.037	NA	µG/KG	µG/L	NO	NO	NO	NO
delta-BHC (delta-HCH) c	1.1	ND	ND	ND	1.8 a	NA	0.037	NA	µG/KG	µG/L	NO	NO	NO	NO

Table 10.3.12
Organic Chemicals Detected in Surface Soil, Subsurface Soil, Sediment, and Shallow Groundwater
Comparison to Cross-Media SSLs, Tap-water RBCs, and Saltwater Surface Water Chronic Screening Levels
AOCs 675/676/677
Charleston Naval Complex
Charleston, South Carolina

Parameter	Maximum Concentration				Screening Concentration									
	Surface Soil	Subsurface Soil	Sediment	Shallow GW	Soil to GW SSL	Soil to Air SSL	Tap Water RBC	Saltwater Surf. Wtr. Chronic	Soil Units	Water Units	Leaching Potential	Volatil-ization Potential	Ground-water Migration Concern	Surface Water Migration Concern
gamma-BHC (Lindane) c	1 2	ND	1.2	ND	4.5	NA	0.052	0.016	µG/KG	µG/L	NO	NO	NO	NO
Chlordane c	7.6	ND	ND	ND	5000	20000	0.19	0.004	µG/KG	µG/L	NO	NO	NO	NO
4,4'-DDD c	34	500	6 5	ND	8000	NA	0.28	0.025	µG/KG	µG/L	NO	NO	NO	NO
4,4'-DDE c	38	240	2	ND	27000	NA	0 2	0.14	µG/KG	µG/L	NO	NO	NO	NO
4,4'-DDT c	24	71	2 8	ND	16000	1E+09	0.2	0.001	µG/KG	µG/L	NO	NO	NO	NO
Dieldrin c	ND	ND	3.7	ND	2	1000	0.0042	0.0019	µG/KG	µG/L	NO	NO	NO	NO
Endosulfan I	ND	ND	12	ND	9000 b	NA	220	0.0087	µG/KG	µG/L	NO	NO	NO	NO
Endosulfan II	ND	ND	5.5	ND	9000 b	NA	220	0.0087	µG/KG	µG/L	NO	NO	NO	NO
Endosulfan sulfate	ND	ND	2	ND	4600 a	NA	220	NA	µG/KG	µG/L	NO	NO	NO	NO
Endrin	2 8	ND	12	ND	500	NA	11	0.0023	µG/KG	µG/L	NO	NO	NO	NO
Endrin aldehyde	1.6	ND	8.8	ND	340 a	NA	11	NA	µG/KG	µG/L	NO	NO	NO	NO
Heptachlor epoxide c	3	ND	4	ND	330	5000	0.0012	0 0036	µG/KG	µG/L	NO	NO	NO	NO
Methoxychlor	ND	ND	6.6	ND	80000	NA	180	0.03	µG/KG	µG/L	NO	NO	NO	NO
Organophosphate Pesticides														
Dimethoate	ND	NA	NA	2	15 a	NA	7.3	NA	µG/KG	µG/L	NO	NO	NO	NO
Herbicides														
2,4-D	ND	NA	NA	0.18	370 a	7000000	61	NA	µG/KG	µG/L	NO	NO	NO	NO
Organotin														
Tetrabutyltin	25.28	ND	ND	ND	NA	NA	11	NA	µG/KG	µG/L	NO	NO	NO	NO
TPH - GRO														
Gasoline	NA	NA	NA	115	NA	NA	NA	NA	µG/KG	µG/L	NO	NO	NO	NO
Dioxin Compounds														
2,3,7,8-TCDD equivalents (TEQs) c	2.02	NA	NA	0.395	1600 a	NA	0.45	10	NG/KG	PG/L	NO	NO	NO	NO
123678-HxCDD	1 09	NA	NA	ND	4100 a	NA	4 5	NA	NG/KG	PG/L	NO	NO	NO	NO
123789-HxCDD	0 92	NA	NA	ND	4100 b	NA	4.5	NA	NG/KG	PG/L	NO	NO	NO	NO
1234678-HpCDD	95.6	NA	NA	2.47	108000 a	NA	45	NA	NG/KG	PG/L	NO	NO	NO	NO
OCDD	926	NA	NA	8.79	1080000 a	NA	450	NA	NG/KG	PG/L	NO	NO	NO	NO
123478-HxCDF	2.06	NA	NA	ND	216000 a	NA	4 5	NA	NG/KG	PG/L	NO	NO	NO	NO
123678-HxCDF	0.837	NA	NA	ND	216000 b	NA	4.5	NA	NG/KG	PG/L	NO	NO	NO	NO

Table 10.3.12
Organic Chemicals Detected in Surface Soil, Subsurface Soil, Sediment, and Shallow Groundwater
Comparison to Cross-Media SSLs, Tap-water RBCs, and Saltwater Surface Water Chronic Screening Levels
AOCs 675/676/677
Charleston Naval Complex
Charleston, South Carolina

Parameter	Maximum Concentration				Screening Concentration									
	Surface Soil	Subsurface Soil	Sediment	Shallow GW	Soil to GW SSL	Soil to Air SSL	Tap Water RBC	Saltwater Surf. Wtr. Chronic	Soil Units	Water Units	Leaching Potential	Volatil-ization Potential	Ground-water Migration Concern	Surface Water Migration Concern
123789-HxCDF	ND	NA	NA	3.44	216000 b	NA	4.5	NA	NG/KG	PG/L	NO	NO	NO	NO
234678-HxCDF	0.863	NA	NA	ND	216000 b	NA	4.5	NA	NG/KG	PG/L	NO	NO	NO	NO
1234678-HpCDF	16 6	NA	NA	1.71	54000 a	NA	45	NA	NG/KG	PG/L	NO	NO	NO	NO
OCDF	21.5	NA	NA	0.761	540000 a	NA	450	NA	NG/KG	PG/L	NO	NO	NO	NO

Notes:
Sources of screening concentrations appear in Table 5.5
Explanations of fate and transport screening procedures appear in Section 6.2.
Frequency and range of detections, average detected concentrations, and number of screening concentration exceedances appear in Tables 10.3.2, 10.3.6, and 10.3.10.

a - Calculated soil to groundwater SSL value (See Table 6.2)
b - Based on surrogate compound; see Table 5.5
c - Carcinogenic
GW - Groundwater
NA - Not applicable/not available
ND - Not detected
RBC - Risk-based concentration
SSL - Soil screening level
NG/KG - Nanograms per kilogram
µG/KG - Micrograms per kilogram
PG/L - Picograms per liter
µG/L - Micrograms per liter

Table 10.3.13
Inorganic Chemicals Detected in Surface Soil, Subsurface Soil, Sediment, and Shallow Groundwater
Comparison to Cross-Media SSLs, Tap-Water RBCs, Saltwater Surface Water Chronic Screening Levels, and Background Values
AOCs 675/676/677
Charleston Naval Complex,
Charleston, South Carolina

Parameter	Maximum Concentration				Screening Concentration											
	Surface Soil	Subsurface Soil	Sediment	Shallow GW	Soil to GW SSL	Soil Background	Soil to Air SSL	Tap Water RBC	Shallow GW Background	Saltwater Surf. Wtr Chronic	Soil Units	Water Units	Leaching Potential	Fugitive Particulate Inhalation Concern	Ground-water Migration Concern	Surface Water Migration Concern
Inorganic Chemicals																
Aluminum (Al)	11800	24900	3190	29.5	560000 a	27400	NA	37000	1440	NA	mg/kg	µg/L	NO	NO	NO	NO
Antimony (Sb)	6.6	9.2	0.22	ND	2.7	ND	NA	15	NA	NA	mg/kg	µg/L	YES	NO	NO	NO
Arsenic (As) c	5.4	14.4	0.52	7.1	15	21.6	750	0.045	23	36	mg/kg	µg/L	NO	NO	NO	NO
Barium (Ba)	25.7	33	12.4	73.4	820	54.2	690000	2600	110	NA	mg/kg	µg/L	NO	NO	NO	NO
Beryllium (Be)	0.98	1.1	ND	0.7	32	0.95	1300	73	1.1	NA	mg/kg	µg/L	NO	NO	NO	NO
Cadmium (Cd)	0.72	1.2	ND	1.1	4	0.61	1800	18	NA	9.3	mg/kg	µg/L	NO	NO	NO	NO
Chromium (Cr) (total)	70.5	46.1	10.9	8.6	19	51.3	270	180	14.3	50	mg/kg	µg/L	YES	NO	NO	NO
Chromium (Cr6) (hexavalent)	0.426	NA	NA	ND	19	ND	270	180	ND	50	mg/kg	µg/L	NO	NO	NO	NO
Cobalt (Co)	4.4	7.4	0.63	1.2	990 a	5.8	NA	2200	2.2	NA	mg/kg	µg/L	NO	NO	NO	NO
Copper (Cu)	26.6	278	14.9	3	5600 a	240	NA	1500	4.4	2.9	mg/kg	µg/L	NO	NO	NO	YES
Lead (Pb)	42.4	20.2	30.1	4	400	203	400	15	4.4	8.5	mg/kg	µg/L	NO	NO	NO	NO
Manganese (Mn)	1420	188	23.9	1690	480 a	419	NA	730	5430	NA	mg/kg	µg/L	YES	NO	NO	NO
Mercury (Hg)	0.11	0.2	ND	ND	1	0.47	10	11	NA	0.025	mg/kg	µg/L	NO	NO	NO	NO
Nickel (Ni)	20.9	21.1	16.6	4.2	65	23.9	13000	730	13.3	8.3	mg/kg	µg/L	NO	NO	NO	NO
Selenium (Se)	0.97	2.1	ND	4.4	2.6	1.77	NA	180	ND	71	mg/kg	µg/L	NO	NO	NO	NO
Thallium (Tl)	0.42	0.57	ND	4.6	0.36	ND	NA	2.6	2	21.3	mg/kg	µg/L	YES	NO	YES	NO
Tin (Sn)	2.4	11.2	1.9	ND	5500 a	7.5	NA	22000	NA	NA	mg/kg	µg/L	NO	NO	NO	NO
Vanadium (V)	176	57.1	ND	15.1	3000	113	NA	260	14	NA	mg/kg	µg/L	NO	NO	NO	NO
Zinc (Zn)	130	76.7	66.2	10.2	6200	206	NA	11000	24.4	86	mg/kg	µg/L	NO	NO	NO	NO

Notes:
Sources of screening concentrations appear in Table 5.6
Explanations of fate and transport screening procedures appear in Section 6.2.
Frequency and range of detections, average detected concentrations, and number of screening concentration exceedances appear in Tables 10.3.3, 10.3.7, and 10.3.11.

Background values for soil are shown for comparison purposes only.
Maximum groundwater concentrations are screened against the greater of tap water RBCs or corresponding background values to determine groundwater migration concern.

a - Calculated soil to groundwater SSL value (See Table 6.2)
c - Carcinogenic
GW - Groundwater

NA - Not available/Not applicable
ND - Not detected
RBC - Risk-based concentration

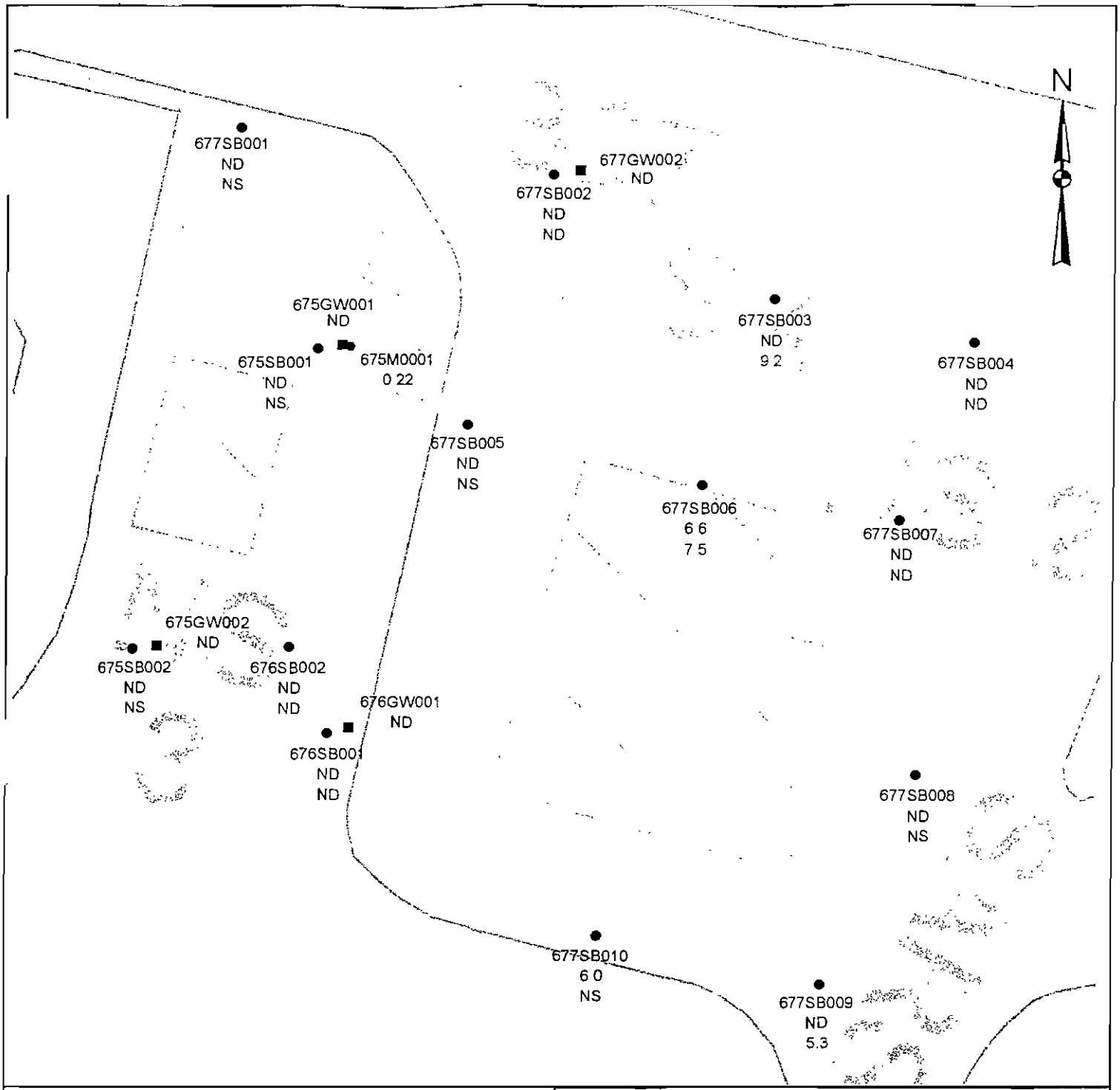
SSL - Soil screening level
MG/KG - Milligrams per kilogram
µG/L - Micrograms per liter

manganese concentrations detected at AOCs 675/676/677. In site groundwater, manganese was present above the RBC but not above the zone-specific background. Thallium exceeded the SSL in one surface soil and three subsurface soil samples, and was present above the RBC and zone background in groundwater. Figure 10.3.5 presents thallium concentrations detected at AOCs 675/676/677.

These inorganics are not typically considered to be associated with petroleum storage and transfer, the past site activities, but they could be associated with the incineration that took place at AOC 676. The distribution of the individual constituents, however, is not particularly unique to AOC 676, which suggests other origins.

The relative distributions of the inorganic constituents do not demonstrate a remarkable trend. The low concentrations of antimony in soil and its sporadic occurrence indicate a small residual mass that is unlikely to be significant; this is further substantiated by its absence in groundwater. The widespread occurrence of chromium and manganese suggest that their presence is not specific to activity at any one AOC, but related to all through a common process or feature - most likely as the result of natural occurrence. This is substantiated by their zone-specific background concentrations. As with antimony, the sporadic occurrence and low concentrations of thallium suggest that the mass in soil should not pose a significant threat to groundwater.

The presence of chromium, manganese, and thallium in groundwater indicates that the soil-to-groundwater pathway has merit, but the distribution of these constituents does not summarily demonstrate the site as the particular source. The area has been filled with non-native material, with a component of finer-grained silts and clays that typically hold inorganics easily sorbed. Also,the combined AOC area is immediately adjacent to the estuarine Cooper River, and exposure to brackish water in the subsurface can lead to many types of mobilizing reactions which can



LEGEND

●	ZONE I SEDIMENT SAMPLE LOCATION
■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (MG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (MG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

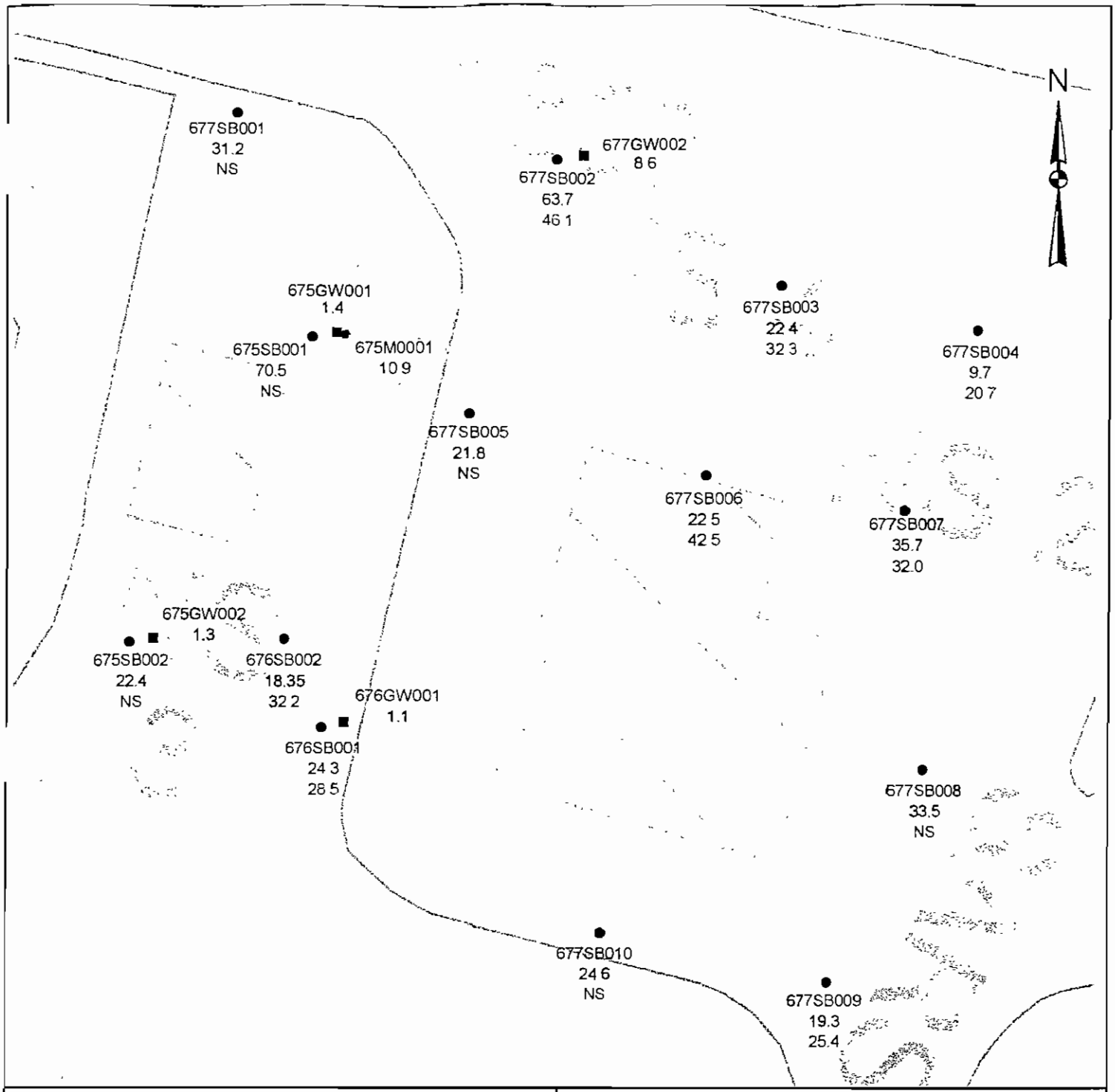
SCALE

20 0 20 40 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.2
ZONE I
AOC 675, 676, 677
ANTIMONY
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=6 UG/L RBC=3.1 MG/KG SSL=2.7 MG/KG



LEGEND

- ZONE I SEDIMENT SAMPLE LOCATION
- MONITORING WELL LOCATION
- ZONE I SOIL BORING LOCATION
- 12.30 ZONE I SURFACE SOIL CONC. (MG/KG)
- 12.30 ZONE I SUBSURFACE SOIL CONC. (MG/KG)
- *12.30* MAXIMUM QUARTERLY GW CONC. (UG/L)
- NS NO SAMPLE TAKEN
- ND NON DETECT

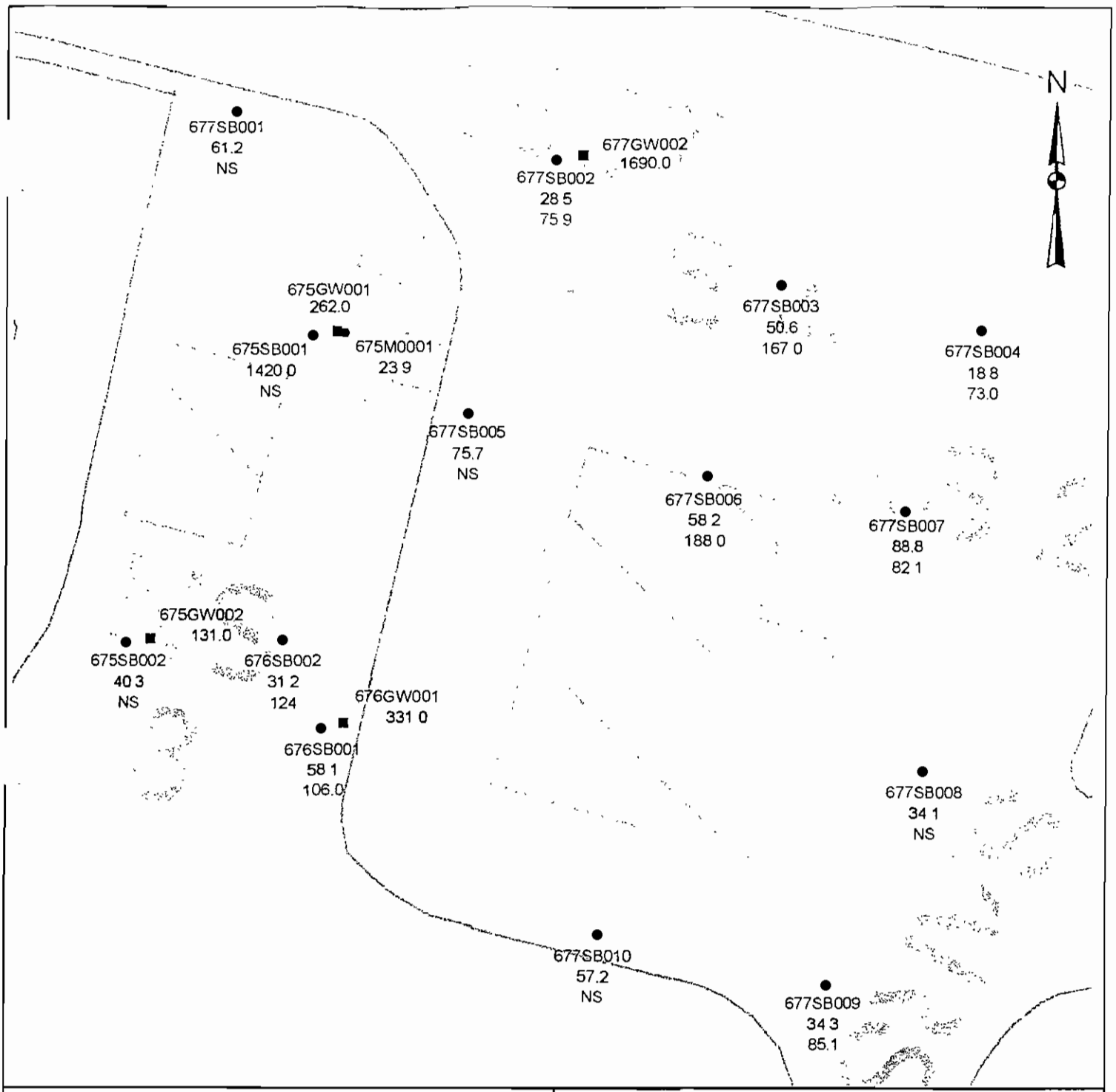
SCALE

20 0 20 40 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.3
ZONE I
AOC 675, 676, 677
CHROMIUM
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=100 UG/L RBC=39 MG/KG SSL=19 MG/KG



LEGEND

- ● ZONE I SEDIMENT SAMPLE LOCATION
- ■ MONITORING WELL LOCATION
- ● ZONE I SOIL BORING LOCATION
- 12.30 ZONE I SURFACE SOIL CONC. (MG/KG)
- 12.30 ZONE I SUBSURFACE SOIL CONC. (MG/KG)
- *12.30* MAXIMUM QUARTERLY GW CONC. (UG/L)
- NS NO SAMPLE TAKEN
- ND NON DETECT

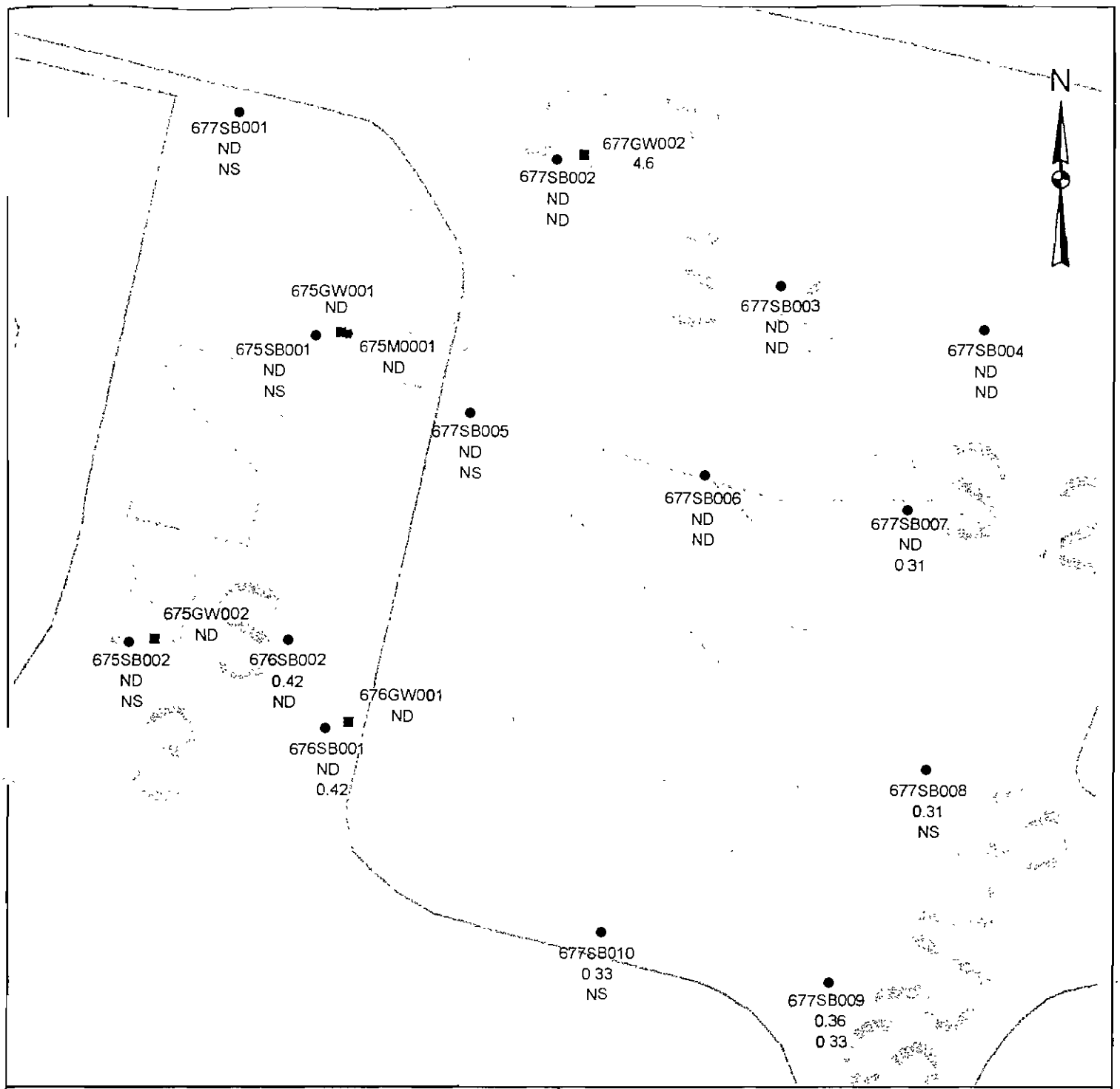
SCALE

20 0 20 40 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.4
ZONE I
AOC 675, 676, 677
MANGANESE
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=NA RBC=160 MG/KG SSL=480 MG/KG



LEGEND

●	ZONE I SEDIMENT SAMPLE LOCATION
■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (MG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (MG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

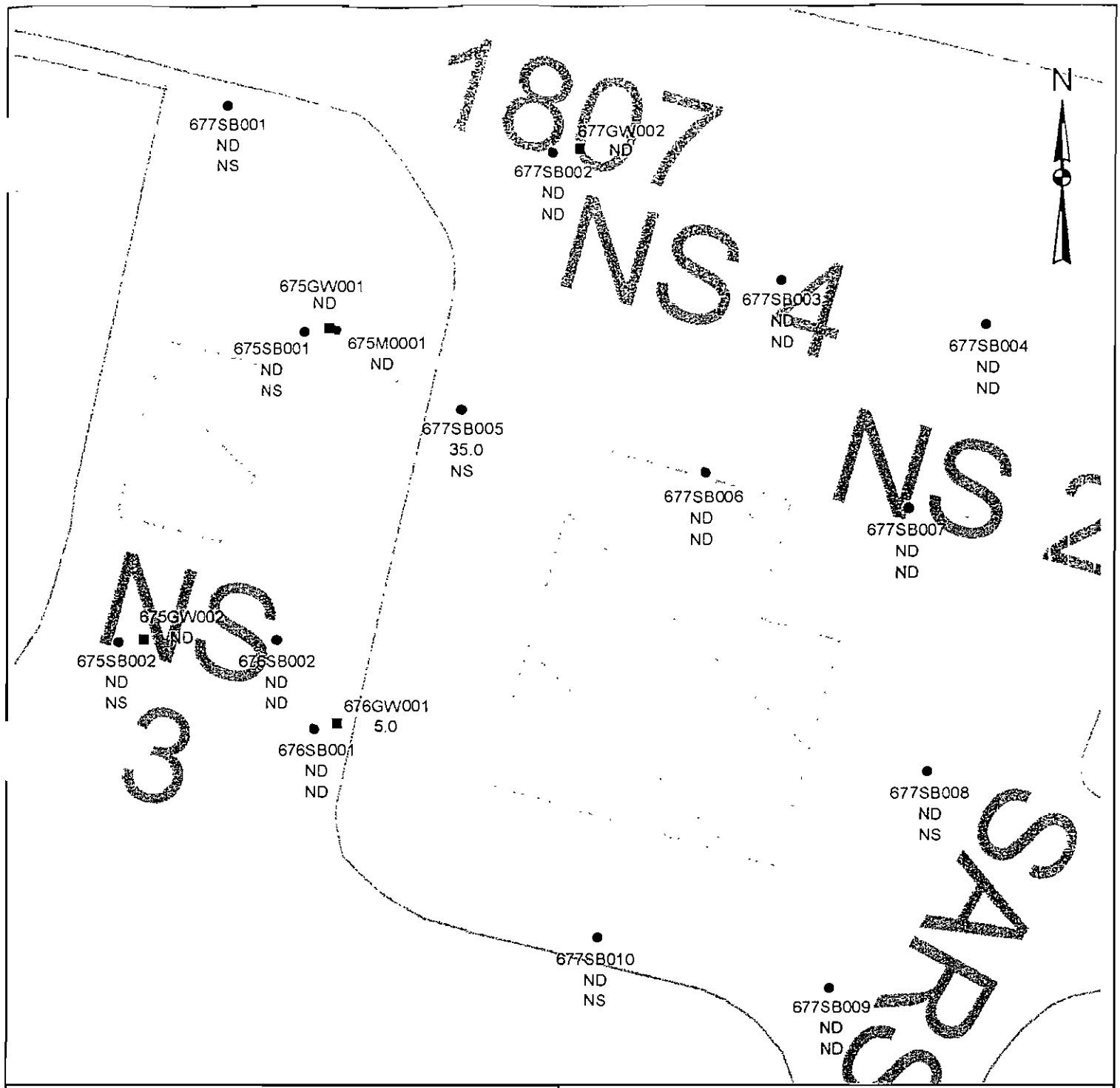
SCALE

20 0 20 40 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.5
ZONE I
AOC 675, 676, 677
THALLIUM
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=2 UG/L RBC=.55 MG/KG SSL=.36 MG/KG



LEGEND

●	ZONE I SEDIMENT SAMPLE LOCATION
■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (UG/KG)
12 30	ZONE I SUBSURFACE SOIL CONC. (UG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

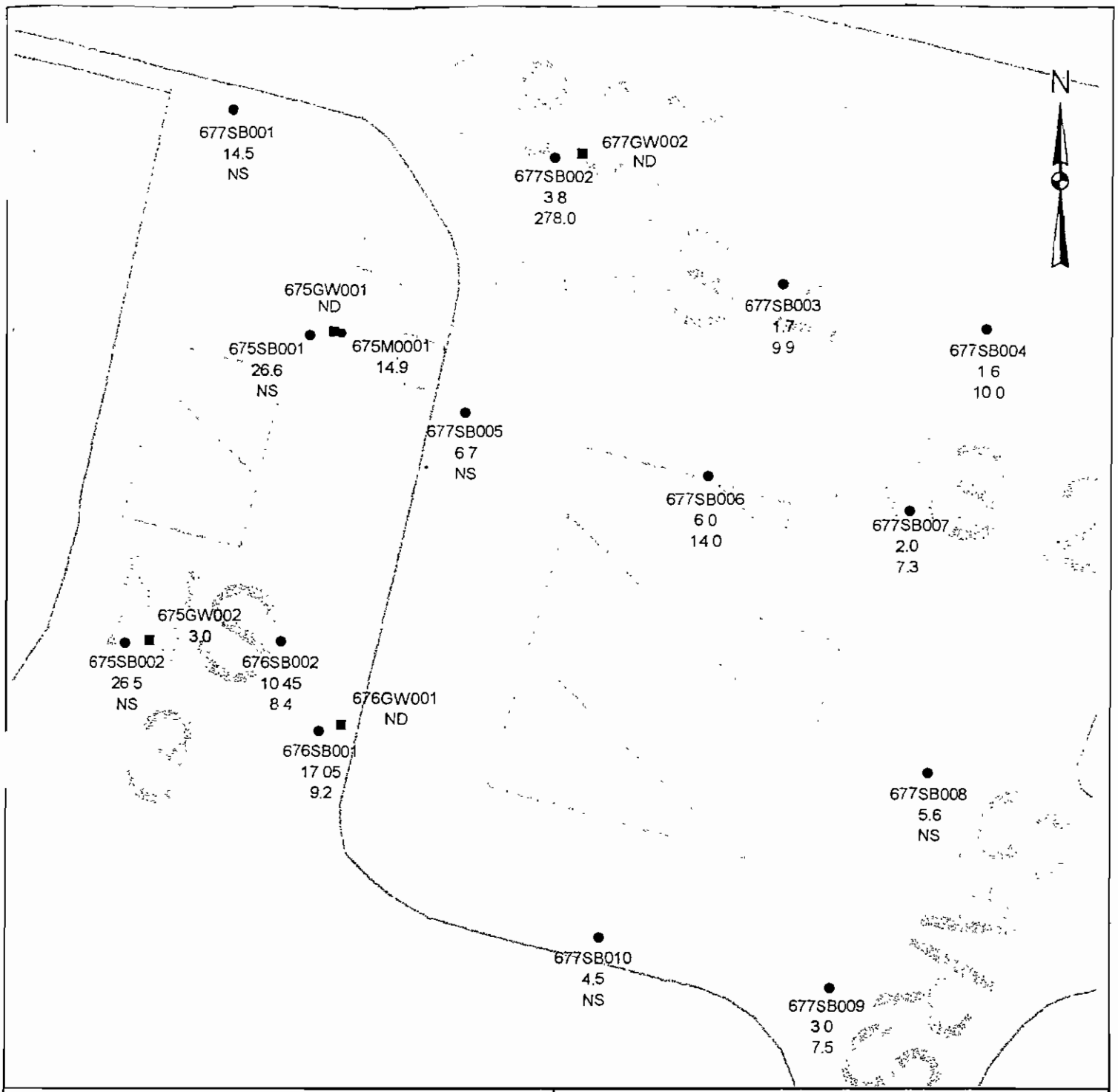
SCALE

20 0 20 40 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.6
ZONE I
AOC 675, 676, 677
DI-N-BUTYLPHTHALATE
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=NA RBC=780000 UG/KG SSL=2300000 UG/KG



LEGEND

●	ZONE I SEDIMENT SAMPLE LOCATION
■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (MG/KG)
12 30	ZONE I SUBSURFACE SOIL CONC. (MG/KG)
12 30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

SCALE

20 0 20 40 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.7
ZONE I
AOC 675, 676, 677
COPPER
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=1300 RBC=310 MG/KG SSL=5600 MG/KG

1-98

release inorganics to the groundwater system. The presence of inorganics in groundwater is therefore not straightforward in a near-surface brackish water environment that can be highly variable in terms of Eh, pH, and metals solubility.

10.3.7.2 Groundwater Migration and Surface Water Cross-Media Transport

Tables 10.3.12 and 10.3.13 compare maximum detected organic and inorganic constituent concentrations, respectively, in shallow groundwater samples to risk-based concentrations for drinking water, and to chronic ambient saltwater surface water quality criteria values for the protection of aquatic life (saltwater surface water chronic screening values). For inorganics, maximum concentrations in groundwater are screened against saltwater chronic values and the greater of (a) risk-based drinking water concentrations and (b) corresponding background reference concentrations for groundwater. To provide a conservative screening, no attenuation or dilution of constituents in groundwater is assumed before comparison to the relevant standards. It should be noted that the risk-based pathway for shallow groundwater is currently an invalid pathway simply because there is no human consumption of the groundwater. This comparison is made for screening only, and to develop strategies for long-term management of the groundwater should an area containing deleterious levels be identified.

No organic constituents were present in groundwater at concentrations exceeding the applicable RBC screening levels.

Two inorganic constituents - manganese and thallium - were present in groundwater at levels that exceeded the applicable drinking water risk-based migration pathway criteria (Figures 10.3.4 and 10.3.5). Manganese concentrations were detected in all wells every round, but did not exceed zone-specific background in any round. Thallium was not detected prior to the fourth-round of sampling, and was detected in only one well in the fourth-round. The presence of manganese and thallium in site groundwater is not unexpected given the soil concentrations, but the inconsistent

1-99

detection of thallium is problematic. It may reflect climatological factors or the complex chemical and stability relationships in the brackish near-surface aqueous environment.

Groundwater flow in the site area is generally towards the adjacent Cooper River, where it undergoes non-point source discharge. Two constituents – di-n-butylpthalate and copper – were identified in site groundwater above the surface water screening criteria. Figures 10.3.6 and 10.3.7 present respectively, di-n-butylpthalate and copper concentrations detected at AOCs 675/676/677. For both constituents, detections were in a single well; di-n-butylpthalate in the first-round and copper in the second-round of sampling. Sample results since that event have been non-detect for both constituents. As a result, the pathway is considered invalid from a chemical standpoint.

10.3.7.3 Soil-to-Sediment Cross-Media Transport

Analytical results for sediment were compared to those for surface soil to ascertain the potential relationship between the two media.

Organic results were somewhat different for the surface soil and sediment, particularly for pesticides/PCBs. Although these constituents were detected in sediment at low concentrations, many were non-detect in soil, indicating a source for these other than the site drainage. Concentrations of inorganics in sediment were generally at lower concentrations than those in soil, suggesting that the site may be the source for these constituents in sediment.

10.3.7.4 Soil-to-Air Transport

Three VOCs – acetone, acetonitrile, and toluene – were detected in site surface soil. However, since all concentrations were far below the soil-to-air SSLs, the pathway is not considered to be significant this site.

10.3.7.5 Fate and Transport Summary

Soil-to-Groundwater Pathway

Four inorganics are present in surface and subsurface soil at levels exceeding SSLs:

- Antimony exhibited non-spatially correlated detections at low concentrations in surface and subsurface soil. It was non-detect in groundwater.
- Chromium was widely detected in surface and subsurface soils, generally at concentrations below background. It was present in groundwater, but at levels below the RBC.
- Manganese was widely detected in surface and subsurface soils, generally at concentrations below the SSL. It was present in groundwater, but at levels below background.
- Thallium was sporadically detected in surface and subsurface soil at concentrations above the SSL, with relatively higher concentrations in the subsurface soil. It was present in groundwater at a concentration above the RBC and background.

Inorganics are not expected to be associated with past site activities, primarily petroleum storage and transfer.

- The distributions of constituents, both individually and relatively, do not show remarkable trends, and suggest an origin other than the site activities.
- The inconsistent, non-spatially correlated detections of antimony and thallium, and the widespread detections of chromium and manganese, do not summarily point to the site as the source, and may be indicative of non-native fill or natural sediment composition.

The pathway is valid for chromium, manganese, and thallium, but is expected to be significant only for thallium.

Groundwater RBC and Surface Water Pathway

Thallium and manganese were the only constituents above RBC in site groundwater.

- Manganese was widely detected for four sample rounds, but never exceeded the zone-specific background.
- Thallium was detected in only one well in the fourth-round, and was non-detect for the previous rounds.
- The presence of these constituents is not unexpected given soil concentrations. Manganese can be attributed to natural occurrence, but the persistence of thallium will need to be defined with further sampling.

Di-n-butylpthalate and copper were the only constituents detected in groundwater above surface water screening values.

- The Cooper River is immediately downgradient of the site, and therefore the pathway is valid from a flow standpoint.
- Both constituents were detected in a single well and only in one round (di-n-butylpthalate in the first and copper in the second). Both have been non-detect in groundwater since, and thus the pathway is considered invalid from a chemical standpoint.

Soil-to-Sediment Pathway

Pesticide and PCB results for sediment did not correlate well with surface soil results, while inorganic results did. These relationships may indicate a secondary source for sediment contamination within the drainage system, or indicate vestiges of typical pesticide application near where the sediment sample was collected.

VI. PIPING INFORMATION

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6
A. Construction Material	Steel					
B. Distance from UST to Dispenser	3'					
C. Number of Dispensers	1 See note 1					
D. Type of System P/S	See note 1					
E. Was Piping Removed from the Ground? Y/N	Y					
F. Visible Corrosion or Pitting Y/N	Y					
G. Visible Holes Y/N	N					
H. Age	> 30 yrs.					

Note 1: UST NS26 was a gravity fed waste oil tank for Building 26

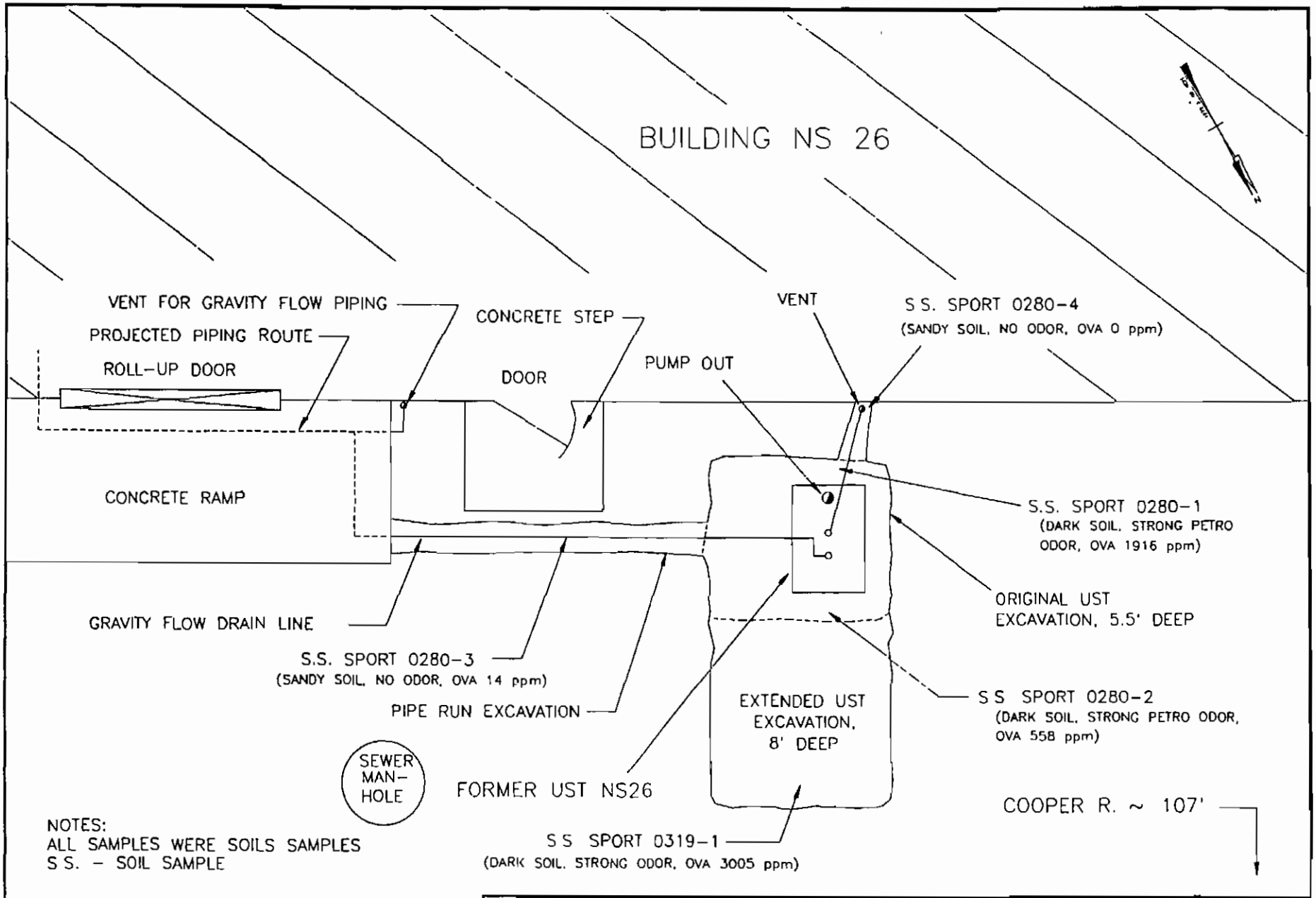
I. If any corrosion, pitting, or holes were observed, describe the location and extent for each line.

All piping associated with the tank was pitted and corroded, but no holes were found.

VII. BRIEF SITE DESCRIPTION AND HISTORY

Building NS 26 was part of the Navy's Shore Intermediate Activity (SIMA) complex. The building was built in 1958 and renovated in 1985. Although an oil/water separator is referenced in early building plans, no separator could be located at the time of the tank removal. It is assumed that the oil water separator piping has not been used since the 1985 renovation The tank apparently continued to be used by pouring used oil down the six inch pump-out pipe.

After sample results were reviewed, efforts were made to "chase" (remove) contaminated soil at the site. The northwest end of the excavation was extended in an effort to recover petroleum contaminated soil. As digging proceeded, OVA readings were taken using the Micro FID flame ionization detector to determine how far to proceed. The OVA reading at the end of the original excavation was 558 parts per million (ppm). The excavation was extended approximately 7 feet out and 8 feet below ground surface level. OVA readings did not improve. The last OVA reading, taken along with soil sample SPORT 0319-1, registered 3005 ppm. Since no improvement was noted based on OVA readings and the excavation was about to impact sewer piping, digging was discontinued.

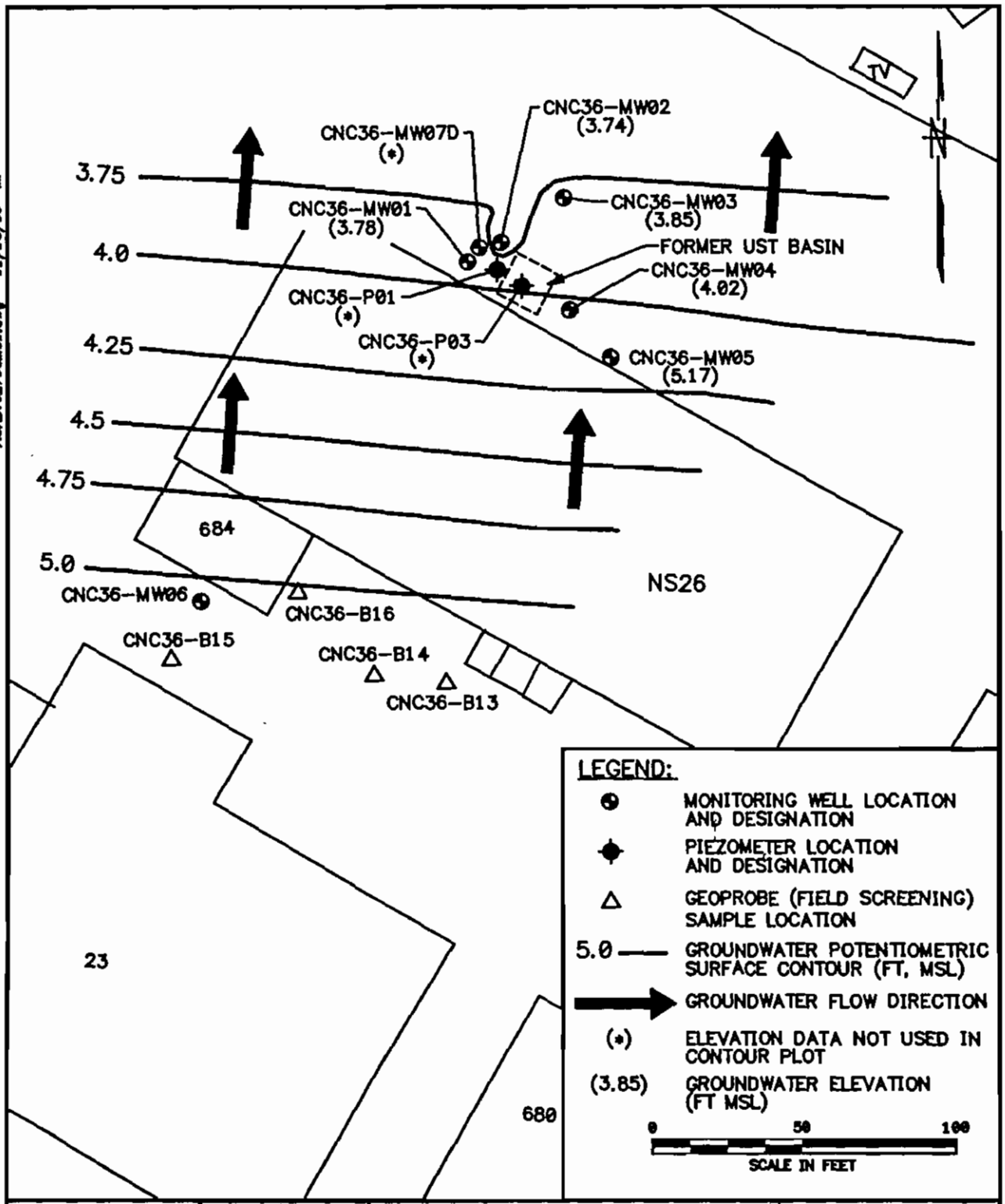


NOTES:
ALL SAMPLES WERE SOILS SAMPLES
S S. - SOIL SAMPLE

Site Map 3
UST NS26
Charleston Naval Base
Charleston, SC

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

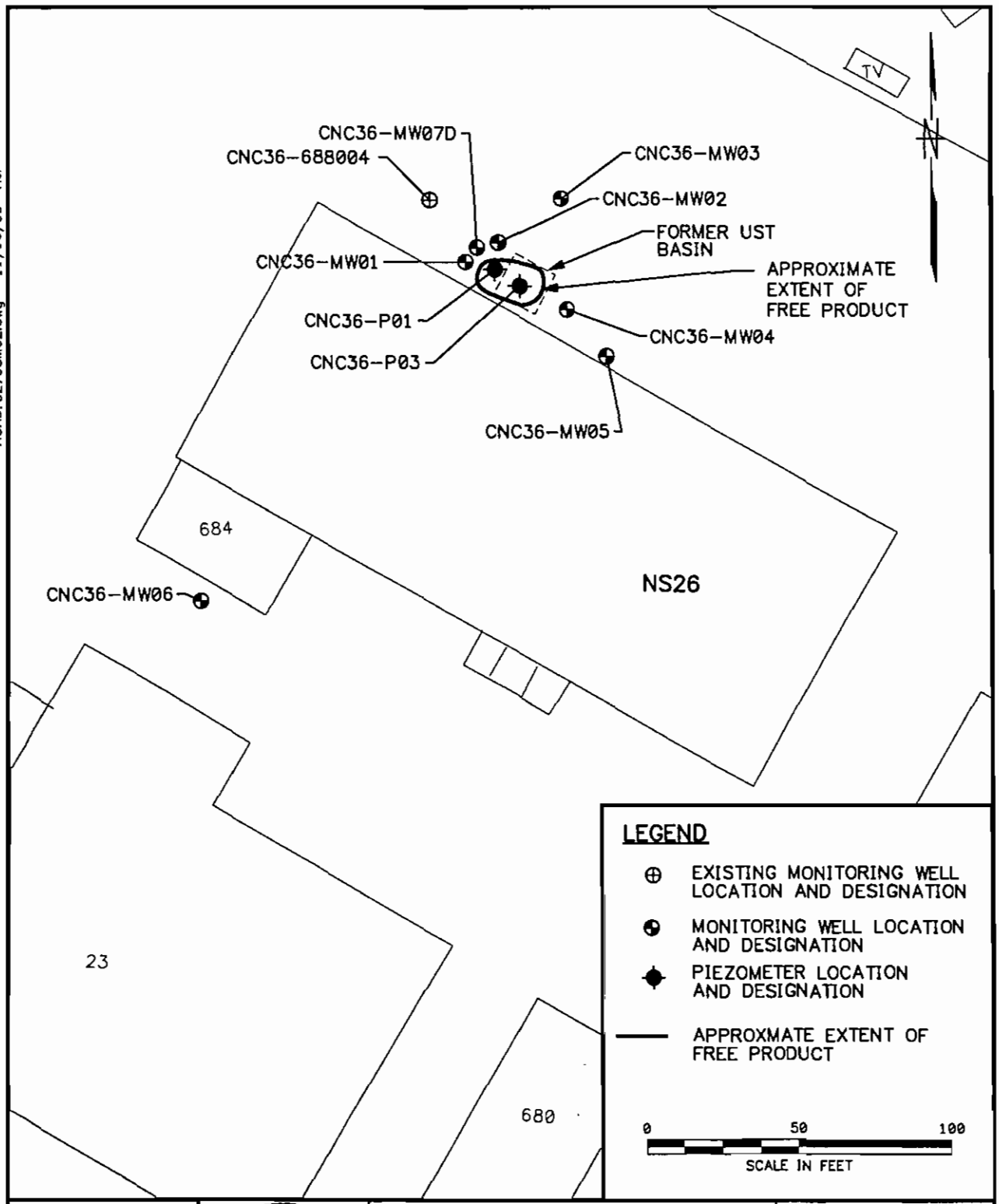
DWG DATE. 26 MAR 97 | DWG NAME NS26_3



ACAD:0270GM01.dwg 11/18/99 MF

DRAWN BY HJP DATE 11/10/99		GROUNDWATER POTENTIOMETRIC MAP (SEPTEMBER 10, 1999) SITE 36, BUILDING NS26 ZONE I, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0270
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 6 / REV. 0

FORM CADD NO. SHEV_AV.DWG - REV 0 - 1/20/98



ACAD:0270GM02.dwg 11/10/99 HJP

DRAWN BY HJP DATE 11/10/99	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	AREAL EXTENT OF FREE PRODUCT (SEPTEMBER 10, 1999) SITE 36, BUILDING NS26 ZONE I, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. 0270
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7 / REV. 0

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

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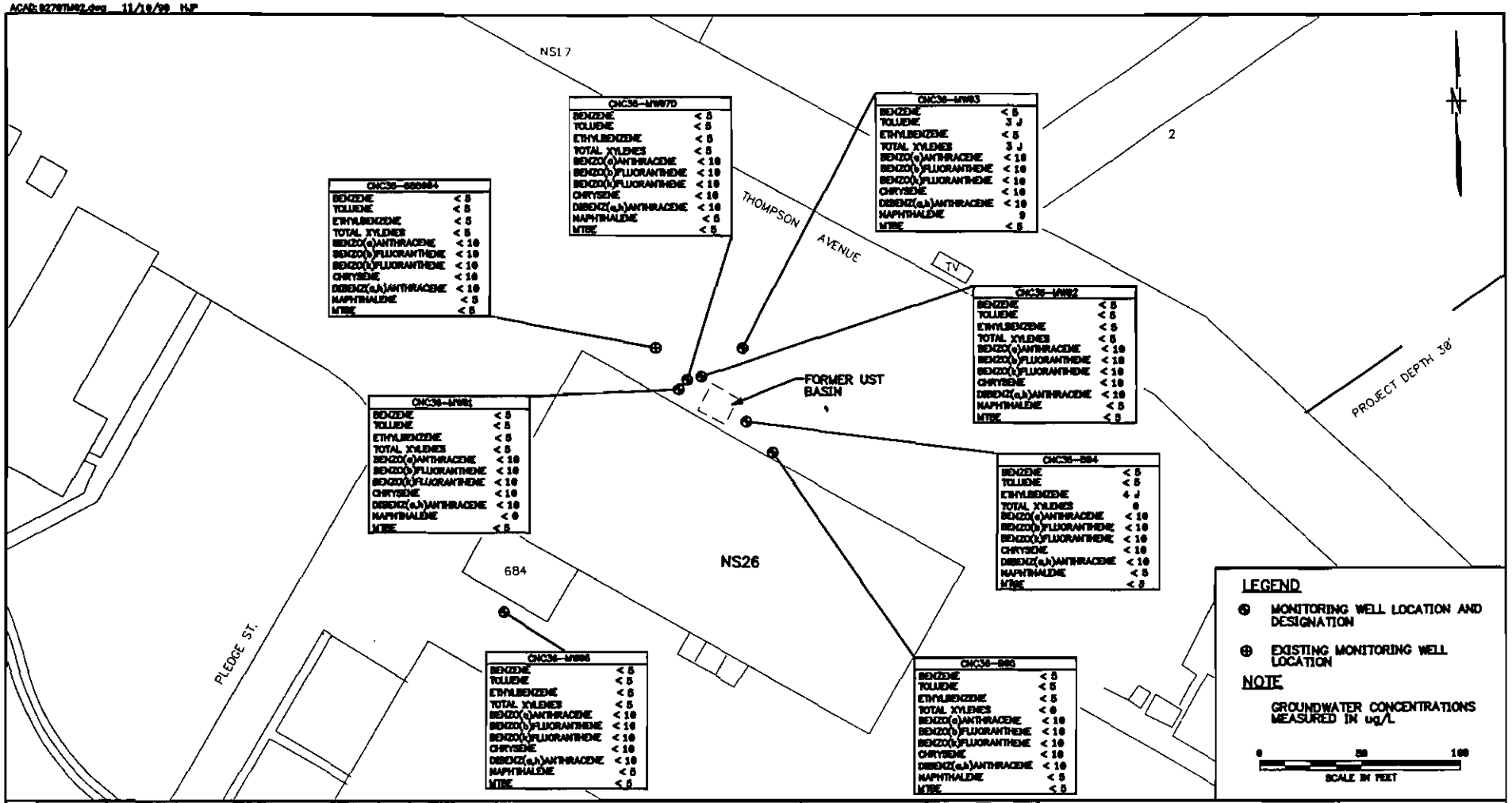
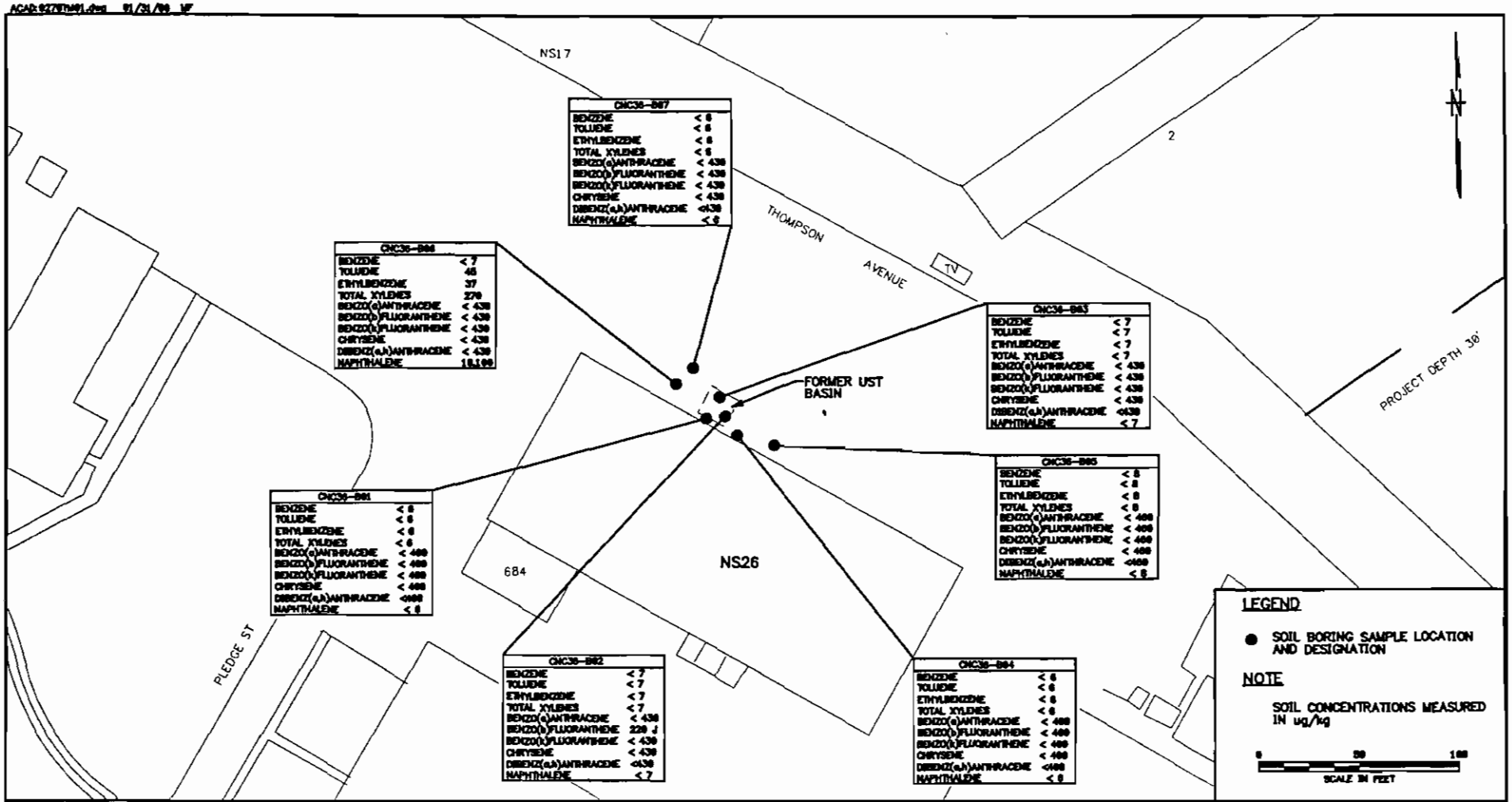


NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 11/10/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

DISTRIBUTION OF CHEMICALS OF CONCERN IN GROUNDWATER
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0270
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 9
REV. 0



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 11/10/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

DISTRIBUTION OF CHEMICALS OF CONCERN IN SOIL
SITE 36, BUILDING NS26
ZONE I, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0270
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 8
REV. 0

FORM CHRS NO. 6267_39A3A0 - REV 0 - 1/28/98

Fig 1

10

NS 26A

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LABORATORY DIVISION
CHARLESTON NAVAL SHIPYARD
CODE 134, BLDG 13
CHARLESTON, S.C. 29408-6100

GENERAL LABORATORY REPORT

Date: 11 August 1995

To: Code 300C.9, Bldg.8

Subj: ANALYSIS OF WASTE OIL / USTNS 006 (LO) (NS 26A)

Ref: (a) Job Order: 71-002-16002
(b) Report NO: 95CH00924 : REM- 334
(c) ECP #2

1. As authorized by reference (a) and requested by reference (b), one (1) sample of WASTE OIL / USTNS 006 (LO) was analyzed per reference (c).

2. The results follow :

TEST	RESULT
Arsenic, mg/l	< 1
Chromium, mg/l	6
Cadmium, mg/l	< 1
Lead, mg/l	28
PCB's, ppm	< 2
Flash Point, °F	> 230
Total Halogens, ppm	58
pH	5.63

OK

R E Oakley 8/11/95 — Analyst

P M Gourick 8-11-95 — Head, LABORATORY DIVISION

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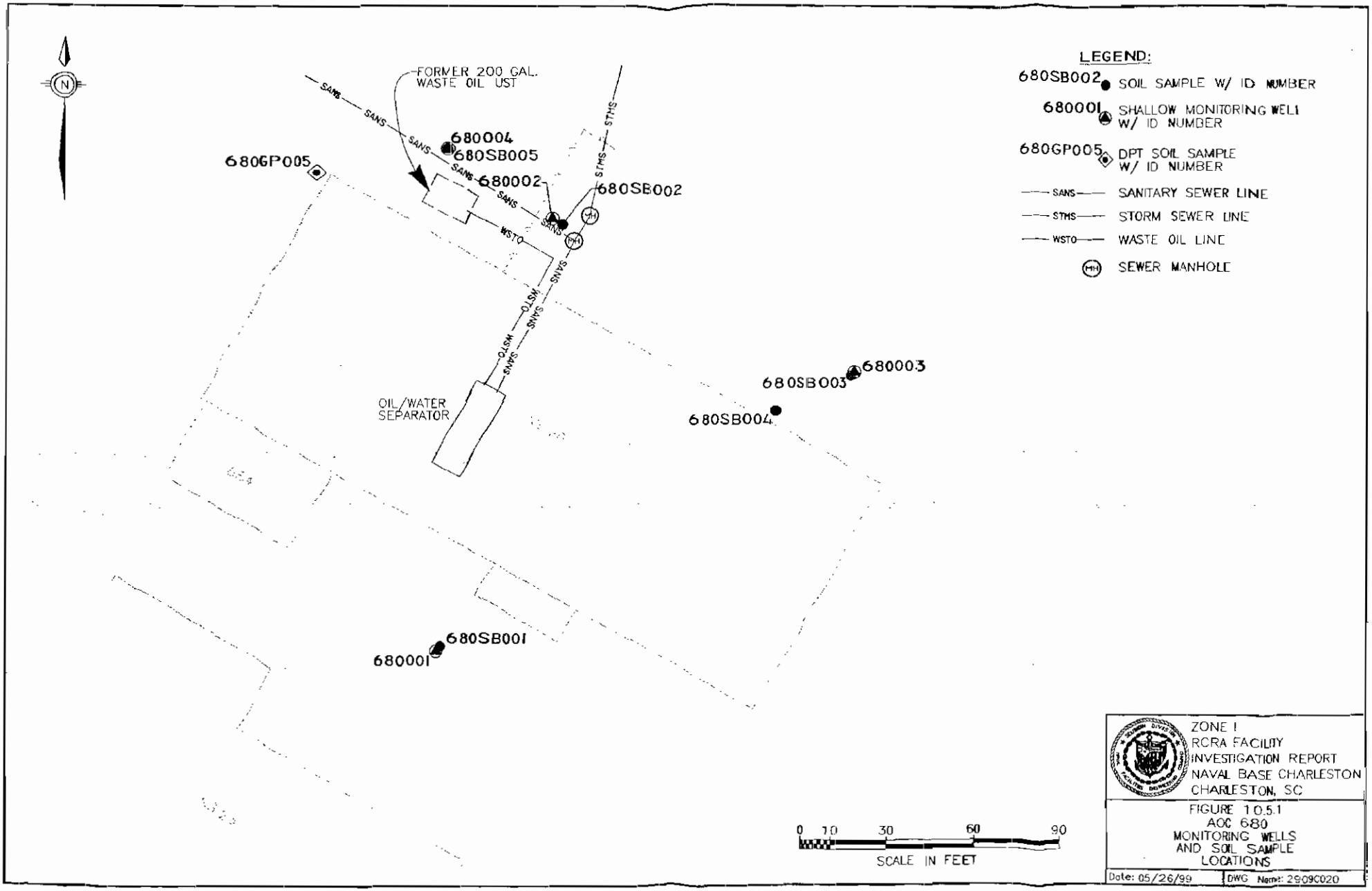
1-110


N
FORMER 200 GAL.
WASTE OIL UST
SANS
STMS
WSTO
680004
680SB005
680GP005
680002
680SB002
OIL/WATER
SEPARATOR
680003
680SB003
680SB004
680SB001
680001
LEGEND:
680SB002 SOIL SAMPLE W/ ID NUMBER
680001 SHALLOW MONITORING WELL W/ ID NUMBER
680GP005 DPT SOIL SAMPLE W/ ID NUMBER
SANS SANITARY SEWER LINE
STMS STORM SEWER LINE
WSTO WASTE OIL LINE
MH SEWER MANHOLE
0 10 30 60 90
SCALE IN FEET
ZONE I
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC
FIGURE 10.5.1
AOC 680
MONITORING WELLS
AND SOIL SAMPLE
LOCATIONS
Date: 05/26/99
DWG Name: 2909C020

10.5 AOC 680, Building NS-26 UST and Grinding Room/Brake Repair Area

AOC 680 includes Building NS-26 and associated former grinding room/brake repair area. Building NS-26 was part of the Navy's Shore Intermediate Activity (SIMA) complex. The building was constructed in 1958 and renovated in 1985. Structures associated with NS-26 include several storage sheds and steel storage trailers.

Three dip tanks were located in the west end of the facility and were used to clean ship parts. The contents of the tanks were tri-sodium phosphate, citric acid, and water. The tanks reportedly were cleaned bi-annually by CNC personnel.

An initial assessment study in 1981 noted that the following hazardous wastes were generated at this facility: boiler cleaning solution (sulfuric acid and nitric acid); cleaning solvents (chlorinated hydrocarbons); and boiler test chemicals (mercuric nitrate). From 1958 through 1981, disposal practices reportedly included discharging neutralized boiler solutions, solvents, and mercuric nitrate solutions directly into the Cooper River.

Historic information indicates that the area was used as a seaplane refueling ramp and as an oil storage area in the 1940s.

In December 1996, a 200 gallon waste oil UST located on the north side of NS-26 was closed by removal. The UST assessment report noted that the tank and associated piping was severly corroded and pitted but no holes were found. The assessment report also notes that the oil-water separator associated with this UST and referenced on early building plans could not be located at the time of UST removal. It is assumed that the oil-water separator has not been used since the building renovations in 1985. The waste oil tank apparently continued to be used after 1985 by pouring used oil down the pump-out piping.

Materials of concern include VOCs and SVOCs. Potential receptors, include future site workers who may be involved in invasive activity that might bring them in direct contact with subsurface contaminants. The ecology of the Cooper River is also a potential receptor.

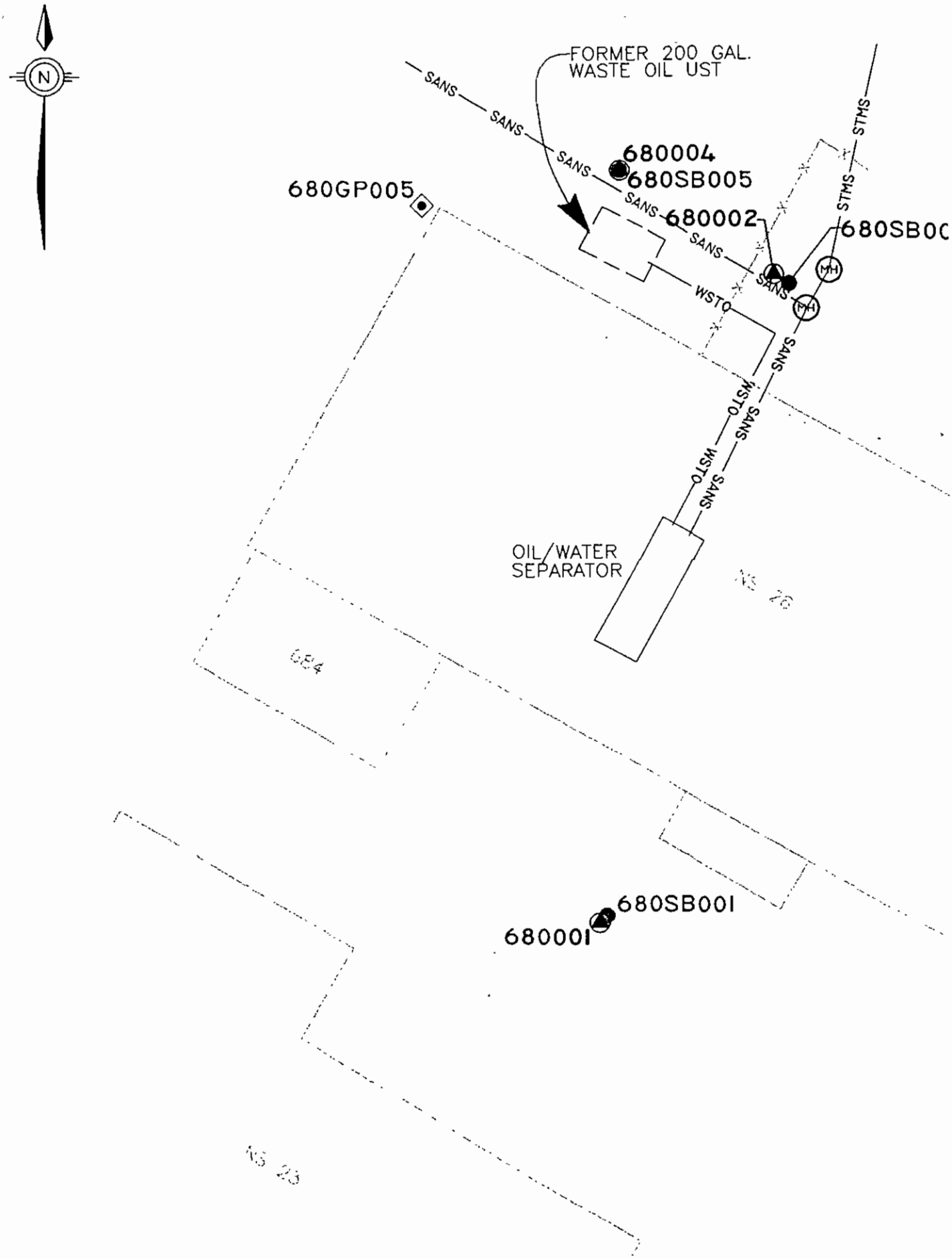
AOC 680 initially only included the former grinding room in Building NS-26, which was reportedly used to repair brake components containing asbestos. Building plans from 1969 show the grinding room on the southern side of Building NS-26. Reportedly, brake repair ceased in 1970. The area once occupied by the grinding room was remodeled in 1985 and is now a short hallway to the southern entrance to the building.

Materials of concern include asbestos dust from brake repair. Air is the potential pathway of concern. Potential receptors include personnel involved with any aggressive activity that could disturb surfaces covered with asbestos.

To fulfill the CSI objectives and to confirm the presence of any contamination from onsite activities, soil and groundwater were sampled in accordance with the final RFI work plan and Section 3 of this report. Microvacuum samples were collected in the former grinding room to confirm the presence, if any, of asbestos fibers.

10.5.1 Soil Sampling and Analysis

Soil was sampled in two rounds at AOC 680 from the locations shown on Figure 10.5.1. The Final RFI work plan proposed collecting one geoprobe soil sample, and four soil samples from the upper- interval and four from the lower- interval. Four proposed upper- interval samples and three of the four proposed lower- interval soil samples were collected. One lower-interval sample was not collected because the water table was encountered at less than 5 bgs. All samples were submitted for analysis at DQO Level III for VOCs, SVOCs, and metals. Two samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which


N
FORMER 200 GAL.
WASTE OIL UST
SANS
SANS
SANS
SANS
SANS
SANS
SANS
SANS
STMS
STMS
680004
680SB005
680GP005
680002
680SB0C
MH
MH
WSTO
WSTO
WSTO
OIL/WATER
SEPARATOR
680SB001
680001

includes a more comprehensive list of VOCs and SVOCs. All samples from round two were submitted for the standard suite of parameters which include VOCs, SVOCs, pesticides, PCBs, cyanide, and metals. Table 10.5.1 summarizes the soil sampling.

Table 10.5.1
AOC 680
Soil Sampling Summary

Sampling Round	Sampling Date	Samples Collected	Sample Analyses	Comments
1	03/17/98 04/08/98	Geoprobe - 1 (1) Upper - 4 (4) Lower - 3 (4) Duplicates - 2	VOCs, SVOCs VOCs, SVOCs VOCs, SVOCs VOCs, SVOCs	
2	09/24/98	Upper - 1 Lower - 1	Standard Suite	Additional boring installed as result of waste oil UST removal

Notes:
( ) = Parenthesis indicate numbers of samples proposed
Standard Suite = VOCs, SVOCs, metals, cyanide, pesticides, and PCBs at DQO Level IV.

10.5.2 Nature and Extent of Contamination in Soil

Organic compound analytical data for soil are summarized in Table 10.5.2. Inorganic analytical data for soil are summarized in Table 10.5.3. Table 10.5.4 summarizes all analytes detected in soil at AOC 680. Appendix D is a complete analytical data report for all samples collected in Zone I.

Volatile Organic Compounds in Soil

Nine VOCs were detected in AOC 680 surface soil samples. The RBC was not exceeded in any surface soil sample. Five VOCs were detected in subsurface samples. 1,2-Dichloroethene (total), in the subsurface soil exceeded its SSL of 200μg/kg with a result of 240μg/kg in sample 680SB00502.

Table 10.5.2
AOC 680
Organic Compound Analytical Results for Soil (μg/kg)

Parameters	Sample Interval	Detection Frequency	Detection Range	Mean	RBC (upper) SSL (lower)	Number of Samples Exceeding RBC or SSL
Volatile Organic Compounds (μg/kg)						
Acetone	Upper	1/6	77	77	7,800,00	0
	Lower	0/4	NA	77	8,000	0
Benzene	Upper	0/6	NA	NA	22,000	0
	Lower	3/4	0.99 - 3	1.66	15	0
Ethylbenzene	Upper	2/6	0.96 - 2.2	1.58	780,000	0
	Lower	3/4	1.1 - 8.4	4.3	6,500	0
Toluene	Upper	1/6	1.6	1.6	1,600,000	0
	Lower	3/4	2.2 - 10	5.2	6,000	0
Xylene (total)	Upper	4/6	1.5 - 10	4.1	16,000,000	0
	Lower	3/4	4.5 - 33	17.17	70,000	0
Tetrachloroethene	Upper	1/6	420	420	12,000	0
	Lower	0/4	ND	ND	30	0
Trichloroethene	Upper	1/6	140	140	58,000	0
	Lower	0/4	ND	ND	30	0
1,1-Dichloroethane	Upper	1/6	6.0	6.0	780,000	0
	Lower	0/4	ND	ND	11,000	0
1,2-Dichloroethene	Upper	1/6	41.0	41.0	7,000	0
	Lower	1/4	240	240	200	1
4-Methyl-2-Pentanone	Upper	1/6	3.0	3.0	630,000	0
	Lower	0/4	ND	ND	6,700	0
Semivolatile Organic Compounds						
BEQ	Upper	2/6	1.63 - 260	131	87	1
	Lower	1/4	4.55	4.55	1,600	0
Benzo(a)pyrene	Upper	1/6	210	210	87	1
	Lower	0/4	NA	NA	4,000	0
Benzo(a)anthracene	Upper	2/6	16 - 270	143	870	0
	Lower	1/4	19.0	19.0	800	0
Benzo(b)fluoranthene	Upper	1/6	210	210	870	0
	Lower	1/4	24.0	24.0	2,500	0
Benzo(k)fluoranthene	Upper	1/6	210	210	8,700	0
	Lower	1/4	22.0	22.0	25,000	0
Chrysene	Upper	2/6	25.0 - 270	147	87,000	0
	Lower	1/4	31.0	31.0	80,000	0
Butylbenzylphthalate	Upper	1/6	430	430	1,600,000	0
	Lower	1/4	1,200	1,200	930,000	0
Phenanthrene	Upper	1/6	28	28	230,000	0
	Lower	0/4	NA	NA	660,000	0

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Table 10.5.2
AOC 680
Organic Compound Analytical Results for Soil (μg/kg)

Parameters	Sample Interval	Detection Frequency	Detection Range	Mean	RBC (upper) SSL (lower)	Number of Samples Exceeding RBC or SSL
Fluoranthene	Upper	1/6	340	340	310,000	0
	Lower	0/4	NA	NA	2,100,000	0
Pyrene	Upper	2/6	16.0 - 440	228	230,000	0
	Lower	0/4	NA	NA	2,100,000	0
bis(2-Ethylhexyl)phthalate (BEHP)	Upper	2/6	22.0 - 310	166	46,000	0
	Lower	0/4	NA	NA	1,800,000	0

Notes:
NA = Not Applicable
ND = Not detected
NL = Not listed
See Table 5.5 for organic compound screening concentrations and their sources.

Table 10.5.3
AOC 680
Inorganic Compound Analytical Results for Soil (mg/kg)

Parameters	Sample Interval	Detection Frequency	Detection Range	Mean	Background Concentration	RBC (upper) SSL (lower)	Number of Samples Exceeding RBC and Background (upper) or SSL and Background (lower)
Aluminum (Al)	Upper	1/1	8,680	8,680	27,400	7,800	0
	Lower	1/1	9,050	9,050	18,900	560,000	0
Arsenic (As)	Upper	1/1	3.6	3.6	21.6	0.43	0
	Lower	1/1	4.9	4.9	6.45	15	0
Barium (Ba)	Upper	1/1	19.2	19.2	54.2	55	0
	Lower	1/1	14.2	14.2	36	820	0
Beryllium (Be)	Upper	1/1	0.34	0.34	0.95	16	0
	Lower	1/1	0.58	0.58	0.67	32	0
Cadmium (Cd)	Upper	1/1	0.45	0.45	0.61	7.8	0
	Lower	1/1	0.67	0.67	0.54	4	0
Chromium (Cr)	Upper	1/1	24.5	24.5	34.5	39	0
	Lower	1/1	21.8	21.8	51.3	19	0
Cobalt (Co)	Upper	1/1	1.5	1.5	5.8	470	0
	Lower	1/1	2.5	2.5	3.48	990	0
Copper (Cu)	Upper	1/1	5.9	5.9	240	310	0
	Lower	1/1	3.2	3.2	11.5	5,600	0

Table 10.5.3
AOC 680
Inorganic Compound Analytical Results for Soil (mg/kg)

Parameters	Sample Interval	Detection Frequency	Detection Range	Mean	Background Concentration	RBC (upper) SSL (lower)	Number of Samples Exceeding RBC and Background (upper) or SSL and Background (lower)
Lead (Pb)	Upper	1/1	10.7	10.7	203	400	0
	Lower	1/1	5.8	5.8	12.3	400	0
Manganese (Mn)	Upper	1/1	46.7	46.7	419	160	0
	Lower	1/1	108	108	118	480	0
Mercury (Hg)	Upper	1/1	0.05	0.05	0.47	2.3	0
	Lower	1/1	0.14	0.14	ND	1	0
Nickel (Ni)	Upper	1/1	8.5	8.5	23.9	160	0
	Lower	1/1	5.8	5.8	15.7	65	0
Selenium (Se)	Upper	1/1	0.29	0.29	1.49	39	0
	Lower	0/1	ND	ND	1.77	2.6	0
Vanadium (V)	Upper	1/1	19.0	19.0	113	55	0
	Lower	1/1	24.4	24.4	38.1	3,000	0
Zinc (Zn)	Upper	1/1	35.4	35.4	206	2,300	0
	Lower	1/1	23.3	23.3	36.2	6,200	0

Notes:
NA = Not Applicable
ND = Not detected
NL = Not listed
See Table 5.6 for organic compound screening concentrations and their sources.

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Table 10.5.4
AOC 680
Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=10)	Subsurface Background
Volatile Organic Compounds (μg/kg)							
Acetone	680SP005	77	780000	NA	NT	8000	NA
Benzene	680SB001	ND	22000	NA	3	15	NA
	680SB002	ND			1		
	680SB004	ND			1		
1,1-Dichloroethane	680SB005	6	780000	NA	ND	11000	NA
1,2-Dichloroethene (total)	680SB005	41	70000	NA	240	200	NA
Ethylbenzene	680SB001	ND	780000	NA	8.4	6500	NA
	680SB002	0.96			1.1		
	680SB003	2.2			NT		
	680SB004	ND			3.4		
4-Methyl-2-Pentanone (MIBK)	680SB005	3	630000	NA	ND	6700	NA
Tetrachloroethene (PCE)	680SB005	420	12000	NA	ND	30	NA
Toluene	680SB001	ND	1600000	NA	10	6000	NA
	680SB002	ND			2.2		
	680SB003	1.6			NT		
	680SB004	ND			3.4		
Trichloroethene (TCE)	680SB005	140	58000	NA	ND	30	NA

Table 10.5.4
AOC 680
Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=10)	Subsurface Background
Xylene (total)	680SB001	ND	16000000	NA	33	70000	NA
	680SB002	2.9			4.5		
	680SB003	10			NT		
	680SB004	1.5			14		
	680SB005	2			ND		
Semivolatile Organic Compounds (μg/kg)							
Benzo(a)pyrene Equivalents (BEQs)	680SB003	260.4	87	NA	NT	1600	NA
	680SB005	1.6			4.6		
Benzo(a)anthracene	680SB003	270	870	NA	NT	800	NA
	680SB005	16			19		
Benzo(a)pyrene	680SB003	210	87	NA	NT	4000	NA
Benzo(b)fluoranthene	680SB003	210	870	NA	NT	2500	NA
	680SB005	ND			24		
Benzo(k)fluoranthene	680SB003	210	8700	NA	NT	25000	NA
	680SB005	ND			22		
Chrysene	680SB003	270	87000	NA	NT	80000	NA
	680SB005	25			31		
Butylbenzylphthalate	680SB001	430	1600000	NA	1,200	930000	NA

Table 10.5.4
AOC 680
Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=10)	Subsurface Background
bis(2-Ethylhexyl)phthalate (BEHP)	680SB005	22	46000	NA	ND	1800000	NA
	680SP005	310			NT		
Fluoranthene	680SB003	340	310000	NA	NT	2100000	NA
Phenanthrene	680SP005	28	230000	NA	NT	660000	NA
Pyrene	680SB003	440	230000	NA	NT	2100000	NA
	680SB005	16			25		
Inorganics (mg/kg)							
Aluminum (Al)	680SB005	8680	7800	27400	9050	560000	18900
Arsenic (As)	680SB005	3.6	0.43	21.6	4.9	15	6.45
Barium (Ba)	680SB005	19.2	550	54.2	14.2	820	36
Beryllium (Be)	680SB005	0.34	16	0.95	0.58	32	0.67
Cadmium (Cd)	680SB005	0.45	7.8	0.61	0.67	4	0.54
Chromium (Cr) (total)	680SB005	24.5	39	34.5	21.8	19	51.3
Cobalt (Co)	680SB005	1.5	470	5.8	2.5	990	3.48
Copper (Cu)	680SB005	5.9	310	240	3.2	5600	11.5
Lead (Pb)	680SB005	10.7	400	203	5.8	400	12.3
Manganese (Mn)	680SB005	46.7	160	419	108	480	118
Mercury (Hg)	680SB005	0.05	2.3	0.47	0.14	1	ND
Nickel (Ni)	680SB005	8.5	160	23.9	5.8	65	15.7

Table 10.5.4
AOC 680
Analytes Detected in Surface and Subsurface Soil

Parameters	Location	Surface Conc.	Residential RBC* (THQ=0.1)	Surface Background	Subsurface Conc.	Soil to Groundwater SSL* (DAF=10)	Subsurface Background
Selenium (Se)	680SB005	0.3	39	1.49	ND	2.6	1.77
Vanadium (V)	680SB005	19	55	113	24.4	3000	38.1
Zinc (Zn)	680SB005	35.4	2300	206	23.3	6200	36.2

Notes:

* = Residential RBCs (THQ=0.1) were used as a reference concentration for upper interval samples. Generic soil-to groundwater SSLs (DAF=10) from the *Soil Screening Guidance: Technical Background Document* (USEPA, 1996b) were used as s reference concentration for lower interval samples.

Bolded concentrations exceed the RBC or SSL and the zone background.
All background values for Zone I are based on twice the means of the grid sample concentrations. Background values for the groundwater are based on two sampling rounds in two wells at each depth.

NA - Not applicable/not available
ND - Not detected
NI - Not installed
NL - Not listed
NT - Not taken
RBC - Risk-based concentration
SSL - Soil screening level

Semivolatile Organic Compounds in Soil

Ten SVOCs were detected in surface soil samples collected at AOC 680. Of these compounds, only benzo(a)pyrene was detected at a concentration of 210 μg/kg (sample 680SB00301) that exceeded its RBC (87 μg/kg). The upper interval sample collected at 680SB003 was the only sample that contained benzo(a)pyrene. Five SVOCs were detected in subsurface soil samples. All subsurface soil SVOC detections were below their respective SSLs.

In accordance with recent cPAH guidance (USEPA *Interim Supplemental Guidance to RAGS: Region IV Bulletins, Human Health Risk Assessment, Bulletin No. 2 [USEPA 1995c])* and Section 7 of this report, BEQs were calculated for cPAHs at AOC 680. The calculated BEQ for soil sample 680SB00301 is 260.4 μg/kg, which exceeds the RBC of 87 μg/kg. No other calculated BEQs exceeded the RBC or SSL.

Inorganic Compounds in Soil

Fifteen metals were detected in the surface soil sample 680SB00501. No detected concentrations exceed the RBC and background (upper). Fourteen metals were detected in subsurface soil sample from 680SB00502. No detections exceeded the SSL and background. Metals were not analyzed in any other soil sample.

10.5.3 Groundwater Sampling and Analysis

To characterize the zone groundwater, three shallow monitoring wells were installed and sampled in accordance with an approved final RFI work plan. Three rounds of groundwater sampling were completed at AOC 680. During the first and third rounds of sampling, AOC 680 was sampled for VOCs and SVOCs at DQO Level III. Samples from round two were also sampled for metals. Table 10.5.5 summarizes the groundwater sampling at AOC 680.

Table 10.5.5
AOC 680
Groundwater Sampling Summary

Sampling Round	Sampling Date	Number of Wells	Sample Analyses	Comments
1	03/17/98 03/18/98	Geoprobe[a]	VOCs, SVOCs	One shallow and one deep sample collected.
	04/15/98	3	VOCs, SVOCs	
2	08/21/98	3	VOCs, SVOCs, metals	
3	10/19/98	1	VOCs, SVOCs	Installed and sampled 680004 only

Notes:
a = One shallow and one deep geoprobe sample was collected near the boundary of AOC 680 and AOC 679.

Figure 10.5.1 illustrates monitoring well locations. The shallow monitoring wells were installed at 12.5 feet bgs in the upper sand layer of the Wando Formation. One deep monitoring point (680GP005) was sampled only during the first round. All wells were installed in accordance with Section 3.3 of this report.

10.5.4 Nature and Extent of Contamination in Groundwater

Table 10.5.6 summarizes the organic analytical results for groundwater at AOC 680. Inorganic analytical data for shallow groundwater are summarized in Table 10.5.7. Tables 10.5.8 and 10.5.9 summarize all analytes detected in the shallow and deep groundwater respectively at AOC 680. Appendix D is a complete analytical report for all samples collected in Zone I.

Volatile Organic Compounds in Groundwater

Eight VOCs were detected in shallow groundwater at AOC 680. Sample 680GP00501 contained acetone (6800 μg/L) and 2-butanone (MEK) (310 μg/L), which exceeded their tap-water RBCs. Tetrachloroethene (PCE) exceeded is tap-water RBC in rounds one (1.4 μg/L in 680GW00201) and two (2.0 μg/L in 680GW00202). Sample 680GW002 contained Trichloroethene (TCE)

(3 μg/L), which exceeded its tap-water RBC of 1.6 μg/L. No other shallow groundwater VOCs exceeded their respective RBC.

Two VOCs, benzene and carbon disulfide, were detected in deep groundwater sample 680GP005. Benzene (0.62 μg/L) exceeded its tap-water RBC of 0.36 μg/L.

Semivolatile Organic Compounds in Groundwater

Two SVOCs, 1,2-dichlorobenzene and bis(2-ethylhexyl)phthalate (BEHP), were detected in shallow groundwater at AOC 680. Sample 680GP00501 contained BEHP (38 μg/L), which exceeded its tap-water RBC of 4.8 μg/L.

One SVOC, naphthalene, was detected in deep groundwater sample 680GP00502. It did not exceed its RBC.

Inorganic Compounds in Groundwater

Three metals (arsenic, chromium, and manganese) were detected in shallow groundwater during the second sampling round. Arsenic exceeded its RBC and shallow background in sample 680GW00102 at 51.8 μg/L. No other detections exceeded the RBC or MCL and background.

Table 10.5.6
AOC 680
Organic Analytical Results for Shallow Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap Water RBC/MCL	Number of Samples Exceeding RBC or MCL
Volatile Organic Compounds (μg/L)						
Acetone	First	1/4	6800	6800	370/NA	1
	Second	0/3	ND	ND		0
	Third	0/1	ND	ND		0
2-Butanone (MEK)	First	1/4	310	310	190/NA	1
	Second	0/3	ND	ND		0
	Third	0/1	ND	ND		0
Carbon Disulfide	First	2/4	0.26 - 0.61	0.435	100/NL	0
	Second	0/3	ND	ND		0
	Third	0/1	ND	ND		0

Table 10.5.6
AOC 680
Organic Analytical Results for Shallow Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap Water RBC/MCL	Number of Samples Exceeding RBC or MCL
Chlorobenzene	First	1/4	1.7	1.7	3.5/NL	0
	Second	0/3	ND	ND		0
	Third	0/1	ND	ND		0
1,1-Dichloroethane	First	1/4	0.89	0.89	80/NL	0
	Second	1/3	1.0	1.0		0
	Third	0/1	ND	ND		0
1,2-Dichloroethene (total)	First	2/4	0.63 - 1.3	0.96	5.5/NL	0
	Second	3/3	1.0 - 3.0	1.67		0
	Third	0/1	ND	ND		0
Tetrachloroethene	First	2/4	0.64 - 1.4	1.02	1.1/5	1
	Second	1/3	2.0	2.0		1
	Third	0/1	ND	ND		0
Trichloroethene	First	1/4	0.85	0.85	1.6/5	0
	Second	1/3	3.0	3.0		1
	Third	0/1	ND	ND		0
Semi-volatile Organic Compounds (μg/L)						
Bis(2-ethylhexyl)phthalate (BEHP)	First	1/4	38.0	38.0	4.8/NL	1
	Second	0/3	ND	ND		0
	Third	0/1	ND	ND		0
1,2-Dichlorobenzene	First	0/4	ND	ND	6.4/600	0
	Second	1/3	1.0	1.0		0
	Third	0/1	ND	ND		0

Notes:
NL = Not Listed
NA = Not Applicable
ND = Not Detected
See Table 5.5 for organic screening concentrations and their sources.

Table 10.5.7
AOC 680
Inorganic Analytical Results for Groundwater (μg/L)

Parameter	Sample Round	Detection Frequency	Detection Range	Mean	Tap Water RBC/MCL	Shallow Groundwater Background	Number of Samples Exceeding Lower of RBC or MCL and Background
Arsenic (As)	Second*	2/3	3.1 - 51.8	27.5	0.045/50	23	1
Chromium (Cr)	Second	1/3	8.2	8.2	18/100	14.3	0
Manganese (Mn)	Second	3/3	20.5 - 82.3	55.2	73/NL	5,430	0

Notes:
* - Only sampled for metals in the second round of sampling
NL = Not Listed
NA = Not Applicable
ND = Not Detected
See Table 5.6 for inorganic screening concentrations and their sources.

Table 10.5.8
AOC 680
Analytes Detected in Shallow Groundwater (μg/L)

Parameters	Location	1st Round	2nd Round	3rd Round	Tap Water RBC*	MCL/SMCL*	Shallow Background
Volatile Organic Compounds							
Acetone	680GP005	6800	NT	NT	370	NA	
2-Butanone (MEK)	680GP005	310	NT	NT	190	NA	
Carbon disulfide	680GW003	0.61	ND	ND	100	NA	
	680GP005	0.26	NT	NT			
Chlorobenzene	680GW002	1.7	ND	ND	3.5	NA	
1,1-Dichloroethane	680GW002	0.89	1	ND	80	NA	
1,2-Dichloroethene (total)	680GW001	1.3	1	ND	5.5	NA	
	680GW002	0.63	1	ND			
	680GW003	ND	3	ND			
Tetrachloroethene (PCE)	680GW002	1.4	2	ND	1.1	5	
	680GP005	0.64	ND	ND			
Trichloroethene (TCE)	680GW002	0.85	3	ND	1.6	5	
Semivolatile Organic Compounds							
1,2-Dichlorobenzene	680GW002	ND	1	ND	6.4	600	
bis(2-Ethylhexyl)phthalate (BEHP)	680GP005	38	NT	NT	4.8	NA	
Inorganics							
Arsenic (As)	680GW001	NT	51.8	NT	0.045	50	23
	680GW002	NT	3.1	NT			

Table 10.5.8
AOC 680
Analytes Detected in Shallow Groundwater (μg/L)

Parameters	Location	1st Round	2nd Round	3rd Round	Tap Water RBC*	MCL/SMCL*	Shallow Background
Chromium (Cr) (total)	680GW001	NT	8.2	NT	18	100	14.3
Manganese (Mn)	680GW001	NT	62.8	NT	73	NL	5430
	680GW002	NT	82.3	NT			
	680GW003	NT	20.5	NT			

Notes:
* = Tap Water RBCs (THQ=0.1) from *Risk-Based Concentration Table* (USEPA, October 22, 1997), and MCLs/SMCLs from *Drinking Water Regulations and Health Advisories* (USEPA, 1996e)

Bolded concentrations exceed the RBC and the zone background
All background values for Zone I are based on twice the means of the grid sample concentrations. Background values for the groundwater are based on two sampling rounds in two wells at each depth

NA - Not applicable/not available
ND - Not detected
NI - Not installed
NL - Not listed
NT - Not taken
RBC - Risk-based Concentration
MCL - Maximum Concentration Levels
SMCL - Secondary Maximum Concentration Levels

Table 10.5.9
AOC 680
Analytes Detected in Deep Groundwater (μg/l)

Parameters	Location	1st Round	2nd Round	3rd Round	Tap Water RBC*	MCL/SMCL*	Shallow Background
Volatile Organic Compounds							
Benzene	680GP005	ND	0.62	ND	0.36	5	
Carbon disulfide	680GP005	ND	4.8	ND	100	NA	
Semivolatile Organic Compounds							
Naphthalene	680GP005	ND	9.5	ND	150	NA	

Notes:
* = Tap Water RBCs (THQ=0.1) from *Risk-Based Concentration Table* (USEPA, October 22, 1997), and MCLs/SMCLs from *Drinking Water Regulations and Health Advisories* (USEPA, 1996e)

Bolded concentrations exceed the RBC and the zone background
All background values for Zone I are based on twice the means of the grid sample concentrations. Background values for the groundwater are based on two sampling rounds in two wells at each depth

NA - Not applicable/not available
ND - Not detected
NI - Not installed
NL - Not listed
NT - Not taken
RBC - Risk-based Concentration
MCL - Maximum Concentration Levels
SMCL - Secondary Concentration Levels

A deep groundwater sample was only collected in the first sample round.

10.5.5 Microvacuum Sampling and Analysis

Microvacuum sampling was performed at AOC 680 from horizontal surfaces in the hallway and in the ship fitters shop area in Building NS-26. The Final RFI work plan proposed collecting nine to 12 dust samples for asbestos analysis. Microvacuum samples were collected as stated in the site-specific sampling and analysis plan in the Zone I work plan. Nine samples were collected. Samples were submitted for bulk asbestos analysis by phase-contrast light microscopy. Table 10.5.10 summarizes the sampling at AOC 680.

Table 10.5.10
AOC 680
Dust Sampling Summary

Samples Proposed	Samples Collected	Analyses Proposed	Analyses Collected	Deviation
9 to 12	9	Asbestos	Asbestos	ND

Note:
ND = No Deviation

10.5.6 Nature and Extent of Contamination in Dust

No asbestos fibers were detected in the samples. Appendix D contains a complete analytical report for all samples collected at AOC 680.

10.5.7 Fate and Transport

AOC 680 includes Building NS-26 and associated former grinding room/brake repair area. Building NS-26 was part of the Navy's Shore Intermediate Activity (SIMA) complex. The building was constructed in 1958 and renovated in 1985. Structures associated with NS-26 include several storage sheds and steel storage trailers. Environmental media sampled as part of the as AOC 680 investigation include surface soil, subsurface soil, and shallow groundwater. Potential constituent migration pathways investigated include soil to groundwater, groundwater migration, and emission of volatiles from surface soil to air. Additionally, an effort to preliminarily address the issue of discharge to surface water receptors was made. This assessment is intended to serve

as a qualitative analysis using the analytical data for these media coupled with the current understanding of hydrogeological conditions at the site.

10.5.7.1 Soil to Groundwater Cross-Media Transport

Tables 10.5.11 and 10.5.12 compare maximum detected organic and inorganic constituent concentrations in surface soil and subsurface soil samples respectively to risk-based soil screening levels considered protective of groundwater. To provide a conservative screen, generic soil screening levels are used; leachate entering the aquifer is assumed to be diluted by a ratio of 10:1, with no attenuation of constituents in soil (DAF=10).

Three organic compounds - 1,2-Dichloroethene tetrachloroethene (1,2 DCE), trichloroethene (PCE), and TCE - were present in soil above their respective screening values. 1,2 DCE was present at greater concentration in the subsurface, suggesting that Zone I may be a relict of TCE degradation. Both PCE and TCE were non-detect in subsurface soil, but both were present in groundwater, suggesting that calculated leachability values may be too high. The distribution of chlorinated solvents was spatially limited, occurring in only 1 of 6 sample locations. The presence of chlorinated solvents is consistent with past site activities, namely metal grinding and brake cleaning and repair. The presence of these parameters in groundwater validates the pathway with respect to them. Figures 10.5.2, 10.5.3, and 10.5.4 present 1,2 DCE, PCE, and TCE concentrations detected at AOC 680 respectively.

One inorganic - chromium - was present in soil above its screening value. It was present in both surface and subsurface soil at one location, as well as in groundwater. Figure 10.5.5 presents the chromium concentrations detected at AOC 680. Notably, it was at concentrations in soil below the zone-wide background concentrations. Furthermore, the presence of chromium is not expected to be associated with the past site activities. However, the presence of CR in soil and groundwater validates the pathway with respect to this parameter.

Table 10.5.11
Organic Chemicals Detected in Surface Soil, Subsurface Soil, Sediment, and Shallow Groundwater
Comparison to Cross-media SSLs, Tap Water RBCs, and Saltwater Surface Water Chronic Screening Levels
AOC 680
Charleston Naval Complex
Charleston, South Carolina

Parameter	Maximum Concentration				Screening Concentration									
	Surface Soil	Subsurface Soil	Sediment	Shallow GW	Soil to GW SSL	Soil to Air SSL	Tap Water RBC	Saltwater Surf. Wtr. Chronic	Soil Units	Water Units	Leaching Potential	Volatil-ization Potential	Ground-water Migration Concern	Surface Water Migration Concern
Volatile Organic Compounds														
Acetone	77	ND	NA	ND	8000	1.0E+08	3700	NA	UG/KG	UG/L	NO	NO	NO	NO
Benzene c	ND	3	NA	ND	15	800	0 36	109	UG/KG	UG/L	NO	NO	NO	NO
Carbon disulfide	ND	ND	NA	0.61	16000	720000	1000	NA	UG/KG	UG/L	NO	NO	NO	NO
Chlorobenzene	ND	ND	NA	1.7	700	130000	35	105	UG/KG	UG/L	NO	NO	NO	NO
1,1-Dichloroethane	6	ND	NA	1	11000	1300000	800	NA	UG/KG	UG/L	NO	NO	NO	NO
1,2-Dichloroethene (total)	41	240	NA	3	200	1100000	55	NA	UG/KG	UG/L	YES	NO	NO	NO
Ethylbenzene	2.2	8.4	NA	ND	6500	400000	1300	4.3	UG/KG	UG/L	NO	NO	NO	NO
4-Methyl-2-Pentanone (MIBK)	3	ND	NA	ND	6700 a	NA	2900	NA	UG/KG	UG/L	NO	NO	NO	NO
Tetrachloroethene (PCE) c	420	ND	NA	2	30	11000	1 1	45	UG/KG	UG/L	YES	NO	YES	NO
Trichloroethene (TCE) c	140	ND	NA	3	30	5000	1.6	NA	UG/KG	UG/L	YES	NO	YES	NO
Xylene (total)	10	33	NA	ND	70000 a	410000	12000	NA	UG/KG	UG/L	NO	NO	NO	NO
Semivolatile Organic Compounds														
Benzo(a)pyrene Equivalents	260	4.55	NA	ND	1600 a	NA	0.0092	NA	UG/KG	UG/L	NO	NO	NO	NO
Benzo(a)anthracene c	270	19	NA	ND	800	NA	0 092	NA	UG/KG	UG/L	NO	NO	NO	NO
Benzo(a)pyrene c	210	ND	NA	ND	4000	NA	0.0092	NA	UG/KG	UG/L	NO	NO	NO	NO
Benzo(b)fluoranthene c	210	24	NA	ND	2500	NA	0.092	NA	UG/KG	UG/L	NO	NO	NO	NO
Benzo(k)fluoranthene c	210	22	NA	ND	25000	NA	0.92	NA	UG/KG	UG/L	NO	NO	NO	NO
Chrysene c	270	ND	NA	ND	80000	NA	9 2	NA	UG/KG	UG/L	NO	NO	NO	NO
Butylbenzylphthalate	430	1200	NA	ND	930000	930000	730	29 4	UG/KG	UG/L	NO	NO	NO	NO
1,2-Dichlorobenzene	ND	ND	NA	1	8500	560000	6.4	19.7	UG/KG	UG/L	NO	NO	NO	NO
bis(2-Ethylhexyl)phthalate (BEHP) c	310	ND	NA	38	1800000	31000000	4.8	NA	UG/KG	UG/L	NO	NO	YES	NO
Fluoranthene	340	ND	NA	ND	2100000	NA	1500	1.6	UG/KG	UG/L	NO	NO	NO	NO
Phenanthrene	28	ND	NA	ND	660000 a	NA	1100	NA	UG/KG	UG/L	NO	NO	NO	NO
Pyrene	440	ND	NA	ND	2100000	NA	1100	NA	UG/KG	UG/L	NO	NO	NO	NO

Notes:
Sources of screening concentrations appear in Table 5 5
Explanations of fate and transport screening procedures appear in Section 6.2.
Frequency and range of detections, average detected concentrations, and number of screening concentration exceedances appear in Tables 10.5.2 and 10 5.6

a - Calculated soil to groundwater SSL value (See Table 6 2)
b - Based on surrogate compound; see Table 5.5
c - Carcinogenic
GW - Groundwater

NA - Not applicable/not available
ND - Not detected
RBC - Risk-based concentration
SSL - Soil screening level

NG/KG - Nanograms per kilogram
UG/KG - Micrograms per kilogram
PG/L - Picograms per liter
UG/L - Micrograms per liter

Table 10.5.12
Inorganic Chemicals Detected in Surface Soil, Subsurface Soil, Sediment, and Shallow Groundwater
Comparison to Cross-media SSLs, Tap Water RBCs, Saltwater Surface Water Chronic Screening Levels, and Background Values
AOC 680
Charleston Naval Complex
Charleston, South Carolina

Parameter	Maximum Concentration				Screening Concentration											
	Surface Soil	Subsurface Soil	Sediment	Shallow GW	Soil to GW SSL	Soil Backgroun	Soil to Air SSL	Tap Water RBC	Shallow GW Background	Saltwater Surf. Wtr Chronic	Soil Units	Water Units	Leaching Potential	Fugitive Particulate Inhalation Concern	Ground-water Migration Concern	Surface Water Migration Concern
Inorganic Chemicals																
Aluminum (Al)	8680	9050	NA	ND	560000 a	27400	NA	37000	1440	NA	MG/KG	UG/L	NO	NO	NO	NO
Arsenic (As) c	3.6	4.9	NA	51.8	15	21.6	750	0.045	23	36	MG/KG	UG/L	NO	NO	YES	YES
Barium (Ba)	19.2	14.2	NA	ND	820	54.2	690000	2600	110	NA	MG/KG	UG/L	NO	NO	NO	NO
Beryllium (Be)	0.34	0.58	NA	ND	32	0.95	1300	73	1.1	NA	MG/KG	UG/L	NO	NO	NO	NO
Cadmium (Cd)	0.45	0.67	NA	ND	4	0.61	1800	18	NA	9.3	MG/KG	UG/L	NO	NO	NO	NO
Chromium (Cr) (total)	24.5	21.8	NA	8.2	19	51.3	270	180	14.3	50	MG/KG	UG/L	YES	NO	NO	NO
Cobalt (Co)	1.5	2.5	NA	ND	990 a	5.8	NA	2200	2.2	NA	MG/KG	UG/L	NO	NO	NO	NO
Copper (Cu)	5.9	3.2	NA	ND	5600 a	240	NA	1500	4.4	2.9	MG/KG	UG/L	NO	NO	NO	NO
Lead (Pb)	10.7	5.8	NA	ND	400	203	400	15	4.4	8.5	MG/KG	UG/L	NO	NO	NO	NO
Manganese (Mn)	46.7	108	NA	82.3	480 a	419	NA	730	5430	NA	MG/KG	UG/L	NO	NO	NO	NO
Mercury (Hg)	0.05	0.14	NA	ND	1	0.47	10	11	NA	0.025	MG/KG	UG/L	NO	NO	NO	NO
Nickel (Ni)	8.5	5.8	NA	ND	65	23.9	13000	730	13.3	8.3	MG/KG	UG/L	NO	NO	NO	NO
Selenium (Se)	0.29	ND	NA	ND	2.6	1.77	NA	180	ND	71	MG/KG	UG/L	NO	NO	NO	NO
Vanadium (V)	19	24.4	NA	ND	3000	113	NA	260	14	NA	MG/KG	UG/L	NO	NO	NO	NO
Zinc (Zn)	35.4	23.3	NA	ND	6200	206	NA	11000	24.4	86	MG/KG	UG/L	NO	NO	NO	NO

Notes:
Sources of screening concentrations appear in Table 5.6
Explanations of fate and transport screening procedures appear in Section 6.2.
Frequency and range of detections, average detected concentrations, and number of screening concentration exceedances appear in Tables 10.5.3 and 10.5 7.

Background values for soil are shown for comparison purposes only.
Maximum groundwater concentrations are screened against the greater of tap water RBCs or corresponding background values to determine groundwater migration concern.

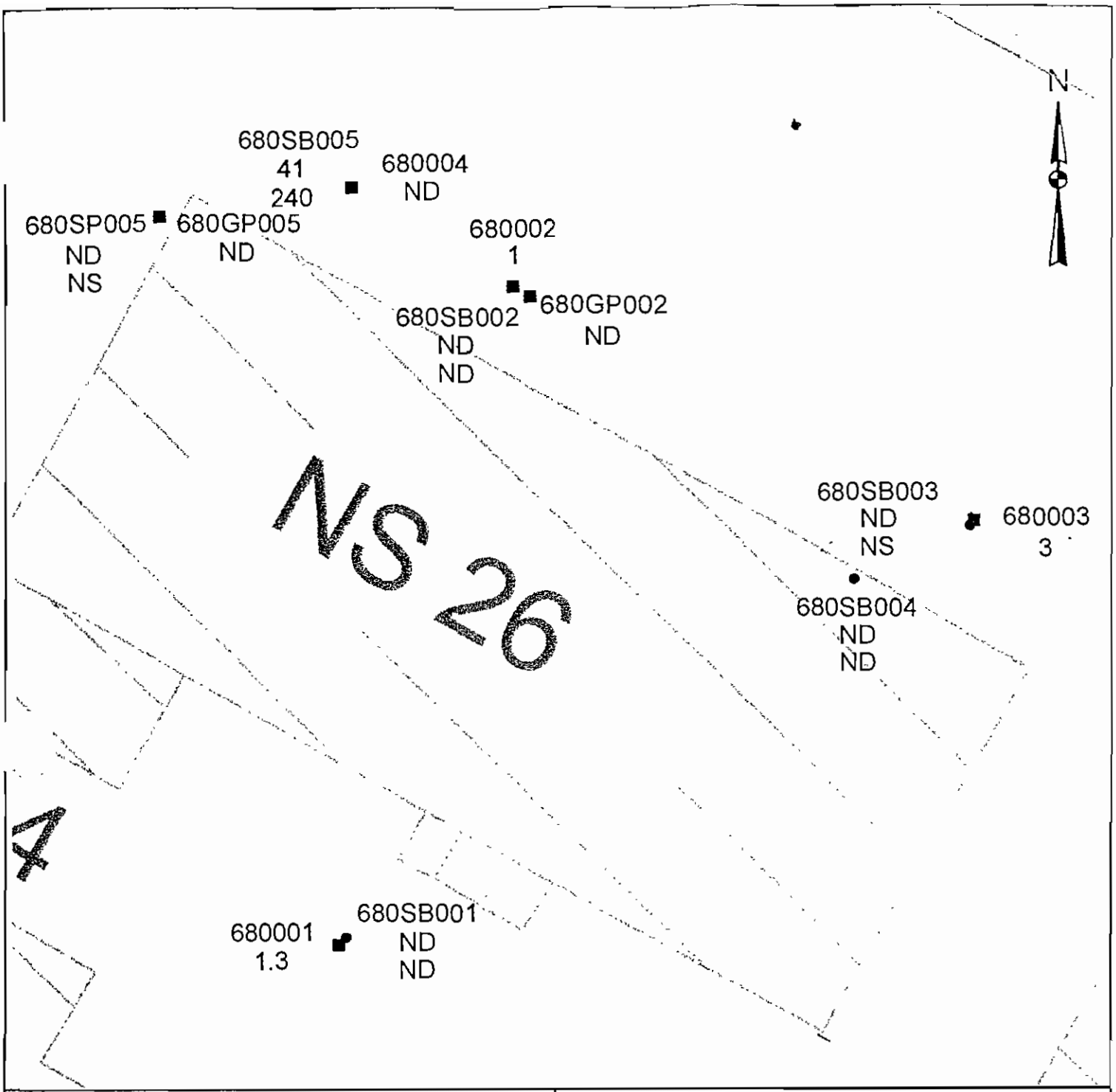
a - Calculated soil to groundwater SSL value (See Table 6.2)
c - Carcinogenic
GW - Groundwater
NA - Not available/Not applicable
ND - Not detected
RBC - Risk-based concentration
SSL - Soil screening level
MG/KG - Milligrams per kilogram
UG/L - Micrograms per liter

10.5.7.2 Groundwater Migration to Surface Water Cross-Media Transport

Tables 10.5.11 and 10.5.12 compare maximum detected organic and inorganic constituent concentrations respectively, in shallow groundwater samples to risk-based concentrations for drinking water, and to chronic ambient saltwater quality criteria values for the protection of aquatic life (saltwater surface water chronic screening values). For inorganics, maximum concentrations in groundwater are screened against the greater of (a) risk-based drinking water concentrations or (b) corresponding background reference concentrations for groundwater, as well as to the saltwater surface water chronic values. To provide a conservative screening, no attenuation or dilution of constituents in groundwater is assumed before comparison to the relevant standards. It should be noted at the beginning of this discussion that the risk-based pathway for shallow groundwater is currently an invalid pathway simply because there is no human consumption of the groundwater, e.g. there is no end-use receptor. This comparison is made for screening only, and to develop strategies for log-term management of the groundwater should an area containing deleterious levels be identified.

Three organic compounds – PCE, TCE, and bis(2-ethylhexyl)phthalate (BEHP) – were present in groundwater` at concentrations that exceeded their respective screening values. All three exhibited only slight exceedances, and all three were detected only in the first quarter of sampling and were non-detect in the third quarter sampling. The inconsistent detection of these parameters coupled with their presence in surface soil and absence in subsurface soil, suggests that their presence in groundwater may be a result of drilling carrydown. Again, the presence of solvents is not inconsistent with past site activities, but BEHP's presence is suspect (it is a common lab artifact). Given their absence in the most recent sampling effort, the pathway is considered invalid with respect to these parameters. Detected concentrations of PCE and TCE are presented in Figures 10.5.3 and 10.5.4. Figure 10.5.6 presents concentrations of BEHP detected at AOC 680.

1-137



LEGEND

■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (UG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (UG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

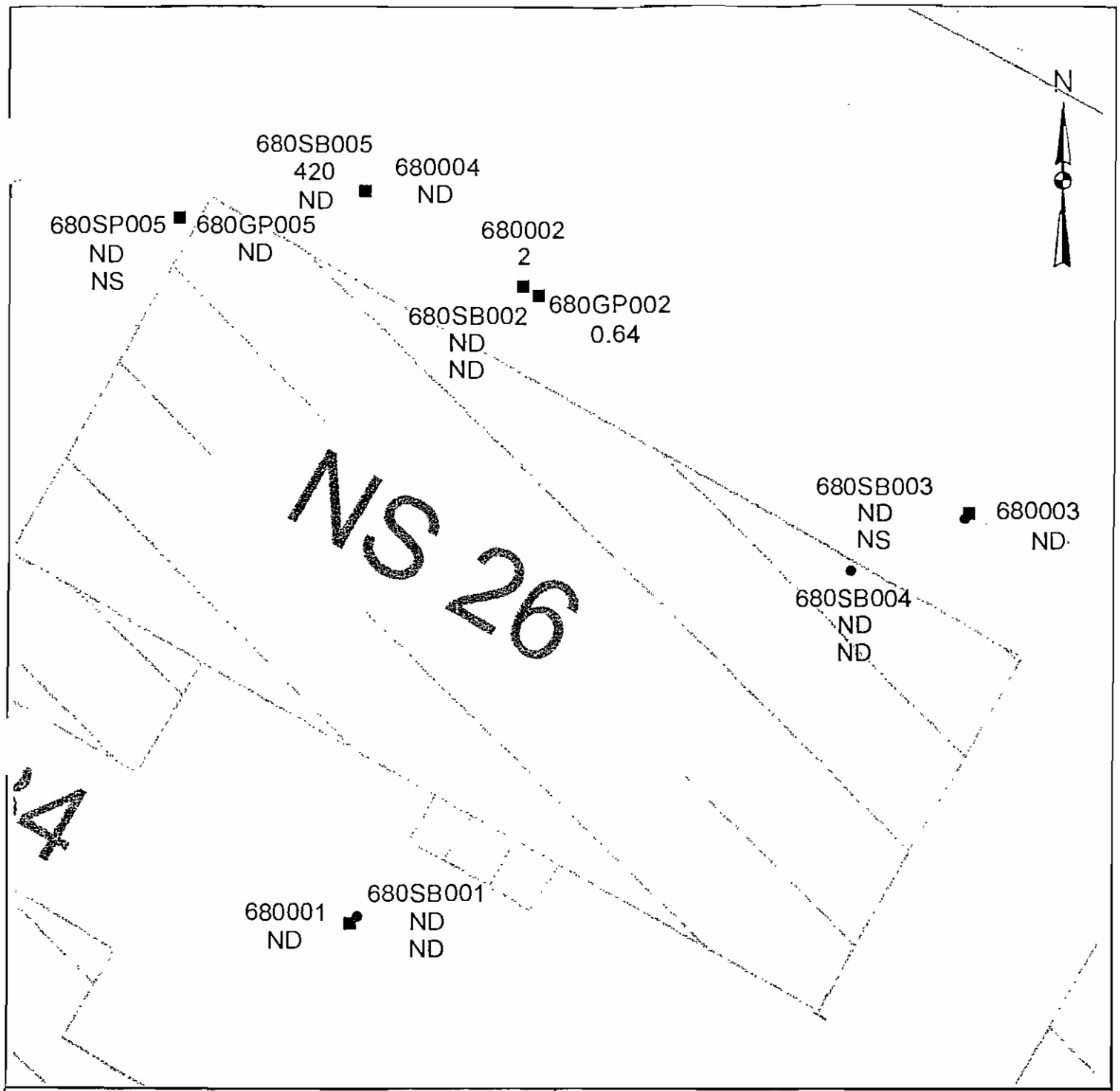
SCALE

0 20 40 60 80 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.2
ZONE I
AOC 680
1,2-DICHLOROETHENE(TOTAL)
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=NA RBC=70000 UG/KG SSL=200 UG/KG



LEGEND

■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (UG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (UG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

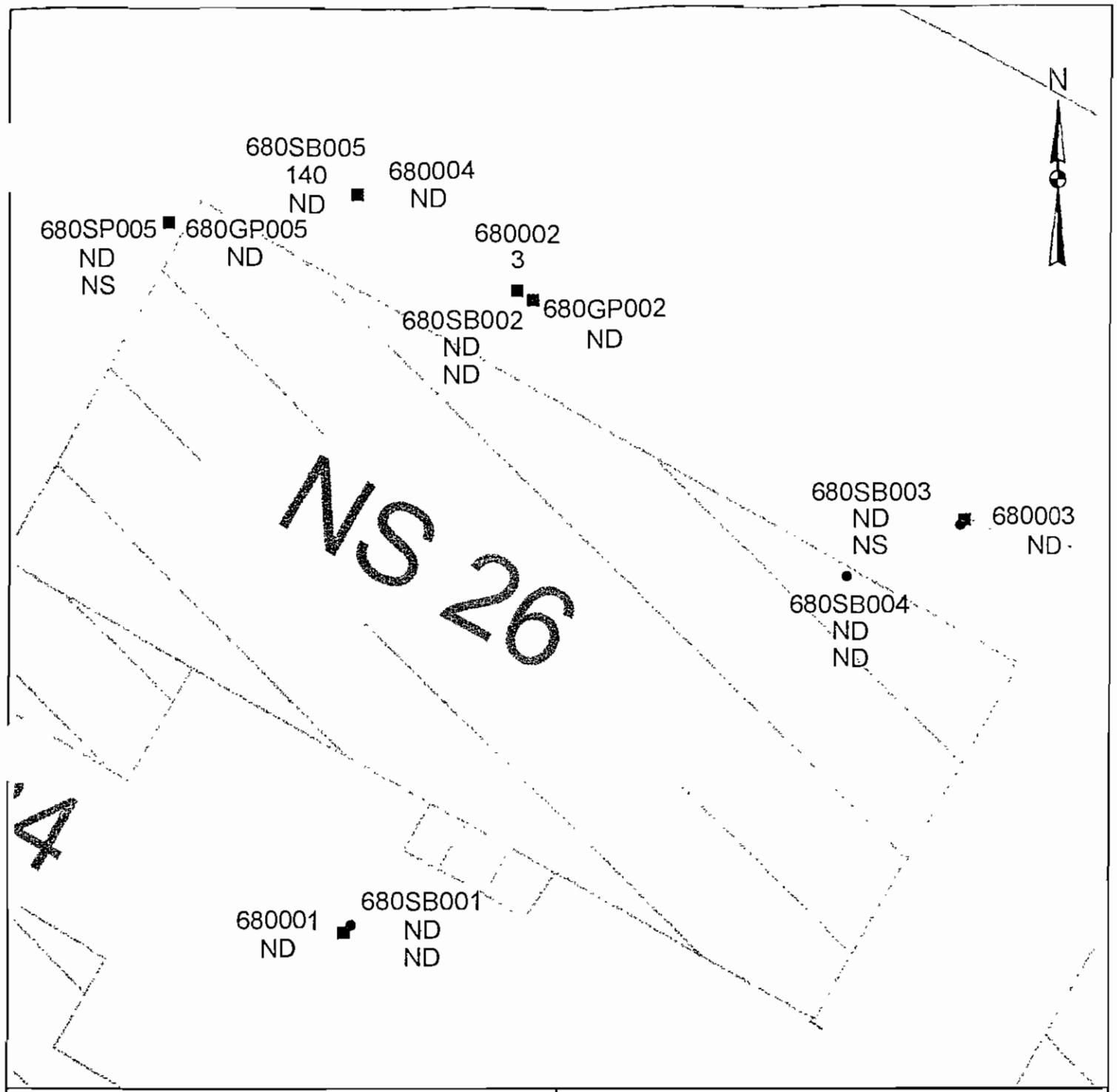
SCALE

0 20 40 60 80 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.3
ZONE I
AOC 680
TETRACHLOROETHENE
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=5 UG/L RBC=12000 UG/KG SSL=30 UG/KG



LEGEND

■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (UG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (UG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

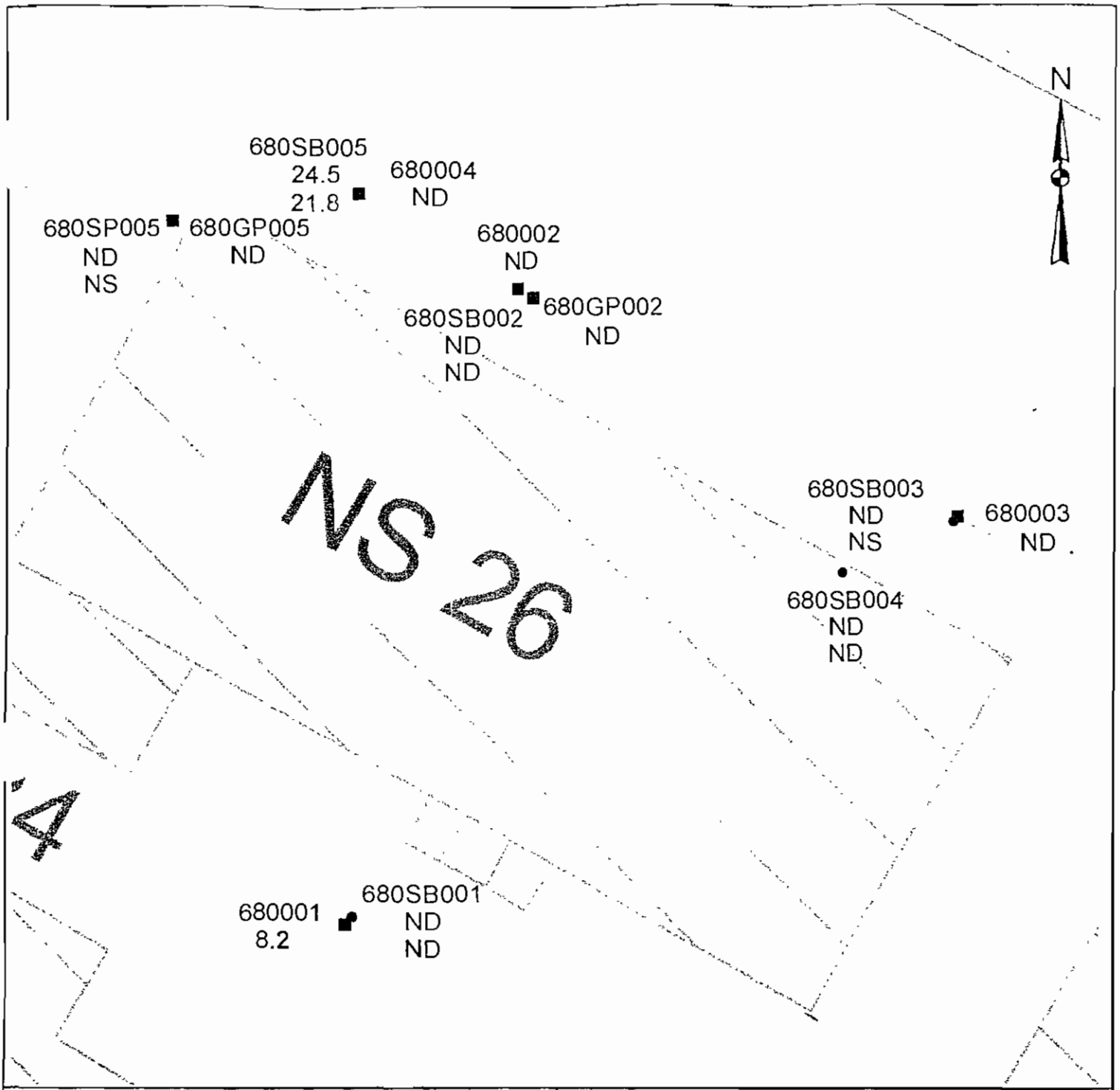
SCALE

0 20 40 60 80 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.4
ZONE I
AOC 680
TRICHLOROETHENE
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=5 UG/L RBC=58000 UG/KG SSL=30 UG/KG



LEGEND

■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (MG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (MG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

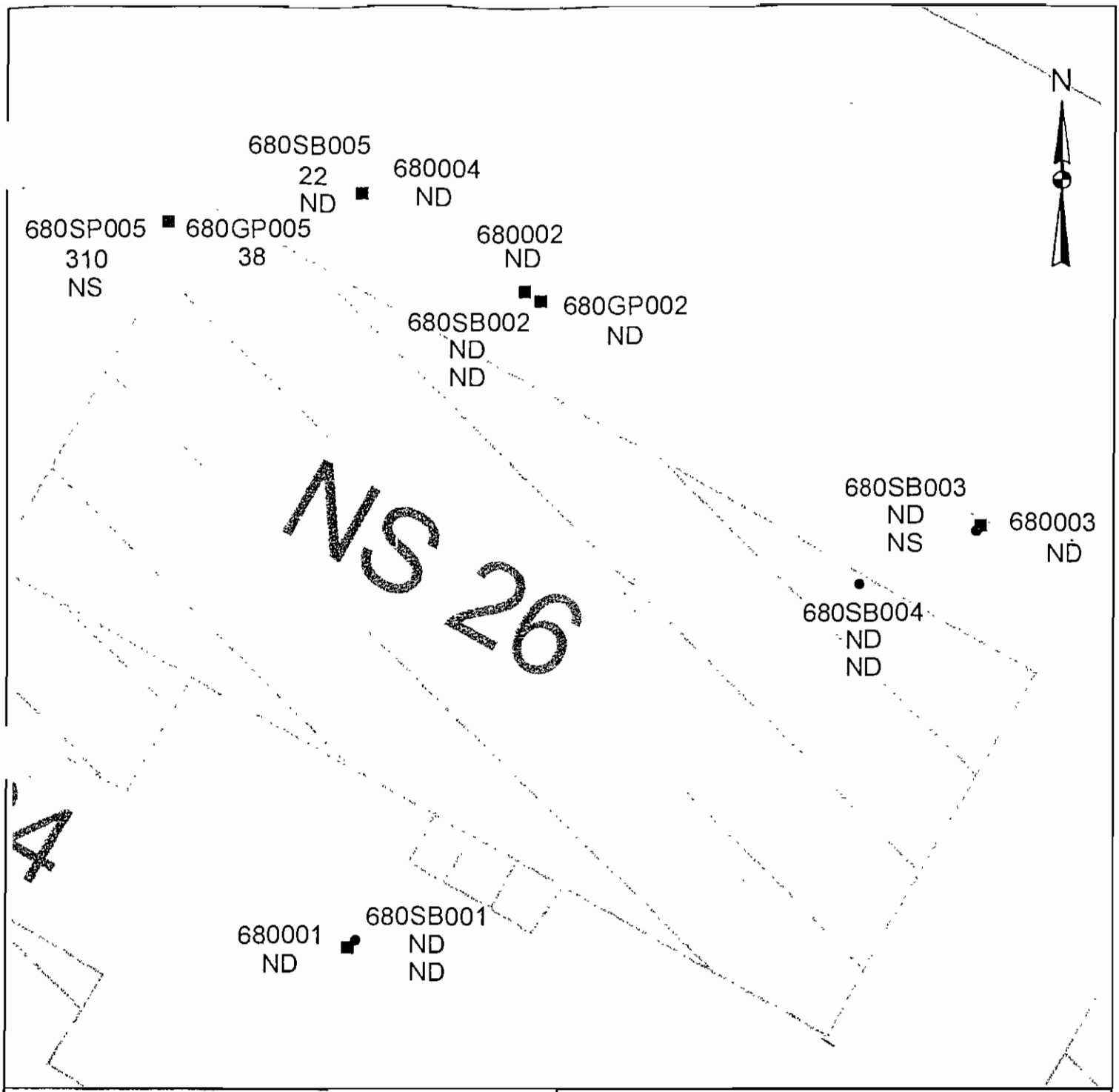
SCALE

0 20 40 60 80 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.5
ZONE I
AOC 680
CHROMIUM
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=100 UG/L RBC=39 MG/KG SSL=19 MG/KG



LEGEND

■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (UG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (UG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

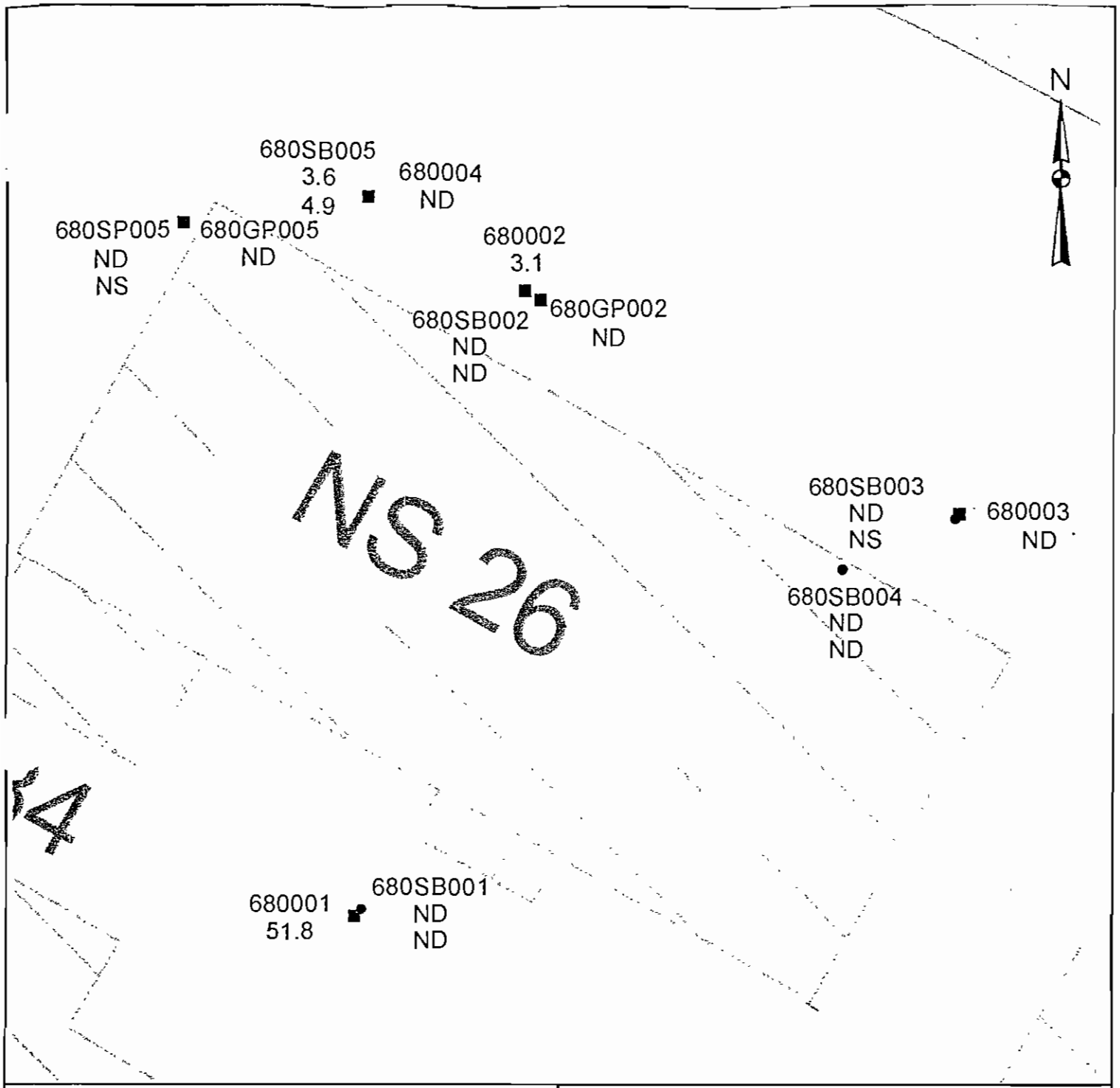
SCALE

0 20 40 60 80 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.6
ZONE I
AOC 680
BEHP
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=NA RBC=46000 UG/KG SSL=1800000 UG/KG



LEGEND

■	MONITORING WELL LOCATION
●	ZONE I SOIL BORING LOCATION
12.30	ZONE I SURFACE SOIL CONC. (MG/KG)
12.30	ZONE I SUBSURFACE SOIL CONC. (MG/KG)
12.30	MAXIMUM QUARTERLY GW CONC. (UG/L)
NS	NO SAMPLE TAKEN
ND	NON DETECT

SCALE

0 20 40 60 80 Feet

ZONE I - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.7
ZONE I
AOC 680
ARSENIC
ZONE I EXCEEDANCES
SOIL AND GW CONCENTRATIONS

MCL=50 UG/L RBC=.43 MG/KG SSL=15 MG/KG

One inorganic – arsenic – was present in groundwater significantly above its RBC. Arsenic is not expected to be associated with past site activities, but it is a common constituent in zone-wide groundwater. This would suggest that leaching from native soil and aquifer matrix may be the mechanism releasing arsenic to groundwater, as opposed to an actual waste release. The presence of arsenic in groundwater at concentrations approximately twice the background validates the pathway, but it is not expected to be significant due to non-use of the resource. Figure 10.5.7 presents concentrations of arsenic detected at AOC 680.

One inorganic constituent – arsenic – was present in groundwater above its screening value for surface water migration. It was detected at approximately twice its background for shallow groundwater, but was not above its SSL in surface or subsurface soil. Additionally, arsenic is not expected to be associated with past site activities, and arsenic is a common constituent in zone-wide soil and groundwater samples. These lines of evidence suggest that either the calculated SSL for arsenic is too high given site conditions, or that arsenic is being imparted through leaching from deeper vadose zone lithologies and/or aquifer matrix. The proximity of the Cooper River and the groundwater flow direction indicate that the River is a potential receptor of groundwater discharge, but attenuation along the flowpath and dilution upon discharge to the River will likely reduce concentrations of arsenic to insignificant levels.

10.5.7.3 Soil to Air Cross-Media Transport

No surface soil parameters were present above their respective screening values for the soil to air pathway, thus the pathway is considered invalid for this AOC.

10.5.7.4 Fate and Transport Summary

1,2 DCE, PCE, TCE, and chromium were present in soil above their respective SSL. PCE and TCE were ND in subsurface soil but were present in groundwater; 1,2 DCE exhibited an increase in subsurface soil (possibly as a degradation product of TCE); and chromium, although above its

Quantitation Report (Not Reviewed)

Data File : C:\HPCHEM\1\DATA\Q6421.D
Acq On : 21 Aug 99 1:22 pm
Sample : WP3647-5 36 GLM Ø1Ø1
Misc : 5970-Q;
Quant Time: Aug 21 13:55 1999

Vial: 5
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0821.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0821.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Aug 18 14:18:02 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0821

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Pentafluorobenzene	10.03	168	1011129	50.00 ug/l	-0.05
29) 1,4-Difluorobenzene	11.76	114	1000936	50.00 ug/l	-0.06
47) Chlorobenzene-d5	20.36	117	776475	50.00 ug/l	-0.06
60) 1,4-Dichlorobenzene-d4	25.16	152	457371	50.00 ug/l	-0.03

System Monitoring Compounds					
27) 1,2-Dichloroethane-d4	10.59	65	384238	39.23 ug/l	-0.09
Surrogate Spike 50.000	Range 65 - 135		Recovery = 78.46%		
28) Dibromofluoromethane	9.80	111	640878	44.27 ug/l	-0.08
Surrogate Spike 50.000	Range 75 - 129		Recovery = 88.54%		
43) Toluene-d8	16.46	98	943815	48.55 ug/l	-0.06
Surrogate Spike 50.000	Range 82 - 120		Recovery = 97.10%		
46) P-Bromofluorobenzene	23.04	95	538397	48.76 ug/l	-0.04
Surrogate Spike 50.000	Range 69 - 125		Recovery = 97.52%		

Target Compounds						Qvalue
2) Dichlorodifluoromethane	2.06	85	163215	11.55 ug/l	# NM	13
5) Vinyl Chloride	2.54	62	29346	3.93 ug/l	NM	79
6) Chloroethane	3.18	64	28883	7.80 ug/l	NM	62
8) Diethyl ether	4.11	59	2385	0.65 ug/L	#	88
9) Acetone	4.74	43	7971	3.93 ug/l	# NM	52
10) Freon-113	4.43	151	26596	3.48 ug/L	# HJ	87
11) Acrolein	4.58	56	829	1.55 ug/L	NM	95
12) Acrylonitrile	6.48	53	1492	1.47 ug/l	# NM	68
13) Methylene Chloride	5.62	84	14821	1.77 ug/l	# NM	62
18) 1,1-Dichloroethane	7.24	63	124207	7.19 ug/l	H	87
20) 1,2-Dichloroethene (cis)	8.66	96	38159	4.73 ug/l	# HJ	69
24) Tetrahydrofuran	9.20	42	1314	0.70 ug/l	#	56
30) 1,1-Dichloropropene	10.01	75	86887	5.50 ug/l	# NM	23
39) Benzene	10.51	78	76326	4.07 ug/l		100
42) 4-methyl-2-pentanone	16.54	43	4766	0.60 ug/l	#	44
44) Toluene	16.65	92	430234	35.48 ug/l	#	98
55) Ethylbenzene	20.69	91	301919	13.43 ug/l		93
57) m+p-Xylene	20.98	106	262048	33.11 ug/l		91
58) o-Xylene	21.90	106	249376	29.27 ug/l		89
61) Isopropylbenzene	22.70	105	63933	2.10 ug/l	# HJ	95
65) 2-Chlorotoluene	23.71	91	96922	5.01 ug/l	H	74
66) n-Propylbenzene	23.51	91	202111	5.92 ug/l	H	97
68) 1,3,5-Trimethylbenzene	23.88	105	346357	15.79 ug/l	H	98
69) tert-Butylbenzene	24.55	119	170818	6.94 ug/l	# NM	1
70) 1,2,4-Trimethylbenzene	24.55	105	1505544	67.65 ug/l	H	98
71) Sec-Butylbenzene	24.83	105	77015	2.19 ug/l	HJ	73

(#) = qualifier out of range (m) = manual integration

Quantitation Report (Not Reviewed)

Data File : C:\HPCHEM\1\DATA\Q6421.D
Acq On : 21 Aug 99 1:22 pm
Sample : WP3647-5
Misc : 5970-Q;
Quant Time: Aug 21 13:55 1999

Vial: 5
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0821.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0821.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Aug 18 14:18:02 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0821

Compound	R.T.	QIon	Response	Conc Unit	Qvalue
73) ~~p-Isopropyltoluene~~	25.07	119	124142	~~4.87 ug/l #~~ HJ	44
75) n-Butylbenzene	25.75	91	331516	11.51 ug/l # NM	31
76) 1,2-Dichlorobenzene	25.80	146	70456	5.39 ug/l H	82
77) 1,2-Dibromo-3-Chloropropan	27.05	75	10876	5.55 ug/l NM	100
78) 1,3,5 Trichlorobenzene	27.30	180	11397	0.89 ug/L #	85
81) Naphthalene	28.63	128	1605801	108.14 ug/l	96

JB 08230

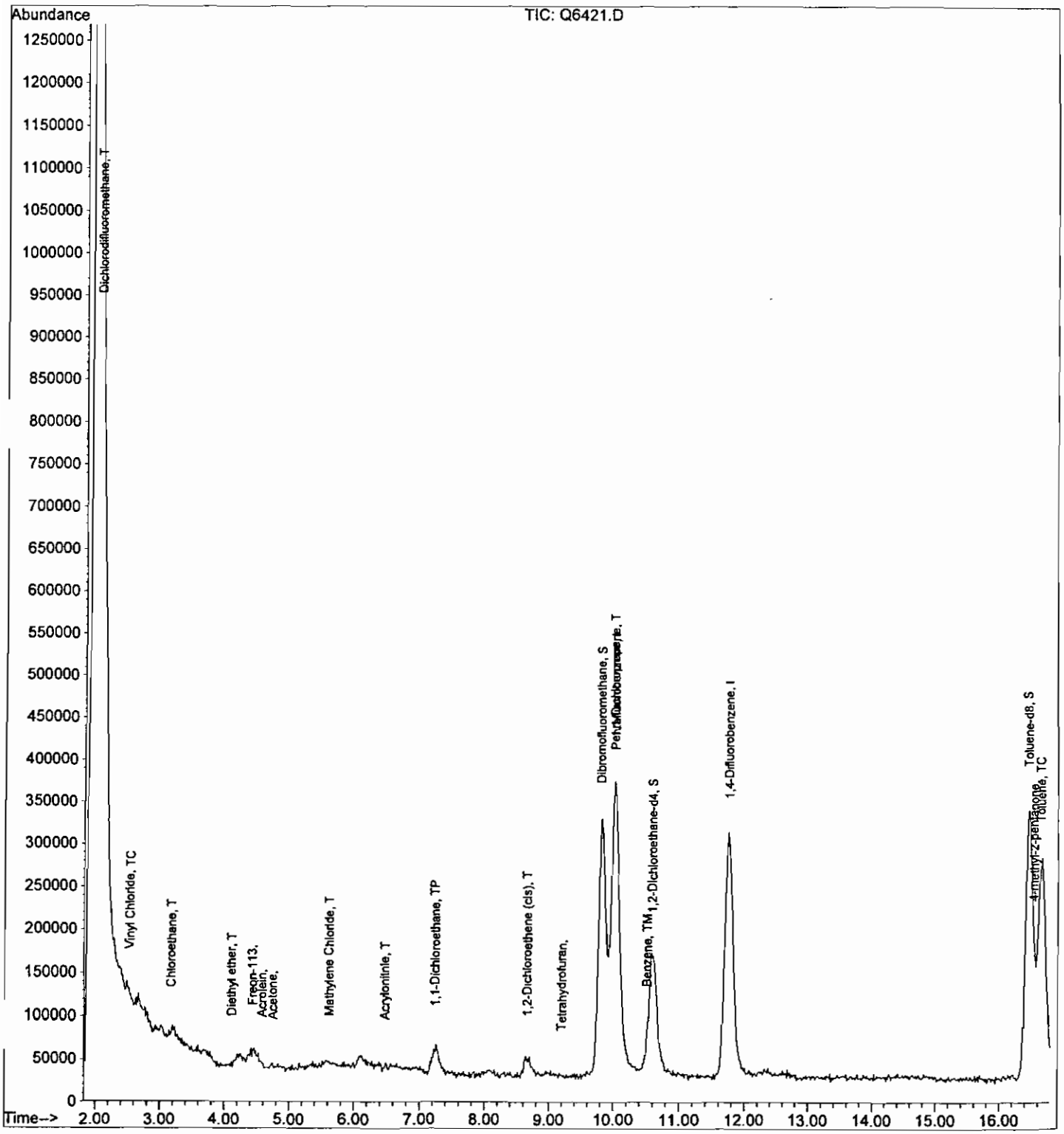
(#) = qualifier out of range (m) = manual integration

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6421.D
Acq On : 21 Aug 99 1:22 pm
Sample : WP3647-5
Misc : 5970-Q;
Quant Time: Aug 21 13:55 1999

Vial: 5
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0821.RES

Method : C:\HPCHEM\1\METHODS\Q82W0821.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Aug 18 14:18:02 1999
Response via : Multiple Level Calibration

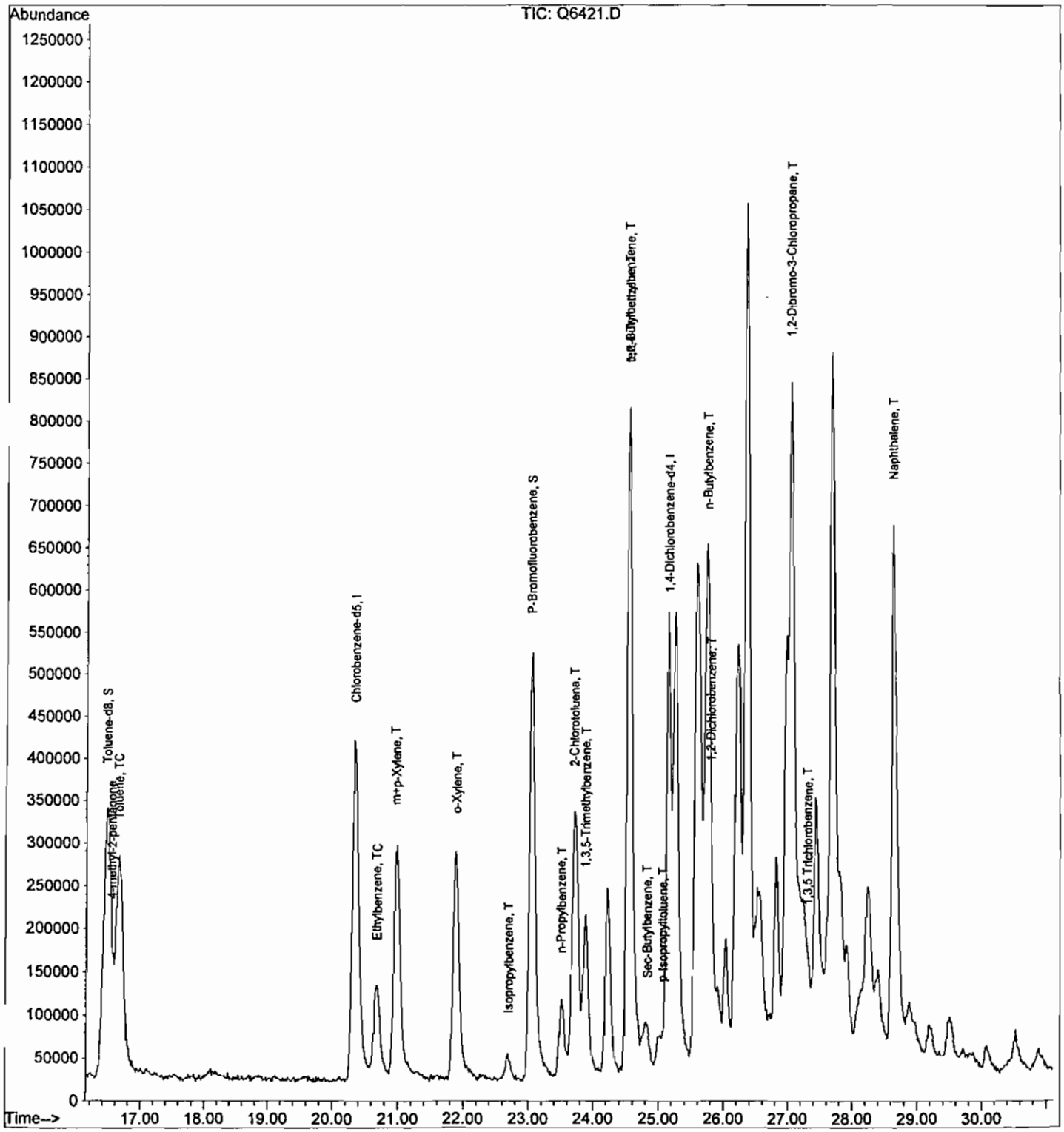


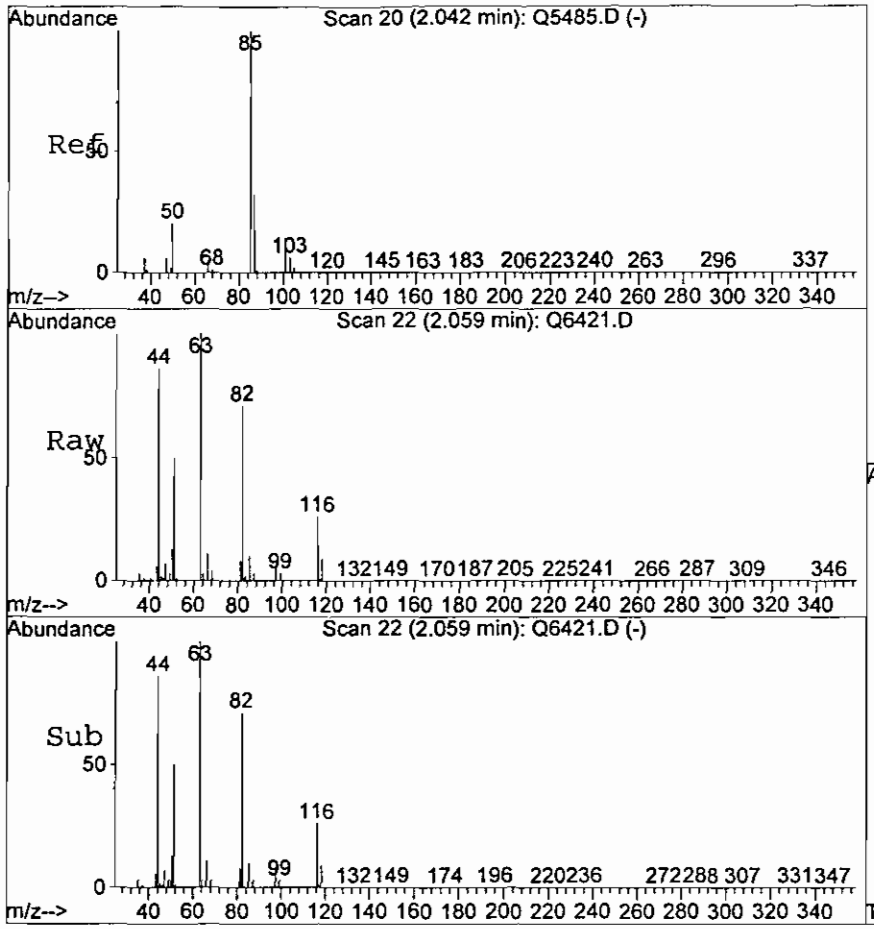
Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6421.D
Acq On : 21 Aug 99 1:22 pm
Sample : WP3647-5
Misc : 5970-Q;
Quant Time: Aug 21 13:55 1999

Vial: 5
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0821.RES

Method : C:\HPCHEM\1\METHODS\Q82W0821.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Aug 18 14:18:02 1999
Response via : Multiple Level Calibration

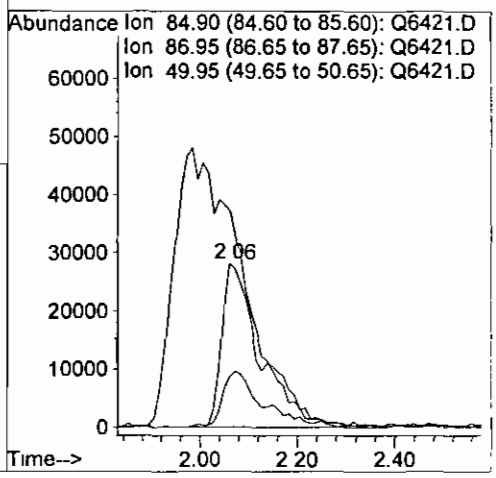


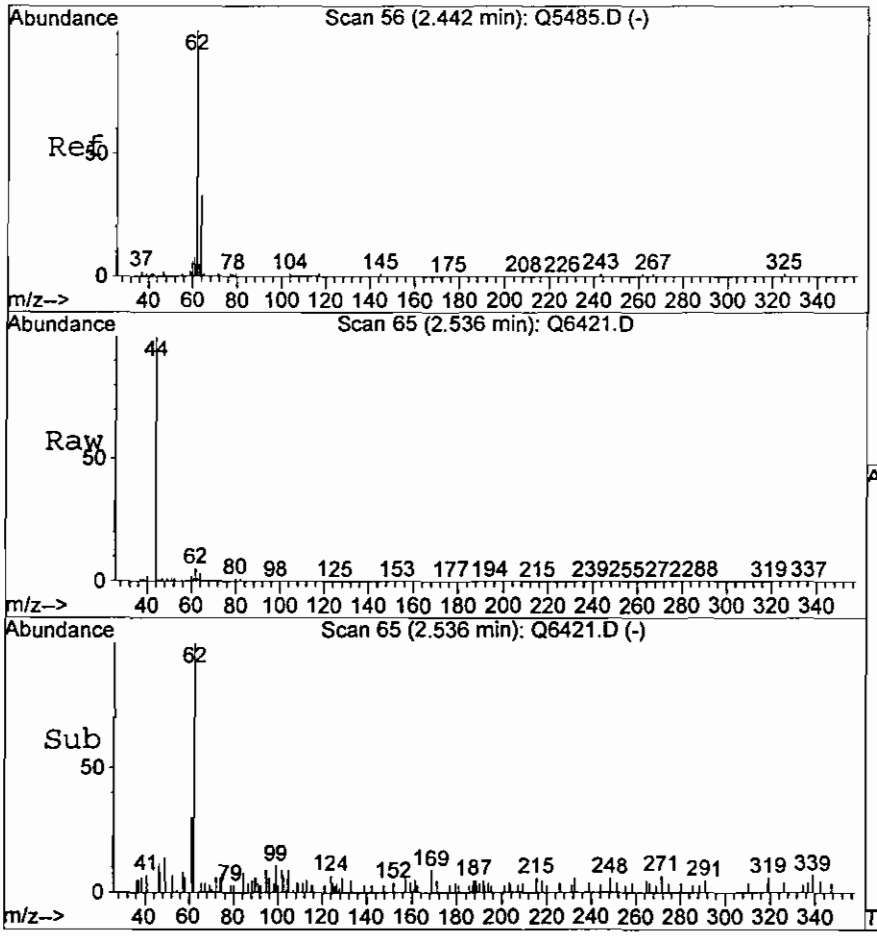


#2
Dichlorodifluoromethane
Concen: 11.55 ug/l
RT: 2.06 min Scan# 22
Delta R.T. -0.09 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:84.9 Resp: 163215

Ion	Ratio	Lower	Upper
85	100		
87	30.7	27.8	41.6
50	130.4	11.3	16.9#
0	0.0	0.0	0.0

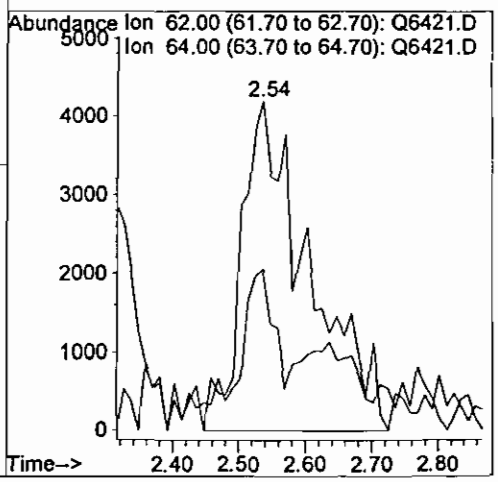




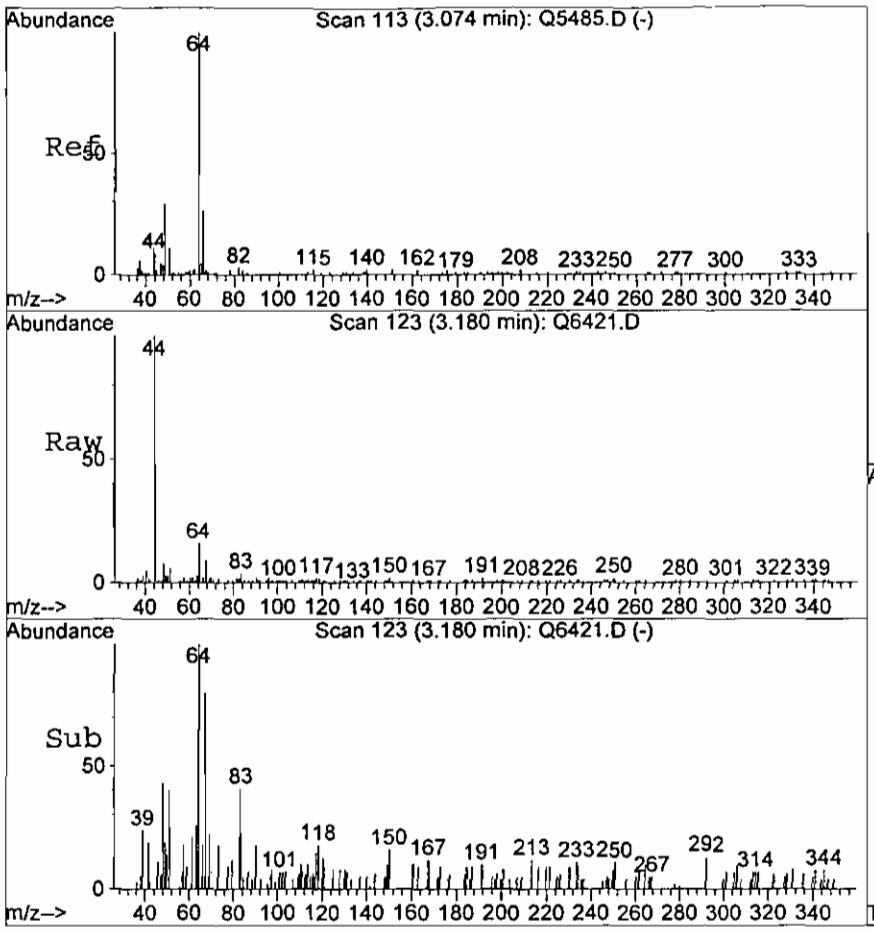
#5
Vinyl Chloride
Concen: 3.93 ug/l
RT: 2.54 min Scan# 65
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:62 Resp: 29346

Ion	Ratio	Lower	Upper
62	100		
64	40.6	9.4	49.4
0	0.0	0.0	0.0
0	0.0	0.0	0.0



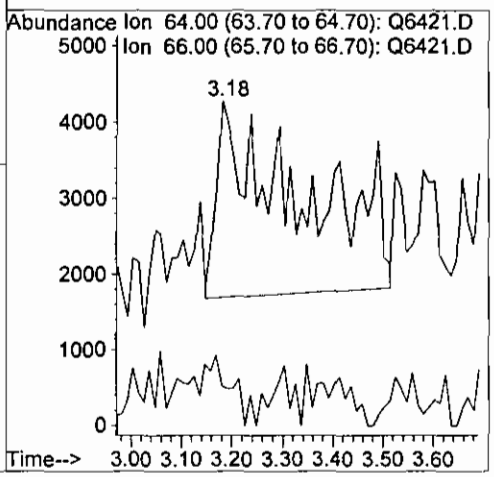
1-146

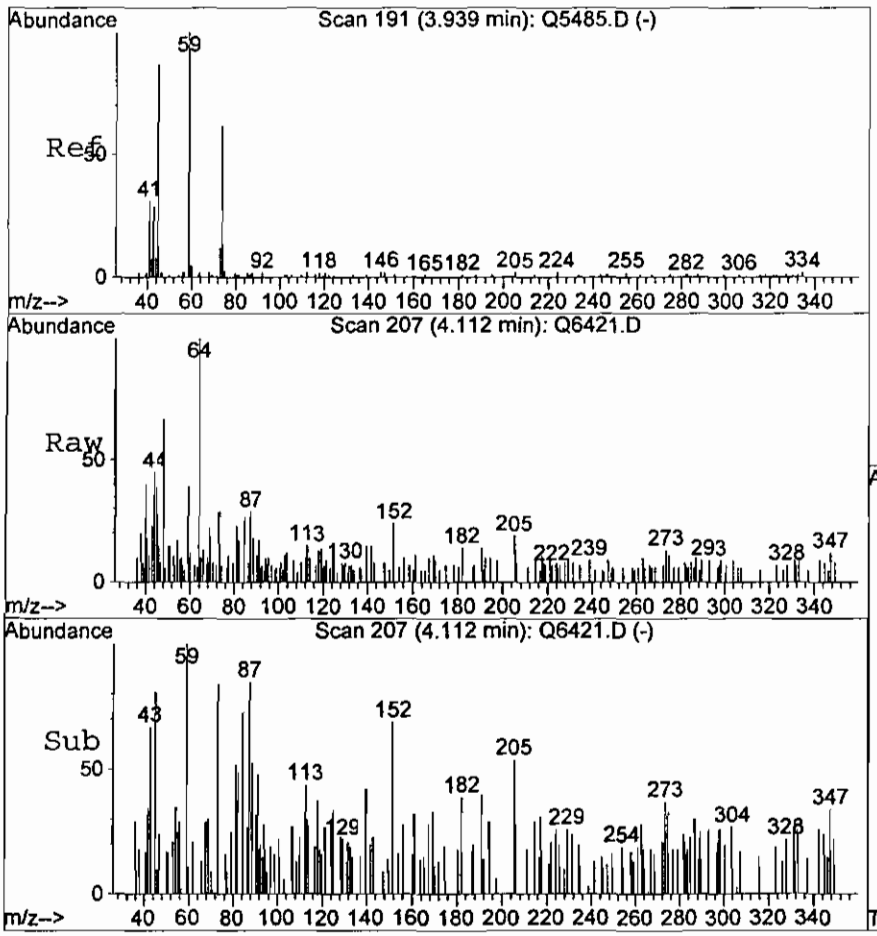


#6
Chloroethane
Concen: 7.80 ug/l
RT: 3.18 min Scan# 123
Delta R.T. -0.07 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:64 Resp: 28883

Ion	Ratio	Lower	Upper
64	100		
66	7.6	7.3	47.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

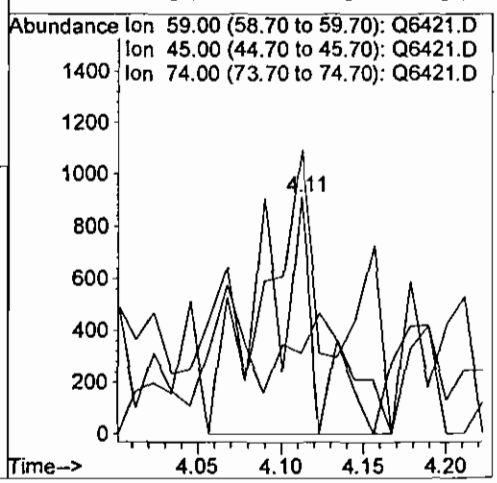


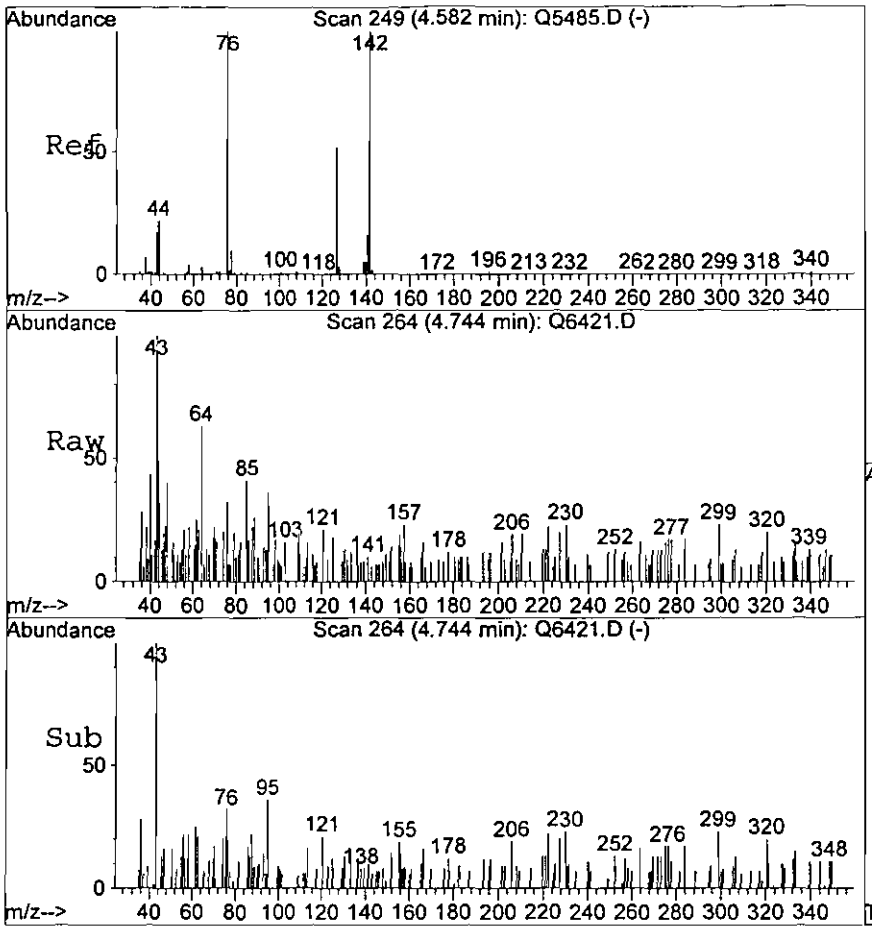


#8
Diethyl ether
Concen: 0.65 ug/L
RT: 4.11 min Scan# 207
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:59 Resp: 2385

Ion	Ratio	Lower	Upper
59	100		
45	81.0	65.7	98.5
74	46.2	53.4	80.0#
0	0.0	0.0	0.0

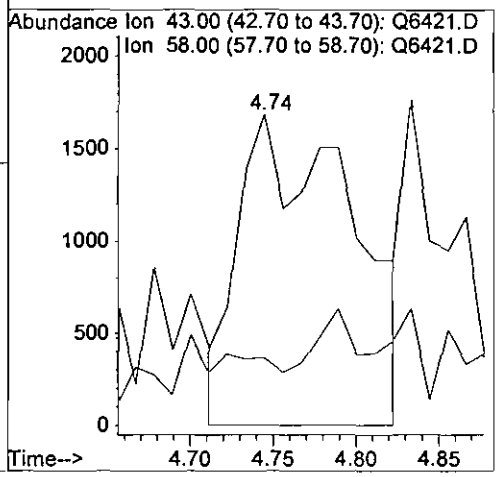


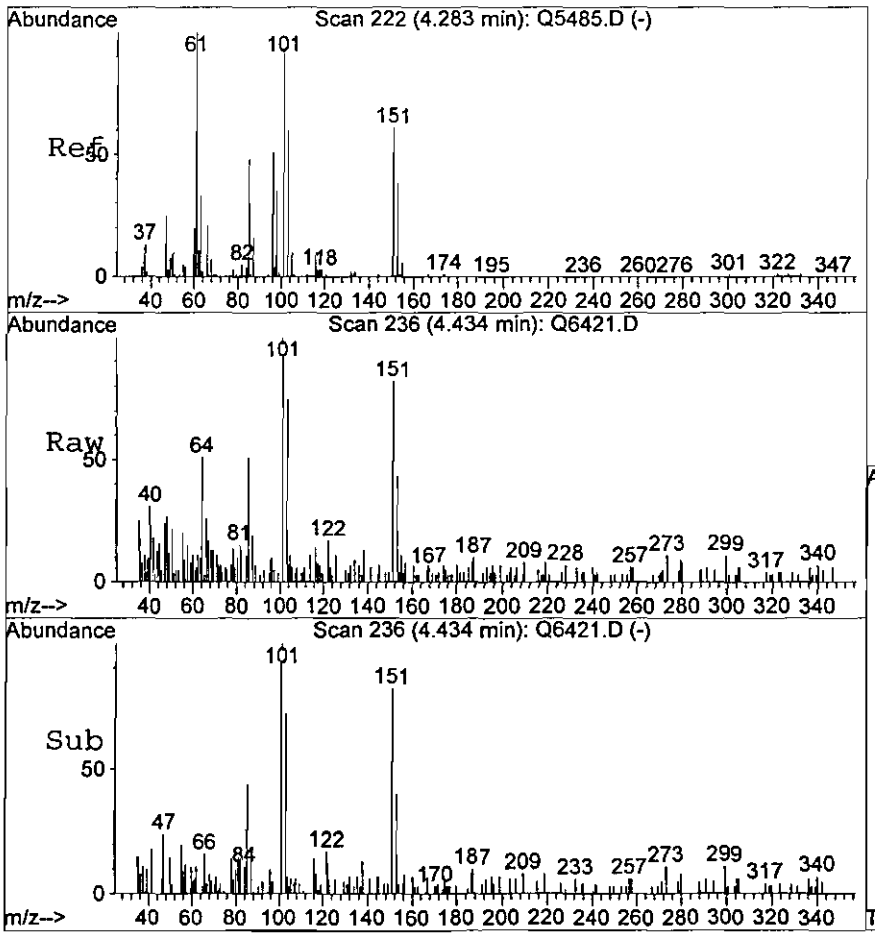


#9
Acetone
Concen: 3.93 ug/l
RT: 4.74 min Scan# 264
Delta R.T. -0.12 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:43 Resp: 7971

Ion	Ratio	Lower	Upper
43	100		
58	0.0	18.5	27.7#
0	0.0	0.0	0.0
0	0.0	0.0	0.0

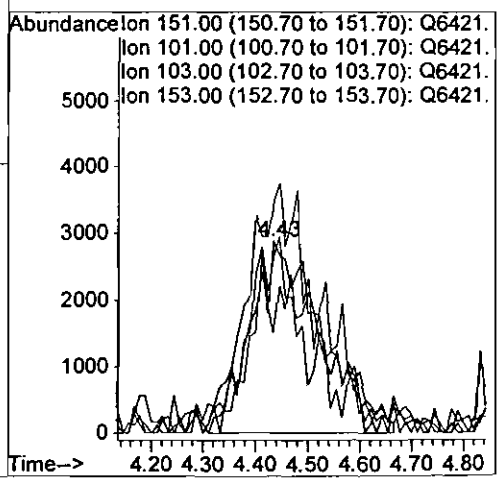


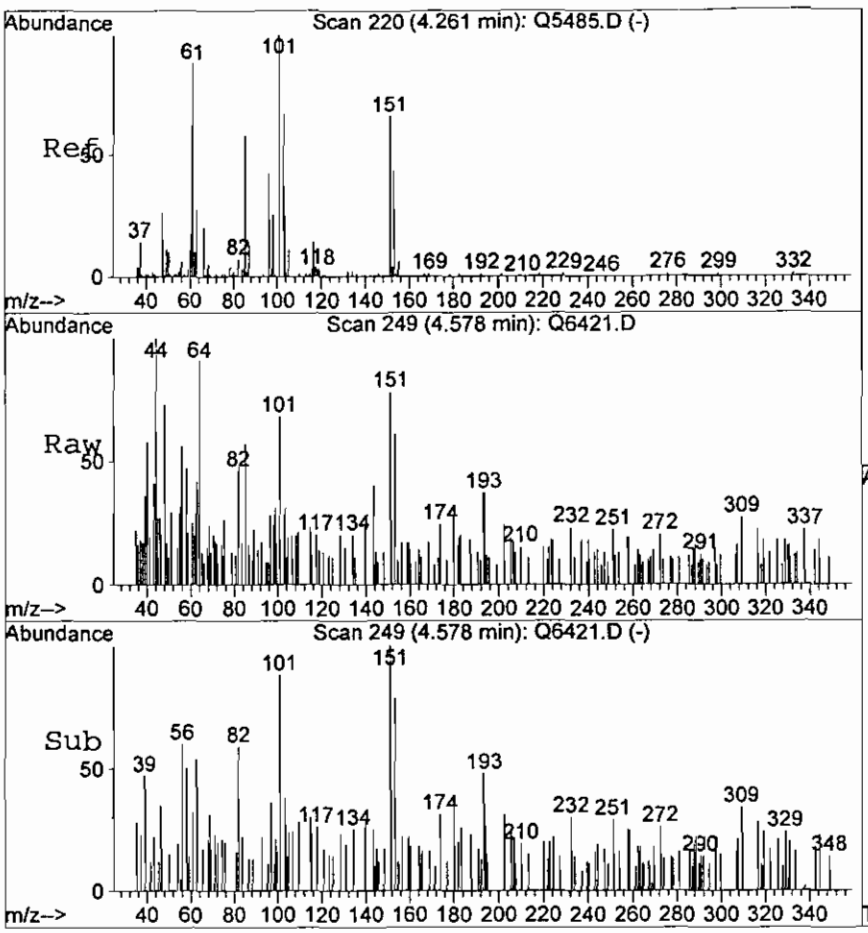


#10
Freon-113
Concen: 3.48 ug/L
RT: 4.43 min Scan# 236
Delta R.T. -0.09 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:151 Resp: 26596

Ion	Ratio	Lower	Upper
151	100		
101	135.0	113.1	169.7
103	95.5	72.8	109.2
153	30.7	51.4	77.0#

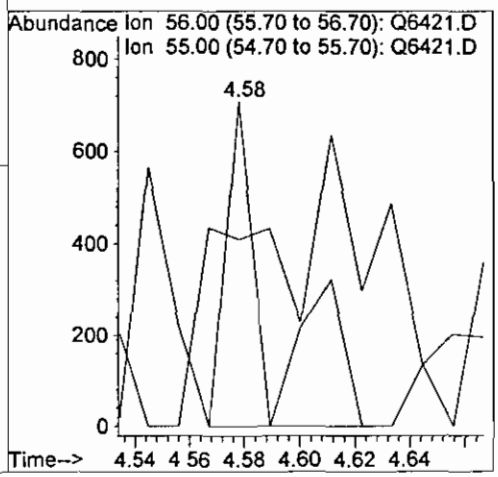


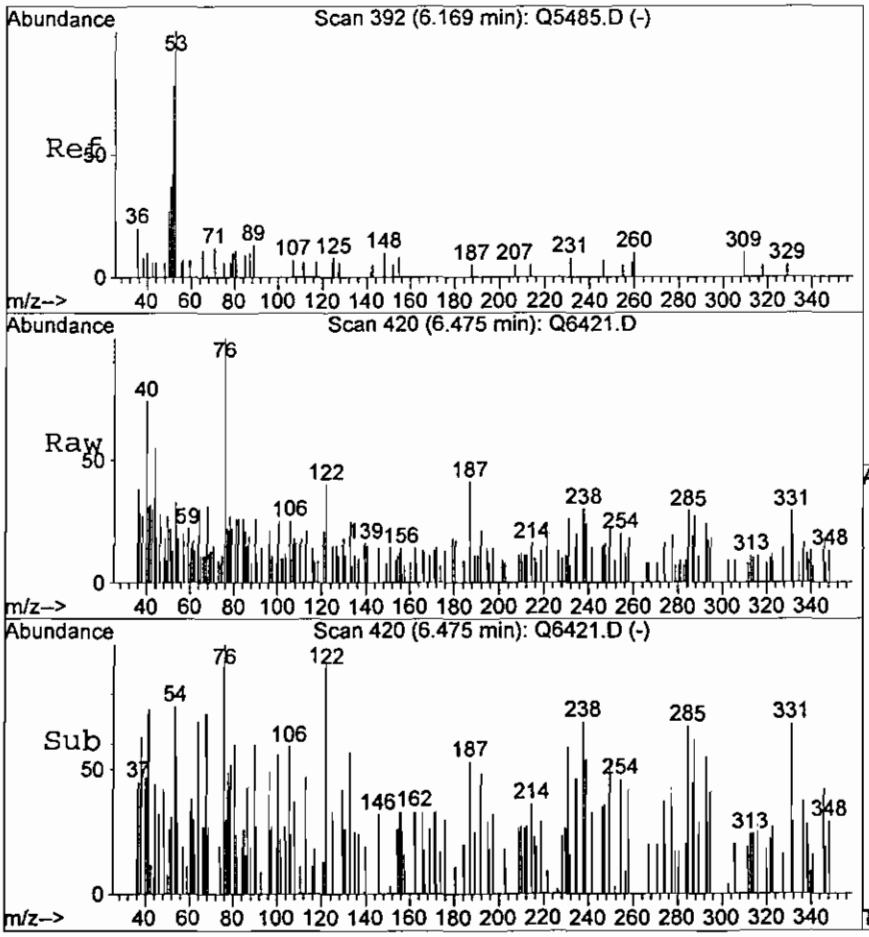


#11
Acrolein
Concen: 1.55 ug/L
RT: 4.58 min Scan# 249
Delta R.T. 0.08 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:56 Resp: 829

Ion	Ratio	Lower	Upper
56	100		
55	120.9	100.9	151.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

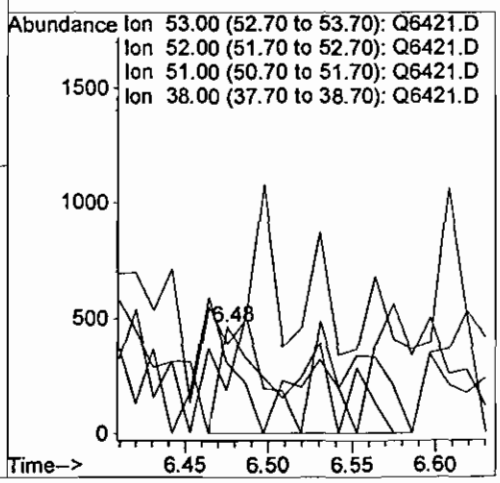


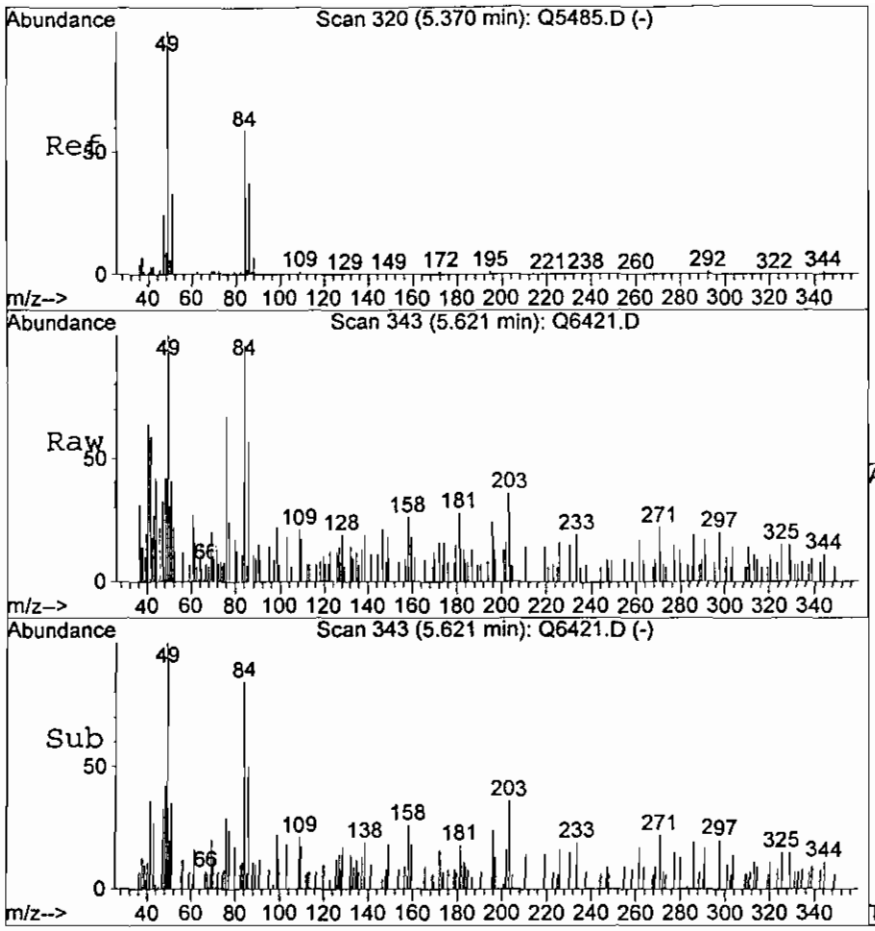


#12
Acrylonitrile
Concen: 1.47 ug/l
RT: 6.48 min Scan# 420
Delta R.T. -0.03 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:53 Resp: 1492

Ion	Ratio	Lower	Upper
53	100		
52	64.8	68.8	103.2#
51	58.0	0.0	0.0#
38	91.6	2.6	4.0#

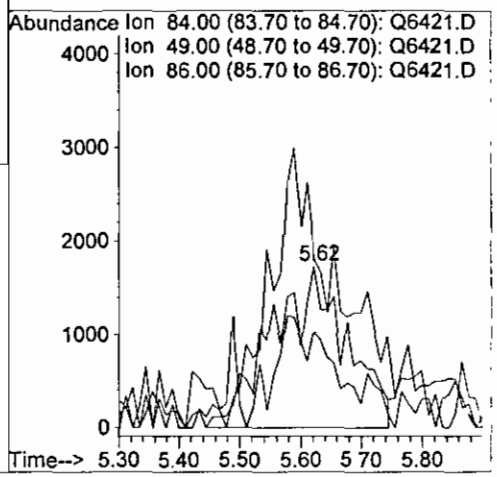


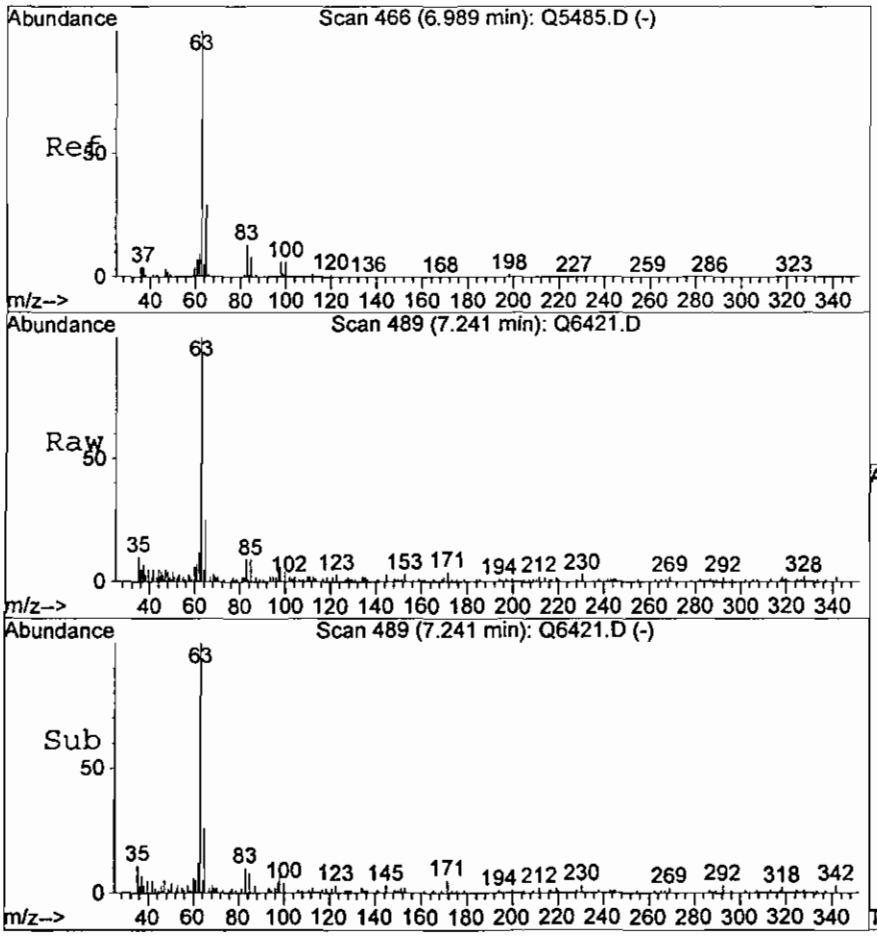


#13
Methylene Chloride
Concen: 1.77 ug/l
RT: 5.62 min Scan# 343
Delta R.T. -0.06 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:84 Resp: 14821

Ion	Ratio	Lower	Upper
84	100		
49	97.7	136.4	176.4#
86	51.4	48.8	88.8
0	0.0	0.0	0.0

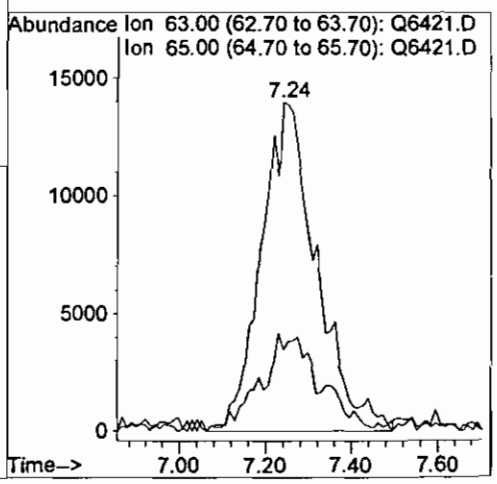


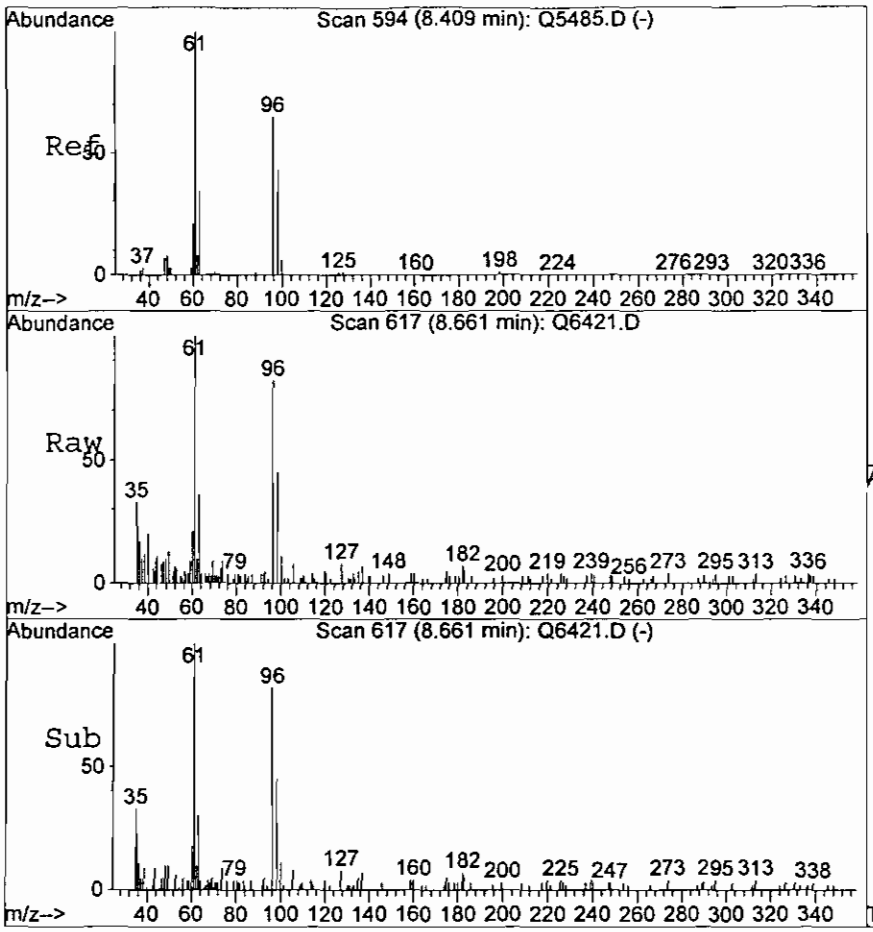


#18
1,1-Dichloroethane
Concen: 7.19 ug/l
RT: 7.24 min Scan# 489
Delta R.T. -0.08 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:63 Resp: 124207

Ion	Ratio	Lower	Upper
63	100		
65	24.8	11.8	51.8
0	0.0	0.0	0.0
0	0.0	0.0	0.0

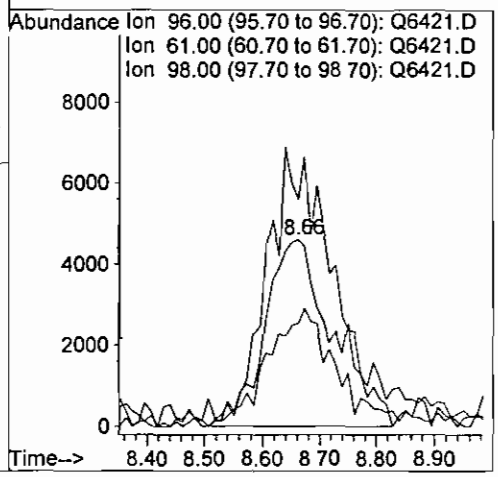


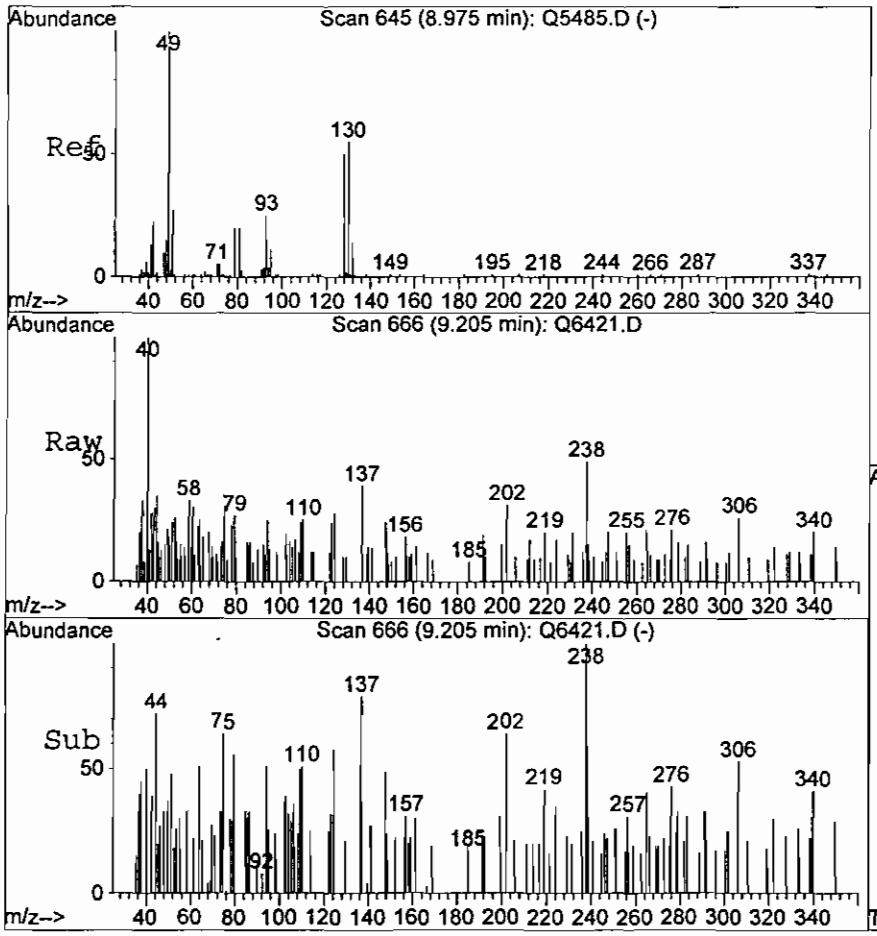


#20
1,2-Dichloroethene (cis)
Concen: 4.73 ug/l
RT: 8.66 min Scan# 617
Delta R.T. -0.07 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:96 Resp: 38159

Ion	Ratio	Lower	Upper
96	100		
61	106.9	134.1	174.1#
98	55.3	50.6	90.6
0	0.0	0.0	0.0

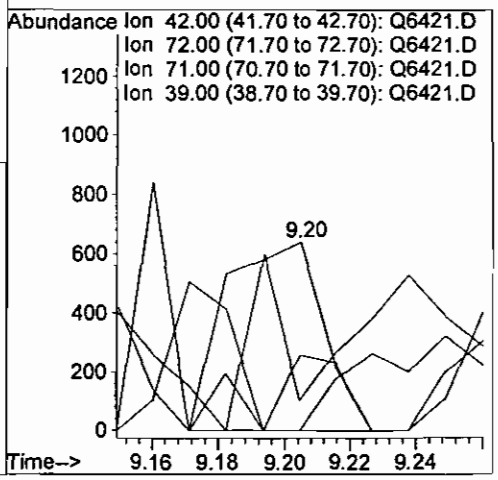


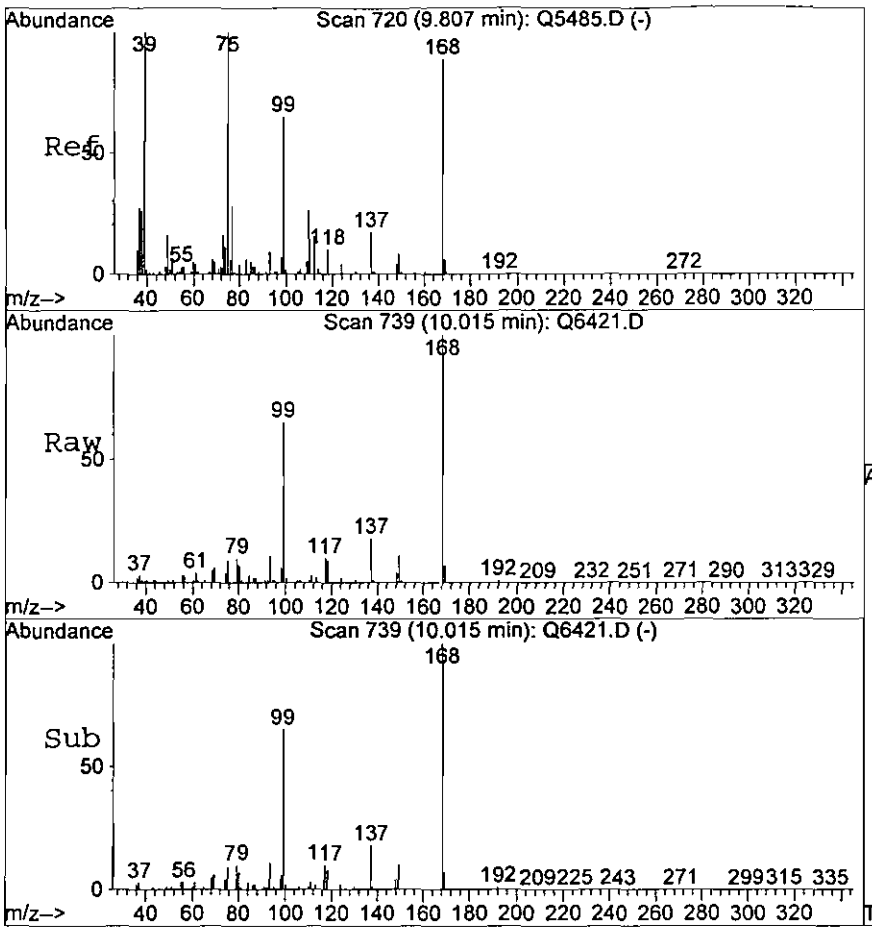


#24
Tetrahydrofuran
Concen: 0.70 ug/l
RT: 9.20 min Scan# 666
Delta R.T. -0.09 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:42 Resp: 1314

Ion	Ratio	Lower	Upper
42	100		
72	0.0	14.8	41.0#
71	0.0	14.3	34.9#
39	35.7	14.7	31.3#

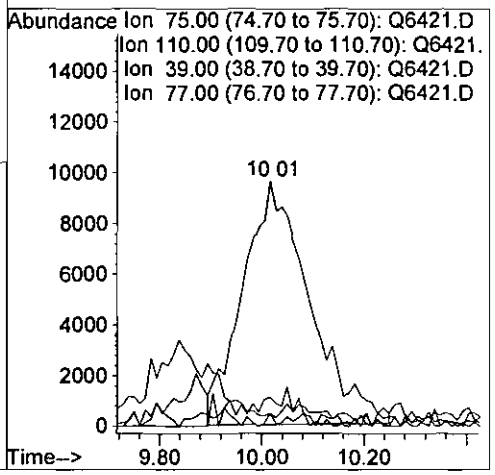


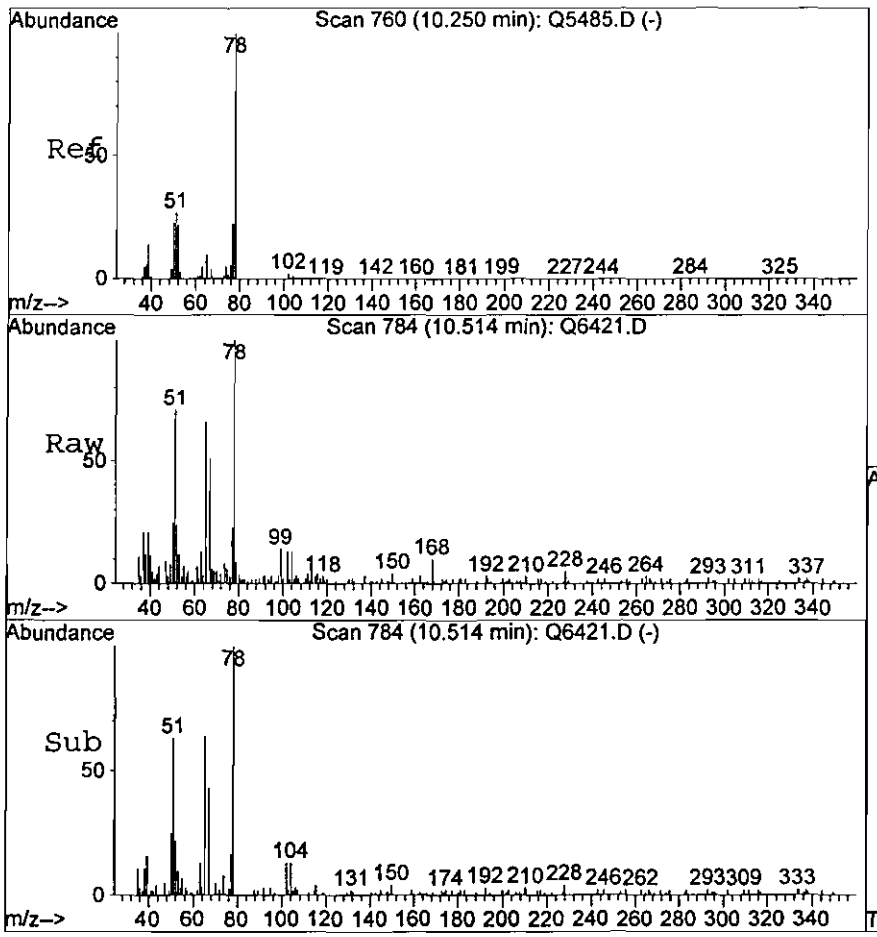


#30
1,1-Dichloropropene
Concen: 5.50 ug/l
RT: 10.01 min Scan# 739
Delta R.T. -0.11 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:75 Resp: 86887

Ion	Ratio	Lower	Upper
75	100		
110	2.0	26.0	39.0#
39	0.0	68.3	102.5#
77	0.7	24.0	36.0#

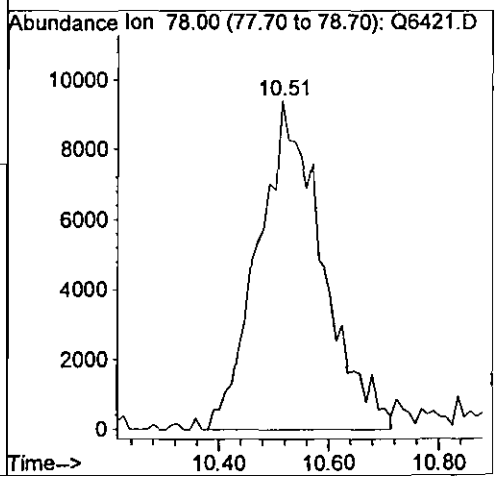


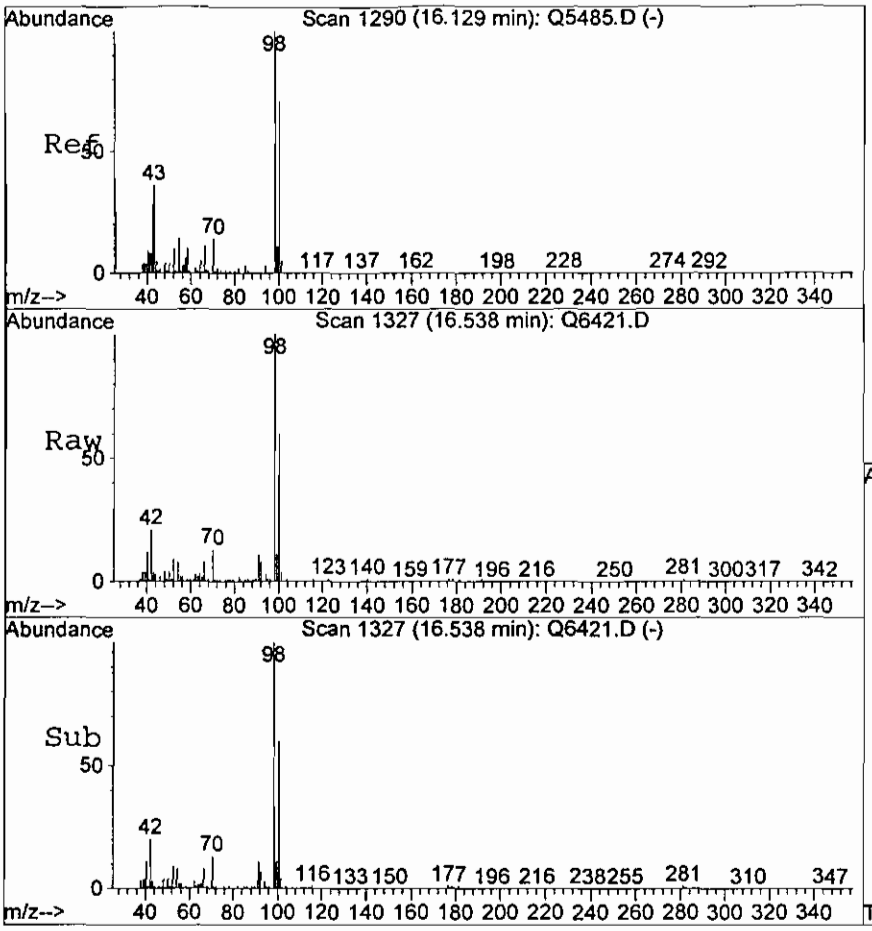


#39
Benzene
Concen: 4.07 ug/l
RT: 10.51 min Scan# 784
Delta R.T. -0.07 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:78 Resp: 76326

Ion	Ratio	Lower	Upper
78	100		
0	0.0	0.0	0.0
0	0.0	0.0	0.0
0	0.0	0.0	0.0

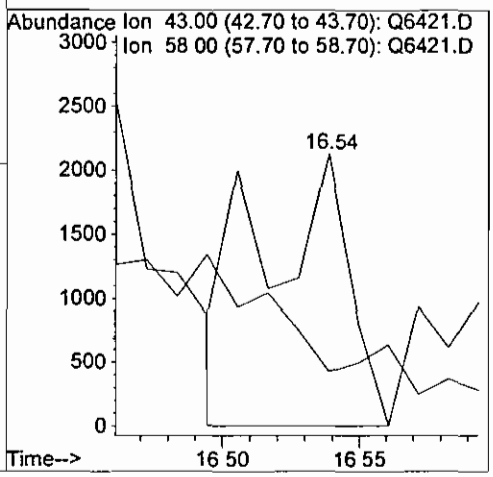


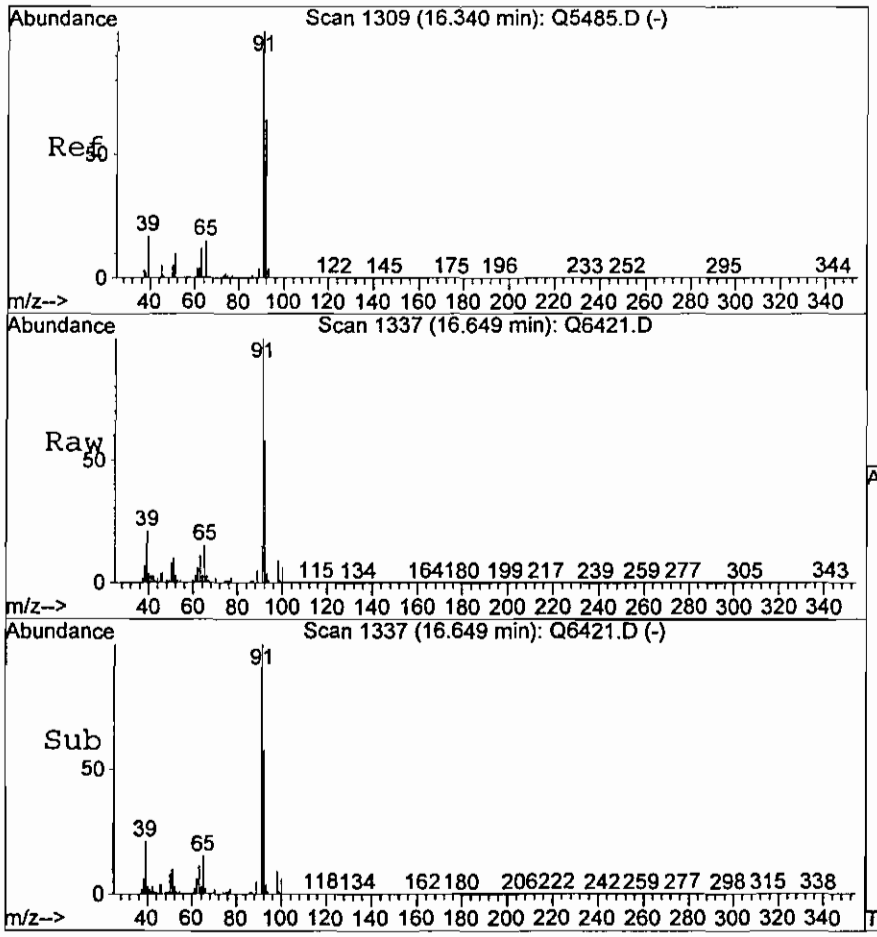


#42
4-methyl-2-pentanone
Concen: 0.60 ug/l
RT: 16.54 min Scan# 1327
Delta R.T. -0.00 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:43 Resp: 4766

Ion	Ratio	Lower	Upper
43	100		
58	0.0	24.5	36.7#
0	0.0	0.0	0.0
0	0.0	0.0	0.0

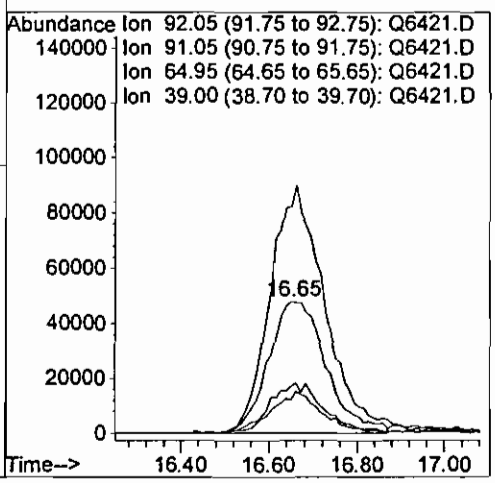


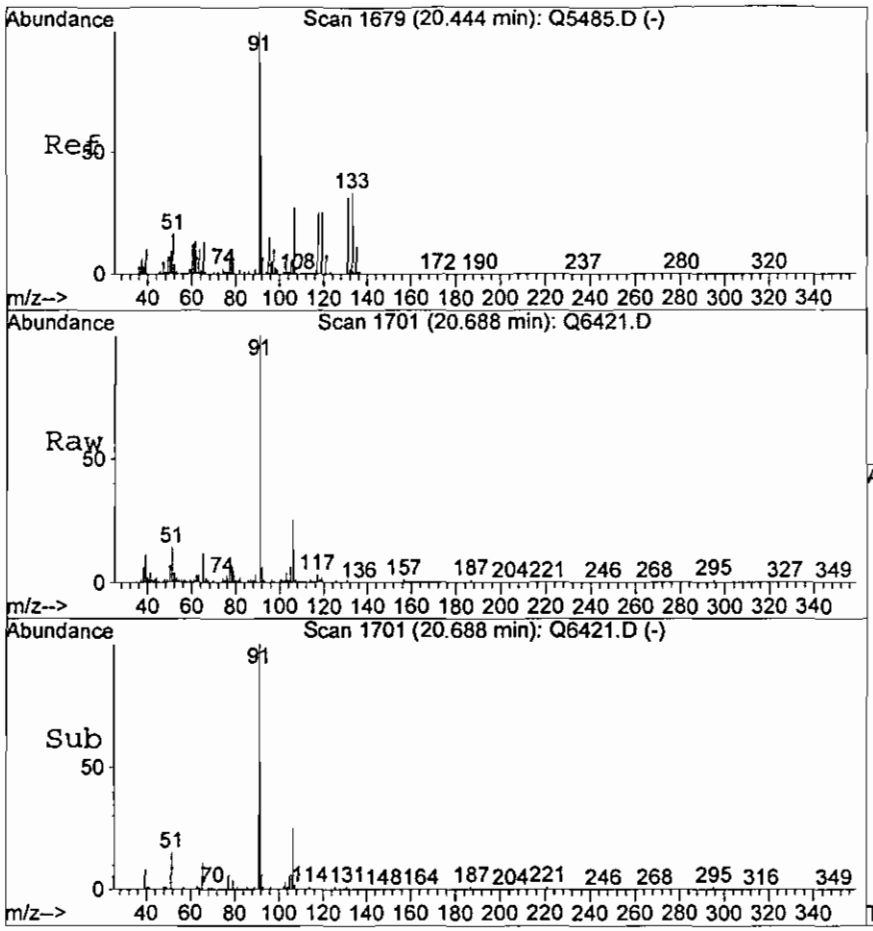


#44
Toluene
Concen: 35.48 ug/l
RT: 16.65 min Scan# 1337
Delta R.T. -0.07 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:92.05 Resp: 430234

Ion	Ratio	Lower	Upper
92	100		
91	171.2	138.2	207.4
65	25.0	20.8	31.2
39	34.1	22.6	34.0#

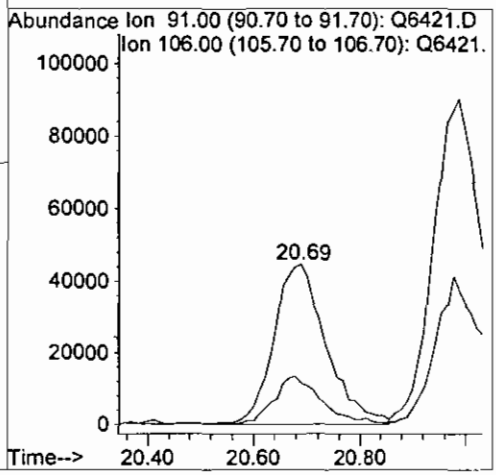


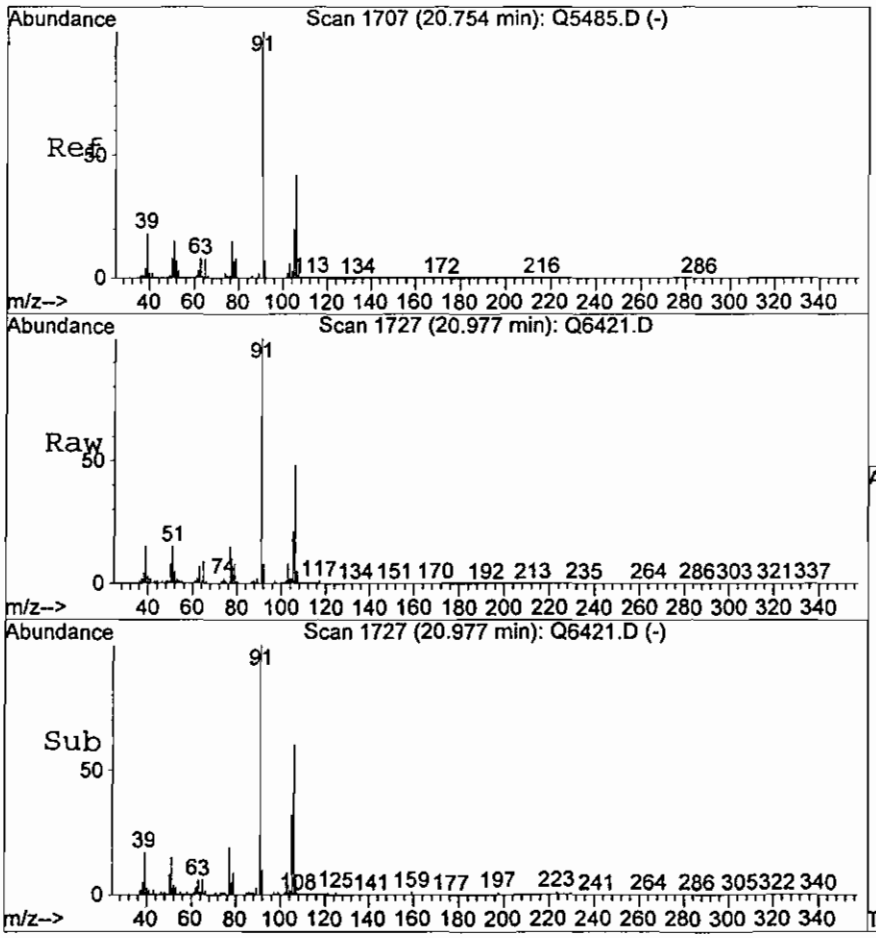


#55
Ethylbenzene
Concen: 13.43 ug/l
RT: 20.69 min Scan# 1701
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:91 Resp: 301919

Ion	Ratio	Lower	Upper
91	100		
106	24.7	8.5	48.5
0	0.0	0.0	0.0
0	0.0	0.0	0.0

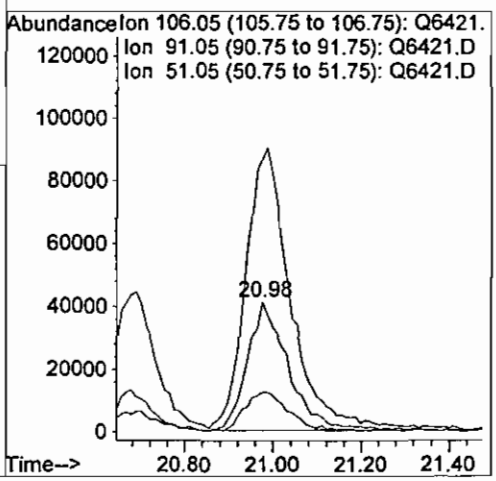


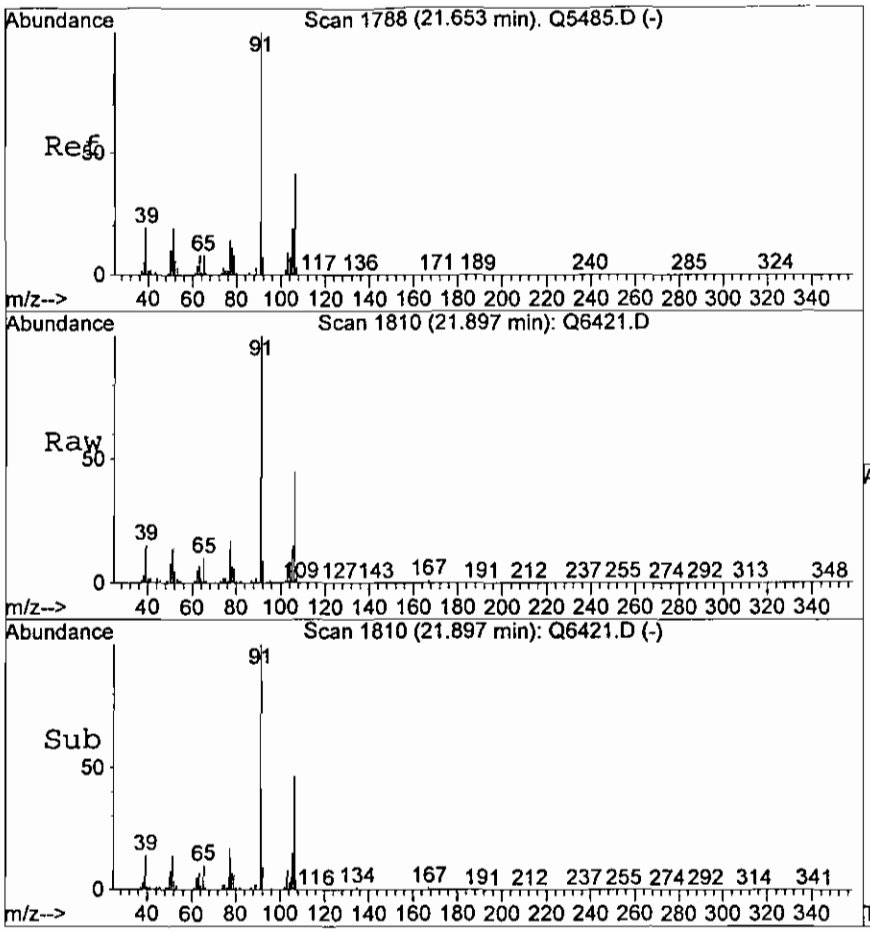


#57
m+p-Xylene
Concen: 33.11 ug/l
RT: 20.98 min Scan# 1727
Delta R.T. -0.05 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:106.05 Resp: 262048

Ion	Ratio	Lower	Upper
106	100		
91	208.9	204.5	244.5
51	29.7	11.8	51.8
0	0.0	0.0	0.0

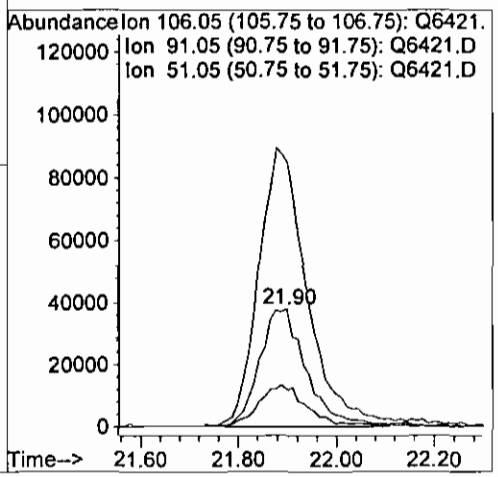


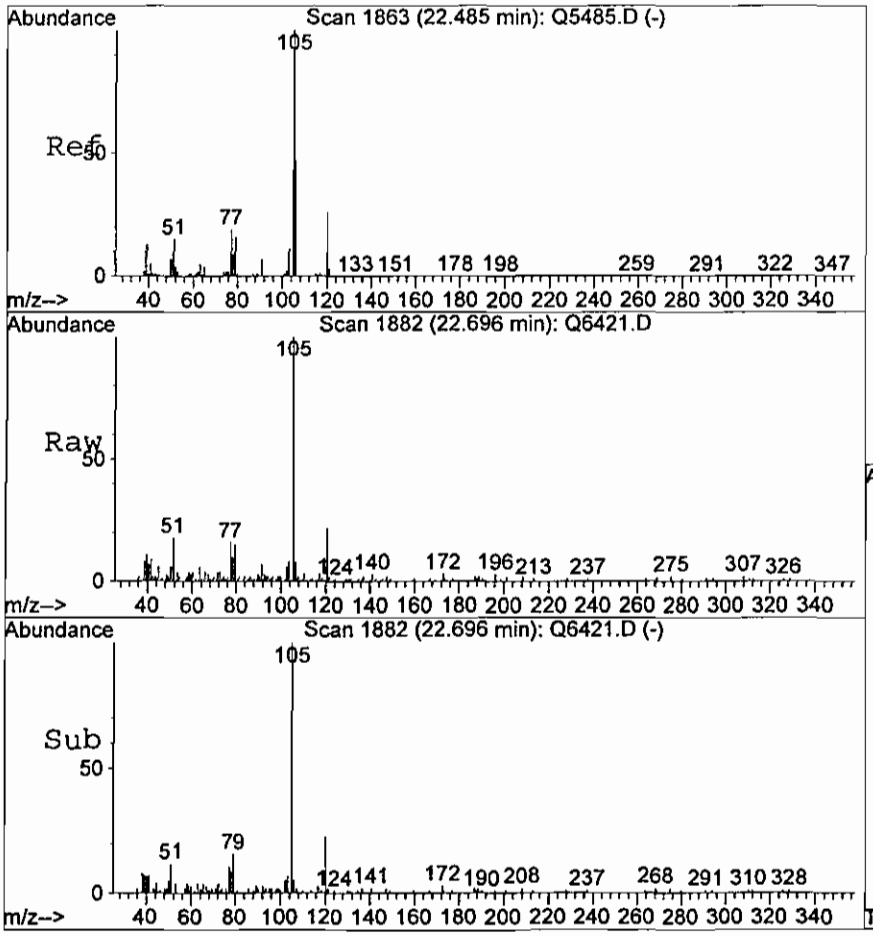


#58
o-Xylene
Concen: 29.27 ug/l
RT: 21.90 min Scan# 1810
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:106.05 Resp: 249376

Ion	Ratio	Lower	Upper
106	100		
91	221.1	193.0	289.4
51	30.8	27.8	41.6
0	0.0	0.0	0.0

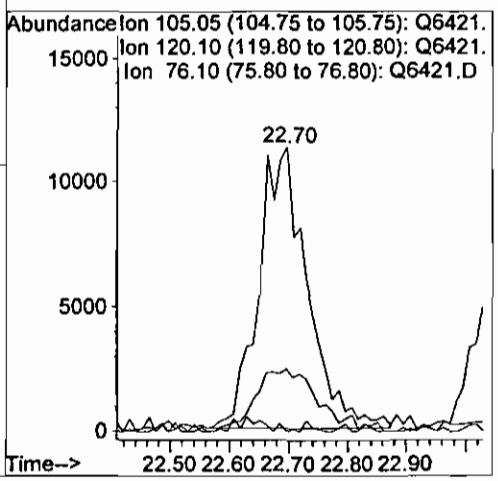


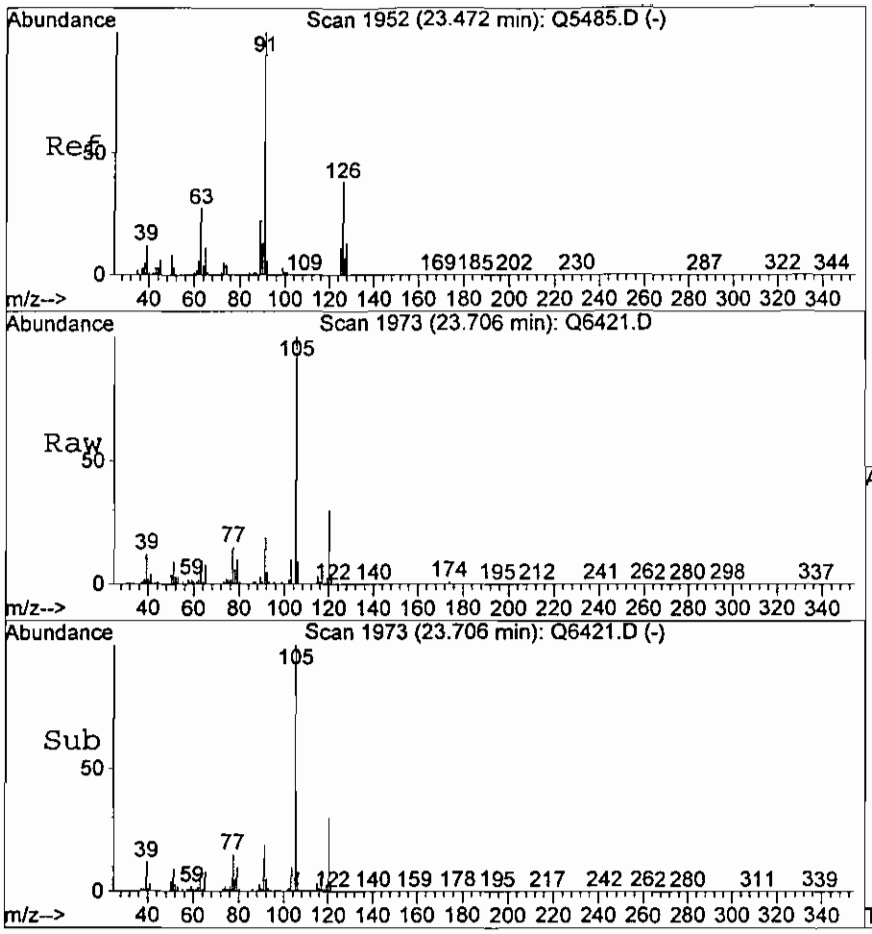


#61
Isopropylbenzene
Concen: 2.10 ug/l
RT: 22.70 min Scan# 1882
Delta R.T. -0.03 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:105.05 Resp: 63933

Ion	Ratio	Lower	Upper
105	100		
120	22.5	19.9	29.9
76	0.0	2.8	4.2#
0	0.0	0.0	0.0

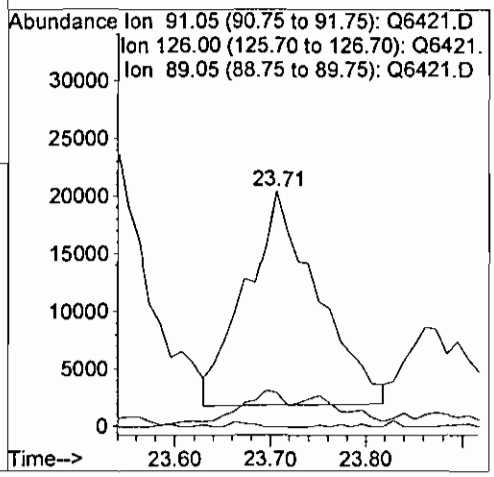


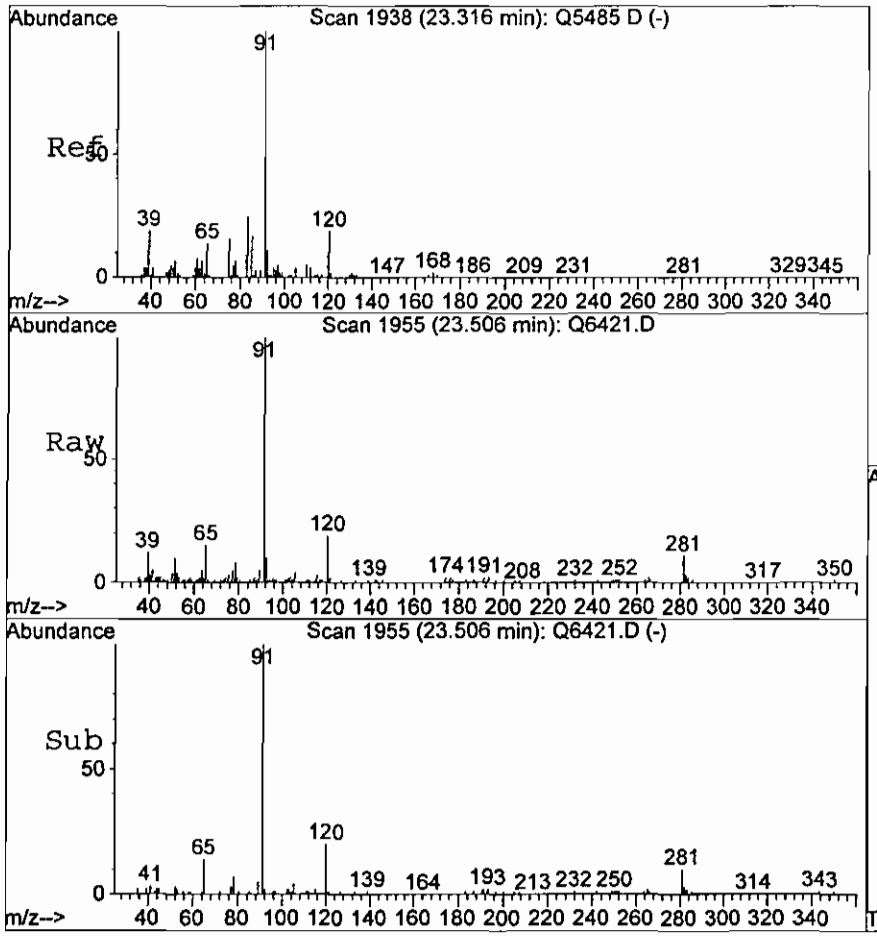


#65
2-Chlorotoluene
Concen: 5.01 ug/l
RT: 23.71 min Scan# 1973
Delta R.T. 0.00 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:91.05 Resp: 96922

Ion	Ratio	Lower	Upper
91	100		
126	0.0	0.0	38.0
89	15.1	0.0	32.7
0	0.0	0.0	0.0

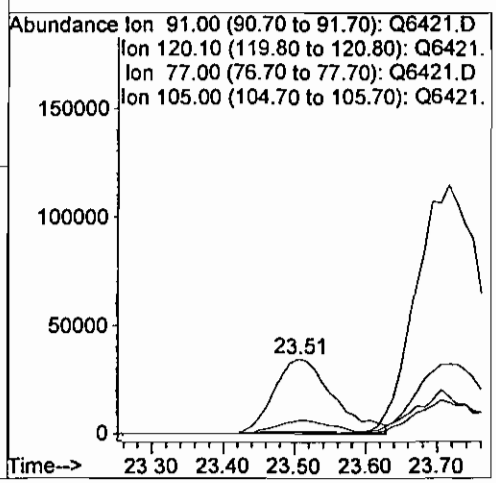


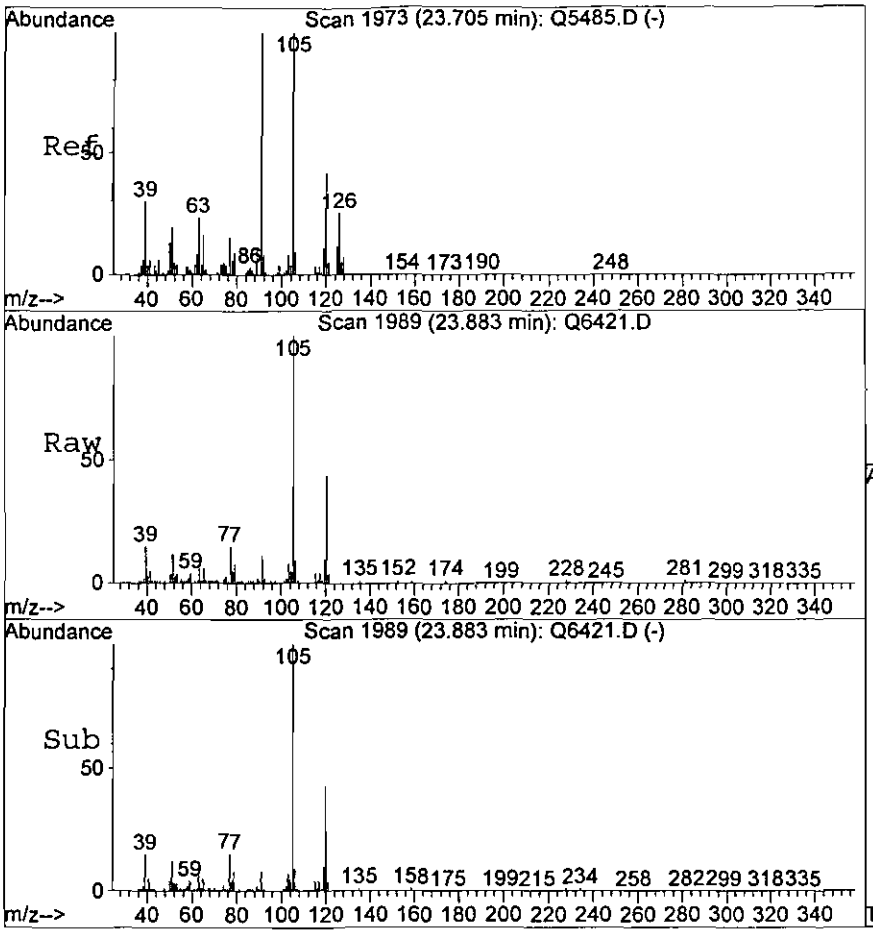


#66
n-Propylbenzene
Concen: 5.92 ug/l
RT: 23.51 min Scan# 1955
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:91 Resp: 202111

Ion	Ratio	Lower	Upper
91	100		
120	19.3	0.7	40.7
77	4.6	0.0	24.9
105	4.2	0.0	23.6

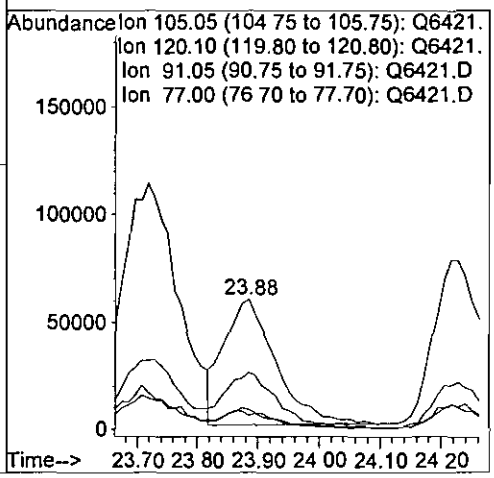


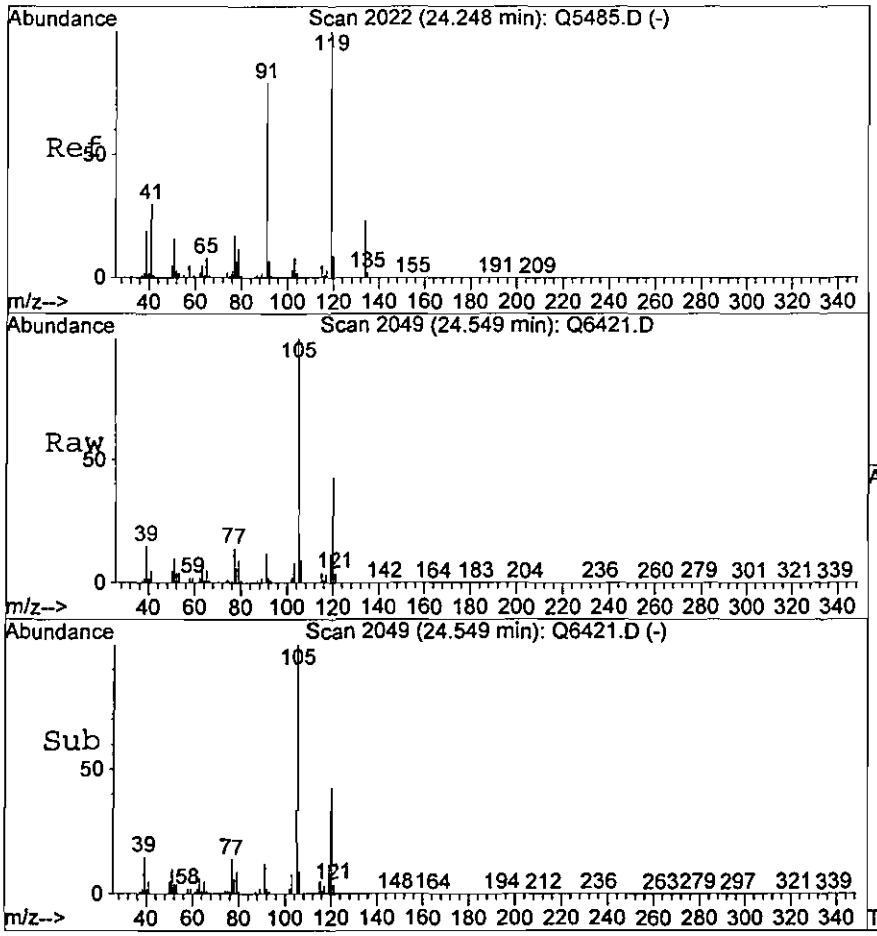


#68
1,3,5-Trimethylbenzene
Concen: 15.79 ug/l
RT: 23.88 min Scan# 1989
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:105.05 Resp: 346357

Ion	Ratio	Lower	Upper
105	100		
120	43.7	24.6	64.6
91	9.7	0.0	30.4
77	15.3	0.0	33.0

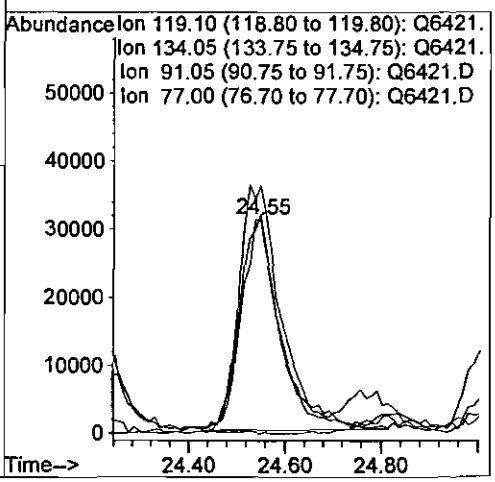


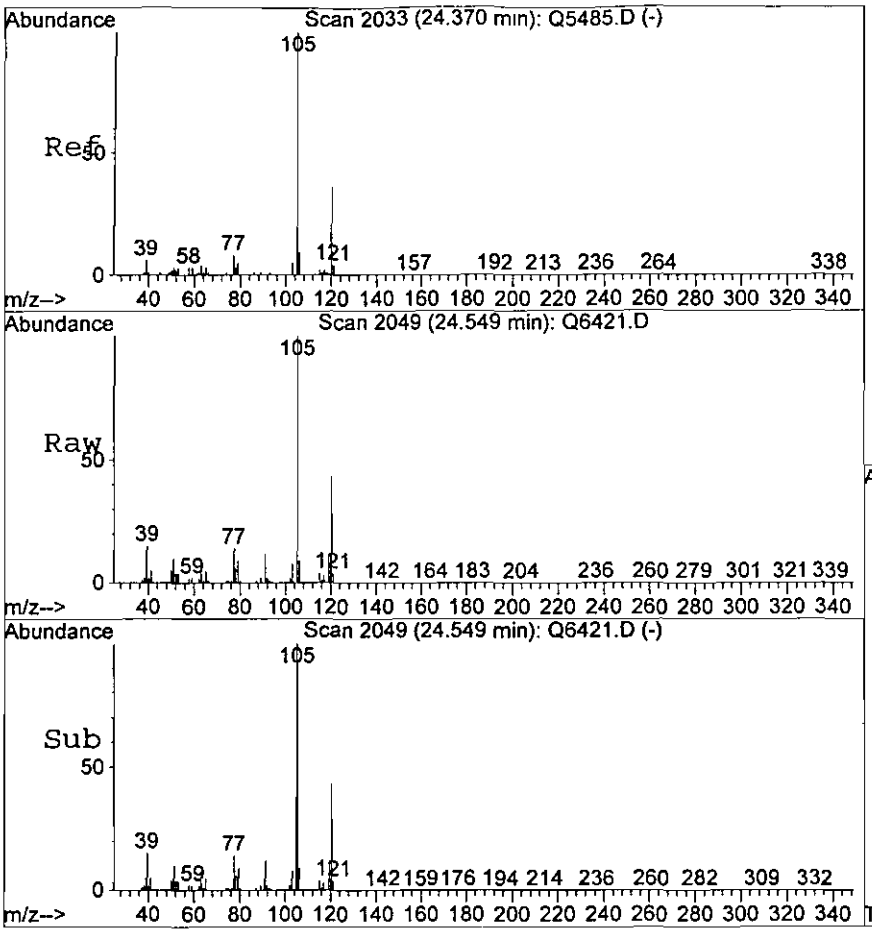


#69
tert-Butylbenzene
Concen: 6.94 ug/l
RT: 24.55 min Scan# 2049
Delta R.T. 0.08 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:119.1 Resp: 170818

Ion	Ratio	Lower	Upper
119	100		
134	0.0	4.2	44.2#
91	101.6	11.5	51.5#
77	116.1	0.0	31.0#

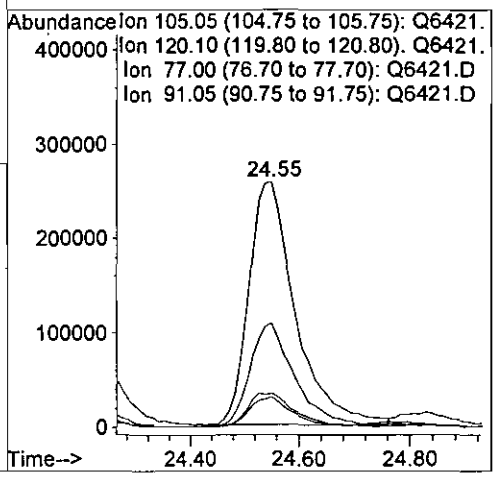


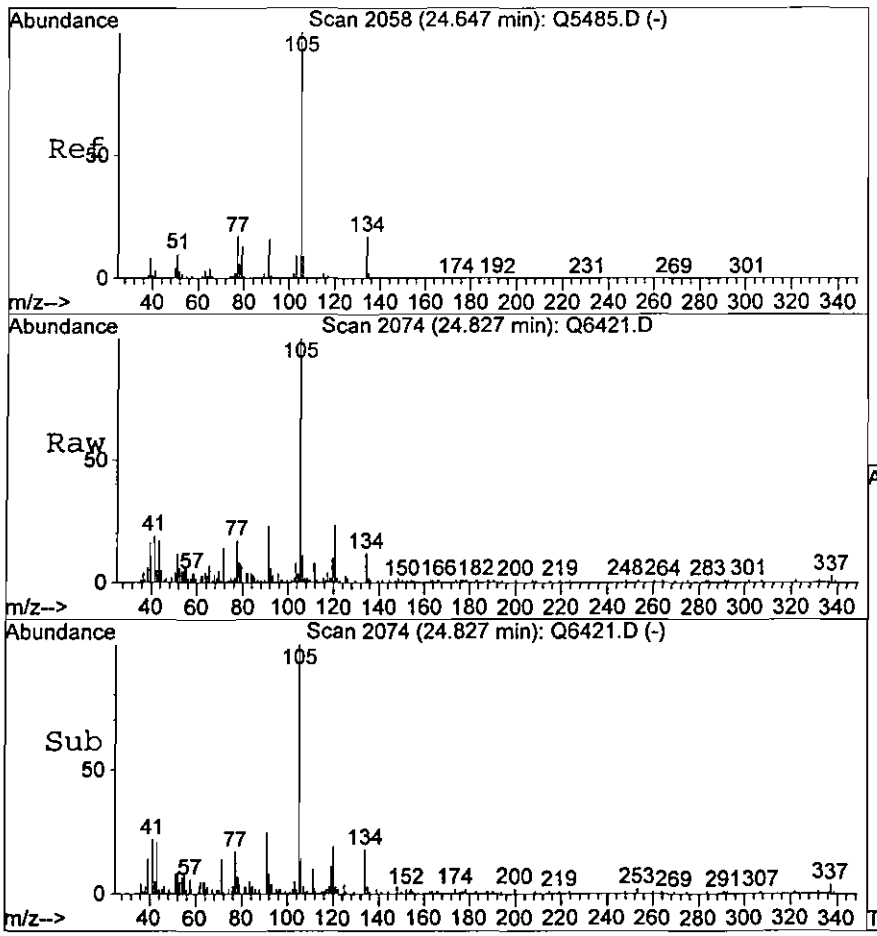


#70
1,2,4-Trimethylbenzene
Concen: 67.65 ug/l
RT: 24.55 min Scan# 2049
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:105.05 Resp: 1505544

Ion	Ratio	Lower	Upper
105	100		
120	42.8	22.0	62.0
77	13.9	0.0	34.0
91	12.2	0.0	28.5

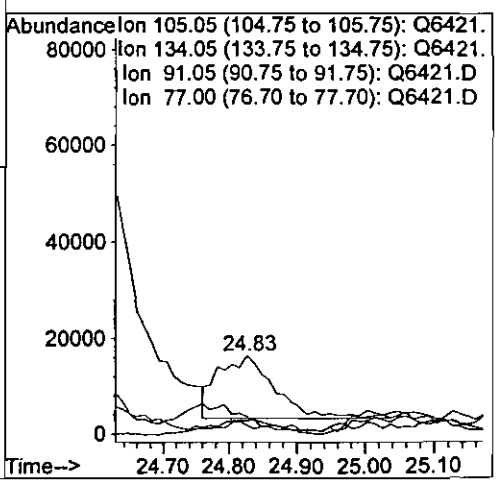


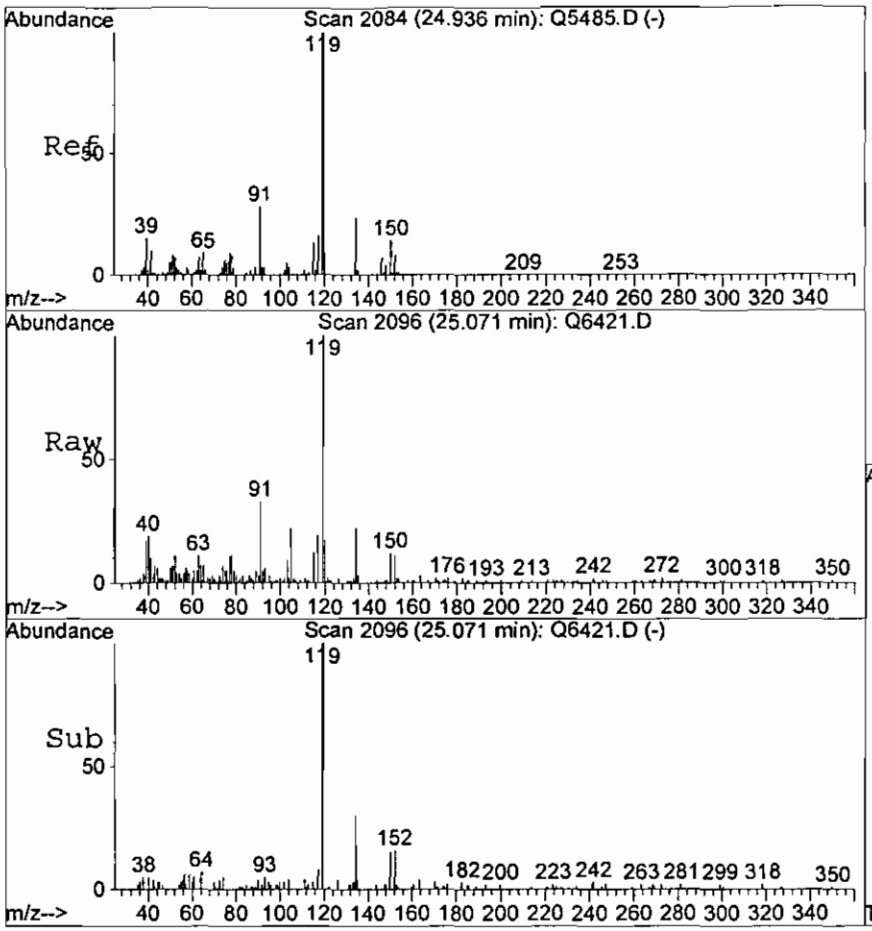


#71
Sec-Butylbenzene
Concen: 2.19 ug/l
RT: 24.83 min Scan# 2074
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:105.05 Resp: 77015

Ion	Ratio	Lower	Upper
105	100		
134	5.5	0.0	38.2
91	0.0	0.0	37.4
77	10.5	0.0	34.1

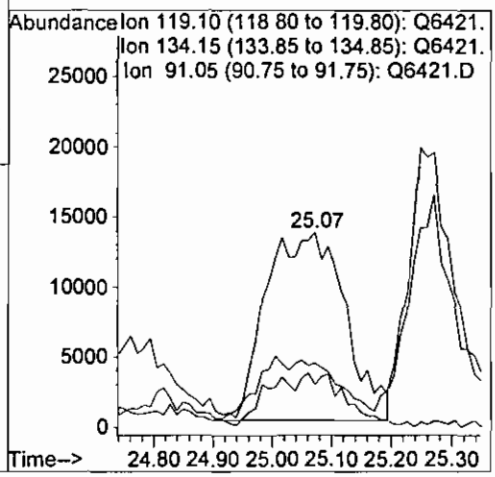


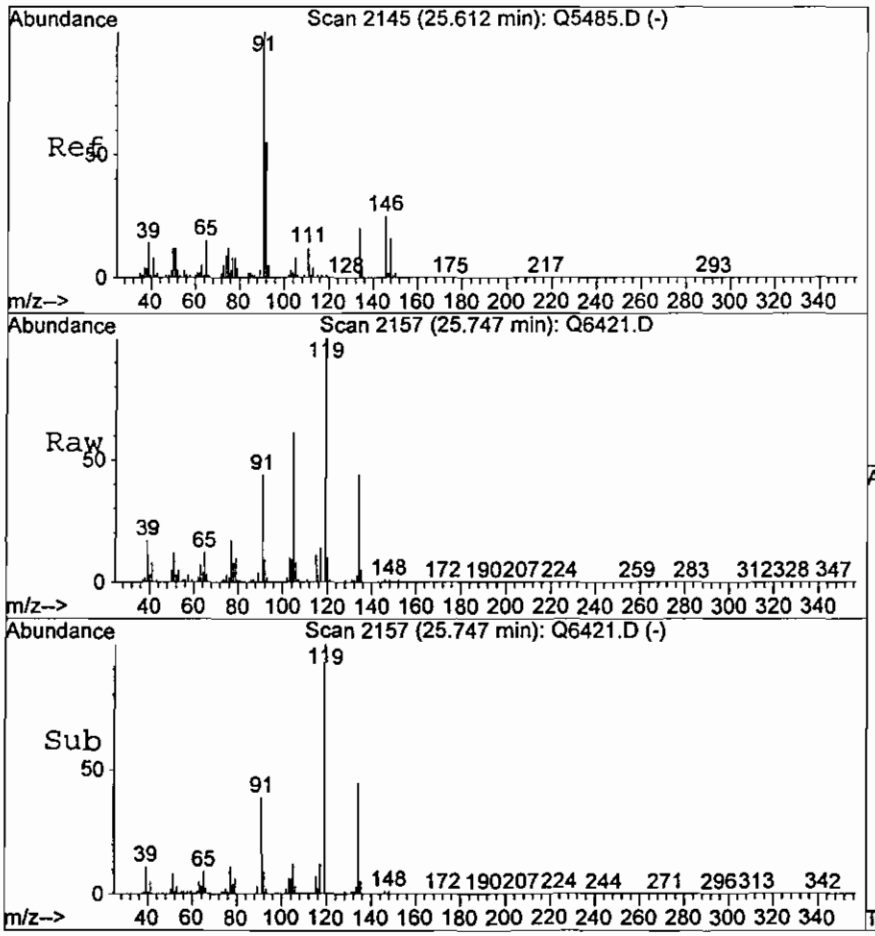


#73
p-Isopropyltoluene
Concen: 4.87 ug/l
RT: 25.07 min Scan# 2096
Delta R.T. -0.07 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:119.1 Resp: 124142

Ion	Ratio	Lower	Upper
119	100		
134	18.7	4.9	44.9
91	18.7	59.8	99.8#
0	0.0	0.0	0.0

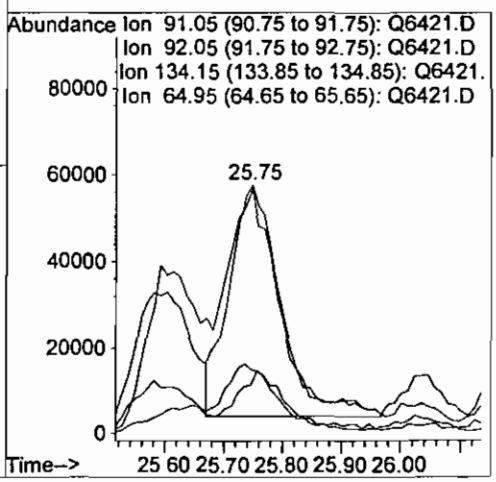


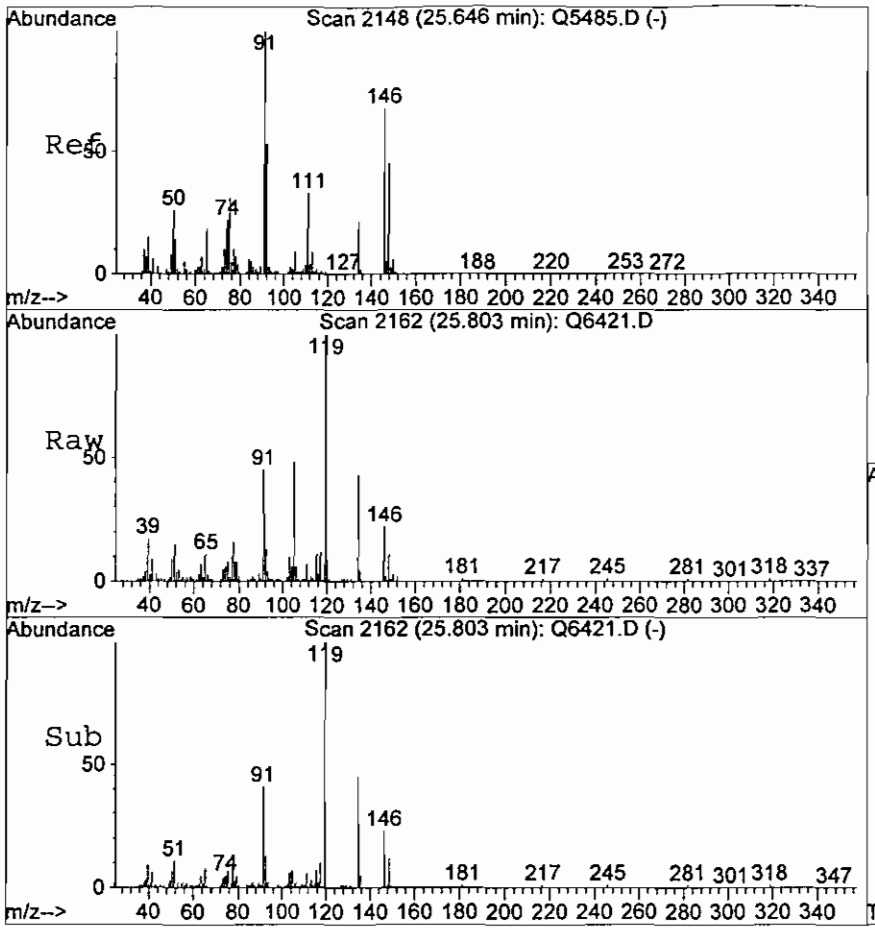


#75
n-Butylbenzene
Concen: 11.51 ug/l
RT: 25.75 min Scan# 2157
Delta R.T. -0.07 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:91.05 Resp: 331516

Ion	Ratio	Lower	Upper
91	100		
92	19.4	34.5	74.5#
134	93.0	2.2	42.2#
65	24.9	0.0	34.6

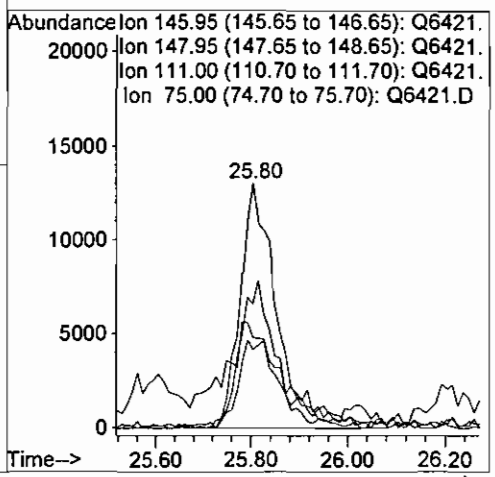


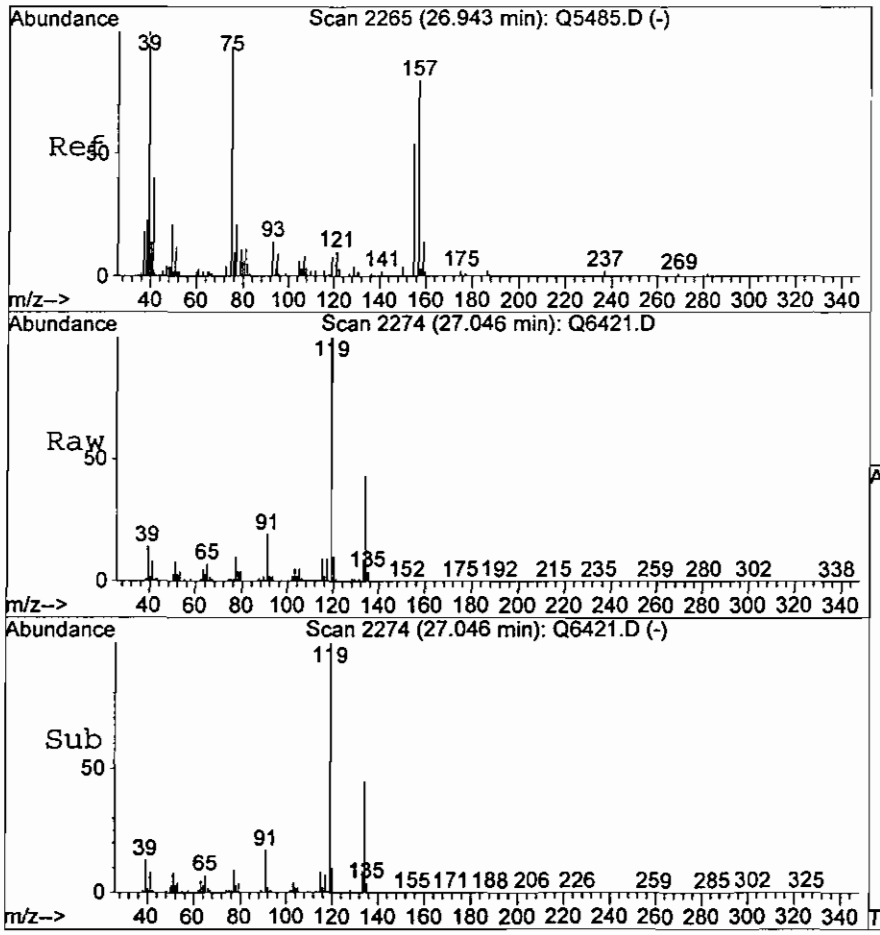


#76
1,2-Dichlorobenzene
Concen: 5.39 ug/l
RT: 25.80 min Scan# 2162
Delta R.T. -0.04 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:145.95 Resp: 70456

Ion	Ratio	Lower	Upper
146	100		
148	50.6	47.4	87.4
111	30.9	25.4	65.4
75	34.3	18.1	58.1

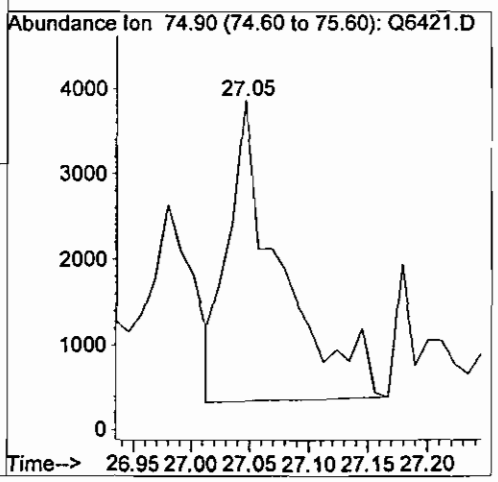


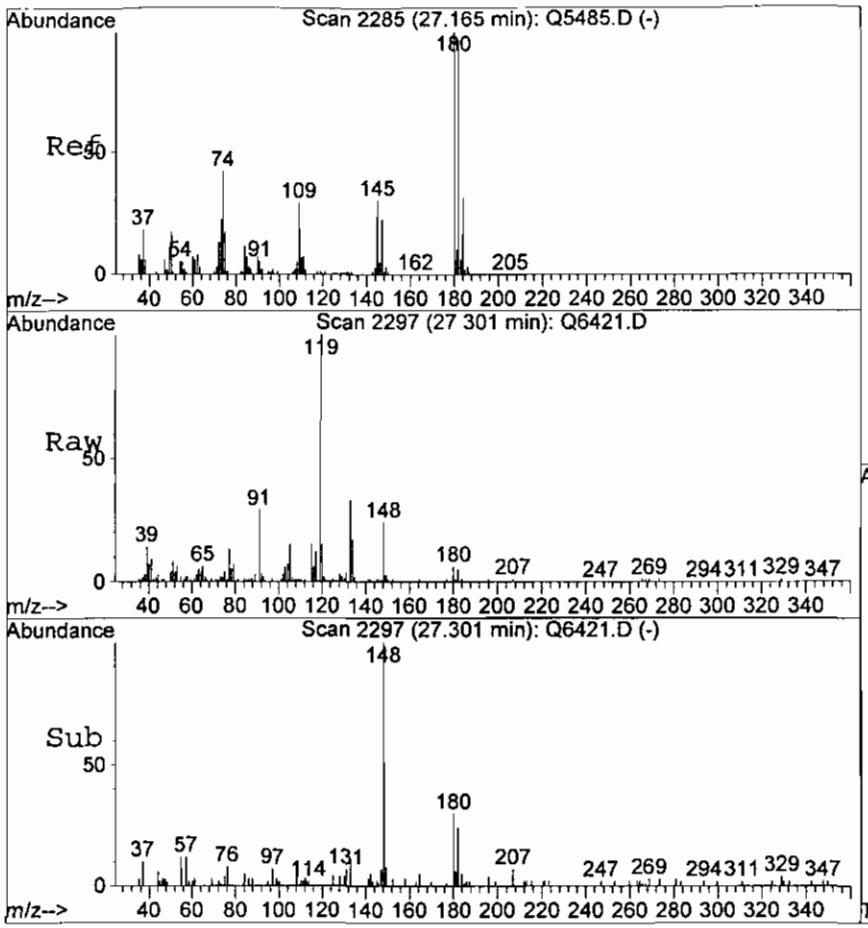


#77
1,2-Dibromo-3-Chloropropane
Concen: 5.55 ug/l
RT: 27.05 min Scan# 2274
Delta R.T. -0.06 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:74.9 Resp: 10876

Ion	Ratio	Lower	Upper
75	100		
0	0.0	0.0	0.0
0	0.0	0.0	0.0
0	0.0	0.0	0.0

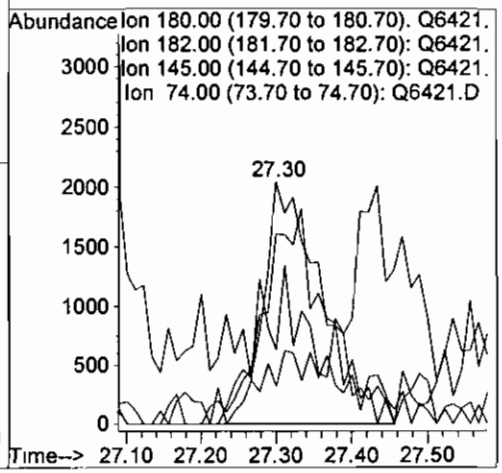


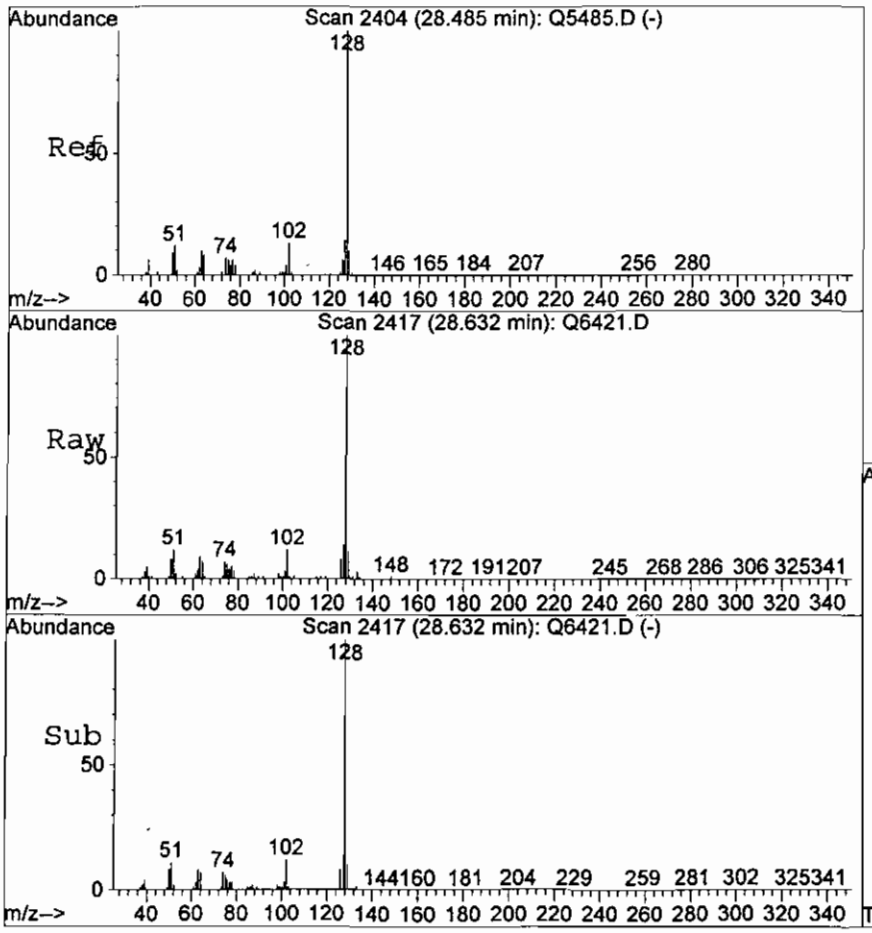


#78
1,3,5 Trichlorobenzene
Concen: 0.89 ug/L
RT: 27.30 min Scan# 2297
Delta R.T. -0.05 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:180 Resp: 11397

Ion	Ratio	Lower	Upper
180	100		
182	88.6	4.8	188.8
145	35.4	18.3	42.7
74	13.2	25.0	46.4#

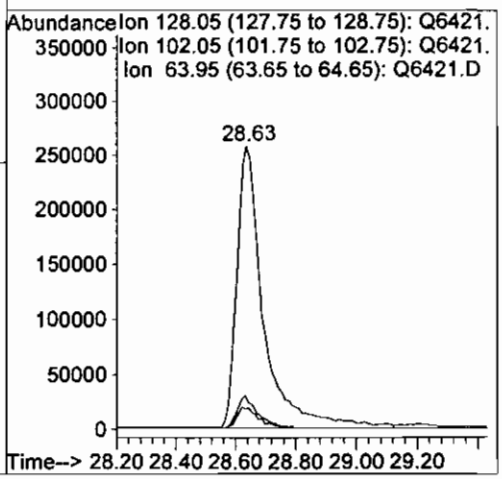




#81
Naphthalene
Concen: 108.14 ug/l
RT: 28.63 min Scan# 2417
Delta R.T. -0.03 min
Lab File: Q6421.D
Acq: 21 Aug 99 1:22 pm

Tgt Ion:128.05 Resp: 1605801

Ion	Ratio	Lower	Upper
128	100		
102	11.9	0.0	30.3
64	6.9	0.0	28.2
0	0.0	0.0	0.0



Quantitation Report (Not Reviewed)

Q

Data File : C:\HPCHEM\1\DATA\Q6647.D
Acq On : 16 Sep 99 2:25 am
Sample : WP3906-14 36 GLM Ø2Ø1D
Misc : 5970-Q;
Quant Time: Sep 16 2:57 1999

Vial: 17
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0915

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Pentafluorobenzene	11.83	168	462302	50.00 ug/l	0.00
29) 1,4-Difluorobenzene	13.87	114	481015	50.00 ug/l	-0.01
47) Chlorobenzene-d5	21.54	117	371791	50.00 ug/l	-0.03
60) 1,4-Dichlorobenzene-d4	25.82	152	167008	50.00 ug/l	-0.03
System Monitoring Compounds					
27) 1,2-Dichloroethane-d4	12.45	65	182603	40.18 ug/l	-0.01
Surrogate Spike 50.000	Range 65 - 135		Recovery = 80.36%		
28) Dibromofluoromethane	11.53	111	280452	45.62 ug/l	0.00
Surrogate Spike 50.000	Range 75 - 129		Recovery = 91.24%		
43) Toluene-d8	18.13	98	461704	49.27 ug/l	0.00
Surrogate Spike 50.000	Range 82 - 120		Recovery = 98.54%		
46) P-Bromofluorobenzene	23.90	95	237245	49.52 ug/l	-0.04
Surrogate Spike 50.000	Range 69 - 125		Recovery = 99.04%		

rget Compounds						Qvalue
~~5) Vinyl Chloride~~	~~3.46~~	~~62~~	~~8048~~	~~2.32 ug/l~~	~~HJ~~	~~78~~
9) Acetone	6.30	43	708	0.68 ug/l	#	71
18) 1,1-Dichloroethane	8.98	63	3774	0.54 ug/l		90
20) 1,2-Dichloroethene (cis)	10.34	96	7740	2.32 ug/l	# HJ	72
30) 1,1-Dichloropropene	11.83	75	24357	3.59 ug/l	# NM	26
44) Toluene	18.33	92	8164	1.53 ug/l	# NM	54
55) Ethylbenzene	21.81	91	6941	0.73 ug/l		79
57) m+p-Xylene	22.07	106	5002	1.55 ug/l	# HJ	58
58) o-Xylene	22.86	106	6152	1.76 ug/l	# HJ	42
66) n-Propylbenzene	24.30	91	8382	0.84 ug/l		86
68) 1,3,5-Trimethylbenzene	24.61	105	14178	2.34 ug/l	# HJ	62
70) 1,2,4-Trimethylbenzene	25.24	105	39270	6.85 ug/l	HJ	88
~~73) p-Isopropyltoluene~~	~~25.74~~	~~119~~	~~4578~~	~~0.75 ug/l~~		~~87~~
75) n-Butylbenzene	26.33	91	3131	0.58 ug/l	#	30
81) Naphthalene	29.09	128	26301	6.57 ug/l	B	88

09/16

(#) = qualifier out of range (m) = manual integration

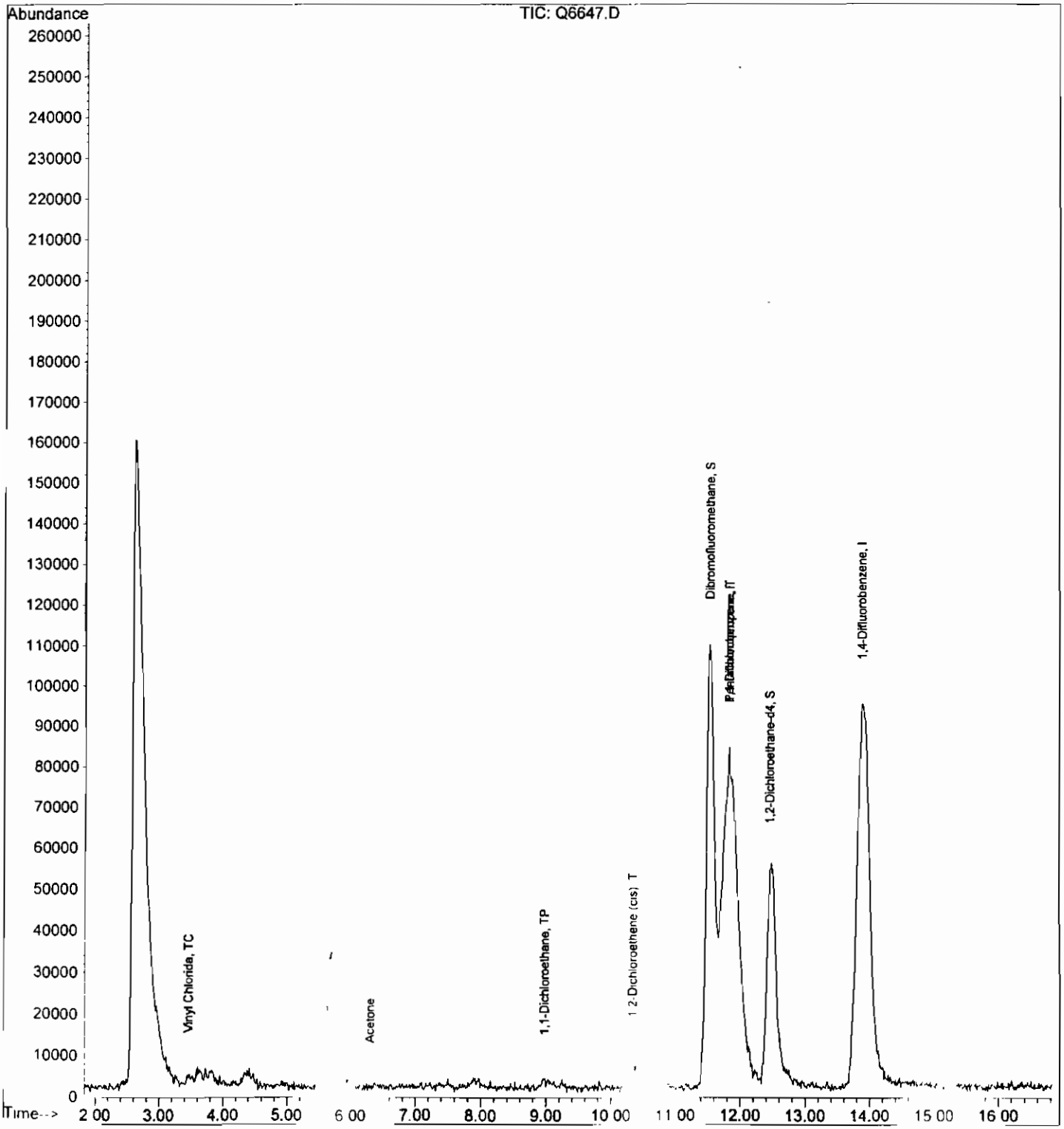
1-162

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6647.D
Acq On : 16 Sep 99 2:25 am
Sample : WP3906-14
Misc : 5970-Q;
Quant Time: Sep 16 2:57 1999

Vial: 17
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration

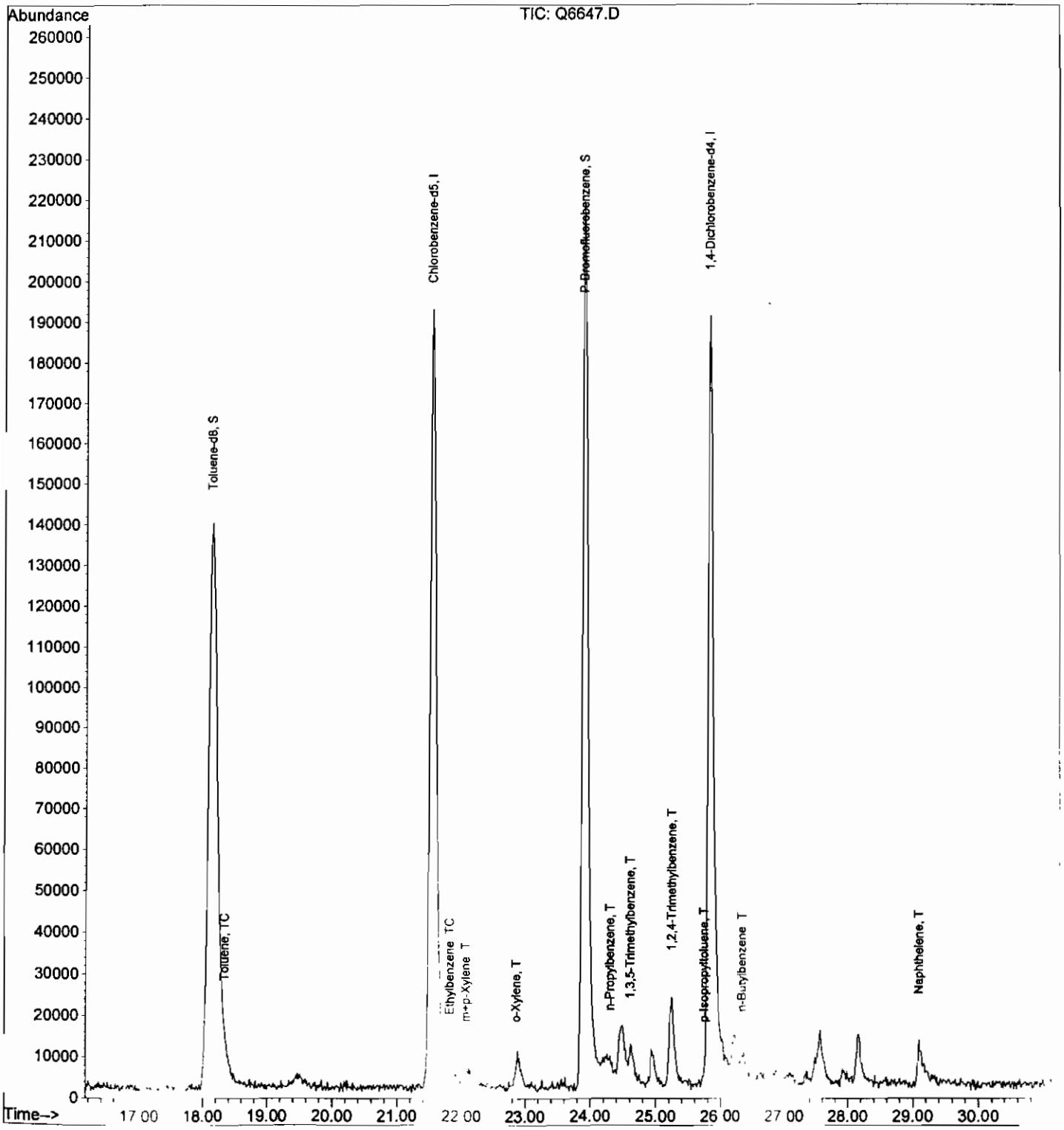


Quantitation Report

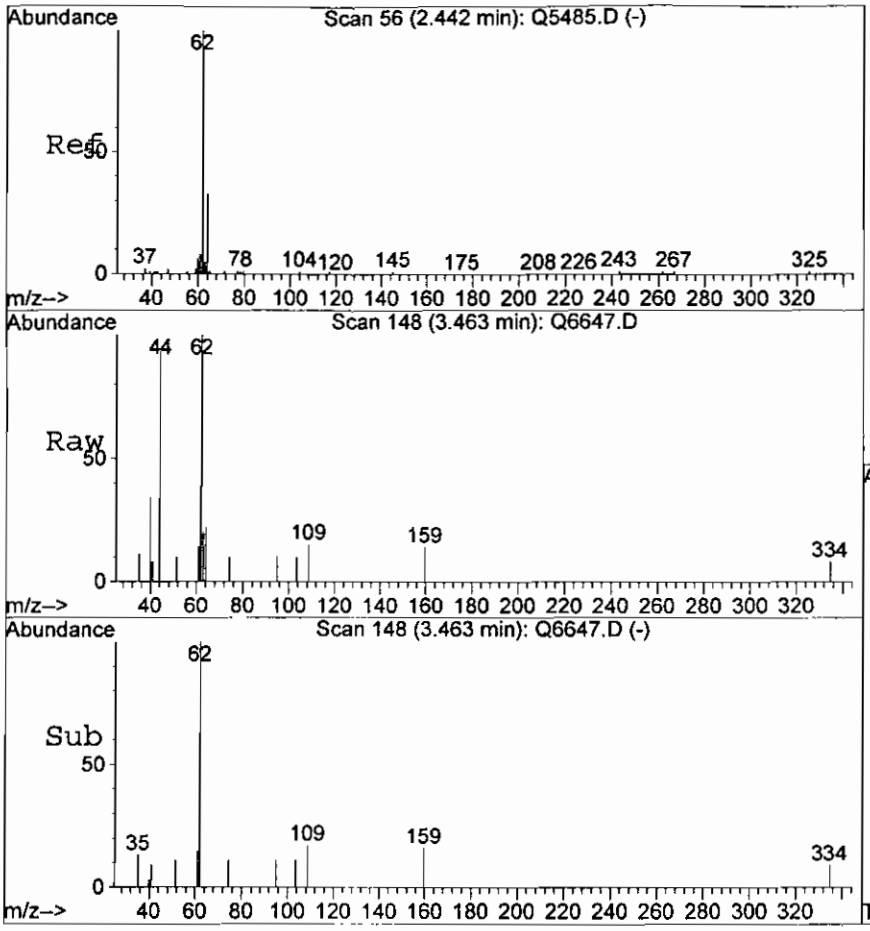
Data File : C:\HPCHEM\1\DATA\Q6647.D
Acq On : 16 Sep 99 2:25 am
Sample : WP3906-14
Misc : 5970-Q;
Quant Time: Sep 16 2:57 1999

Vial: 17
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration



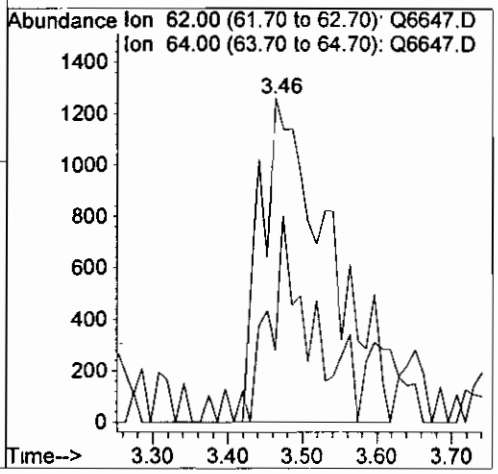
1-164

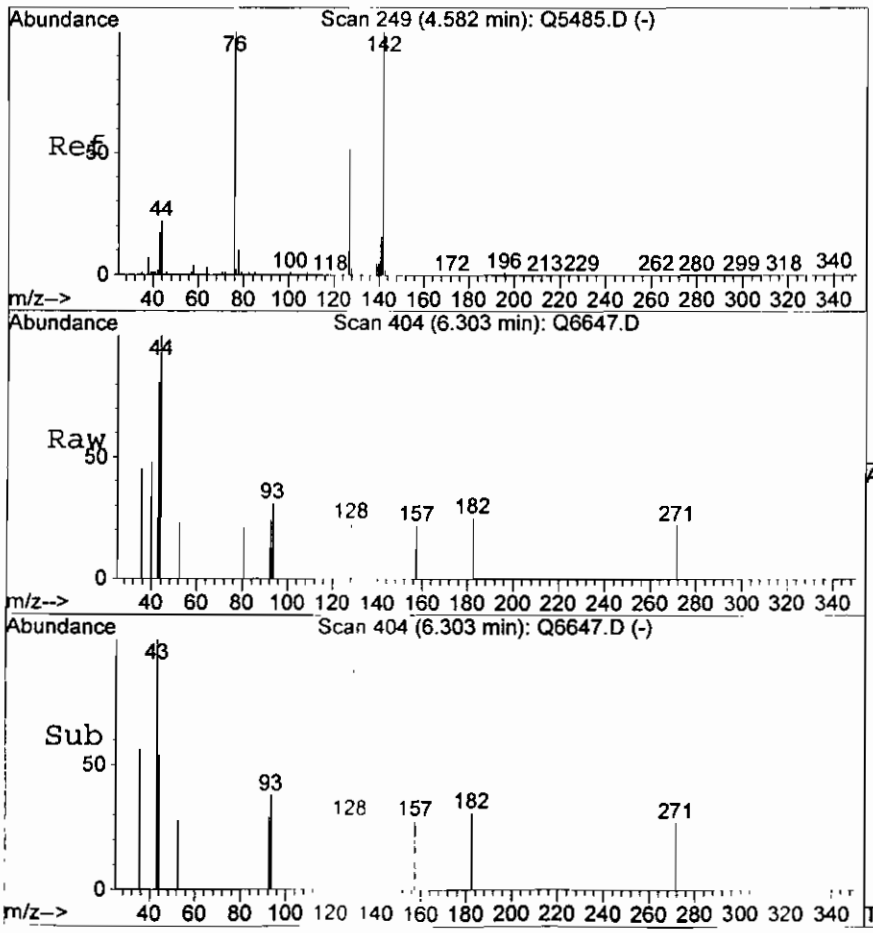


#5
Vinyl Chloride
Concen: 2.32 ug/l
RT: 3.46 min Scan# 148
Delta R.T. 0.01 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:62 Resp: 8048

Ion	Ratio	Lower	Upper
62	100		
64	13.7	4.5	44.5
0	0.0	0.0	0.0
0	0.0	0.0	0.0

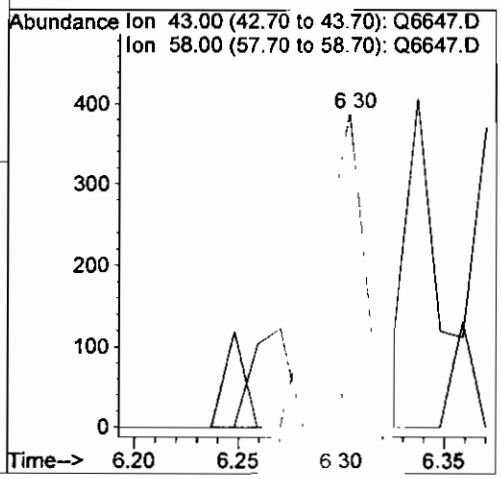


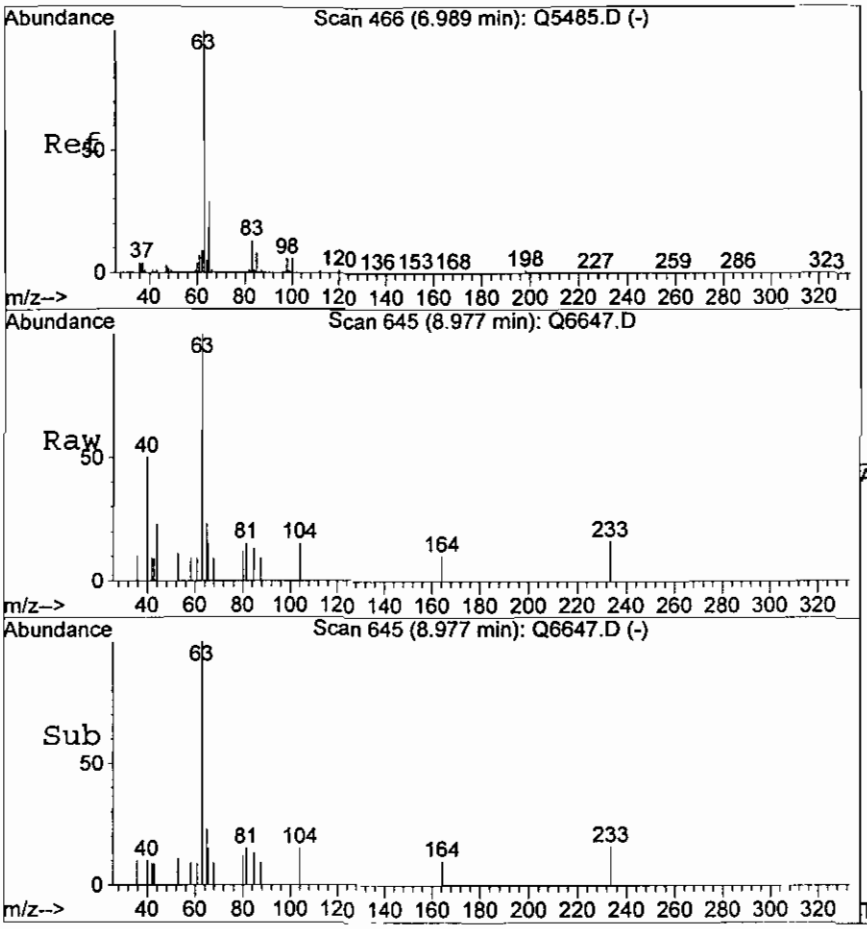


#9
Acetone
Concen: 0.68 ug/l
RT: 6.30 min Scan# 404
Delta R.T. -0.01 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:43 Resp: 708

Ion	Ratio	Lower	Upper
43	100		
58	23.7	9.8	14.8#
0	0.0	0.0	0.0
0	0.0	0.0	0.0

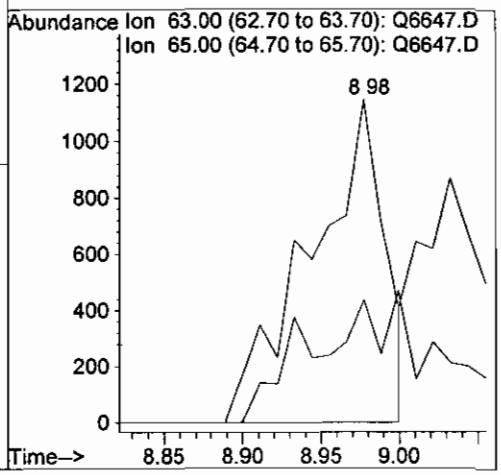


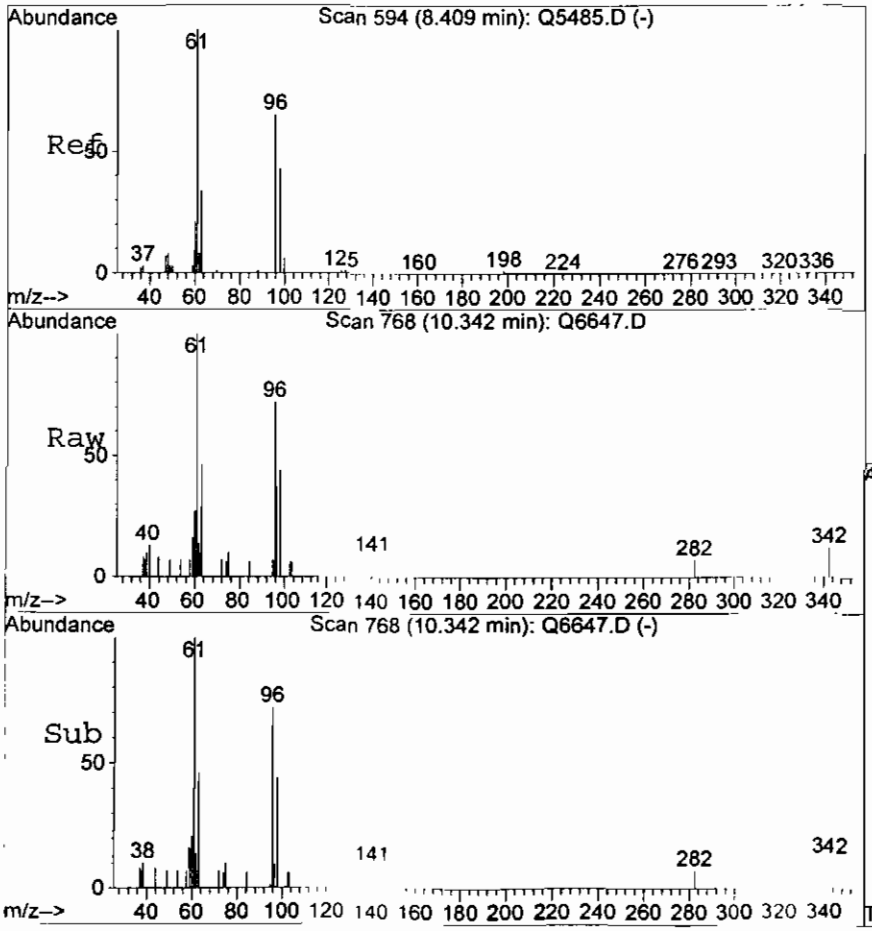


#18
1,1-Dichloroethane
Concen: 0.54 ug/l
RT: 8.98 min Scan# 645
Delta R.T. -0.00 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:63 Resp: 3774

Ion	Ratio	Lower	Upper
63	100		
65	38.1	12.3	52.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

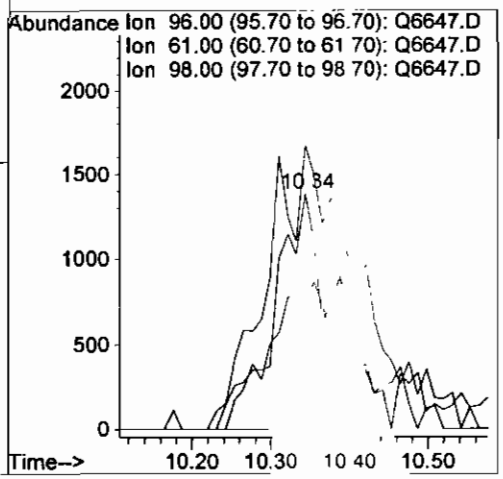


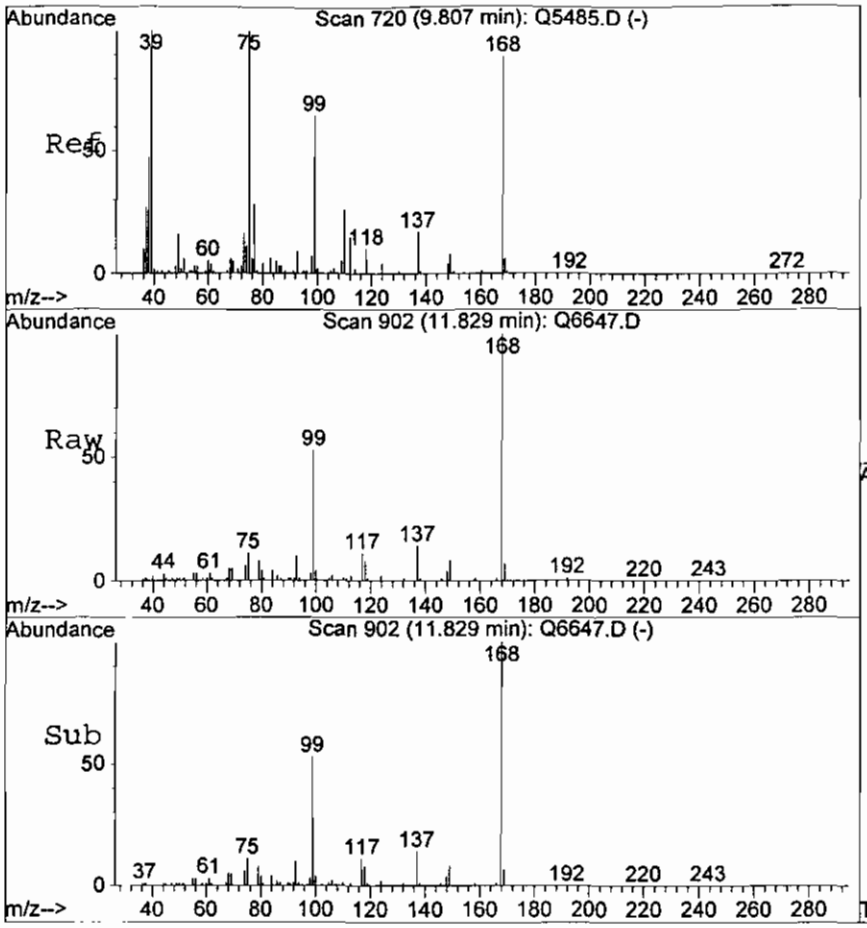


#20
1,2-Dichloroethene (cis)
Concen: 2.32 ug/l
RT: 10.34 min Scan# 768
Delta R.T. -0.00 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:96 Resp: 7740

Ion	Ratio	Lower	Upper
96	100		
61	120.8	146.5	186.5#
98	52.8	42.7	82.7
0	0.0	0.0	0.0

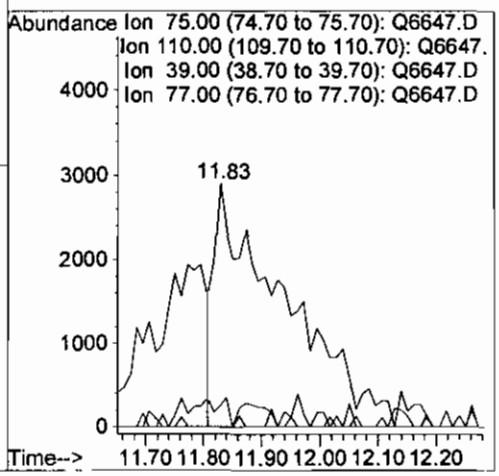


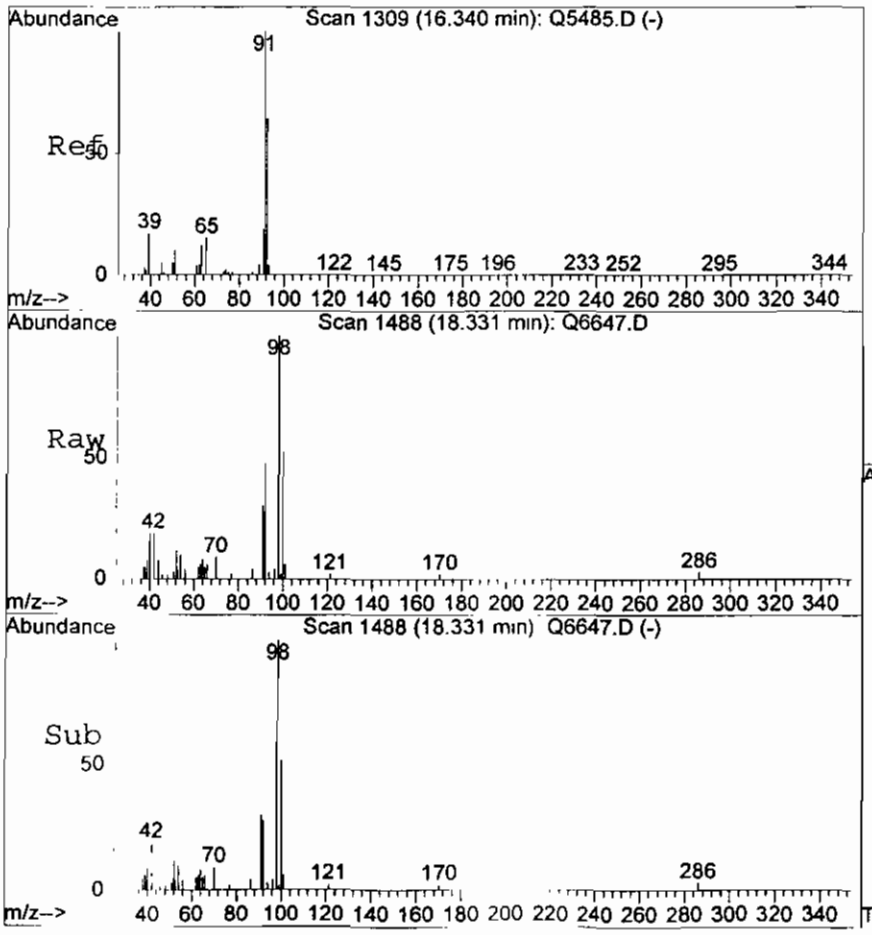


#30
1,1-Dichloropropene
Concen: 3.59 ug/l
RT: 11.83 min Scan# 902
Delta R.T. -0.06 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:75 Resp: 24357

Ion	Ratio	Lower	Upper
75	100		
110	3.7	20.7	31.1#
39	0.0	64.3	96.5#
77	0.0	22.1	33.1#

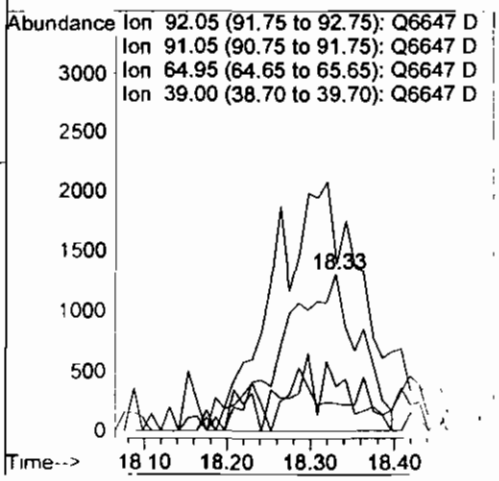


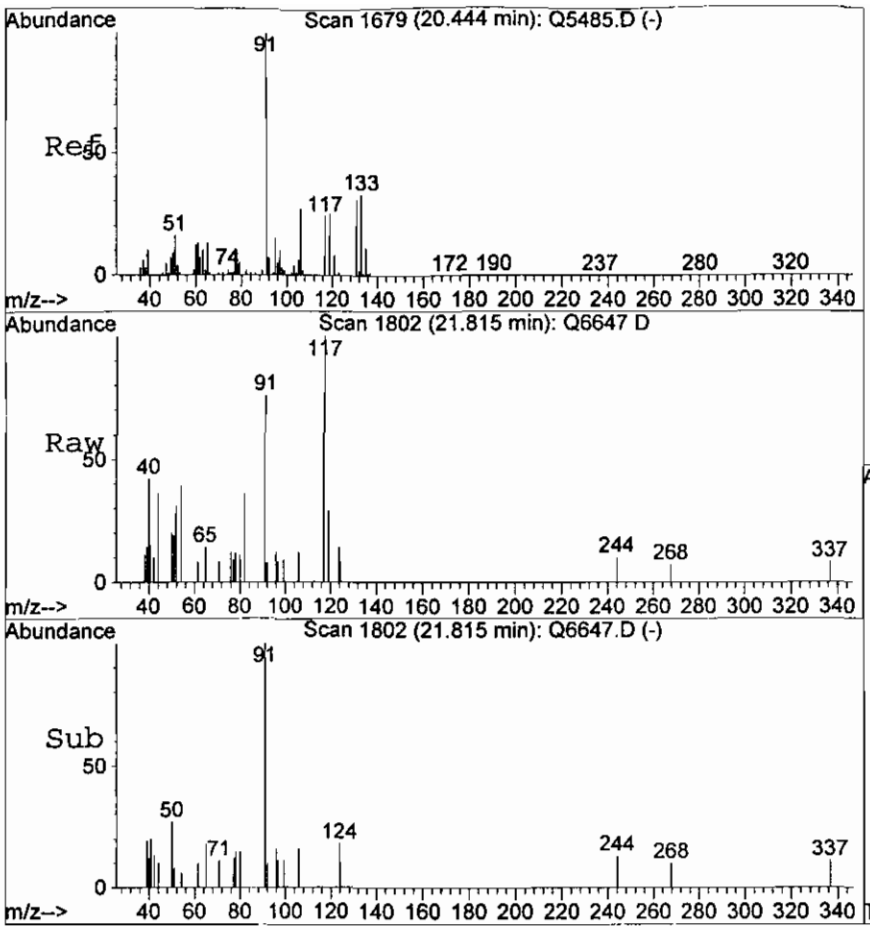


#44
Toluene
Concen: 1.53 ug/l
RT: 18.33 min Scan# 1488
Delta R.T. 0.03 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:92.05 Resp: 8164

Ion	Ratio	Lower	Upper
92	100		
91	93.1	136.5	204.7#
65	17.7	19.2	28.8#
39	20.0	21.4	32.0#

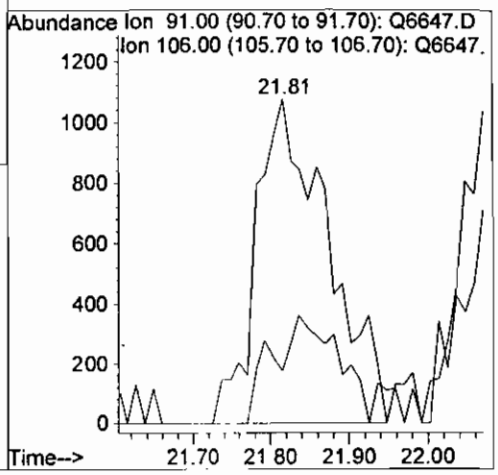


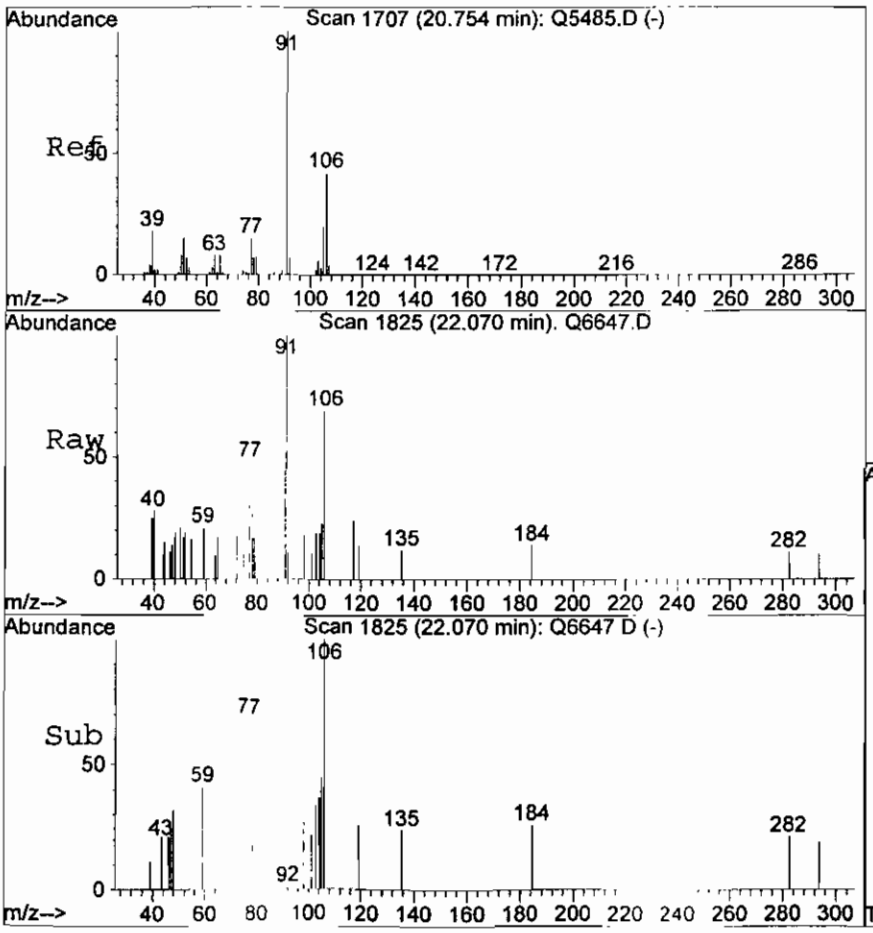


#55
Ethylbenzene
Concen: 0.73 ug/l
RT: 21.81 min Scan# 1802
Delta R.T. -0.04 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:91 Resp: 6941

Ion	Ratio	Lower	Upper
91	100		
106	16.3	7.3	47.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

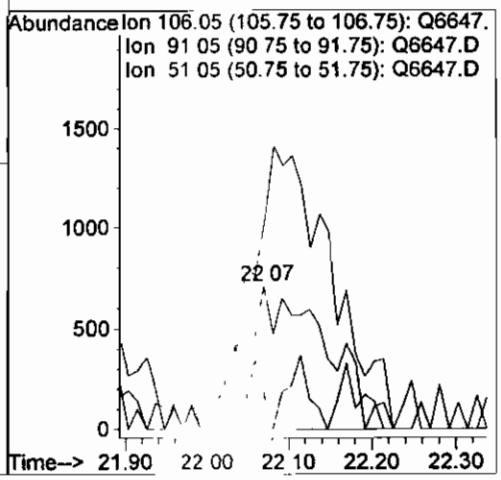


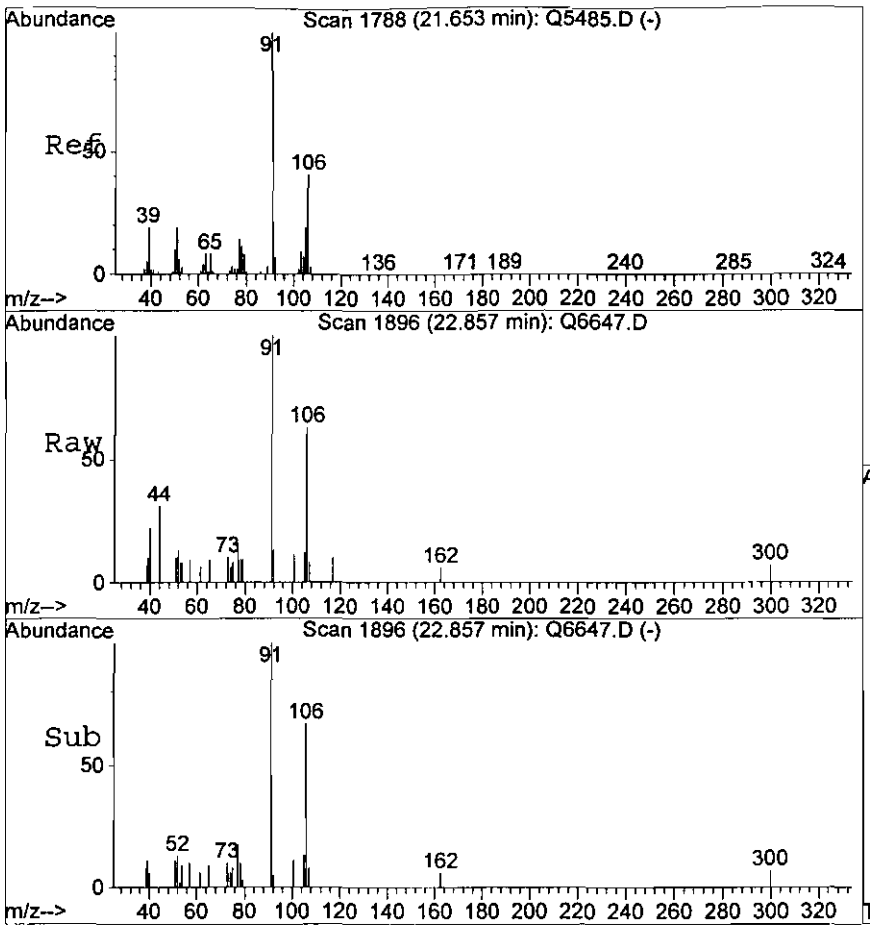


#57
m+p-Xylene
Concen: 1.55 ug/l
RT: 22.07 min Scan# 1825
Delta R.T. -0.07 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:106.05 Resp: 5002

Ion	Ratio	Lower	Upper
106	100		
91	145.9	201.2	241.2#
51	25.4	13.0	53.0
0	0.0	0.0	0.0

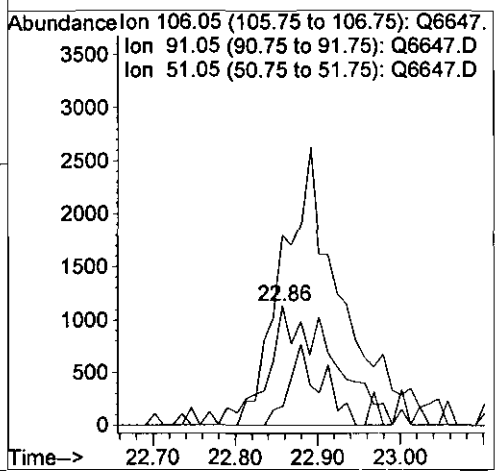


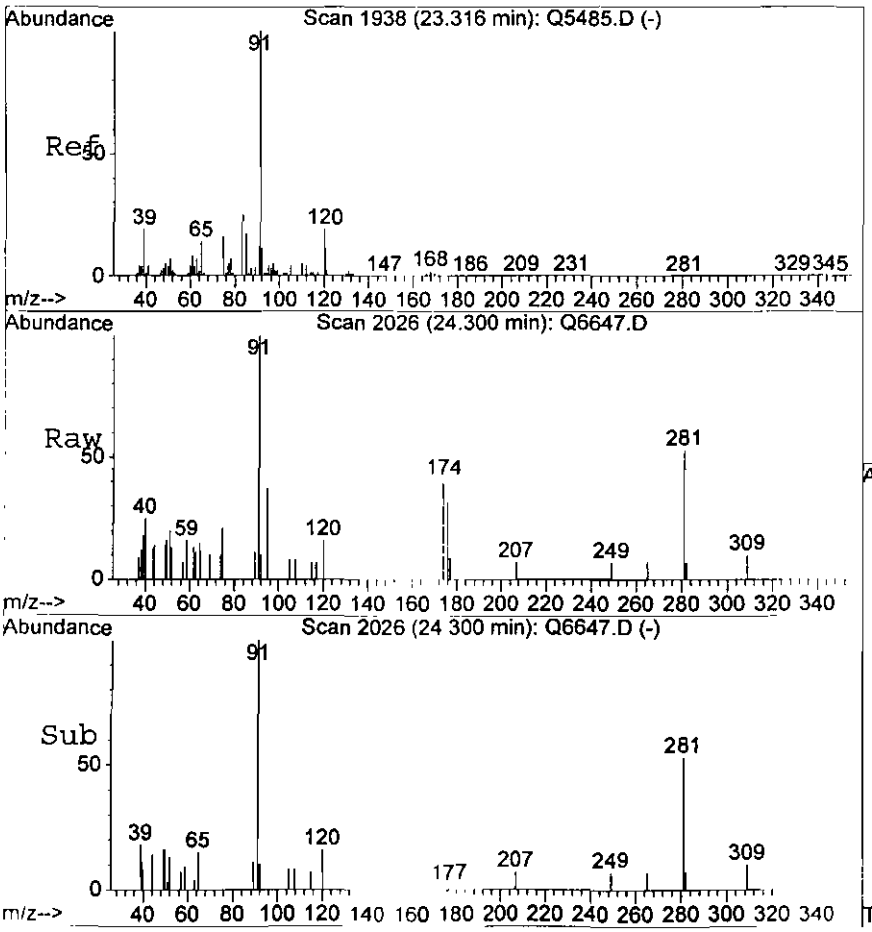


#58
o-Xylene
Concen: 1.76 ug/l
RT: 22.86 min Scan# 1896
Delta R.T. -0.07 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:106.05 Resp: 6152

Ion	Ratio	Lower	Upper
106	100		
91	147.4	195.3	292.9#
51	15.8	53.0	79.6#
0	0.0	0.0	0.0

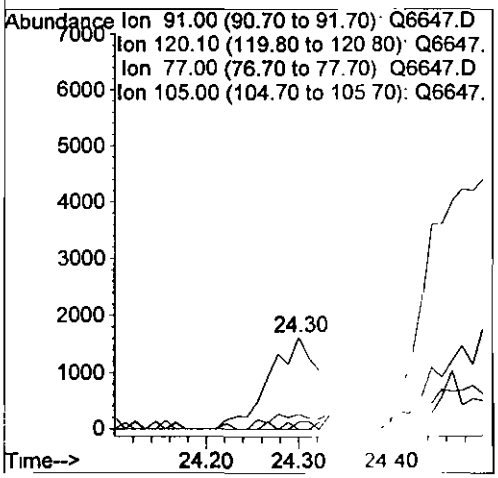


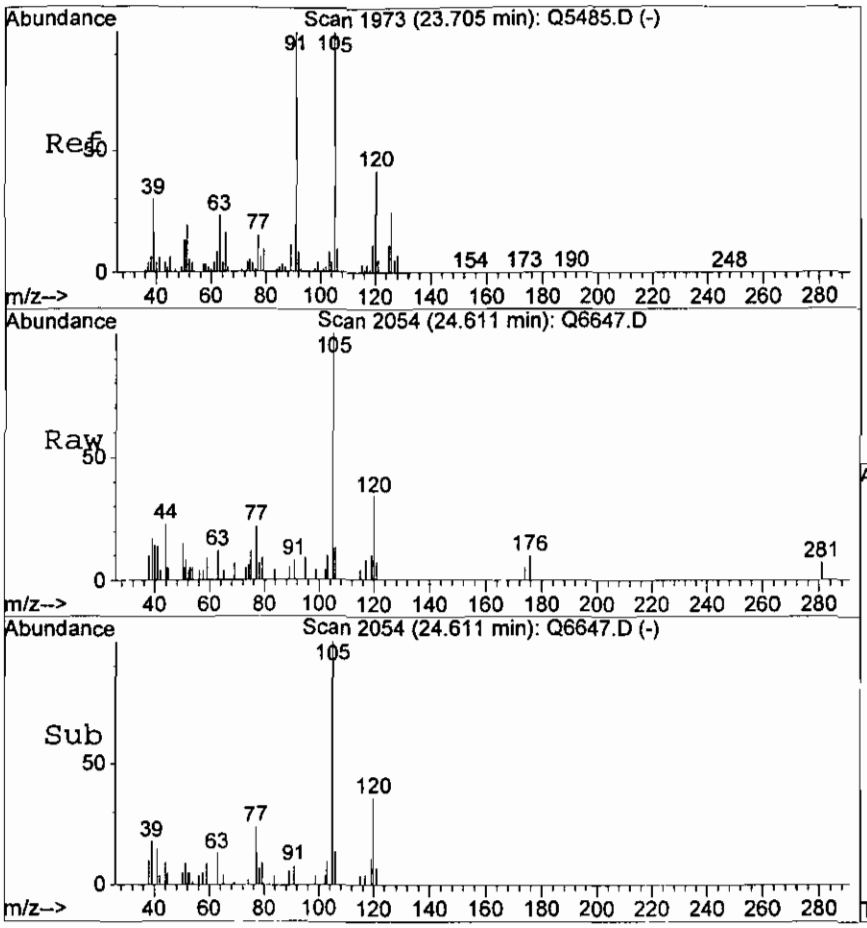


#66
n-Propylbenzene
Concen: 0.84 ug/l
RT: 24.30 min Scan# 2026
Delta R.T. -0.04 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:91 Resp: 8382

Ion	Ratio	Lower	Upper
91	100		
120	16.1	0.5	40.5
77	0.0	0.0	29.0
105	7.8	0.0	23.4

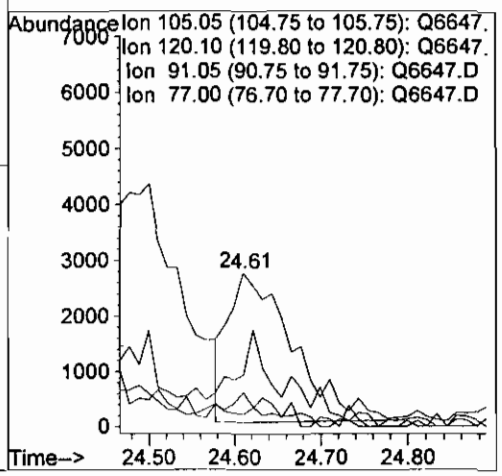


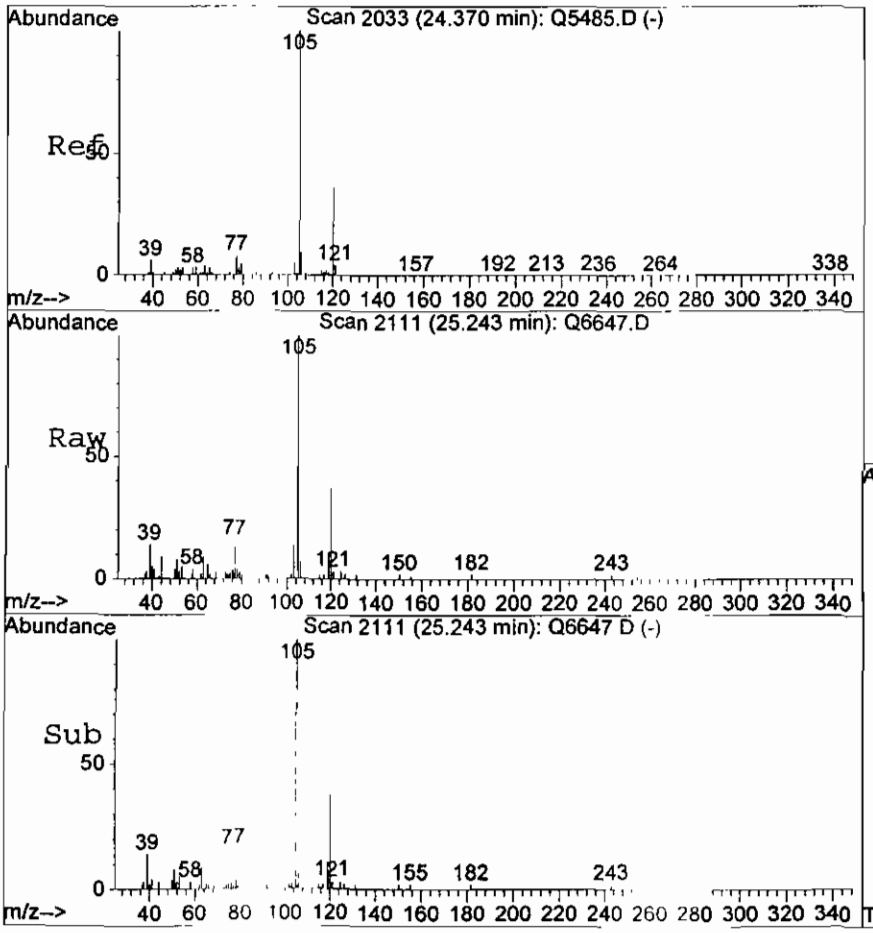


#68
1,3,5-Trimethylbenzene
Concen: 2.34 ug/l
RT: 24.61 min Scan# 2054
Delta R.T. -0.05 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:105.05 Resp: 14178

Ion	Ratio	Lower	Upper
105	100		
120	31.9	25.5	65.5
91	8.5	27.3	67.3#
77	23.8	0.0	34.2

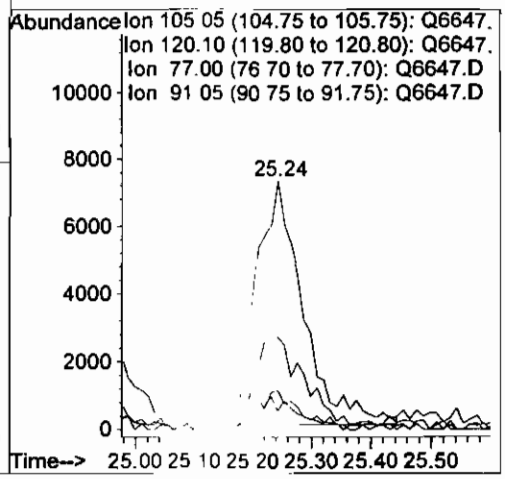


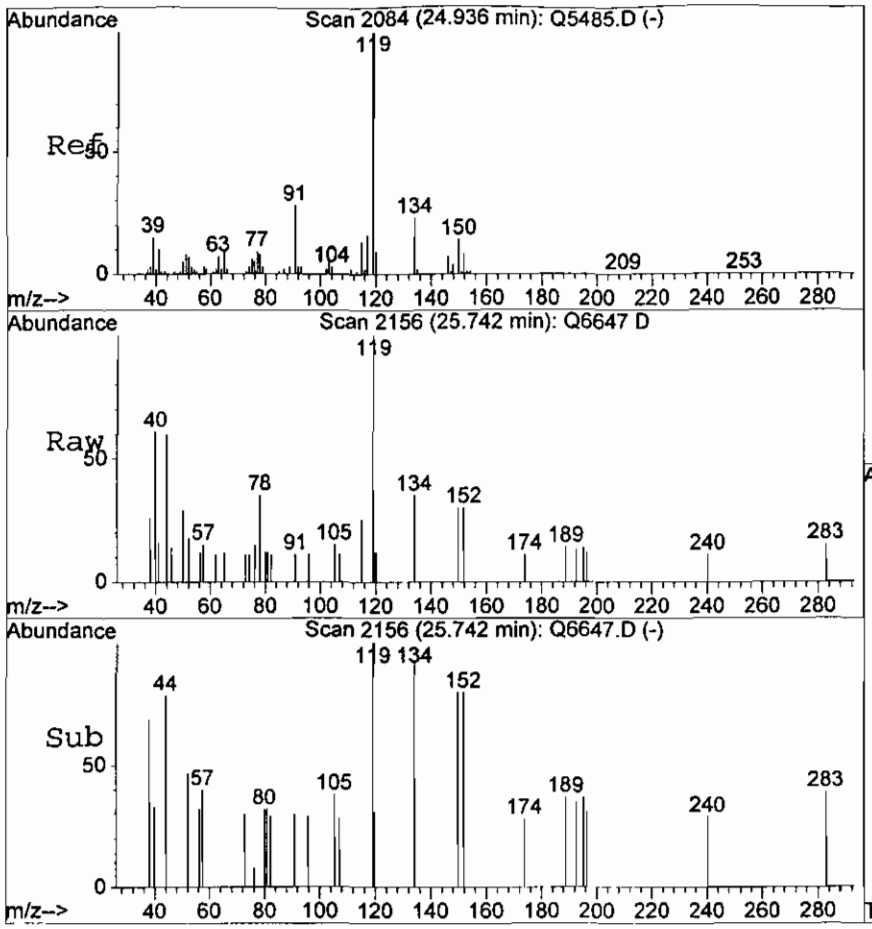


#70
1,2,4-Trimethylbenzene
Concen: 6.85 ug/l
RT: 25.24 min Scan# 2111
Delta R.T. -0.03 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:105.05 Resp: 39270

Ion	Ratio	Lower	Upper
105	100		
120	35.0	21.7	61.7
77	16.2	0.0	34.7
91	7.8	0.0	37.4

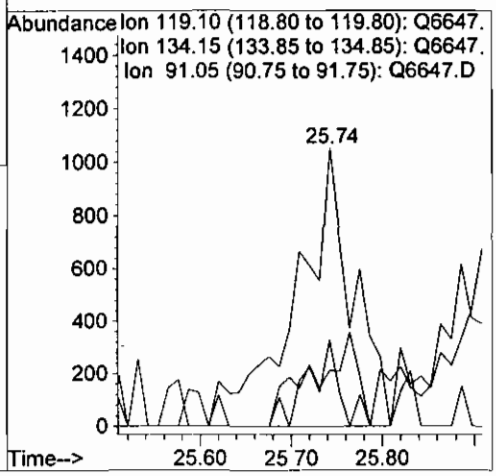


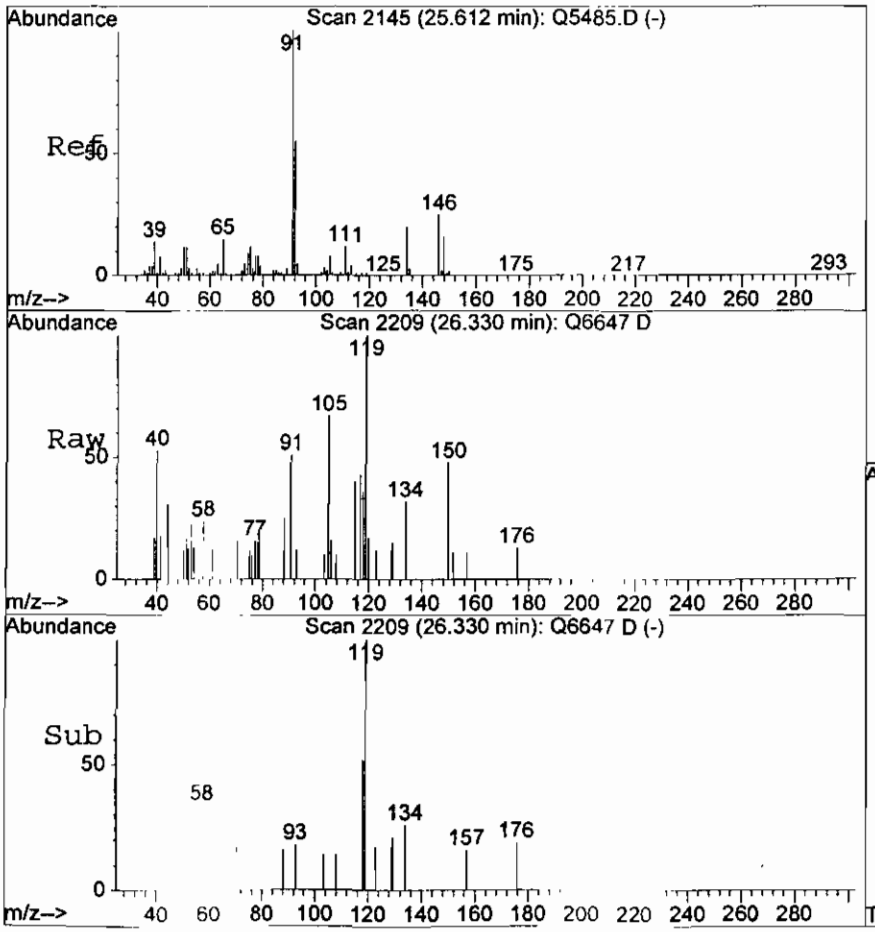


#73
p-Isopropyltoluene
Concen: 0.75 ug/l
RT: 25.74 min Scan# 2156
Delta R.T. -0.01 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:119.1 Resp: 4578

Ion	Ratio	Lower	Upper
119	100		
134	31.1	4.6	44.6
91	20.2	6.6	46.6
0	0.0	0.0	0.0

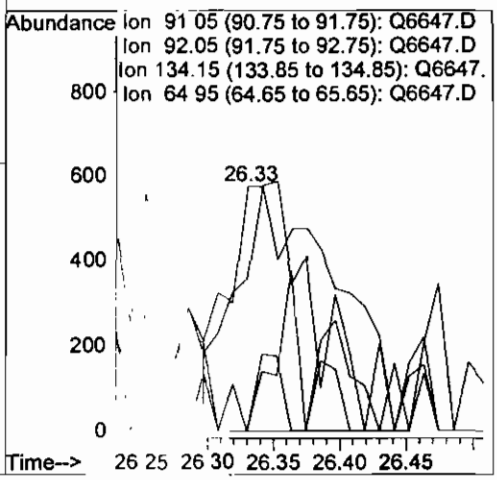


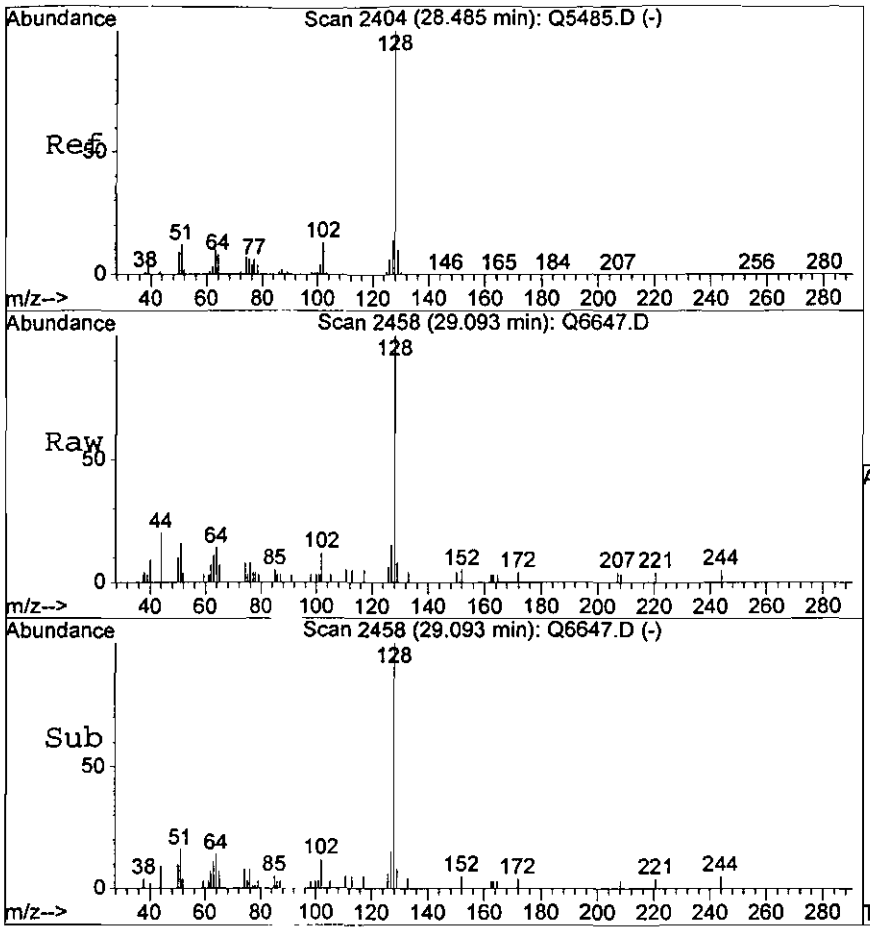


#75
n-Butylbenzene
Concen: 0.58 ug/l
RT: 26.33 min Scan# 2209
Delta R.T. -0.06 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:91.05 Resp: 3131

Ion	Ratio	Lower	Upper
91	100		
92	0.0	34.5	74.5#
134	62.0	3.9	43.9#
65	0.0	0.0	34.2

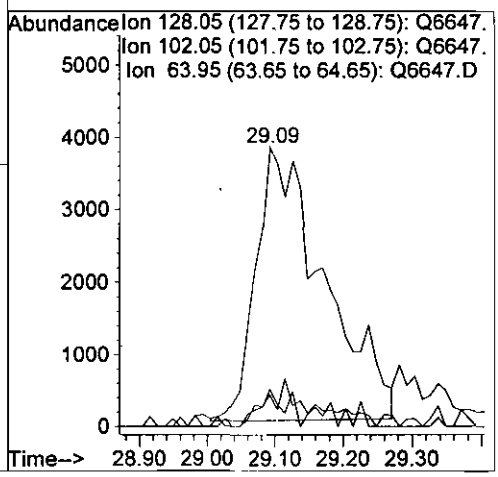




#81
Naphthalene
Concen: 6.57 ug/l
RT: 29.09 min Scan# 2458
Delta R.T. -0.04 min
Lab File: Q6647.D
Acq: 16 Sep 99 2:25 am

Tgt Ion:128.05 Resp: 26301

Ion	Ratio	Lower	Upper
128	100		
102	11.9	0.0	30.4
64	13.9	0.0	25.1
0	0.0	0.0	0.0



Quantitation Report (QDel)

Data File : U:\DATA\U1147.D
Acq On : 30 Sep 99 12:19 pm
Sample : WP3906-30 36GLM Ø3Ø1
Misc : HP5973:
Quant Time: Oct 5 14:15 1999

Vial: 6
Operator: JSS
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: U8260930.RES

Quant Method : C:\HPCHEM\1\METHODS\U8260930.M
Title : VOA 8260A Water Calibration;Full List 5ML
Last Update : Thu Sep 23 07:53:07 1999
Response via : Initial Calibration
DataAcq Meth : U8260930

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Pentafluorobenzene	10.41	168	516298	50.00	UG/L	0.02
28) 1,4-Difluorobenzene	12.57	114	808716	50.00	UG/L	0.03
47) Chlorobenzene-d5	18.66	117	761563	50.00	UG/L	0.00
59) 1,4-Dichlorobenzene-d4	22.75	152	418741	50.00	UG/L	0.00

System Monitoring Compounds

25) 1,2-Dichloroethane-d4	11.23	65	355249	53.76	UG/L	0.04
Surrogate Spike 50.000	Range 65 - 135		Recovery = 107.52%			
27) Dibromofluoromethane	10.02	111	306558	54.54	UG/L	0.05
Surrogate Spike 50.000	Range 75 - 129		Recovery = 109.08%			
43) Toluene-d8	15.85	98	1220454	51.12	UG/L	0.00
Surrogate Spike 50.000	Range 82 - 120		Recovery = 102.24%			
46) P-Bromofluorobenzene	20.79	95	485705	51.46	UG/L	0.00
Surrogate Spike 50.000	Range 69 - 125		Recovery = 102.92%			

Target Compounds Qvalue

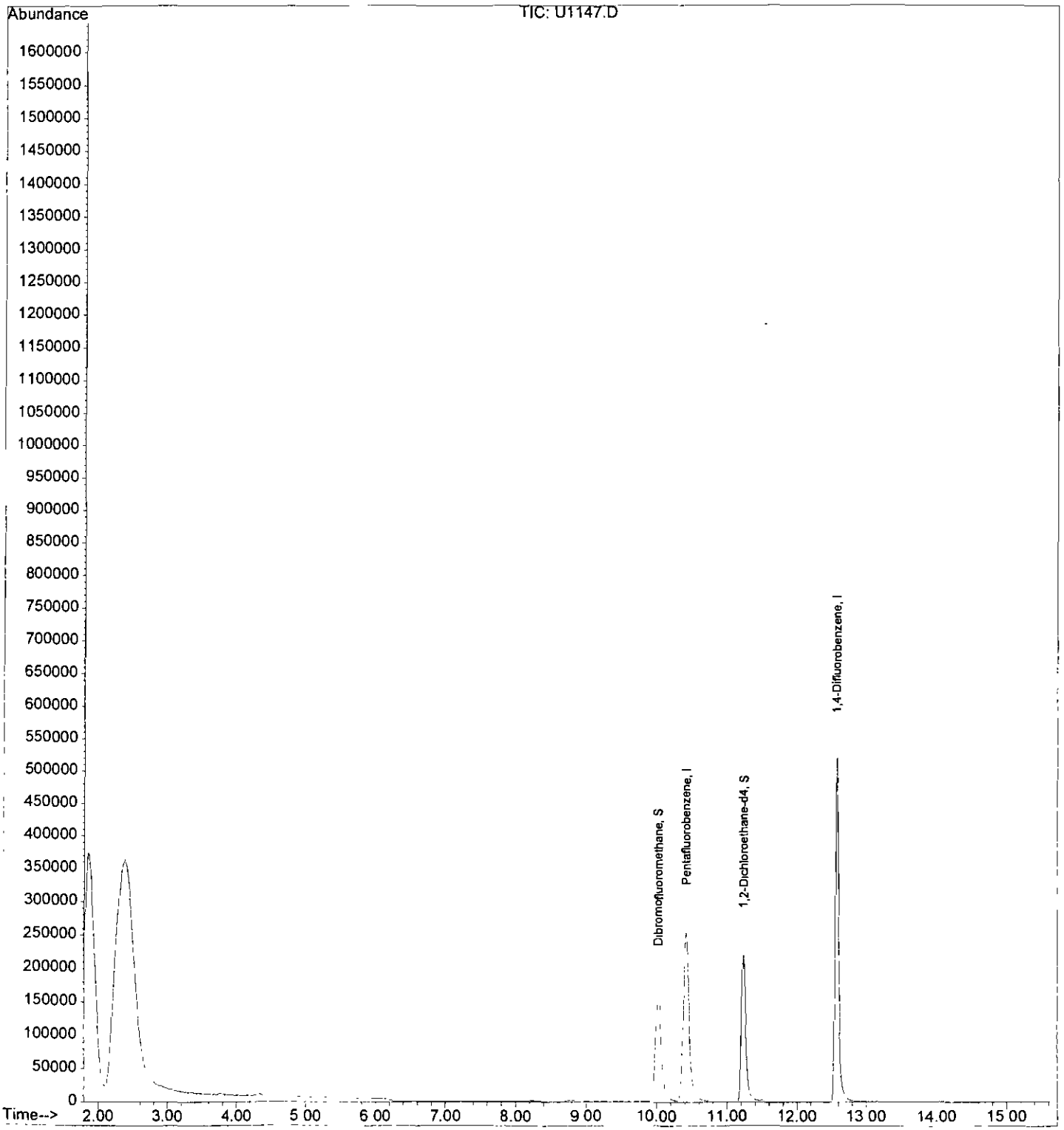
(#) = qualifier out of range (m) = manual integration

Quantitation Report

Data File : U:\DATA\U1147.D
Acq On : 30 Sep 99 12:19 pm
Sample : WP3906-30
Misc : HP5973:
Quant Time: Oct 5 14:15 1999

Vial: 6
Operator: JSS
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: U8260930.RES

Method : U:\METHODS\U8260930.M
Title : VOA 8260A Water Calibration;Full List 5ML
Last Update : Thu Sep 23 07:53:07 1999
Response via : Multiple Level Calibration

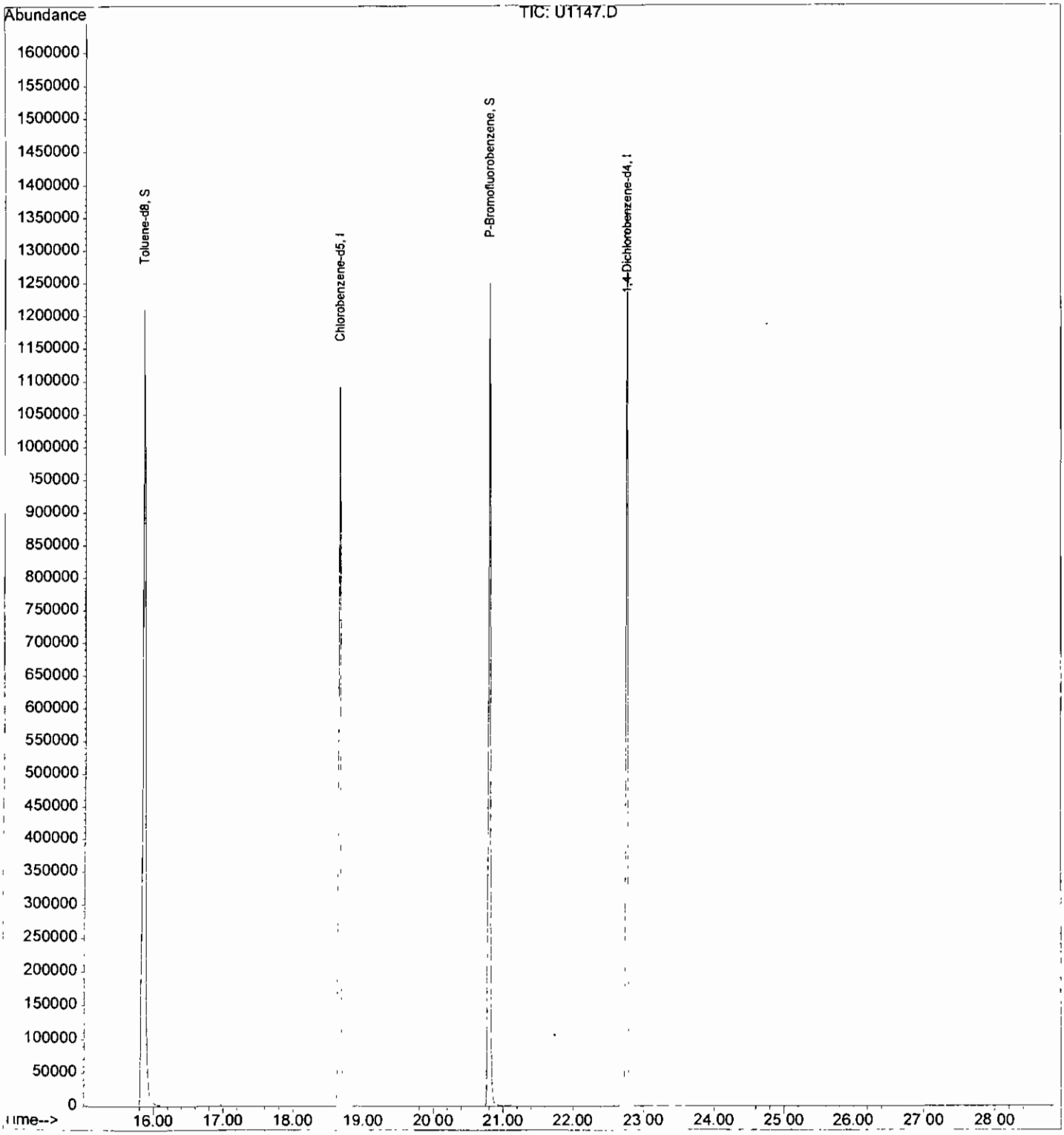


Quantitation Report

Data File : U:\DATA\U1147.D
Acq On : 30 Sep 99 12:19 pm
Sample : WP3906-30
Misc : HP5973:
Quant Time: Oct 5 14:15 1999

Vial: 6
Operator: JSS
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: U8260930.RES

Method : U:\METHODS\U8260930.M
Title : VOA 8260A Water Calibration;Full List 5ML
Last Update : Thu Sep 23 07:53:07 1999
Response via : Multiple Level Calibration



A-175

Quantitation Report (Not Reviewed)

Q

Data File : C:\HPCHEM\1\DATA\Q6635.D
Acq On : 15 Sep 99 6:49 pm
Sample : WP3906-4 36GLMØ4Ø1
Misc : 5970-Q;
Quant Time: Sep 15 19:22 1999

Vial: 5
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0915

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Pentafluorobenzene	11.84	168	491378	50.00 ug/l	0.02
29) 1,4-Difluorobenzene	13.89	114	505349	50.00 ug/l	0.00
47) Chlorobenzene-d5	21.55	117	401648	50.00 ug/l	-0.02
60) 1,4-Dichlorobenzene-d4	25.83	152	184058	50.00 ug/l	-0.02
System Monitoring Compounds					
27) 1,2-Dichloroethane-d4	12.48	65	196536	40.68 ug/l	0.02
Surrogate Spike 50.000	Range 65 - 135		Recovery = 81.36%		
28) Dibromofluoromethane	11.53	111	304148	46.55 ug/l	0.00
Surrogate Spike 50.000	Range 75 - 129		Recovery = 93.10%		
43) Toluene-d8	18.14	98	490743	49.85 ug/l	0.00
Surrogate Spike 50.000	Range 82 - 120		Recovery = 99.70%		
46) P-Bromofluorobenzene	23.91	95	252752	50.22 ug/l	-0.03
Surrogate Spike 50.000	Range 69 - 125		Recovery = 100.44%		

rget Compounds					Qvalue
9) Acetone	6.32	43	709	0.64 ug/l #	89
18) 1,1-Dichloroethane	8.99	63	3802	0.51 ug/l	70
20) 1,2-Dichloroethene (cis)	10.34	96	2001	0.57 ug/l #	79
30) 1,1-Dichloropropene	11.87	75	21435	3.00 ug/l # UM	26
39) Benzene	12.48	78	8723	1.00 ug/l NM	100
44) Toluene	18.32	92	11899	2.12 ug/l HJ	98
52) 1-ChloroHexane	21.56	55	6619	1.59 ug/l #	1
55) Ethylbenzene	21.86	91	44639	4.37 ug/l	81
57) m+p-Xylene	22.12	106	4964	1.42 ug/l # HJ	71
58) o-Xylene	22.89	106	22671	5.99 ug/l #	69
61) Isopropylbenzene	23.58	105	12487	1.03 ug/l # HJ	95
66) n-Propylbenzene	24.32	91	28563	2.59 ug/l HJ	92
68) 1,3,5-Trimethylbenzene	24.63	105	23510	3.52 ug/l # HJ	75
70) 1,2,4-Trimethylbenzene	25.25	105	81020	12.82 ug/l H	87
71) Sec-Butylbenzene	25.53	105	6393	0.65 ug/l	84
75) n-Butylbenzene	26.35	91	5057	0.85 ug/l #	59
76) 1,2-Dichlorobenzene	26.45	146	4079	0.80 ug/l #	76
77) 1,2-Dibromo-3-Chloropropan	27.65	75	467	0.59 ug/l	100
81) Naphthalene	29.10	128	57156	12.96 ug/l B	91

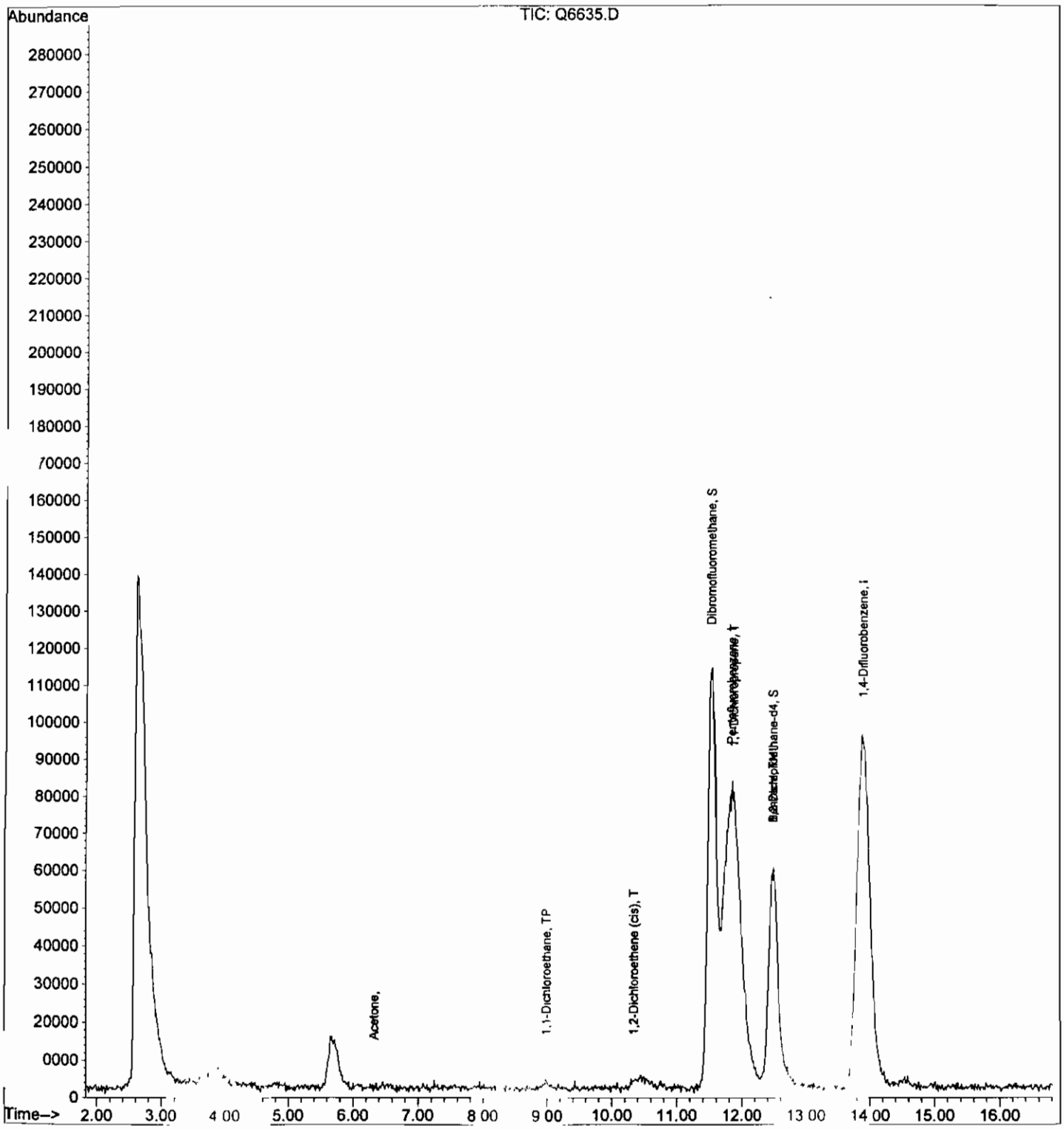
(#) = qualifier out of range (m) = manual integration

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6635.D
Acq On : 15 Sep 99 6:49 pm
Sample : WP3906-4
Misc : 5970-Q;
Quant Time: Sep 15 19:22 1999

Vial: 5
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration



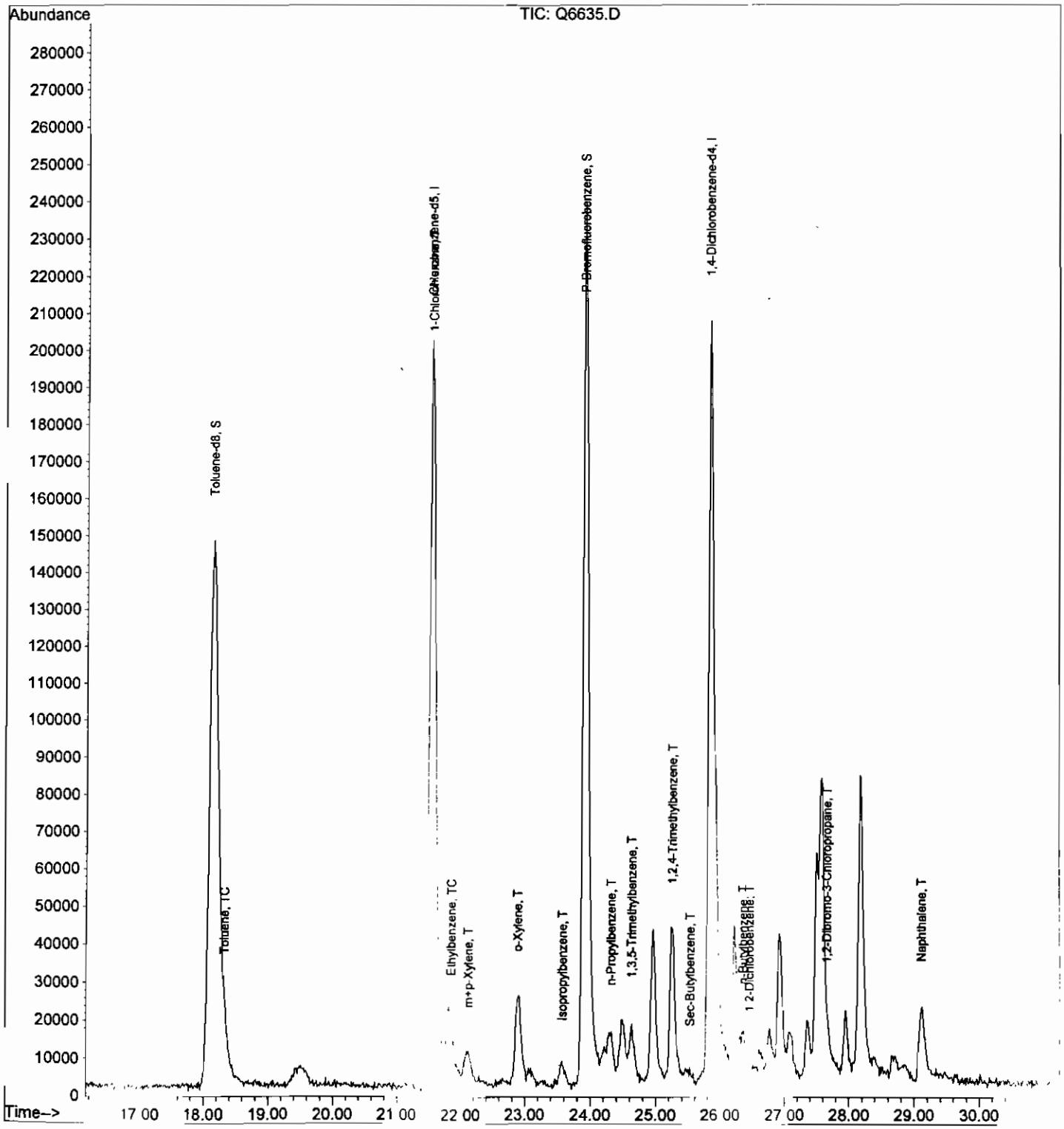
1-177

Quantitation Report

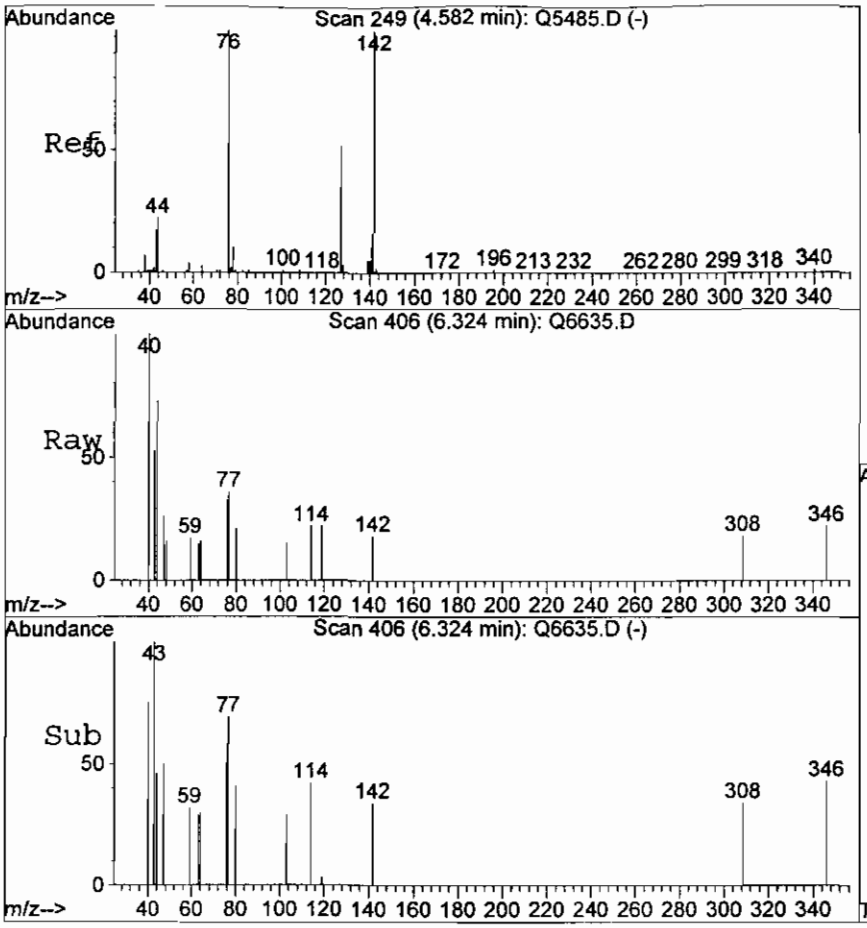
Data File : C:\HPCHEM\1\DATA\Q6635.D
Acq On : 15 Sep 99 6:49 pm
Sample : WP3906-4
Misc : 5970-Q;
Quant Time: Sep 15 19:22 1999

Vial: 5
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration



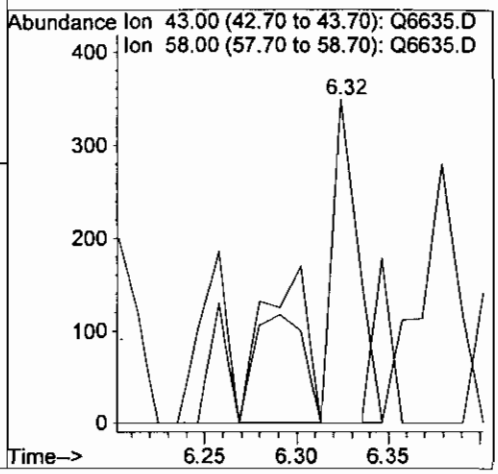
1-178

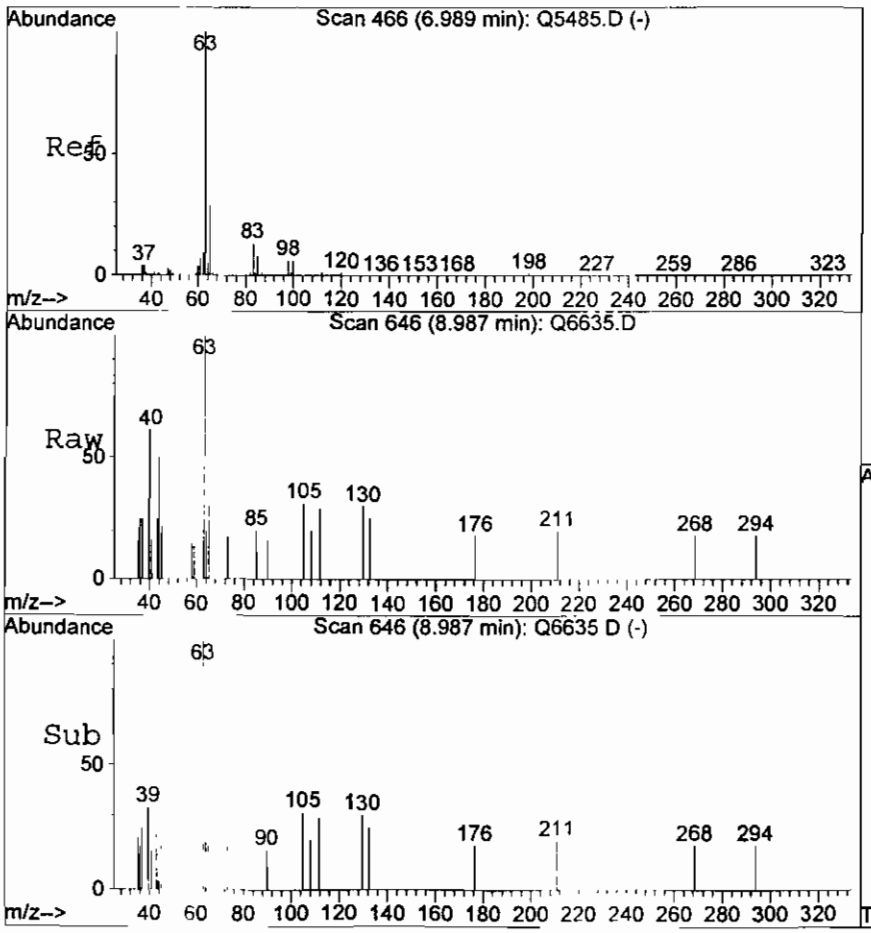


#9
Acetone
Concen: 0.64 ug/l
RT: 6.32 min Scan# 406
Delta R.T. 0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:43 Resp: 709

Ion	Ratio	Lower	Upper
43	100		
58	16.6	9.8	14.8#
0	0.0	0.0	0.0
0	0.0	0.0	0.0

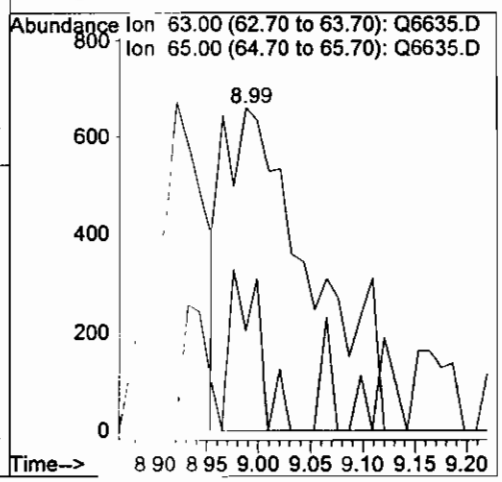


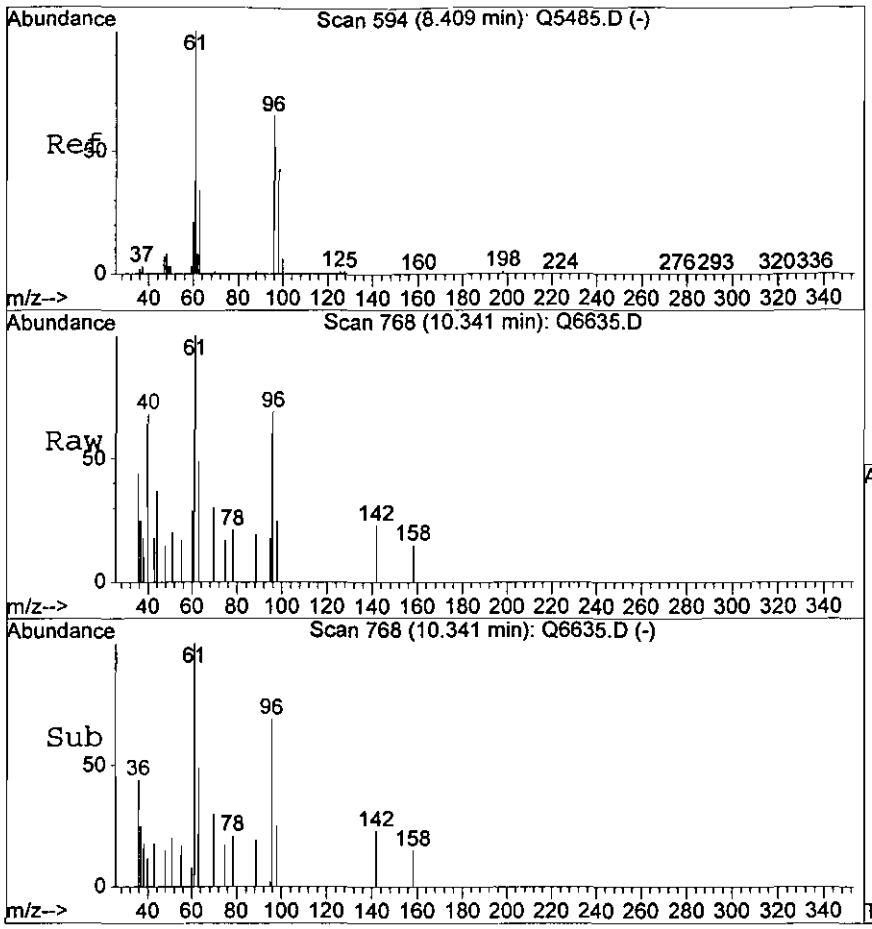


#18
1,1-Dichloroethane
Concen: 0.51 ug/l
RT: 8.99 min Scan# 646
Delta R.T. 0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:63 Resp: 3802

Ion	Ratio	Lower	Upper
63	100		
65	15.6	12.3	52.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

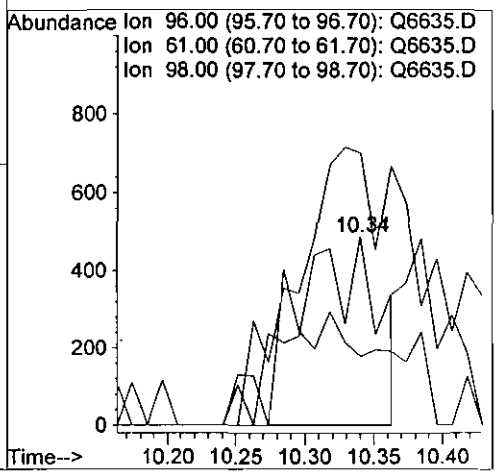


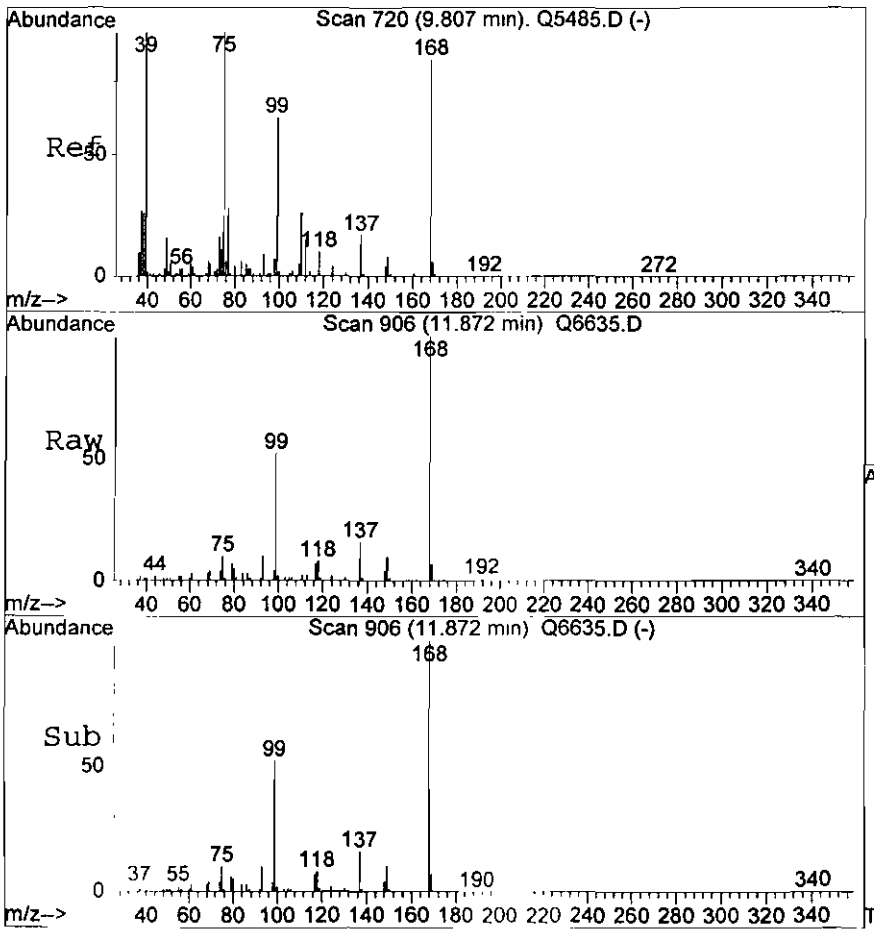


#20
1,2-Dichloroethene (cis)
Concen: 0.57 ug/l
RT: 10.34 min Scan# 768
Delta R.T. -0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:96 Resp: 2001

Ion	Ratio	Lower	Upper
96	100		
61	143.9	146.5	186.5#
98	36.6	42.7	82.7#
0	0.0	0.0	0.0

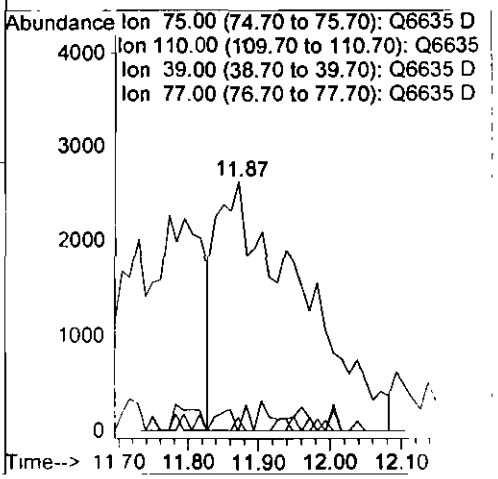


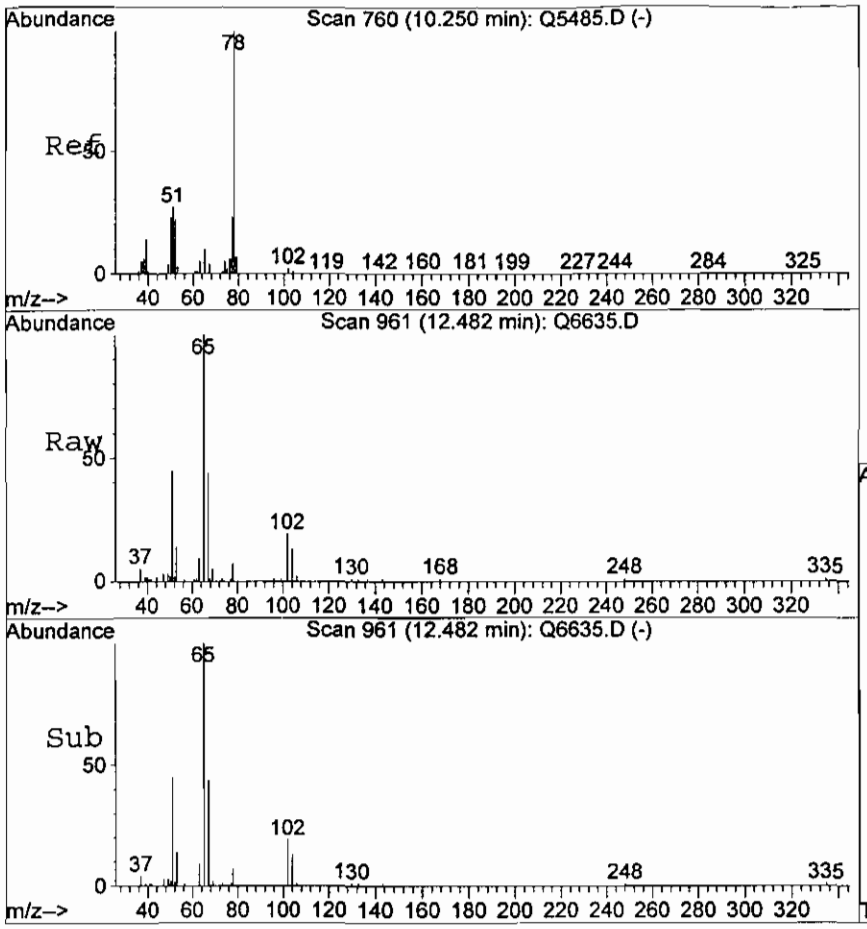


#30
1,1-Dichloropropene
Concen: 3.00 ug/l
RT: 11.87 min Scan# 906
Delta R.T. -0.02 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:75 Resp: 21435

Ion	Ratio	Lower	Upper
75	100		
110	1.7	20.7	31.1#
39	0.5	64.3	96.5#
77	0.0	22.1	33.1#

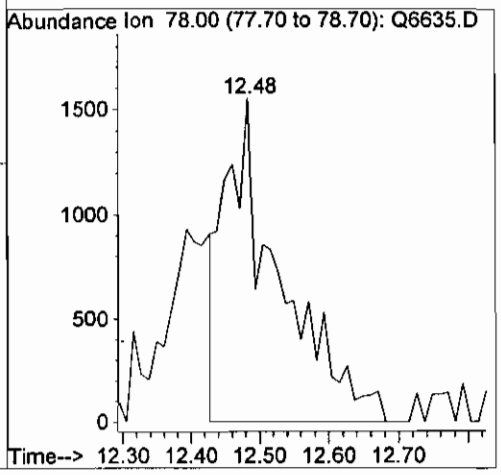


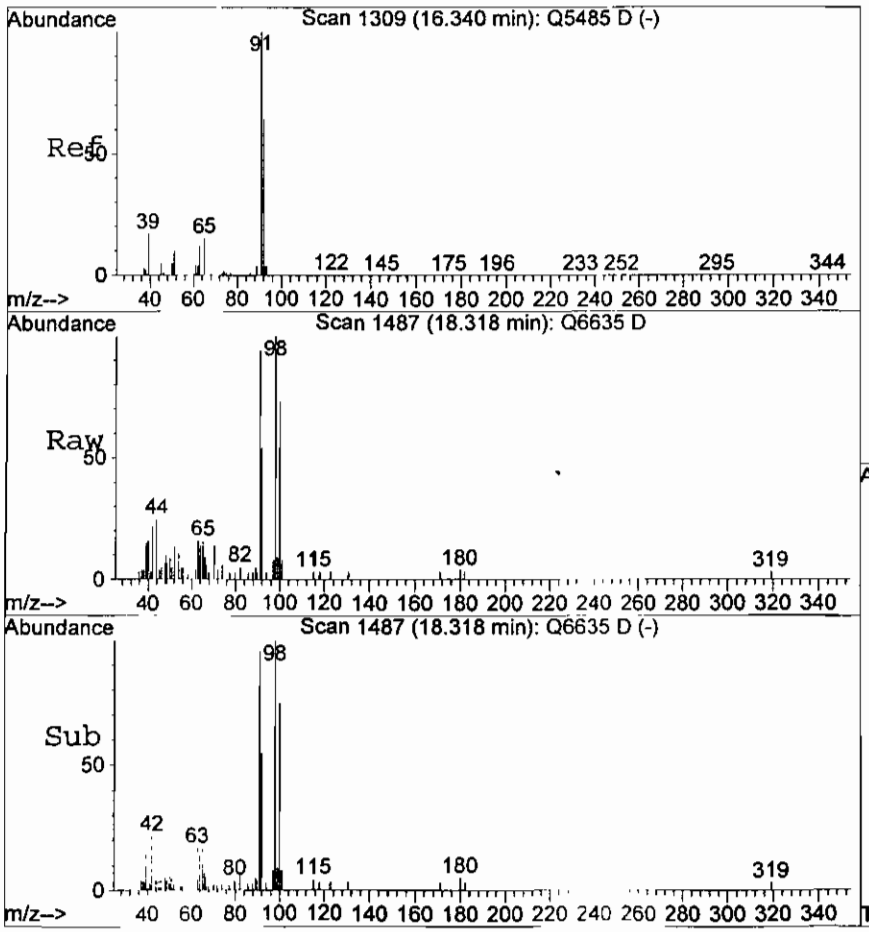


#39
Benzene
Concen: 1.00 ug/l
RT: 12.48 min Scan# 961
Delta R.T. 0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:78 Resp: 8723

Ion	Ratio	Lower	Upper
78	100		
0	0.0	0.0	0.0
0	0.0	0.0	0.0
0	0.0	0.0	0.0

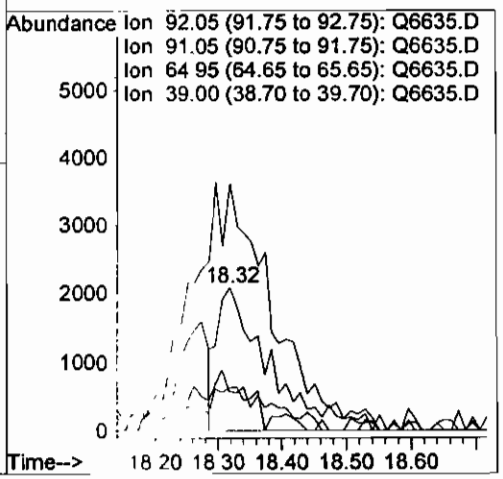


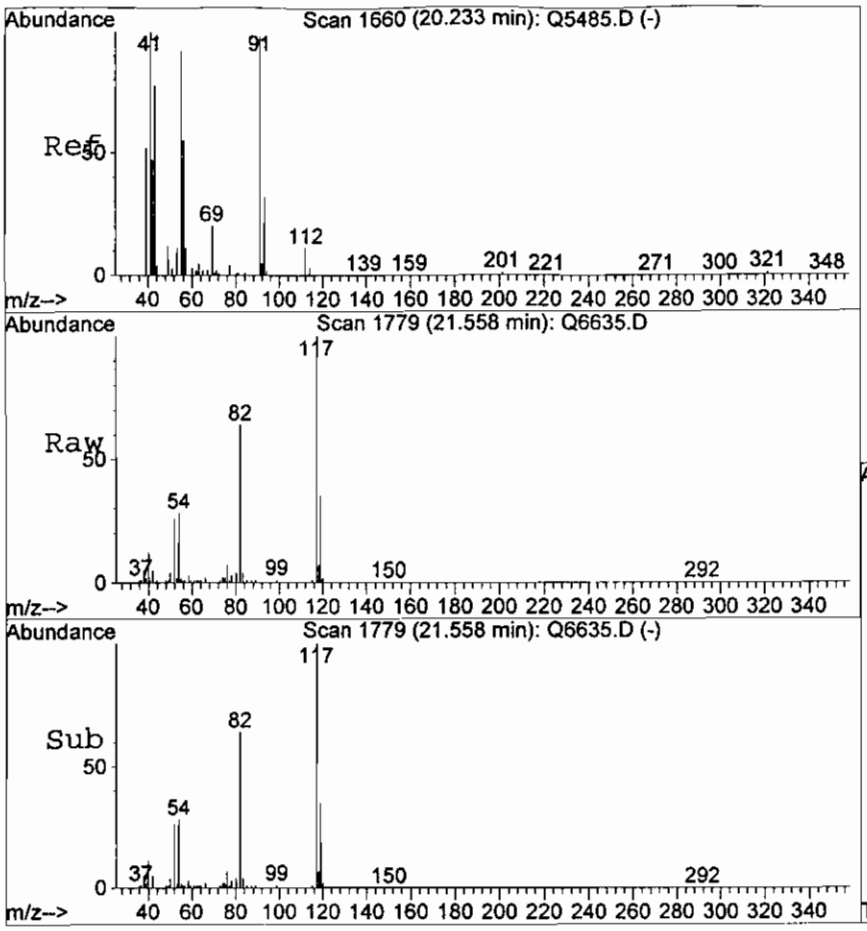


#44
Toluene
Concen: 2.12 ug/l
RT: 18.32 min Scan# 1487
Delta R.T. 0.02 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:92.05 Resp: 11899

Ion	Ratio	Lower	Upper
92	100		
91	168.5	136.5	204.7
65	23.2	19.2	28.8
39	27.7	21.4	32.0

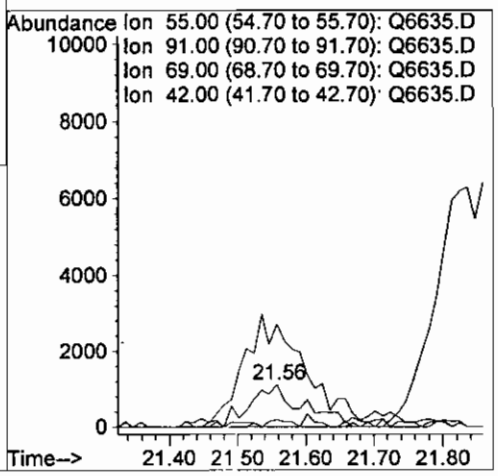


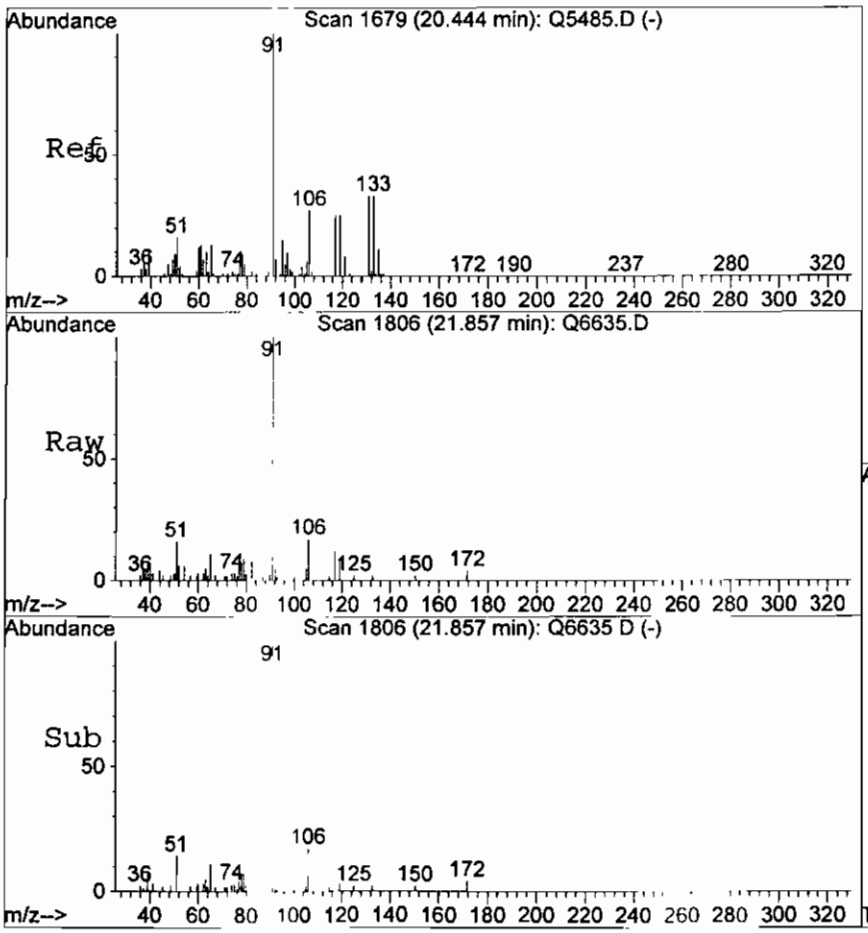


#52
1-ChloroHexane
Concen: 1.59 ug/l
RT: 21.56 min Scan# 1779
Delta R.T. -0.07 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:55 Resp: 6619

Ion	Ratio	Lower	Upper
55	100		
91	6.3	85.4	128.0#
69	0.0	21.3	31.9#
42	233.2	47.6	71.4#

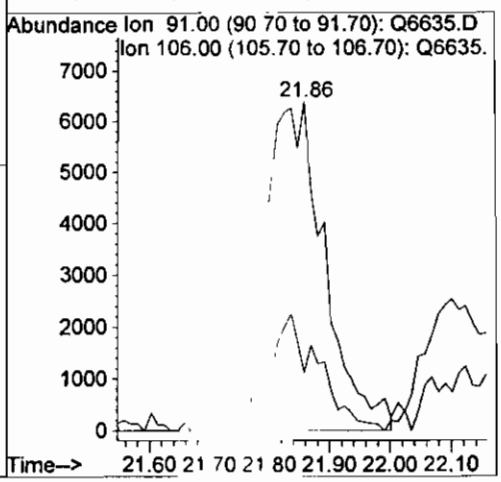


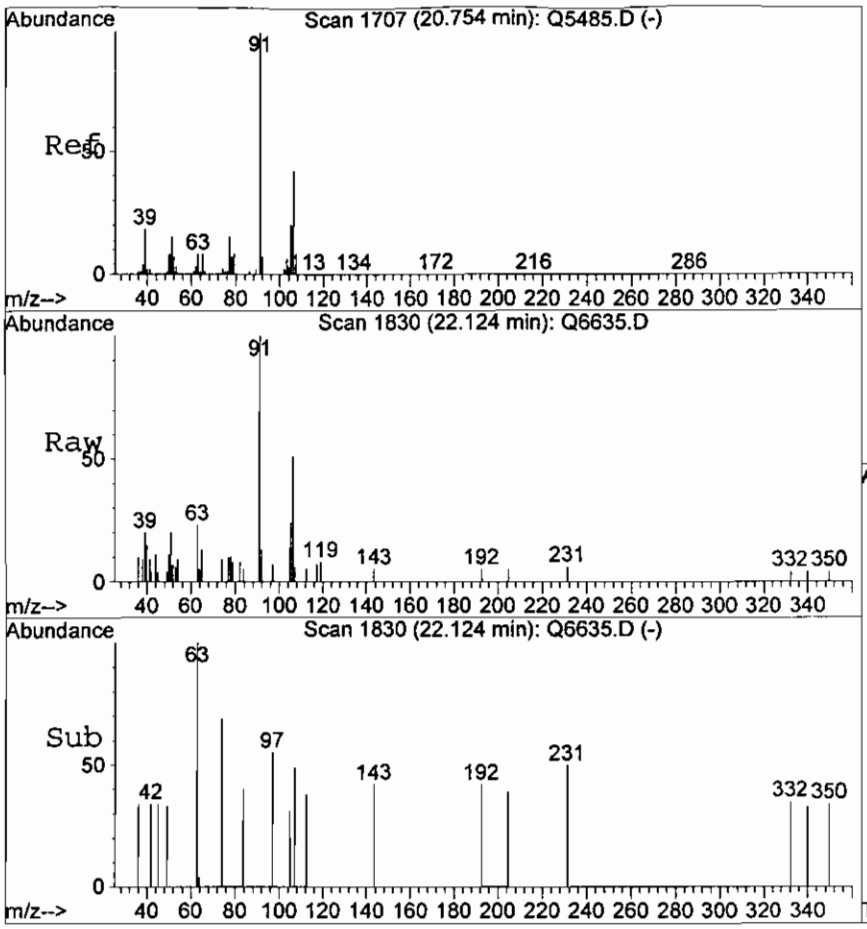


#55
Ethylbenzene
Concen: 4.37 ug/l
RT: 21.86 min Scan# 1806
Delta R.T. 0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:91 Resp: 44639

Ion	Ratio	Lower	Upper
91	100		
106	17.4	7.3	47.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

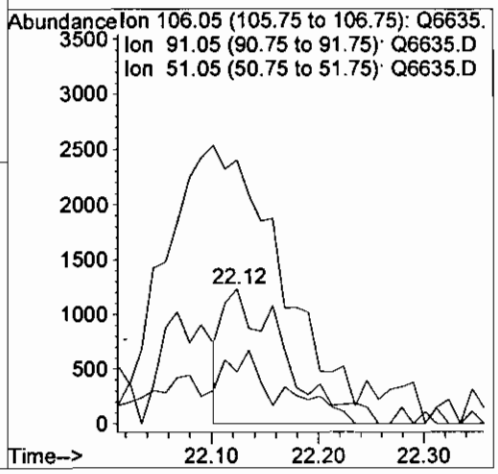


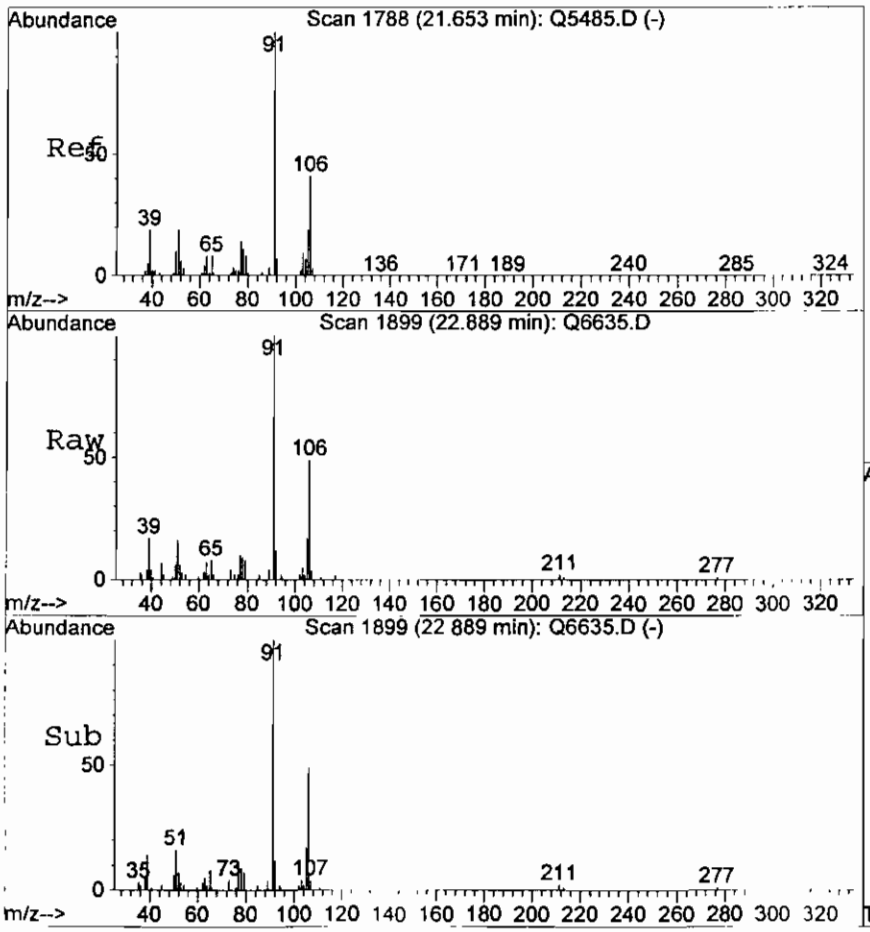


#57
m+p-Xylene
Concen: 1.42 ug/l
RT: 22.12 min Scan# 1830
Delta R.T. -0.02 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:106.05 Resp: 4964

Ion	Ratio	Lower	Upper
106	100		
91	169.0	201.2	241.2#
51	38.3	13.0	53.0
0	0.0	0.0	0.0

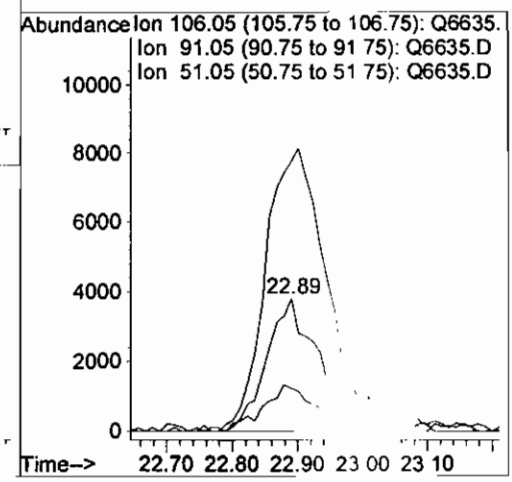


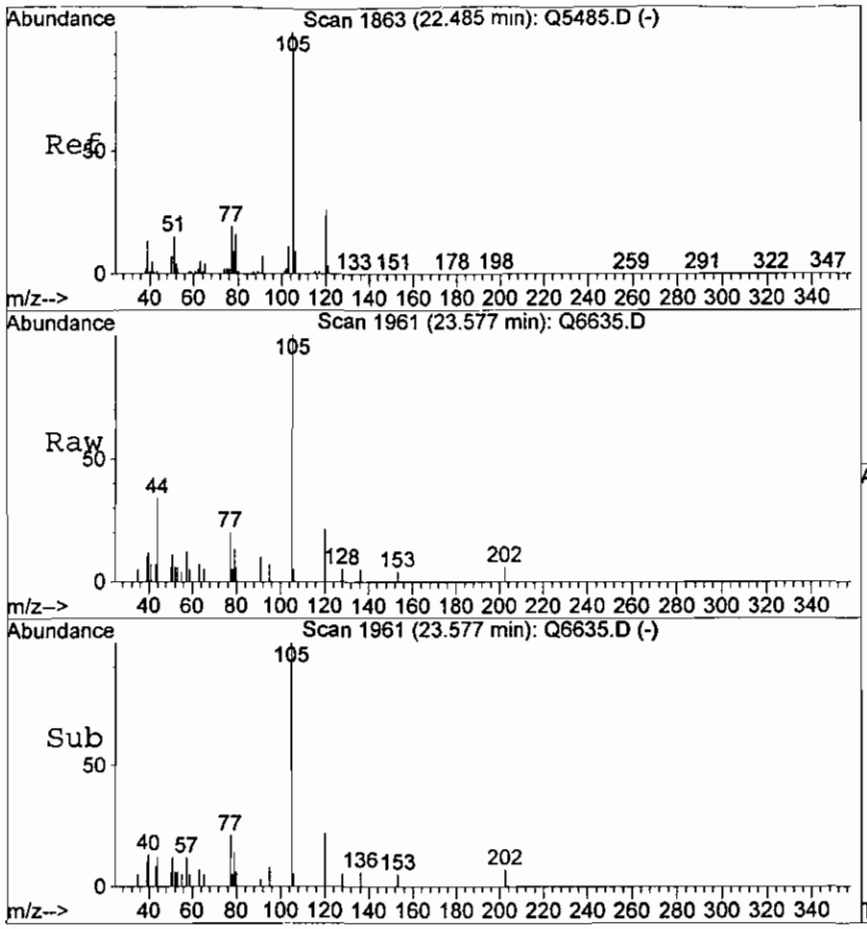


#58
o-Xylene
Concen: 5.99 ug/l
RT: 22.89 min Scan# 1899
Delta R.T. -0.04 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:106.05 Resp: 22671

Ion	Ratio	Lower	Upper
106	100		
91	195.8	195.3	292.9
51	32.6	53.0	79.6#
0	0.0	0.0	0.0

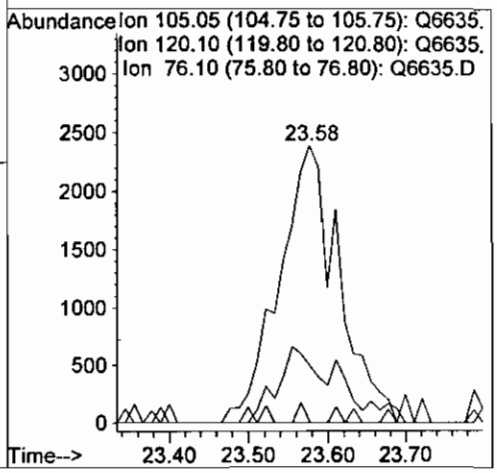


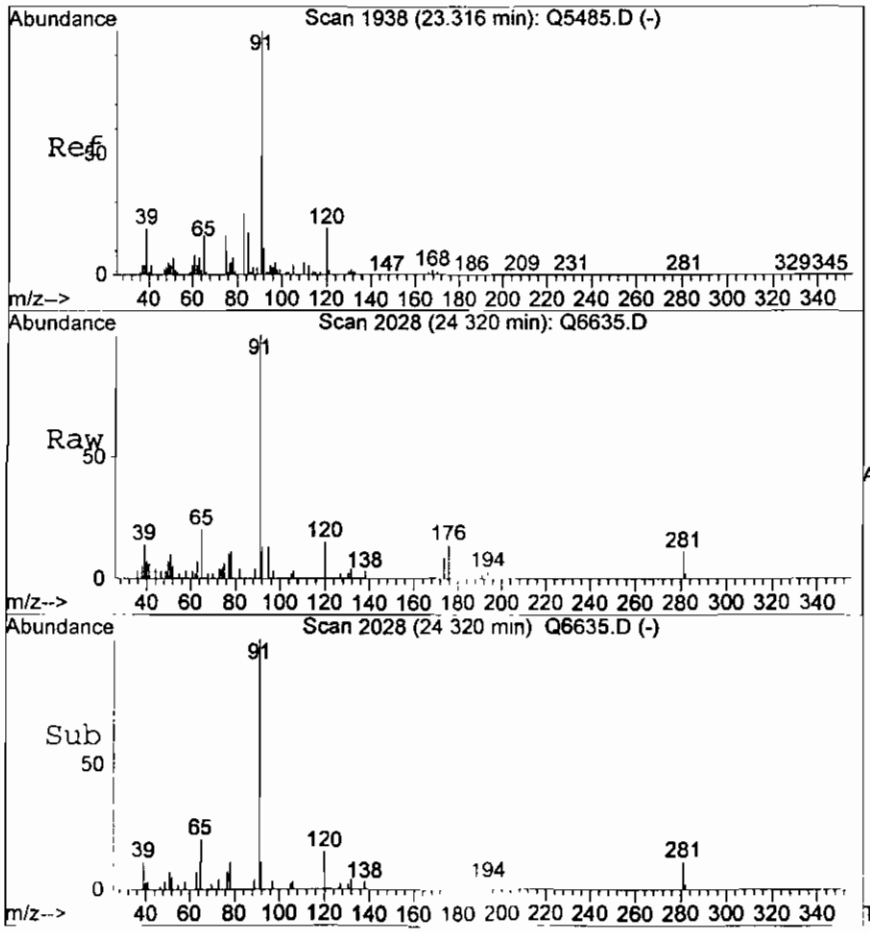


#61
Isopropylbenzene
Concen: 1.03 ug/l
RT: 23.58 min Scan# 1961
Delta R.T. -0.03 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:105.05 Resp: 12487

Ion	Ratio	Lower	Upper
105	100		
120	20.6	18.6	28.0
76	0.0	1.4	2.2#
0	0.0	0.0	0.0

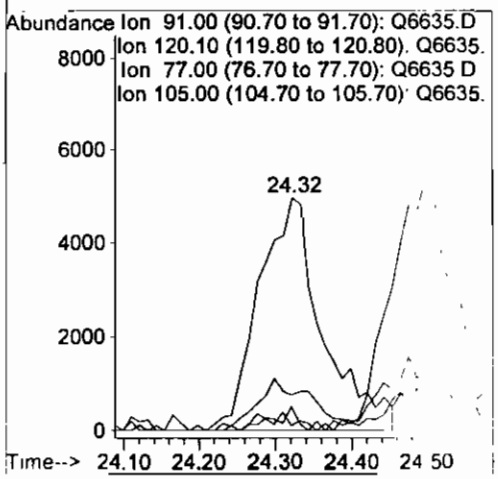


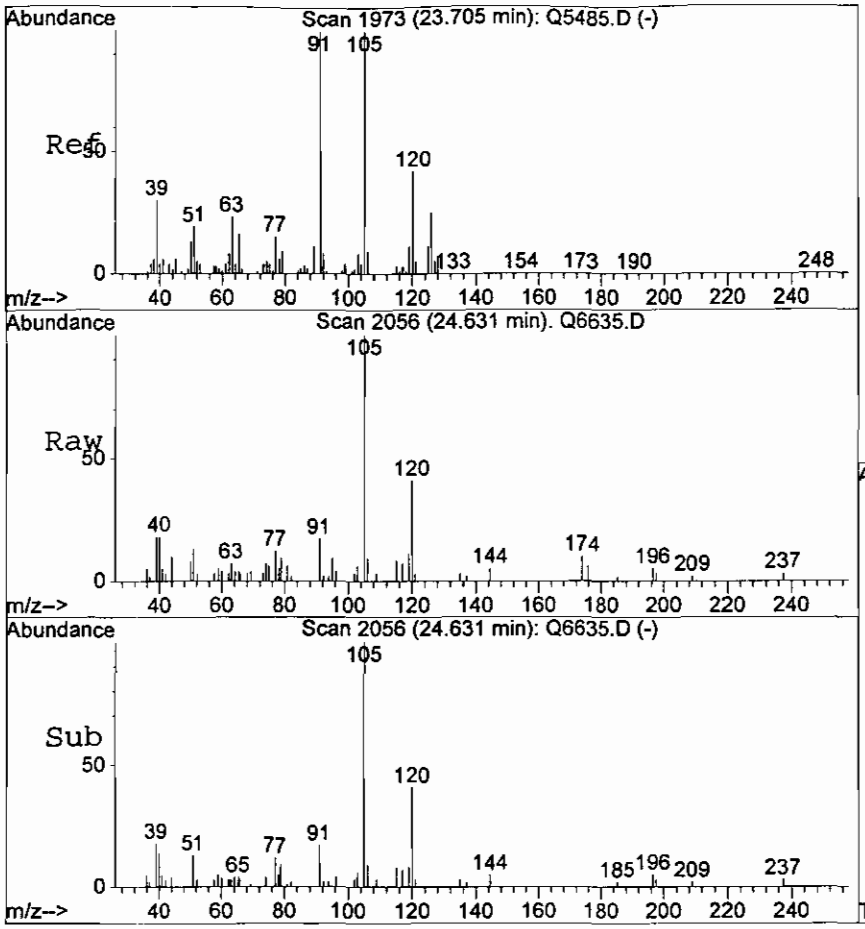


#66
n-Propylbenzene
Concen: 2.59 ug/l
RT: 24.32 min Scan# 2028
Delta R.T. -0.02 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:91 Resp: 28563

Ion	Ratio	Lower	Upper
91	100		
120	15.4	0.5	40.5
77	10.3	0.0	29.0
105	2.2	0.0	23.4

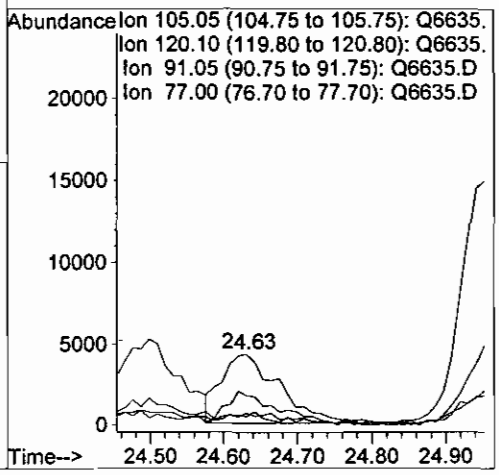


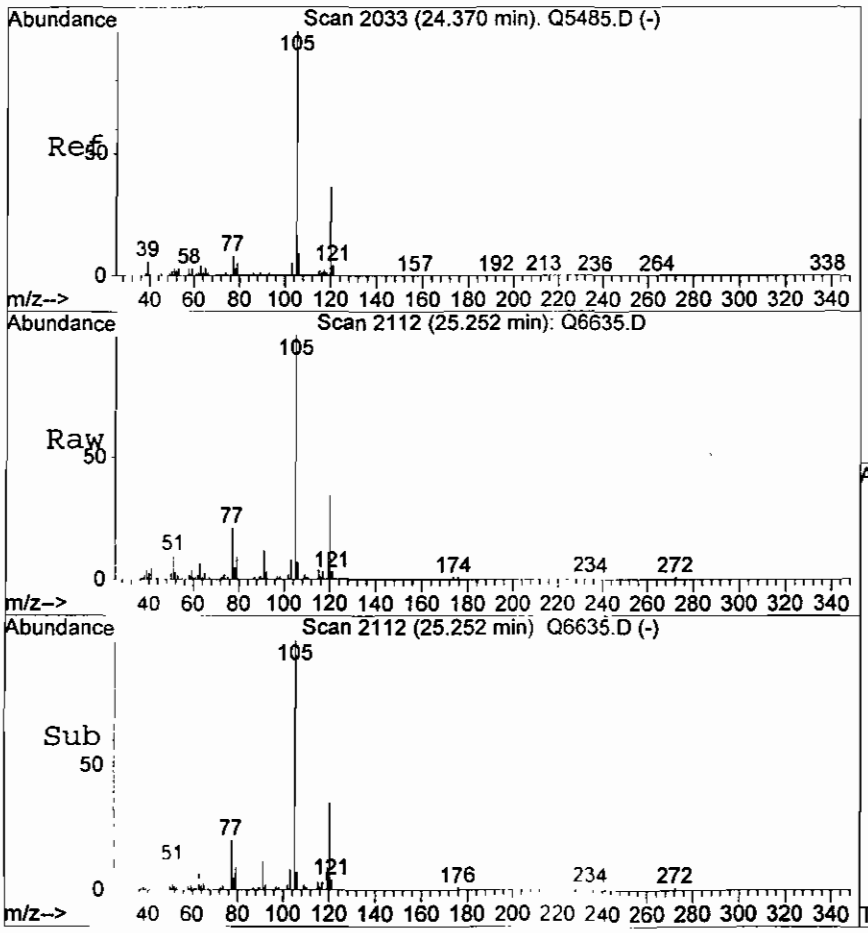


#68
1,3,5-Trimethylbenzene
Concen: 3.52 ug/l
RT: 24.63 min Scan# 2056
Delta R.T. -0.03 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:105.05 Resp: 23510

Ion	Ratio	Lower	Upper
105	100		
120	39.5	25.5	65.5
91	17.7	27.3	67.3#
77	8.2	0.0	34.2

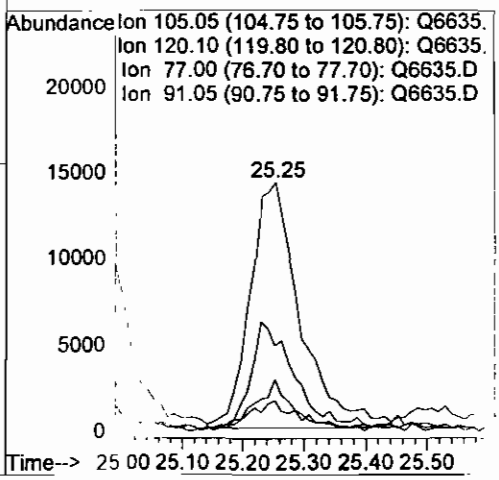


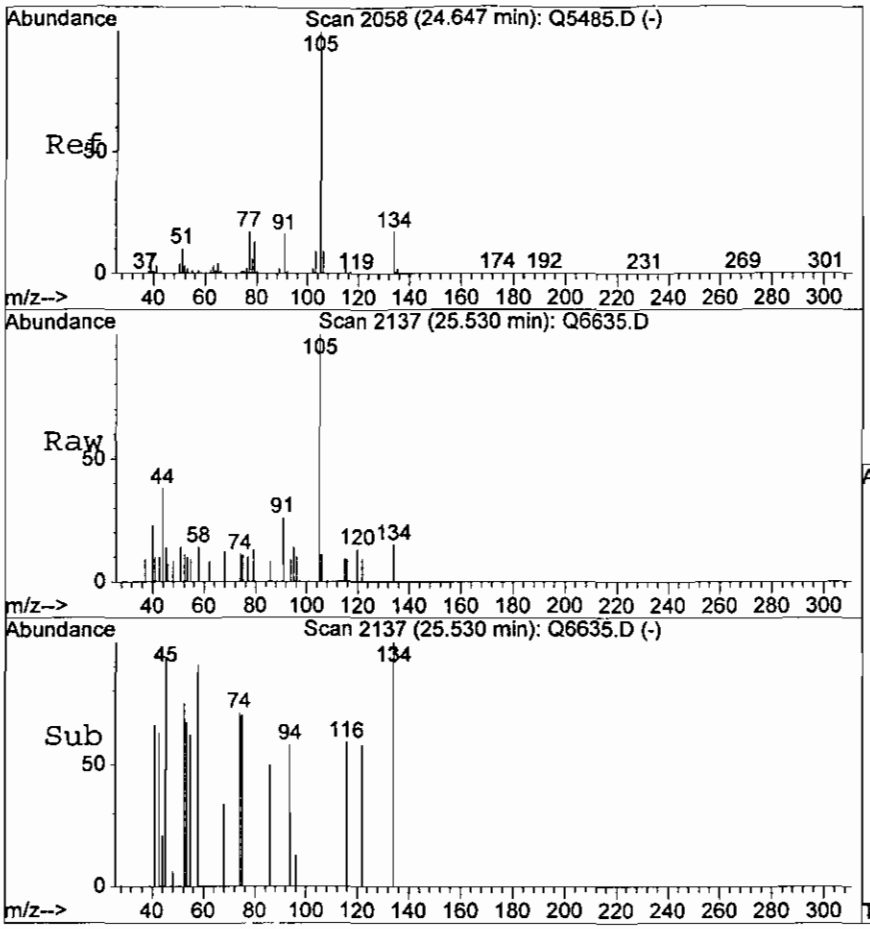


#70
1,2,4-Trimethylbenzene
Concen: 12.82 ug/l
RT: 25.25 min Scan# 2112
Delta R.T. -0.02 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:105.05 Resp: 81020

Ion	Ratio	Lower	Upper
105	100		
120	34.2	21.7	61.7
77	19.8	0.0	34.7
91	10.8	0.0	37.4

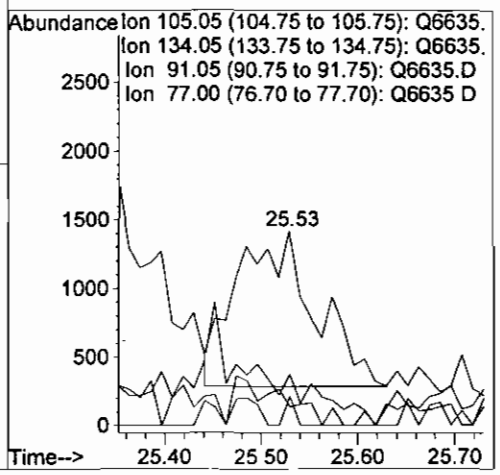


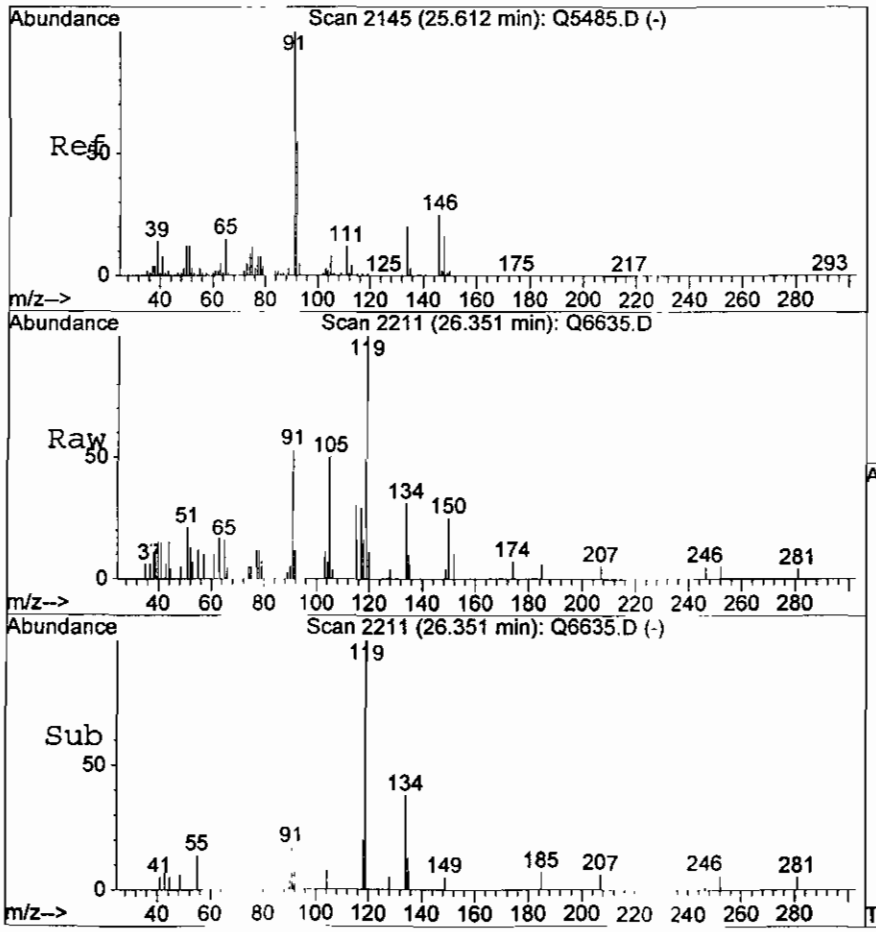


#71
Sec-Butylbenzene
Concen: 0.65 ug/l
RT: 25.53 min Scan# 2137
Delta R.T. 0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:105.05 Resp: 6393

Ion	Ratio	Lower	Upper
105	100		
134	18.9	0.7	40.7
91	21.7	0.0	35.6
77	0.0	0.0	34.7

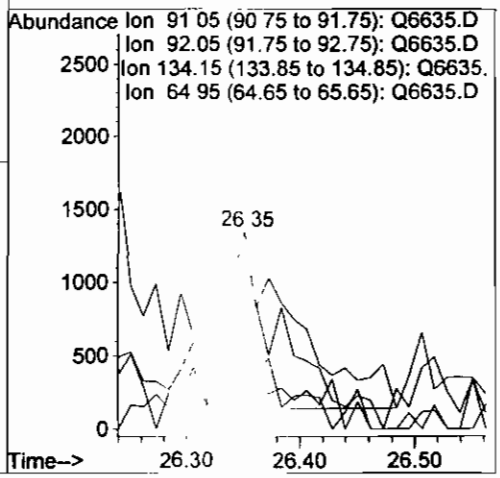


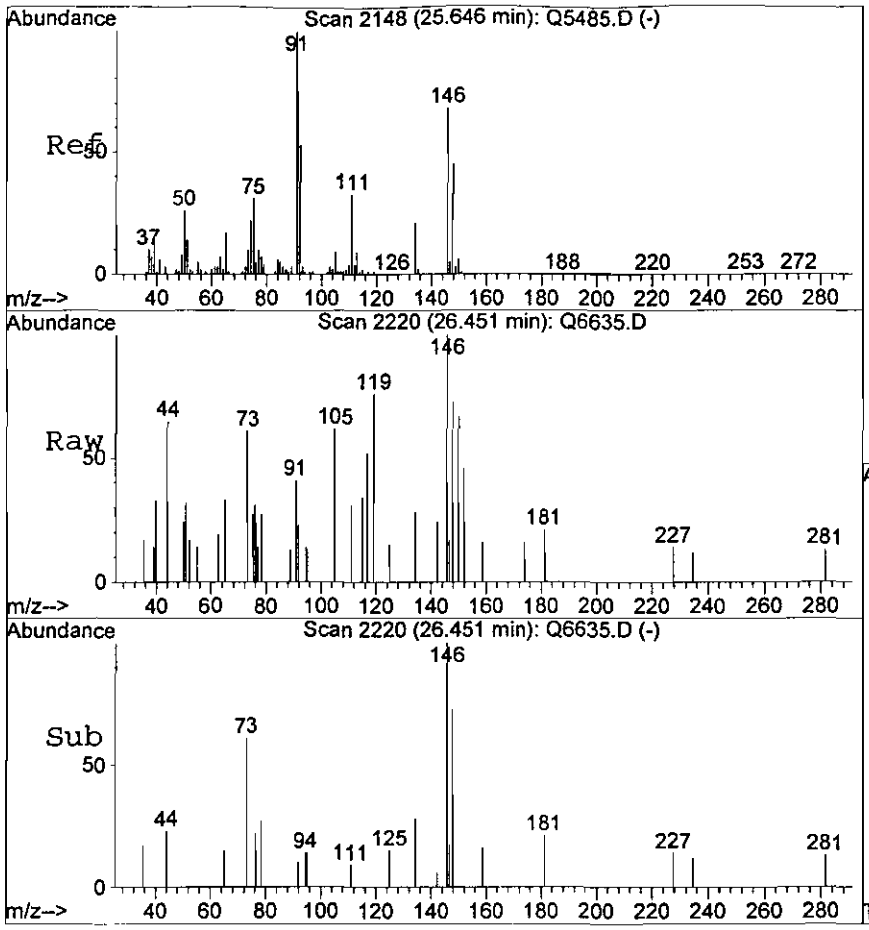


#75
n-Butylbenzene
Concen: 0.85 ug/l
RT: 26.35 min Scan# 2211
Delta R.T. -0.04 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:91.05 Resp: 5057

Ion	Ratio	Lower	Upper
91	100		
92	25.4	34.5	74.5#
134	42.6	3.9	43.9
65	32.9	0.0	34.2

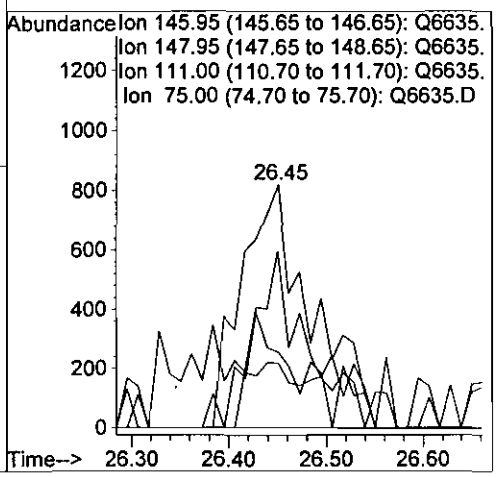


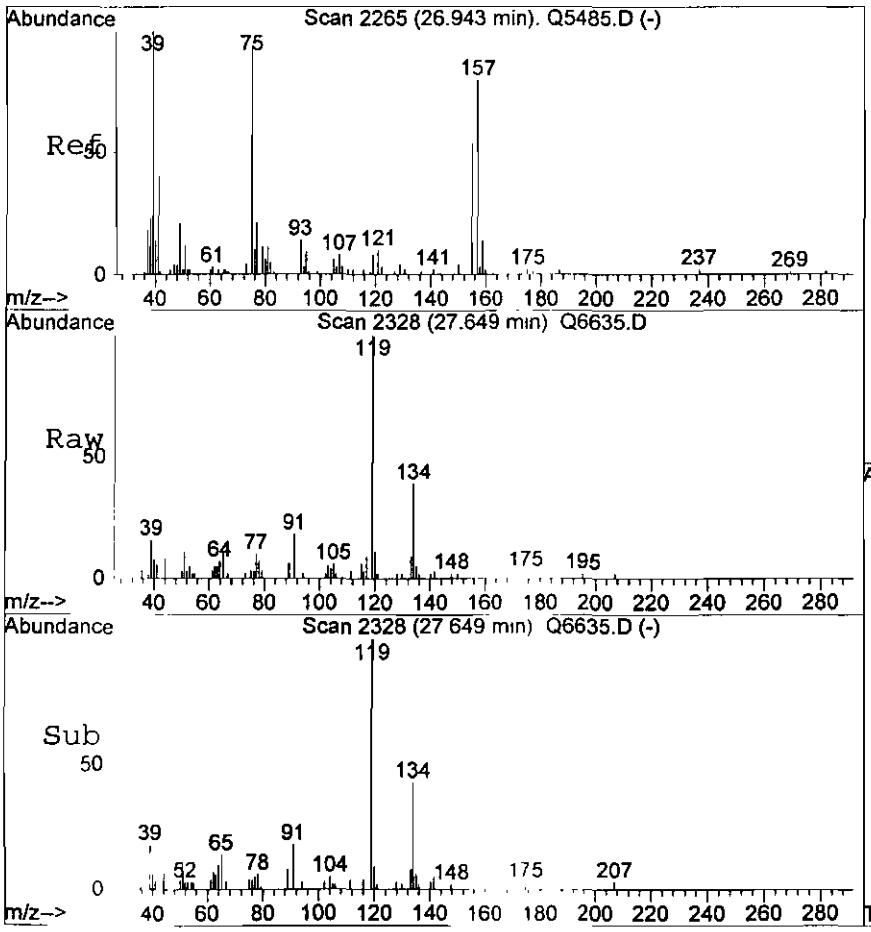


#76
1,2-Dichlorobenzene
Concen: 0.80 ug/l
RT: 26.45 min Scan# 2220
Delta R.T. -0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:145.95 Resp: 4079

Ion	Ratio	Lower	Upper
146	100		
148	72.7	40.7	80.7
111	31.2	18.1	58.1
75	7.3	17.6	57.6#

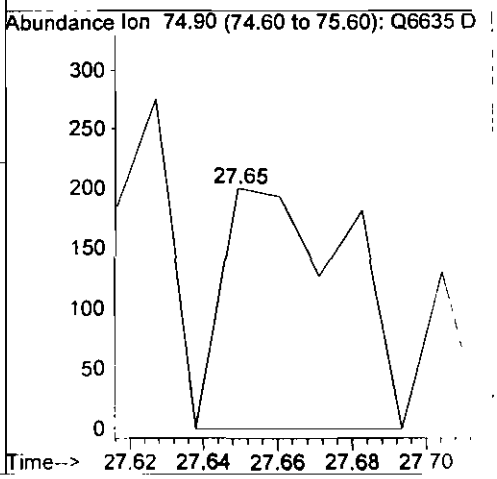


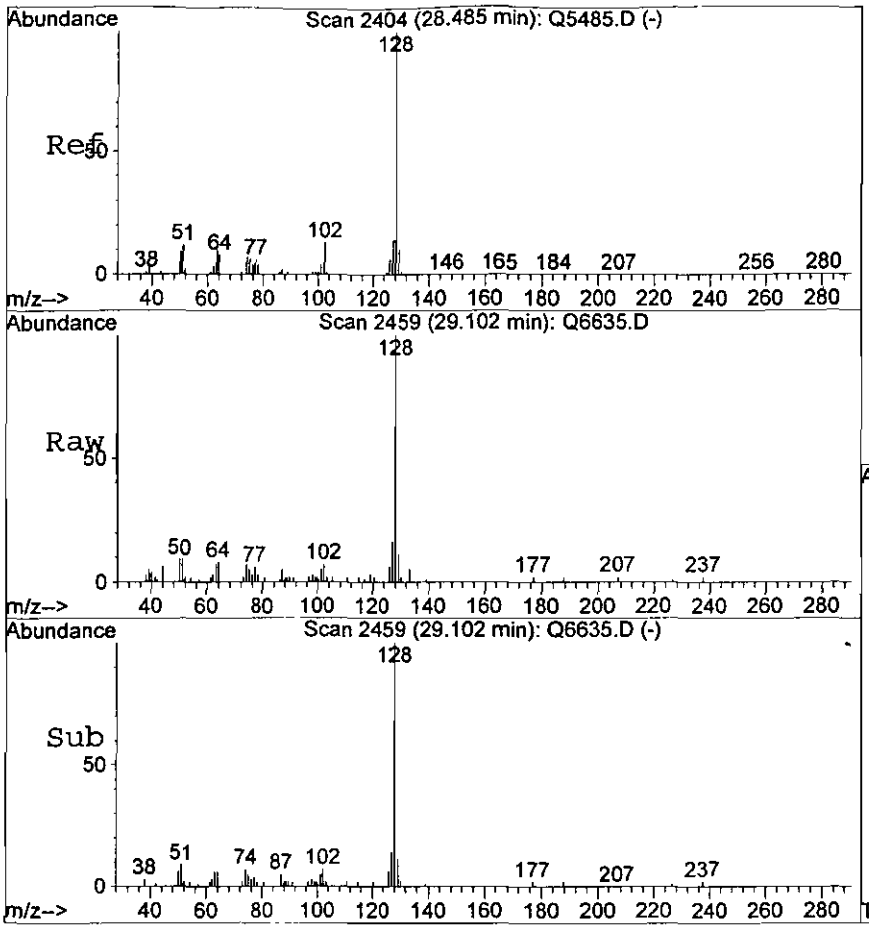


#77
1,2-Dibromo-3-Chloropropane
Concen: 0.59 ug/l
RT: 27.65 min Scan# 2328
Delta R.T. 0.01 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:74.9 Resp: 467

Ion	Ratio	Lower	Upper
75	100		
0	0.0	0.0	0.0
0	0.0	0.0	0.0
0	0.0	0.0	0.0

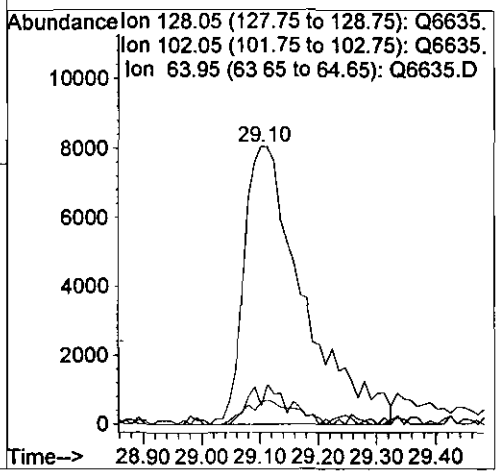




#81
Naphthalene
Concen: 12.96 ug/l
RT: 29.10 min Scan# 2459
Delta R.T. -0.03 min
Lab File: Q6635.D
Acq: 15 Sep 99 6:49 pm

Tgt Ion:128.05 Resp: 57156

Ion	Ratio	Lower	Upper
128	100		
102	6.7	0.0	30.4
64	7.8	0.0	25.1
0	0.0	0.0	0.0



Quantitation Report (Not Reviewed)

Q

Data File : C:\HPCHEM\1\DATA\Q6636.D
Acq On : 15 Sep 99 7:27 pm
Sample : WP3906-5 36GLW Ø8Ø1
Misc : 5970-Q;
Quant Time: Sep 15 20:00 1999

Vial: 6
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0915

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Pentafluorobenzene	11.84	168	489114	50.00 ug/l	0.02
29) 1,4-Difluorobenzene	13.89	114	506055	50.00 ug/l	0.00
47) Chlorobenzene-d5	21.54	117	394909	50.00 ug/l	-0.02
60) 1,4-Dichlorobenzene-d4	25.84	152	190587	50.00 ug/l	-0.01
System Monitoring Compounds					
27) 1,2-Dichloroethane-d4	12.49	65	199395	41.47 ug/l	0.02
Surrogate Spike 50.000	Range 65 - 135		Recovery =	82.94%	
28) Dibromofluoromethane	11.52	111	302228	46.47 ug/l	0.00
Surrogate Spike 50.000	Range 75 - 129		Recovery =	92.94%	
43) Toluene-d8	18.15	98	491075	49.81 ug/l	0.01
Surrogate Spike 50.000	Range 82 - 120		Recovery =	99.62%	
46) P-Bromofluorobenzene	23.92	95	248123	49.23 ug/l	-0.02
Surrogate Spike 50.000	Range 69 - 125		Recovery =	98.46%	
Target Compounds					Qvalue
20) ~~1,1-Dichloropropene~~	11.84	75	27722	3.88 ug/l # NM	26
52) 1-ChloroHexane	21.53	55	2834	0.69 ug/l #	1
81) ~~Naphthalene~~	29.10	128	6152	1.35 ug/l # J	82

JA 091699

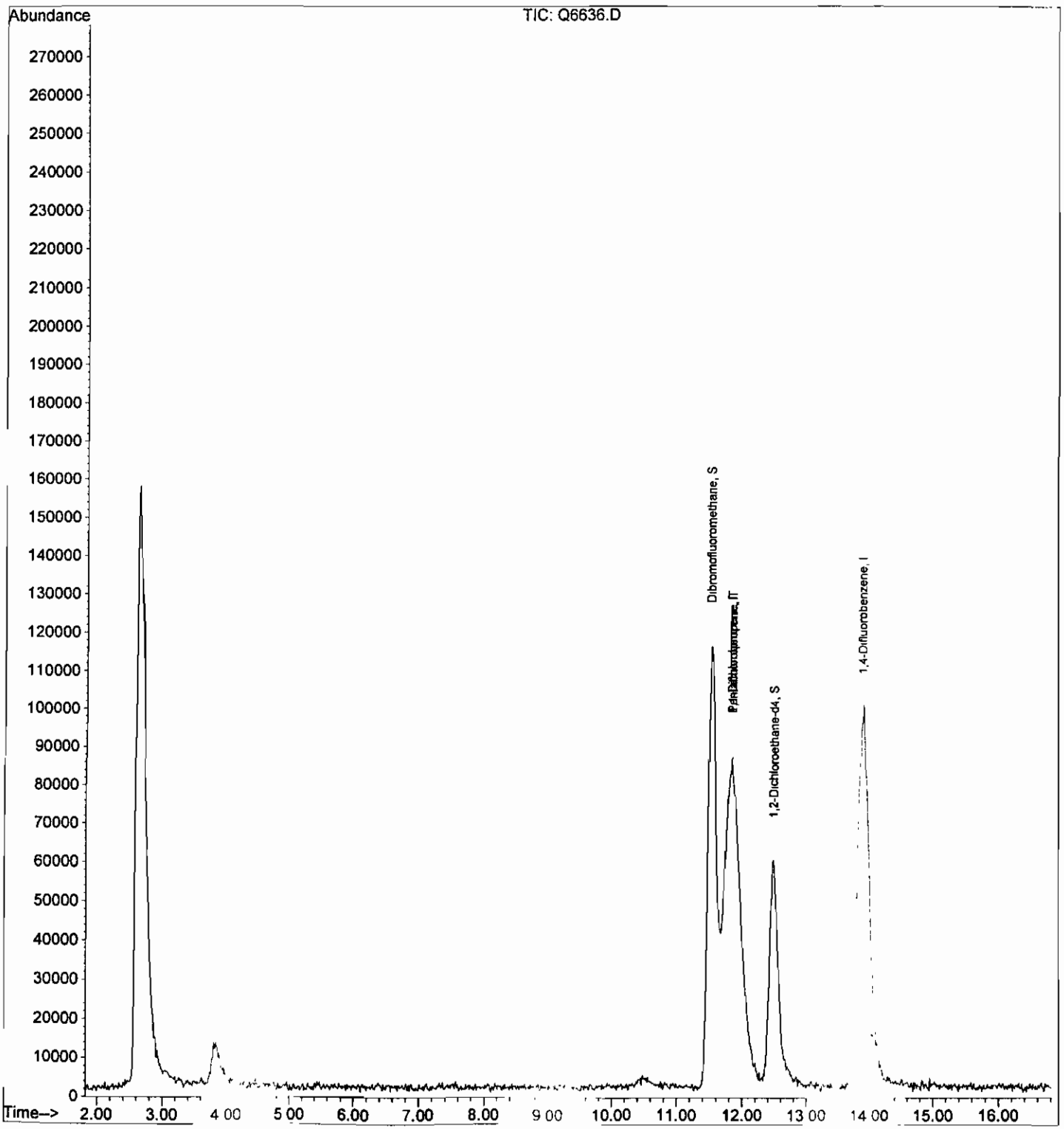
(#) = qualifier out of range (m) = manual integration

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6636.D
Acq On : 15 Sep 99 7:27 pm
Sample : WP3906-5
Misc : 5970-Q;
Quant Time: Sep 15 20:00 1999

Vial: 6
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration

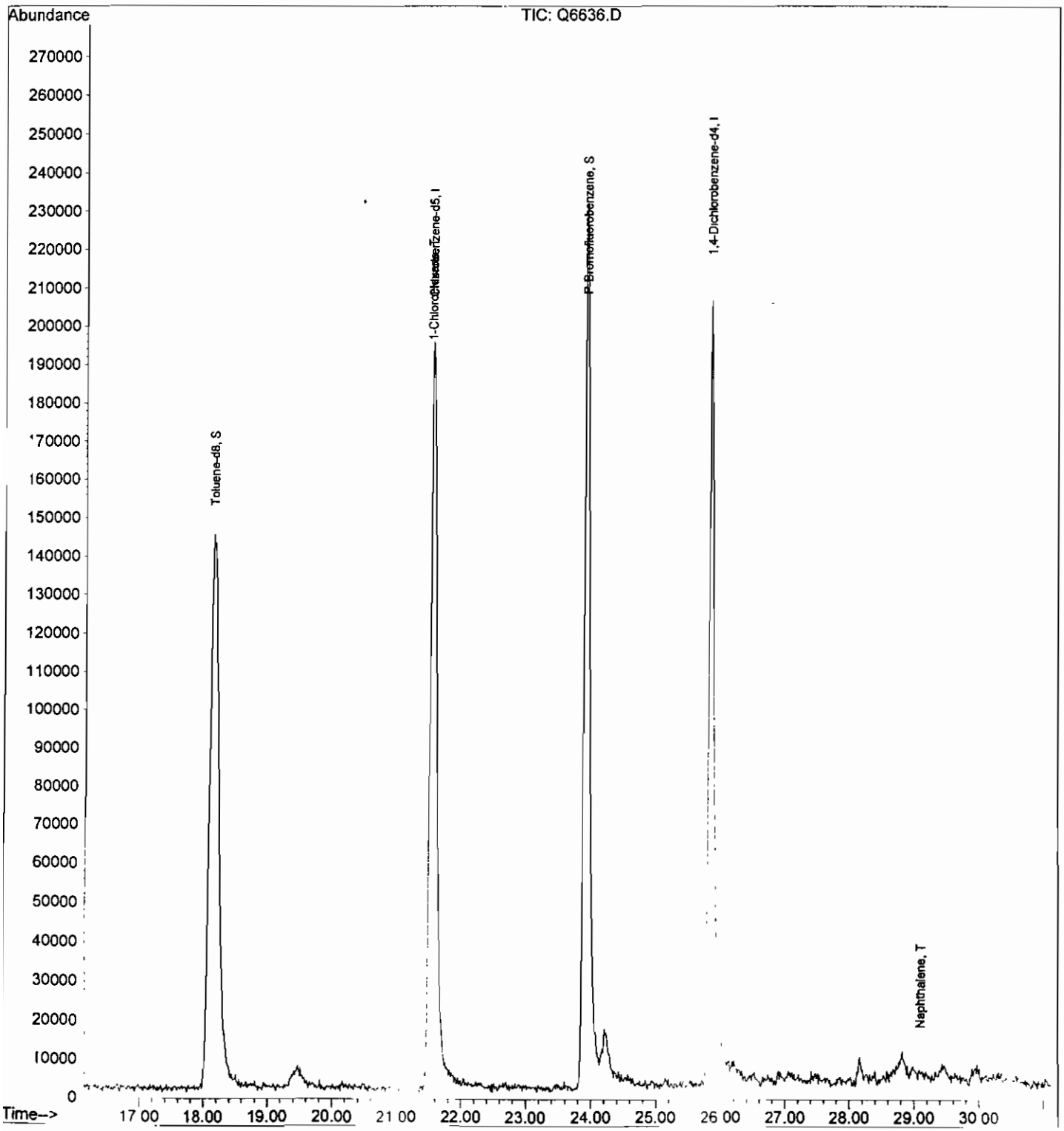


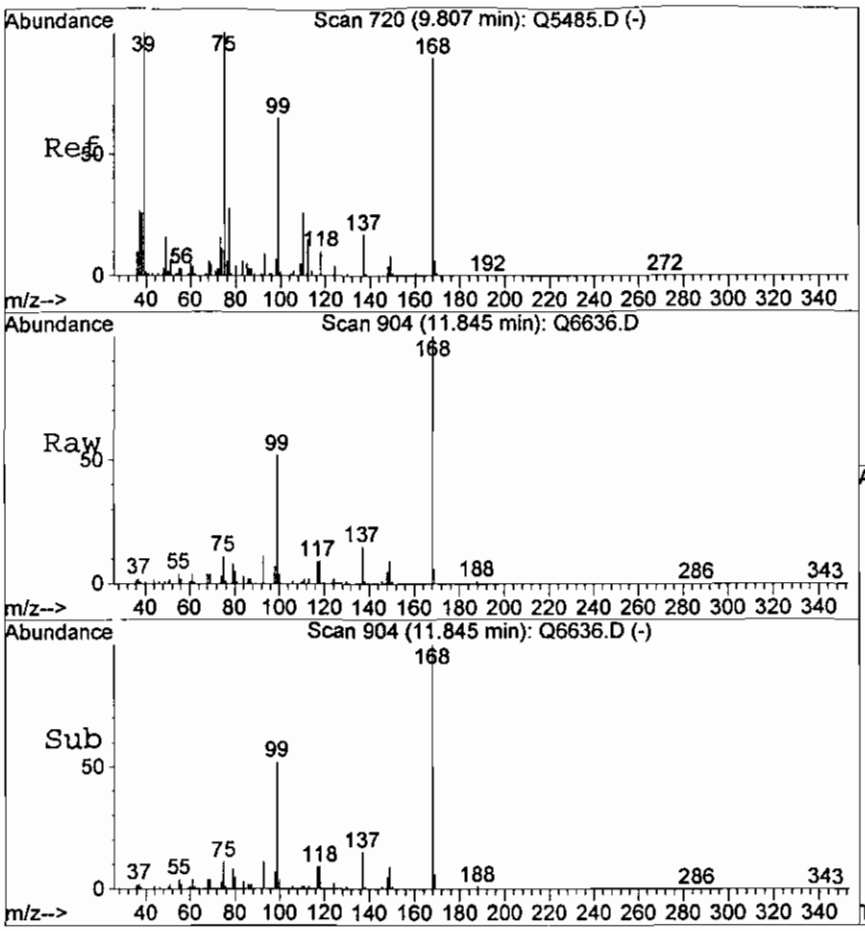
Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6636.D
Acq On : 15 Sep 99 7:27 pm
Sample : WP3906-5
Misc : 5970-Q;
Quant Time: Sep 15 20:00 1999

Vial: 6
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration

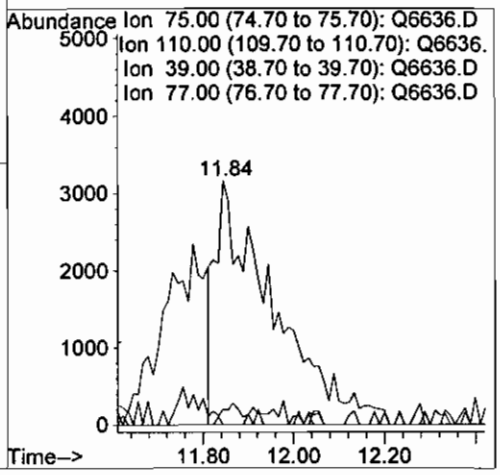


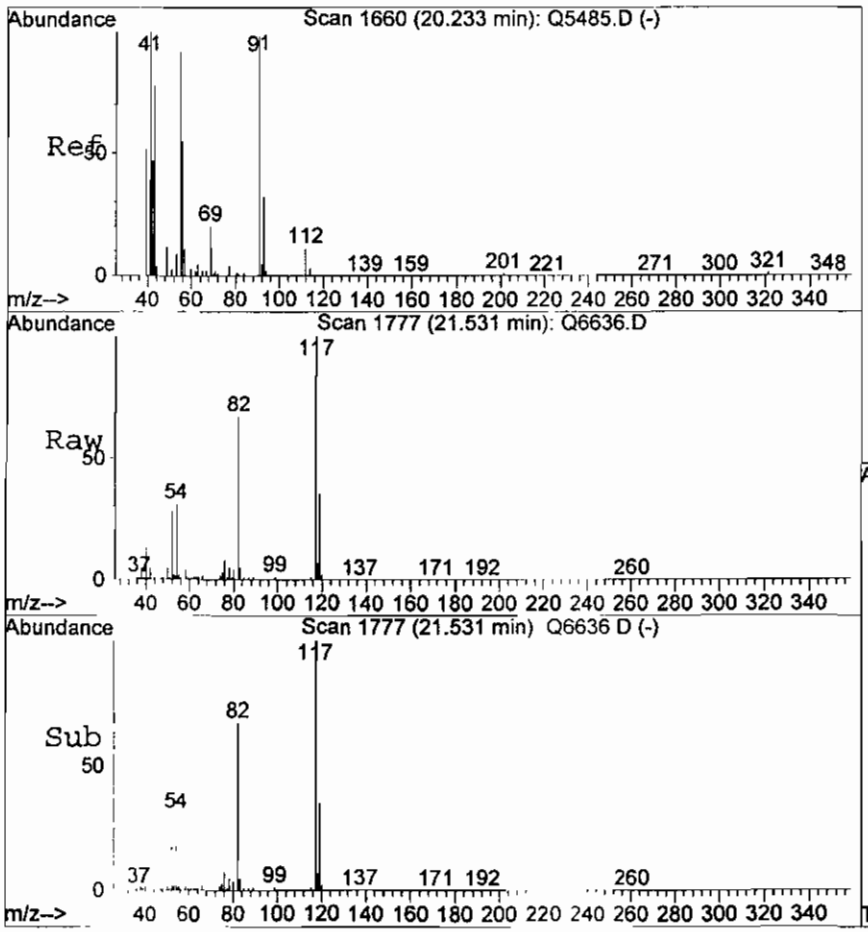


#30
1,1-Dichloropropene
Concen: 3.88 ug/l
RT: 11.84 min Scan# 904
Delta R.T. -0.04 min
Lab File: Q6636.D
Acq: 15 Sep 99 7:27 pm

Tgt Ion:75 Resp: 27722

Ion	Ratio	Lower	Upper
75	100		
110	2.4	20.7	31.1#
39	0.0	64.3	96.5#
77	0.3	22.1	33.1#

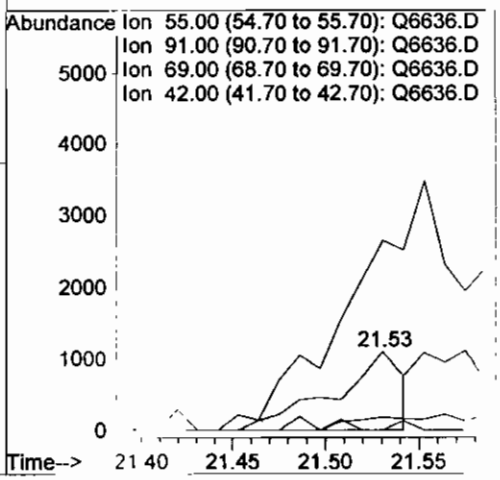


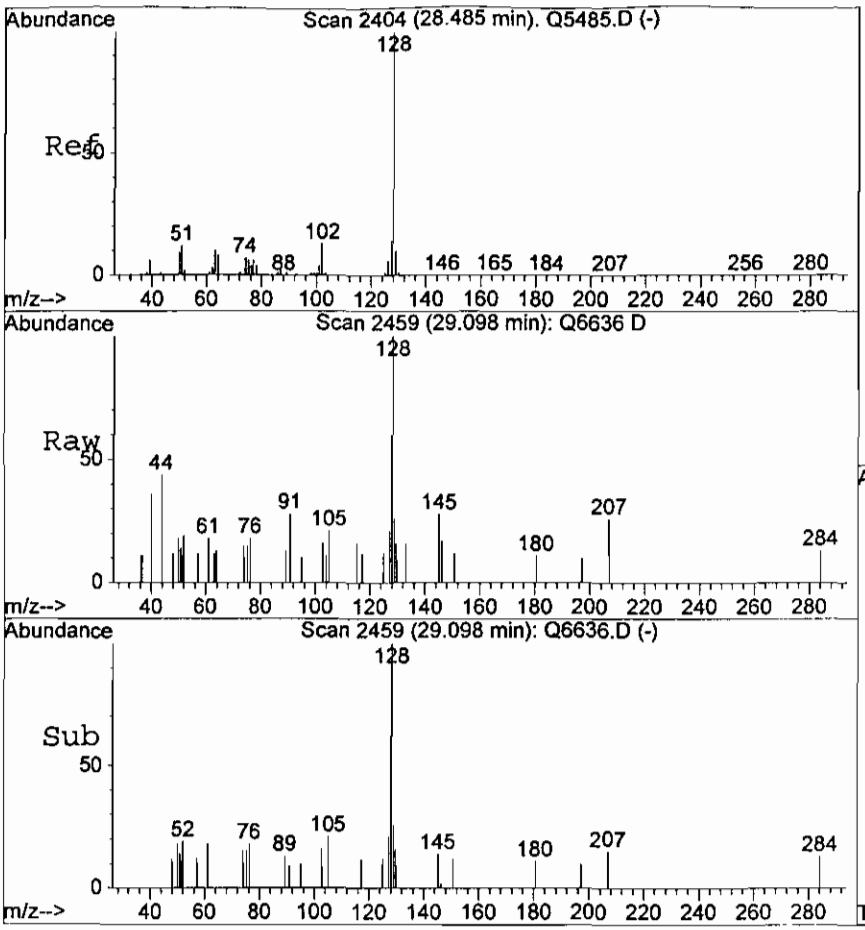


#52
1-ChloroHexane
Concen: 0.69 ug/l
RT: 21.53 min Scan# 1777
Delta R.T. -0.10 min
Lab File: Q6636.D
Acq: 15 Sep 99 7:27 pm

Tgt Ion:55 Resp: 2834

Ion	Ratio	Lower	Upper
55	100		
91	16.3	85.4	128.0#
69	0.0	21.3	31.9#
42	240.6	47.6	71.4#

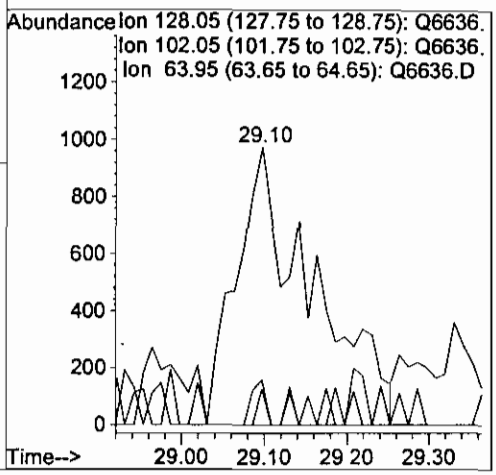




#81
Naphthalene
Concen: 1.35 ug/l
RT: 29.10 min Scan# 2459
Delta R.T. -0.03 min
Lab File: Q6636.D
Acq: 15 Sep 99 7:27 pm

Tgt Ion:128.05 Resp: 6152

Ion	Ratio	Lower	Upper
128	100		
102	16.3	0.0	30.4
64	12.9	0.0	25.1
0	0.0	0.0	0.0



Quantitation Report (Not Reviewed)

Q

Data File : C:\HPCHEM\1\DATA\Q6634.D
Acq On : 15 Sep 99 6:11 pm
Sample : WP3906-3 36GLM0701
Misc : 5970-Q;
Quant Time: Sep 15 18:44 1999

Vial: 4
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0915

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Pentafluorobenzene	11.84	168	489190	50.00 ug/l	0.02
29) 1,4-Difluorobenzene	13.90	114	509923	50.00 ug/l	0.02
47) Chlorobenzene-d5	21.56	117	393507	50.00 ug/l	0.00
60) 1,4-Dichlorobenzene-d4	25.84	152	191867	50.00 ug/l	0.00

System Monitoring Compounds					
27) 1,2-Dichloroethane-d4	12.48	65	202807	42.17 ug/l	0.02
Surrogate Spike 50.000	Range 65 - 135		Recovery = 84.34%		
28) Dibromofluoromethane	11.54	111	309396	47.56 ug/l	0.02
Surrogate Spike 50.000	Range 75 - 129		Recovery = 95.12%		
43) Toluene-d8	18.14	98	488633	49.19 ug/l	0.00
Surrogate Spike 50.000	Range 82 - 120		Recovery = 98.38%		
46) P-Bromofluorobenzene	23.92	95	251649	49.55 ug/l	-0.02
Surrogate Spike 50.000	Range 69 - 125		Recovery = 99.10%		

Target Compounds					Qvalue
9) Acetone	6.30	43	1848	1.69 ug/l # NM	92
22) 2-Butanone	10.45	43	881	0.60 ug/l #	83
25) Chloroform	11.09	83	7263	0.91 ug/l	86
30) 1,1-Dichloropropene	11.86	75	23416	3.25 ug/l # NM	26
79) 1,2,4-Trichlorobenzene	28.74	180	2268	0.55 ug/l #	53
80) Hexachlorobutadiene	28.88	225	1531	0.59 ug/l #	44
81) Naphthalene	29.10	128	4048	0.88 ug/l	90
82) 1,2,3-Trichlorobenzene	29.49	180	2488	0.70 ug/l	88

JA 09/16/9

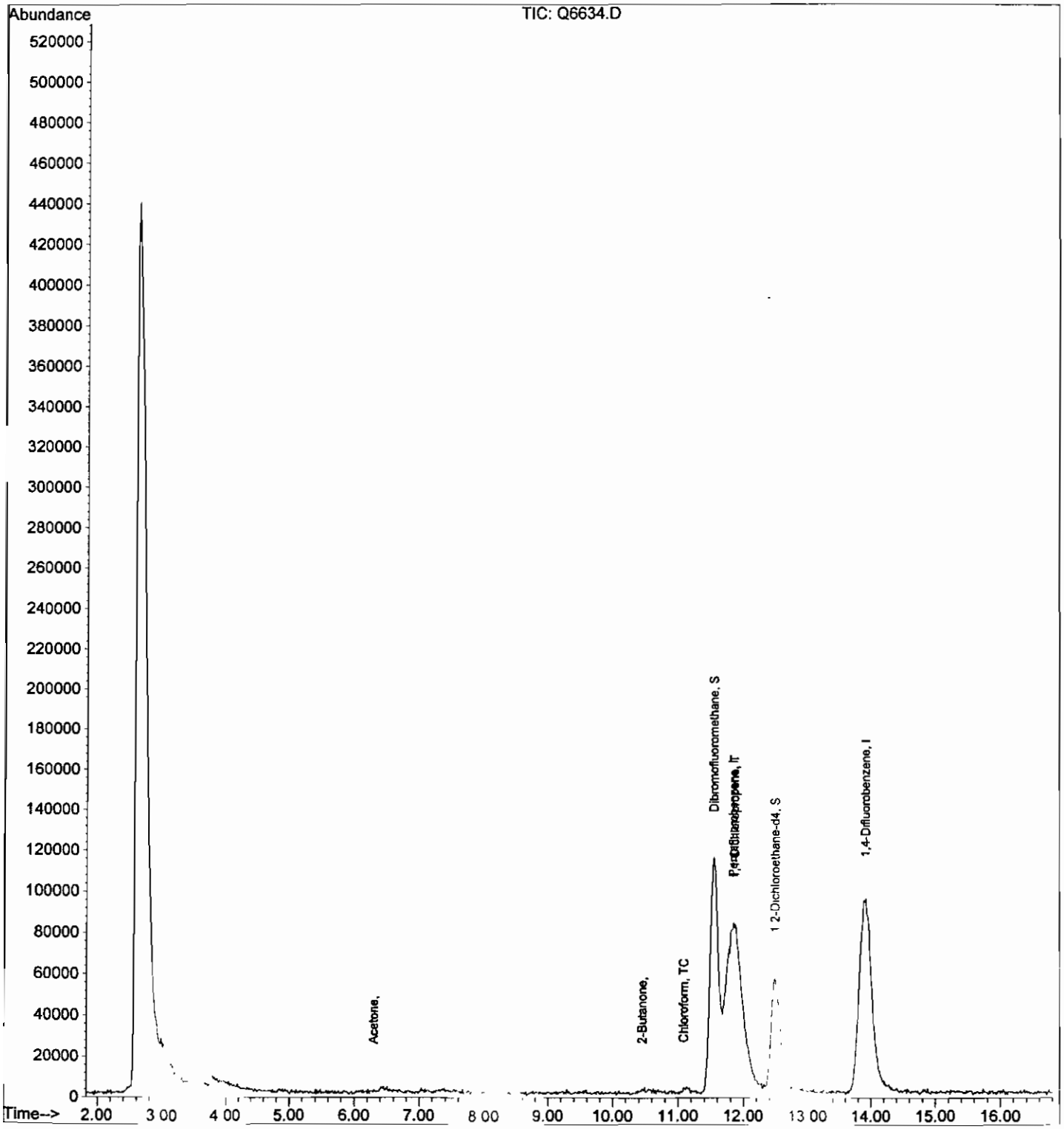
(#) = qualifier out of range (m) = manual integration

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6634.D
Acq On : 15 Sep 99 6:11 pm
Sample : WP3906-3
Misc : 5970-Q;
Quant Time: Sep 15 18:44 1999

Vial: 4
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration



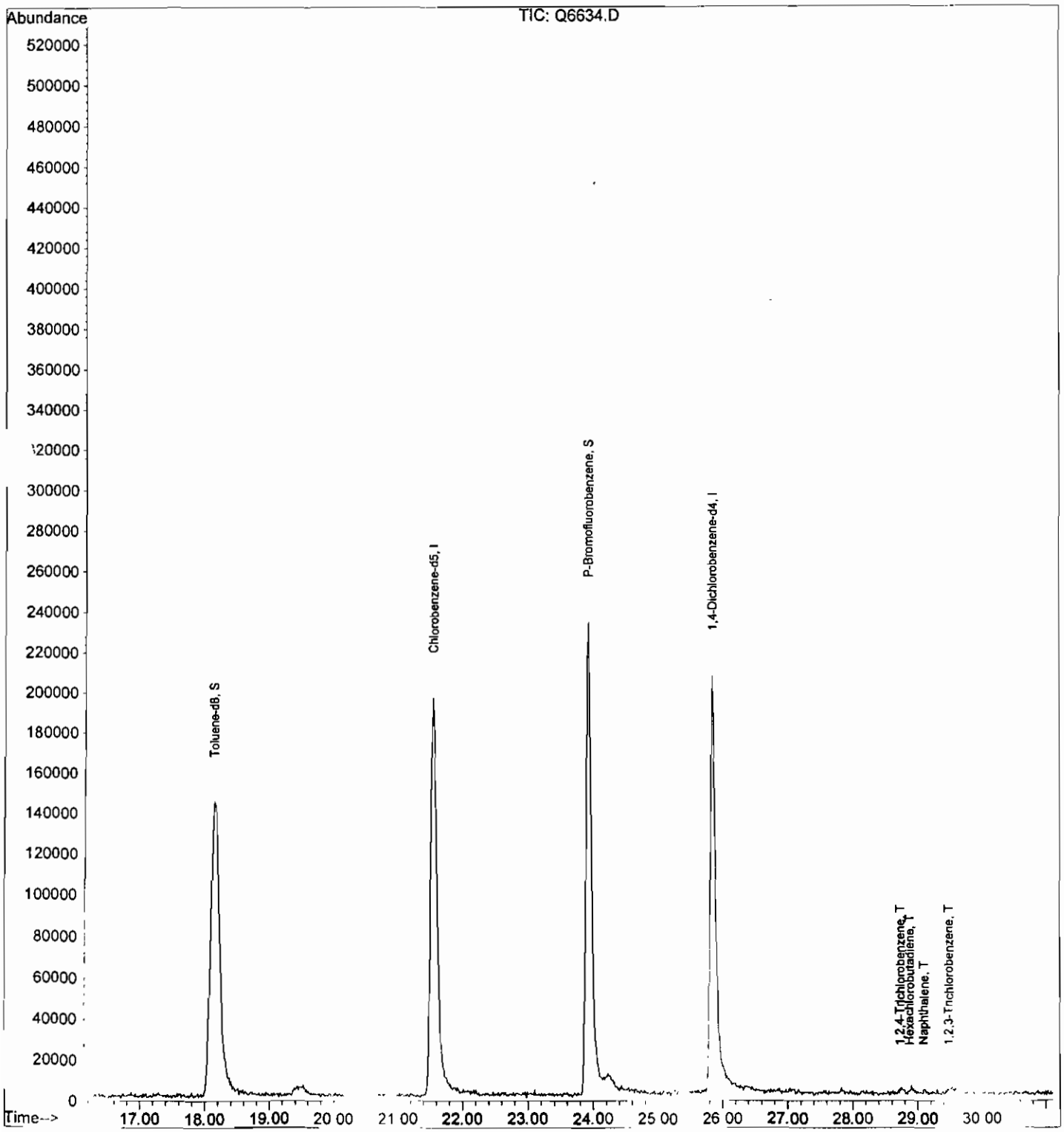
1-195

Quantitation Report

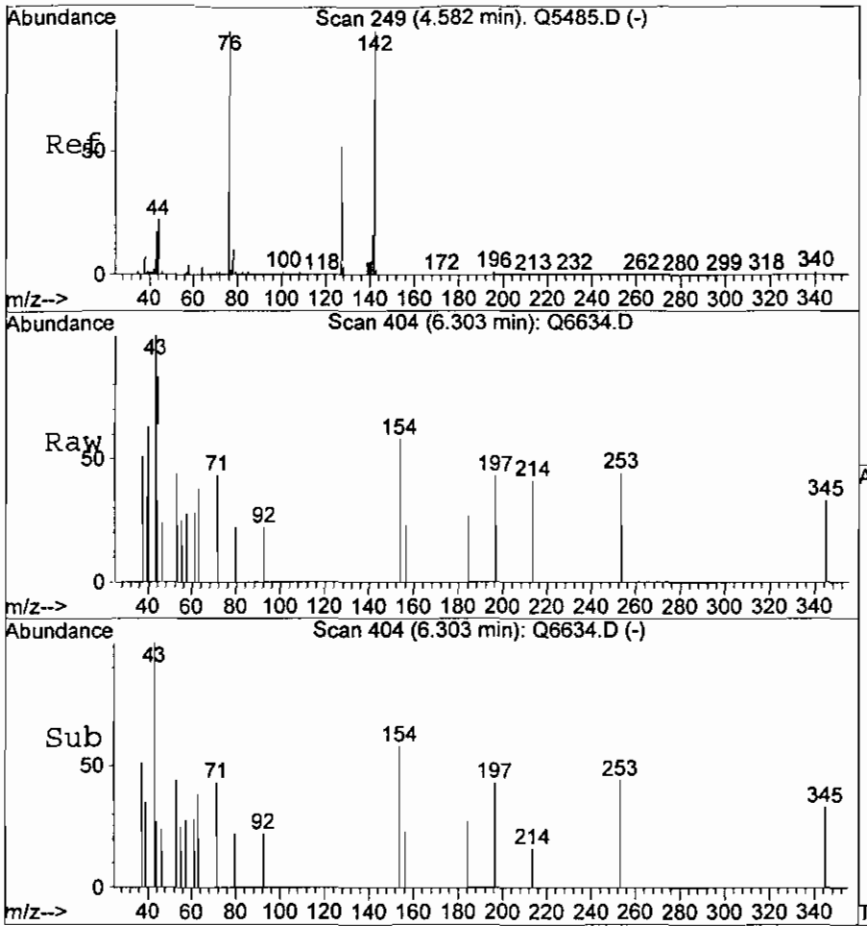
Data File : C:\HPCHEM\1\DATA\Q6634.D
Acq On : 15 Sep 99 6:11 pm
Sample : WP3906-3
Misc : 5970-Q;
Quant Time: Sep 15 18:44 1999

Vial: 4
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0915.RES

Method : C:\HPCHEM\1\METHODS\Q82W0915.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration



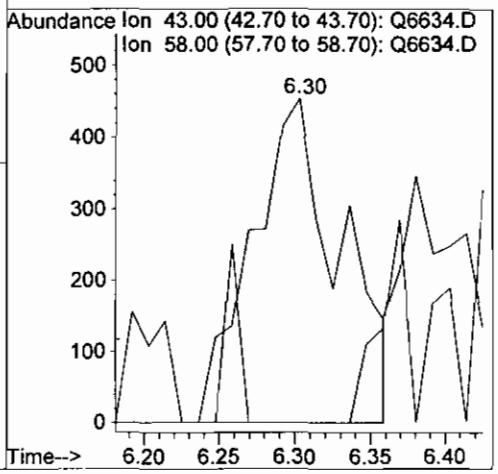
1-196

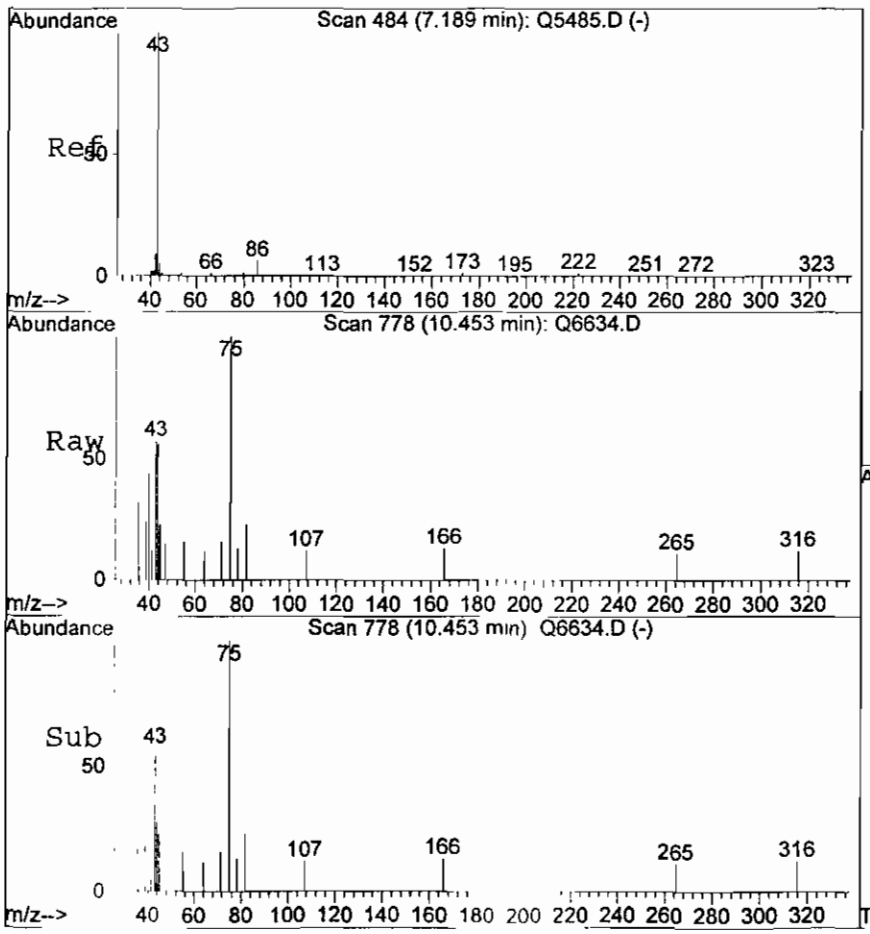


#9
Acetone
Concen: 1.69 ug/l
RT: 6.30 min Scan# 404
Delta R.T. -0.02 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:43 Resp: 1848

Ion	Ratio	Lower	Upper
43	100		
58	9.0	9.8	14.8#
0	0.0	0.0	0.0
0	0.0	0.0	0.0

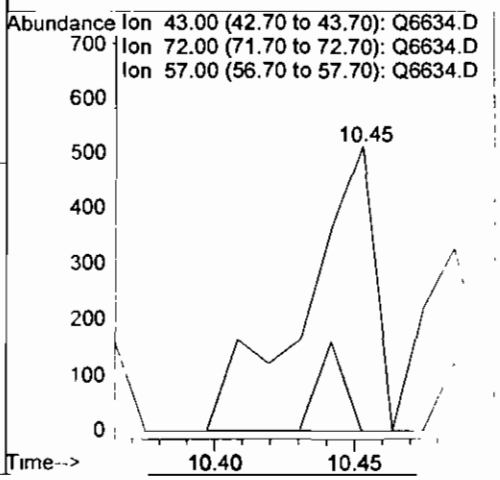


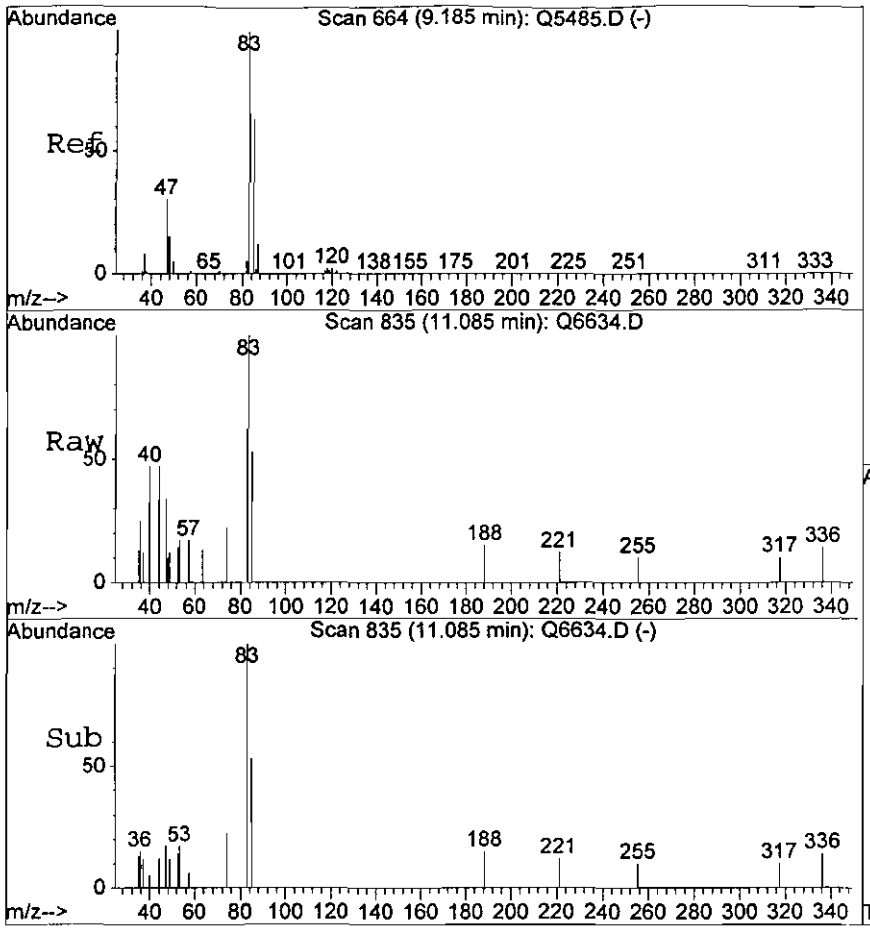


#22
2-Butanone
Concen: 0.60 ug/l
RT: 10.45 min Scan# 778
Delta R.T. 0.02 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:43 Resp: 881

Ion	Ratio	Lower	Upper
43	100		
72	12.1	4.6	6.8#
57	0.0	3.6	5.4#
0	0.0	0.0	0.0

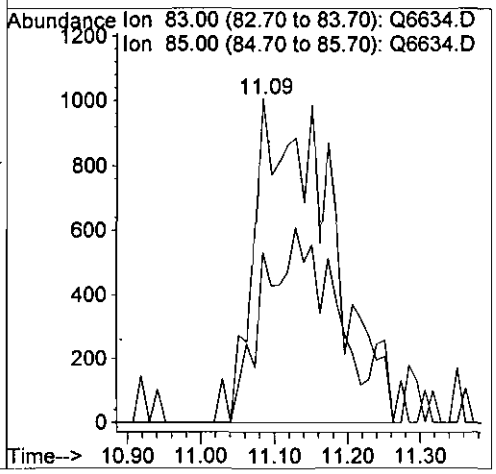


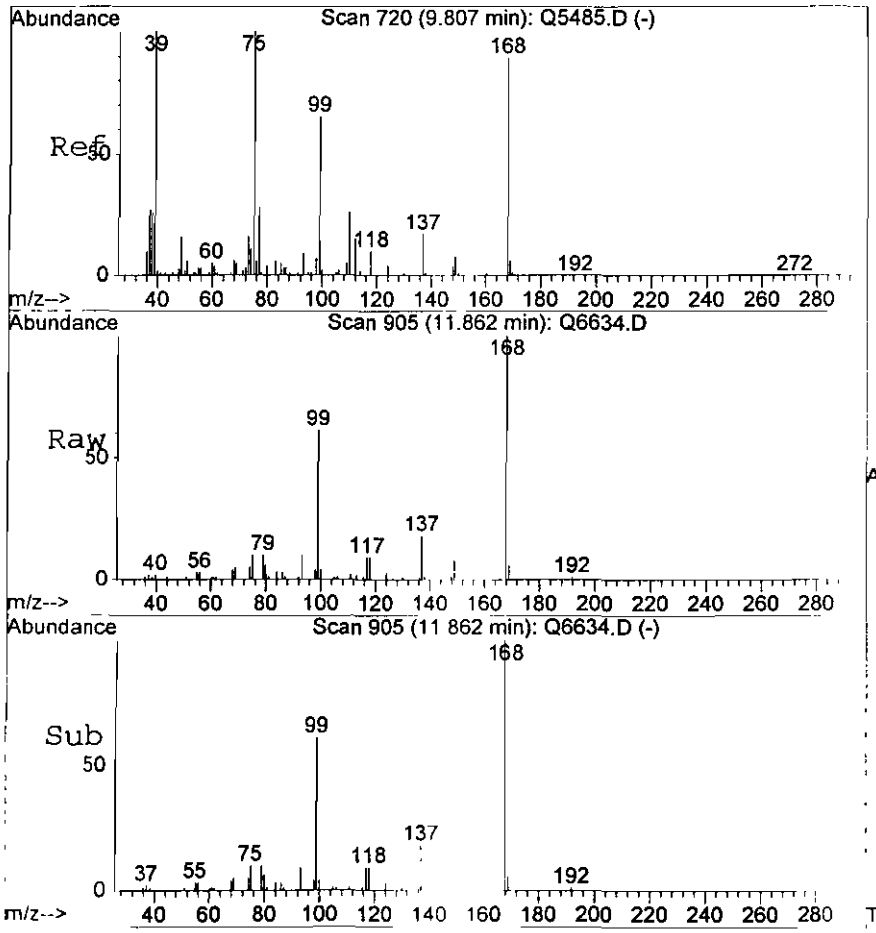


#25
Chloroform
Concen: 0.91 ug/l
RT: 11.09 min Scan# 835
Delta R.T. -0.04 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:83 Resp: 7263

Ion	Ratio	Lower	Upper
83	100		
85	53.0	43.7	83.7
0	0.0	0.0	0.0
0	0.0	0.0	0.0

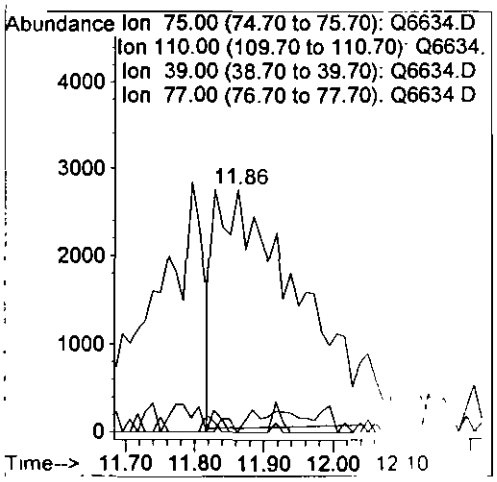




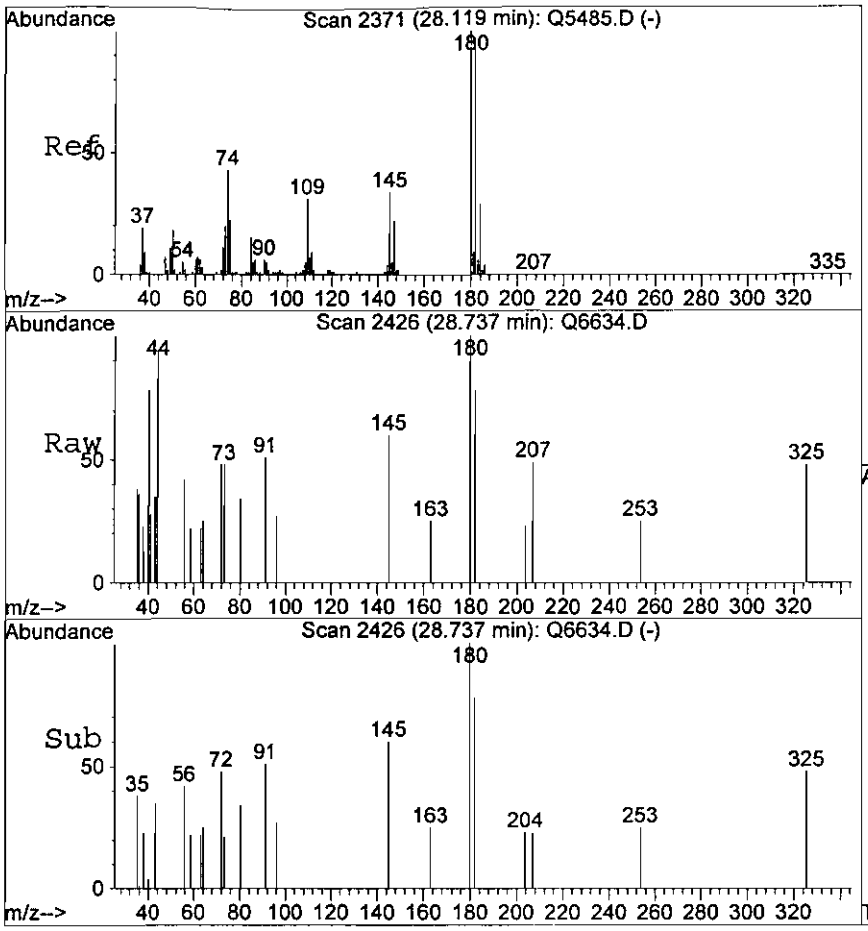
#30
1,1-Dichloropropene
Concen: 3.25 ug/l
RT: 11.86 min Scan# 905
Delta R.T. -0.03 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:75 Resp: 23416

Ion	Ratio	Lower	Upper
75	100		
110	2.1	20.7	31.1#
39	0.0	64.3	96.5#
77	0.0	22.1	33.1#



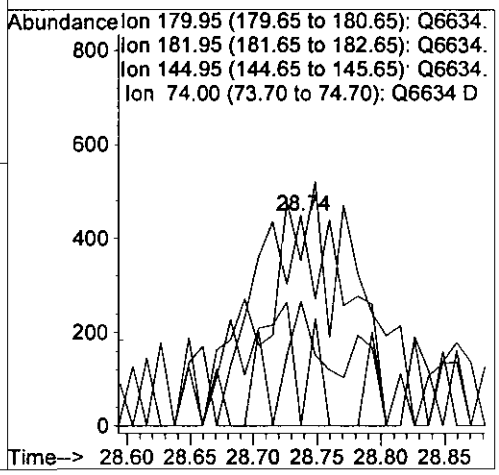
1-198

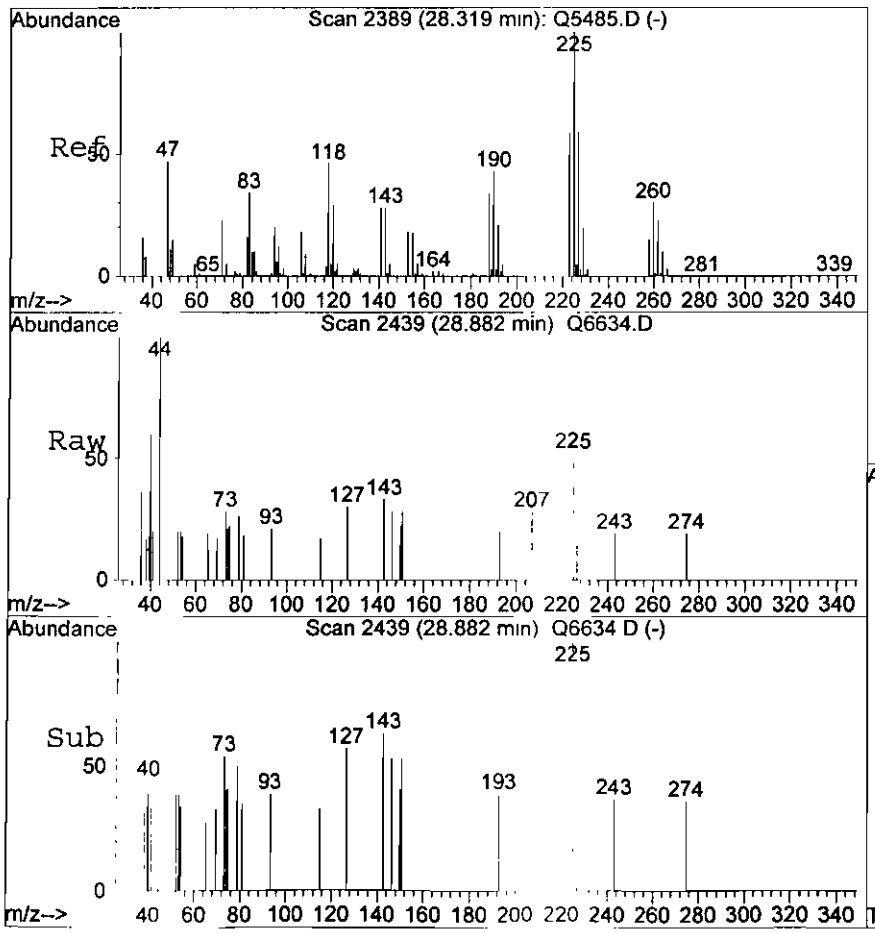


#79
1,2,4-Trichlorobenzene
Concen: 0.55 ug/l
RT: 28.74 min Scan# 2426
Delta R.T. -0.03 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:179.95 Resp: 2268

Ion	Ratio	Lower	Upper
180	100		
182	42.0	73.1	113.1#
145	34.6	7.2	47.2
74	0.0	10.3	50.3#

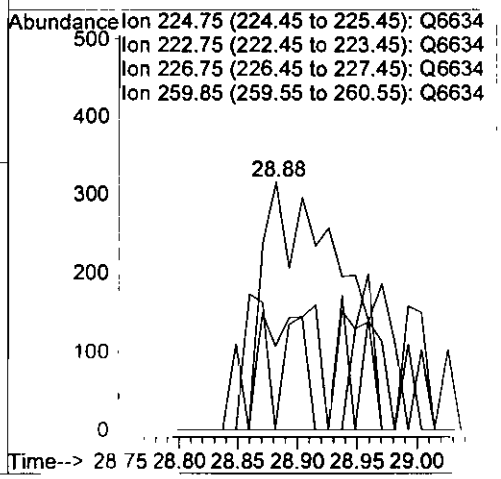


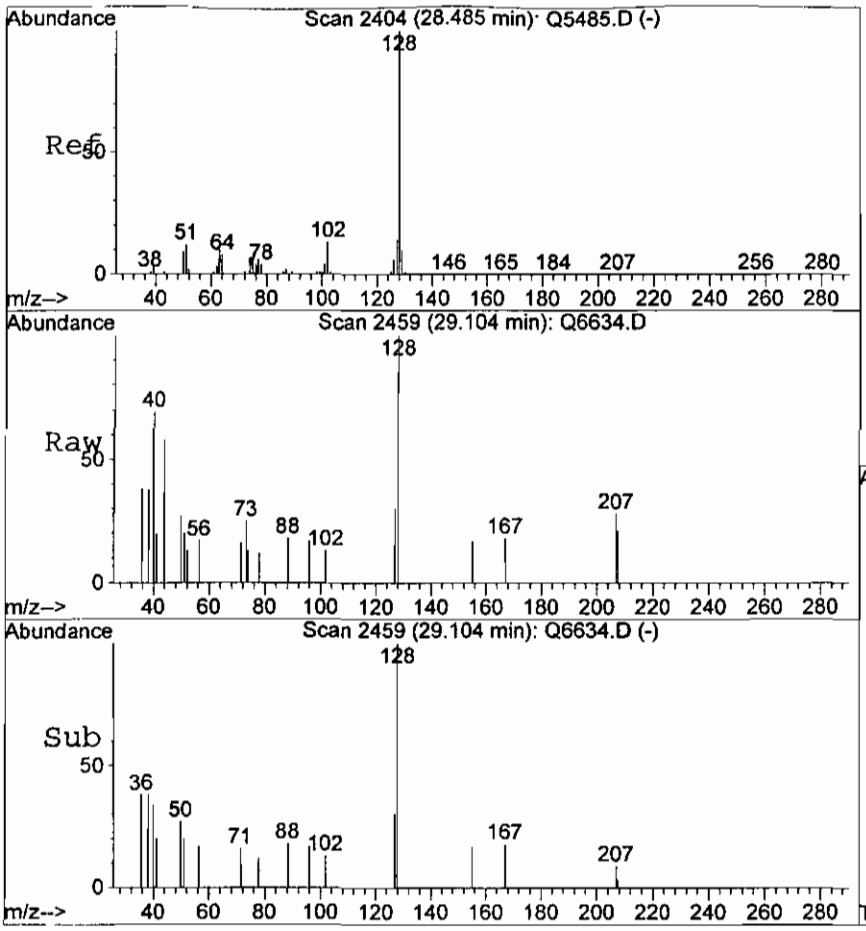


#80
Hexachlorobutadiene
Concen: 0.59 ug/l
RT: 28.88 min Scan# 2439
Delta R.T. -0.05 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:224.75 Resp: 1531

Ion	Ratio	Lower	Upper
225	100		
223	0.0	37.1	77.1#
227	33.9	40.6	80.6#
260	0.0	12.3	52.3#

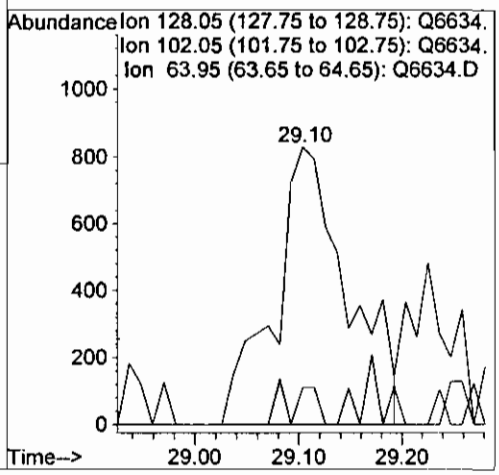


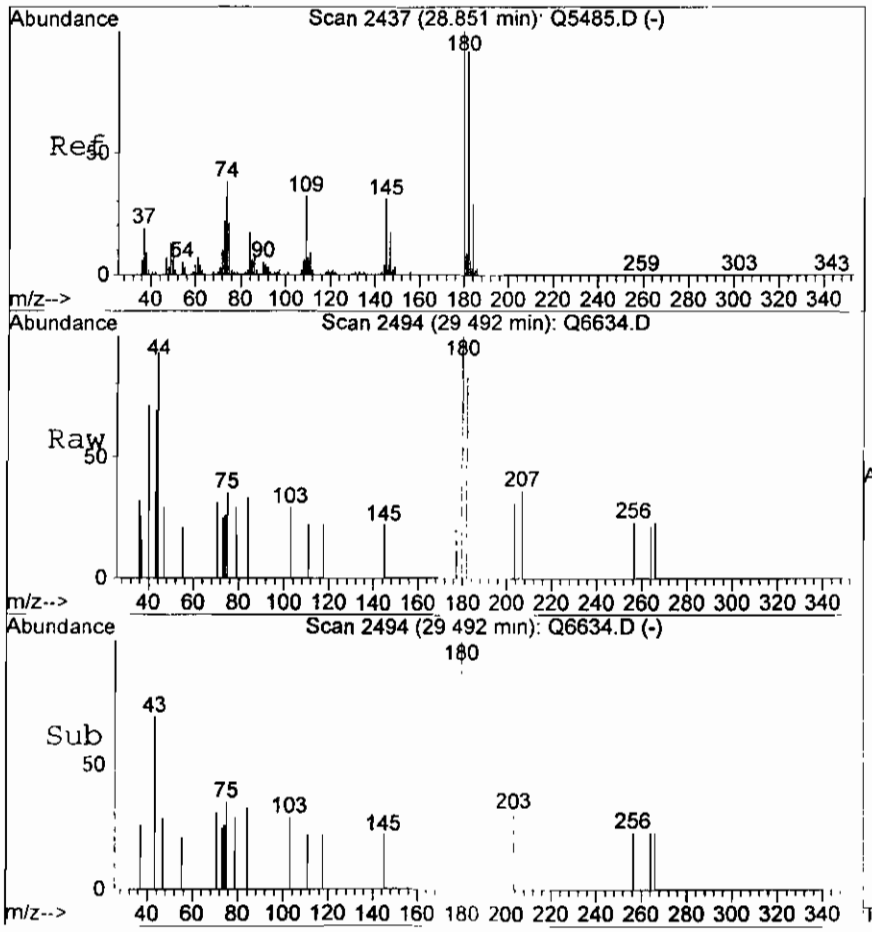


#81
Naphthalene
Concen: 0.88 ug/l
RT: 29.10 min Scan# 2459
Delta R.T. -0.03 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:128.05 Resp: 4048

Ion	Ratio	Lower	Upper
128	100		
102	13.4	0.0	30.4
64	0.0	0.0	25.1
0	0.0	0.0	0.0

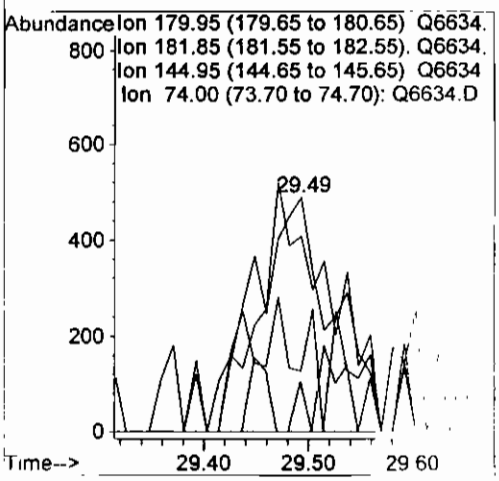




#82
1,2,3-Trichlorobenzene
Concen: 0.70 ug/l
RT: 29.49 min Scan# 2494
Delta R.T. -0.00 min
Lab File: Q6634.D
Acq: 15 Sep 99 6:11 pm

Tgt Ion:179.95 Resp: 2488

Ion	Ratio	Lower	Upper
180	100		
182	83.4	70.5	110.5
145	21.7	14.4	54.4
74	26.2	14.5	54.5



Quantitation Report (Not Reviewed)

Data File : C:\HPCHEM\1\DATA\Q6681.D
Acq On : 17 Sep 99 5:40 pm
Sample : WP3906-28 36GLMØ6Ø1
Misc : 5970-Q;
Quant Time: Sep 17 18:13 1999

Vial: 13
Operator: KMC
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0917.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0917.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0917

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Pentafluorobenzene	11.91	168	471704	50.00 ug/l	0.09
29) 1,4-Difluorobenzene	13.96	114	480130	50.00 ug/l	0.07
47) Chlorobenzene-d5	21.59	117	368073	50.00 ug/l	0.03
60) 1,4-Dichlorobenzene-d4	25.83	152	150188	50.00 ug/l	-0.02
System Monitoring Compounds					
27) 1,2-Dichloroethane-d4	12.51	65	184495	39.78 ug/l	0.05
Surrogate Spike 50.000	Range 65 - 135		Recovery = 79.56%		
28) Dibromofluoromethane	11.56	111	284153	45.30 ug/l	0.04
Surrogate Spike 50.000	Range 75 - 129		Recovery = 90.60%		
43) Toluene-d8	18.17	98	445906	47.68 ug/l	0.04
Surrogate Spike 50.000	Range 82 - 120		Recovery = 95.36%		
46) P-Bromofluorobenzene	23.94	95	211020	44.13 ug/l	0.00
Surrogate Spike 50.000	Range 69 - 125		Recovery = 88.26%		

Target Compounds					Qvalue
30) 1,1-Dichloropropene	11.90	75	19244	2.84 ug/l # NM	25
~~52) 1-ChloroHexane~~	~~21.62~~	~~55~~	~~5033~~	~~1.32 ug/l # NM~~	~~1~~

Boazon

(#) = qualifier out of range (m) = manual integration

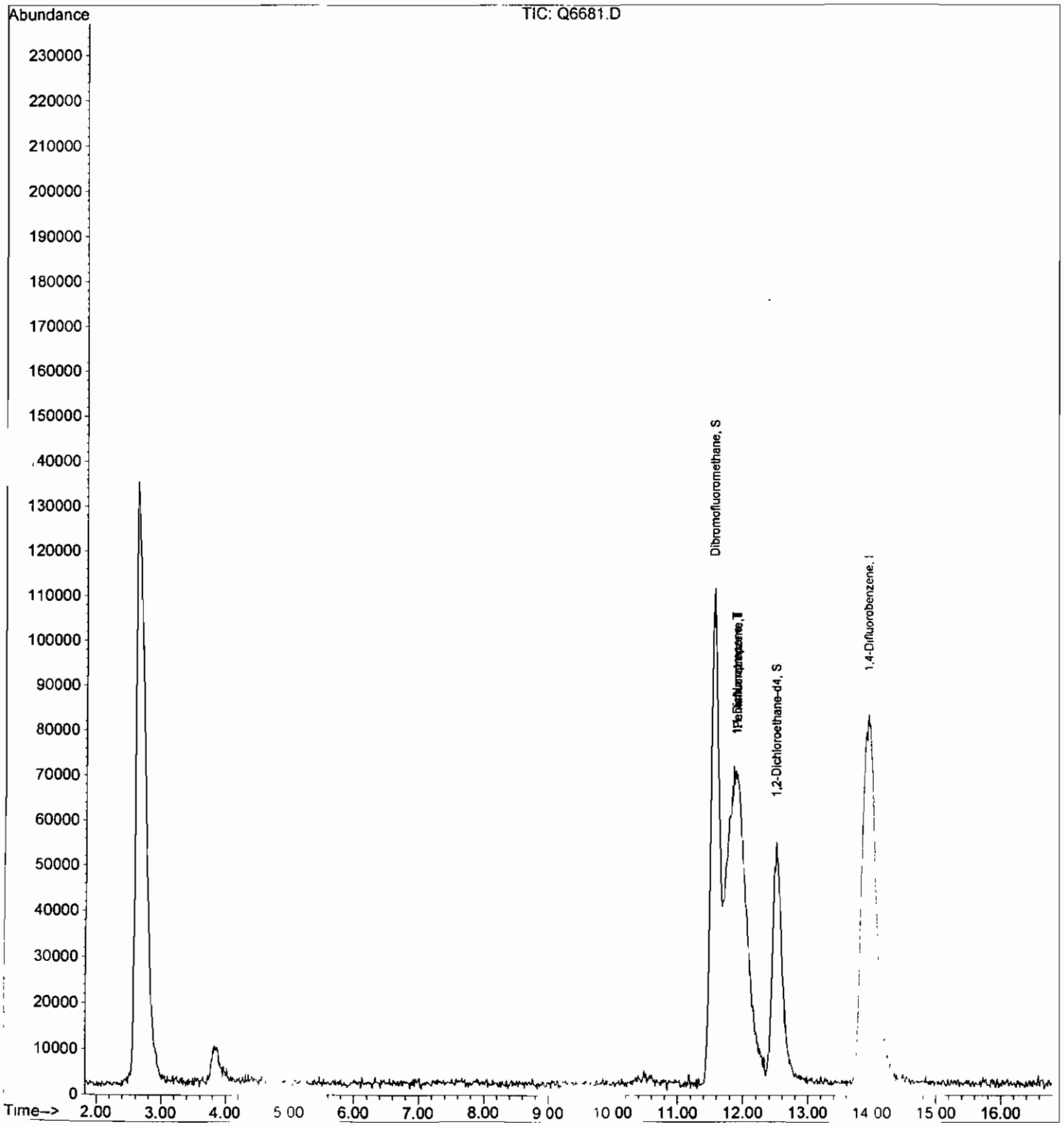
1-2021

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6681.D
Acq On : 17 Sep 99 5:40 pm
Sample : WP3906-28
Misc : 5970-Q;
Quant Time: Sep 17 18:13 1999

Vial: 13
Operator: KMC
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0917.RES

Method : C:\HPCHEM\1\METHODS\Q82W0917.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration



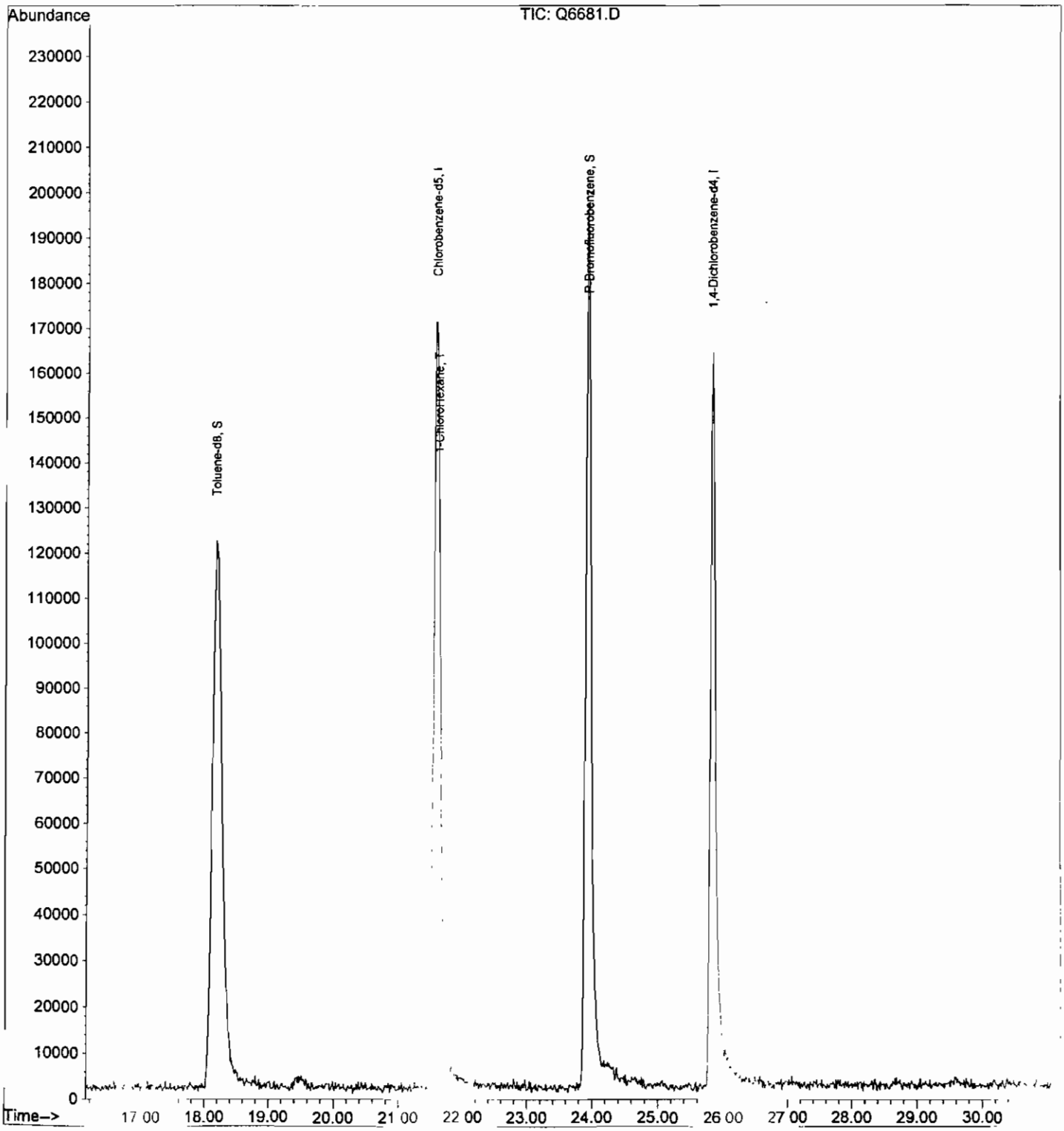
1-202

Quantitation Report

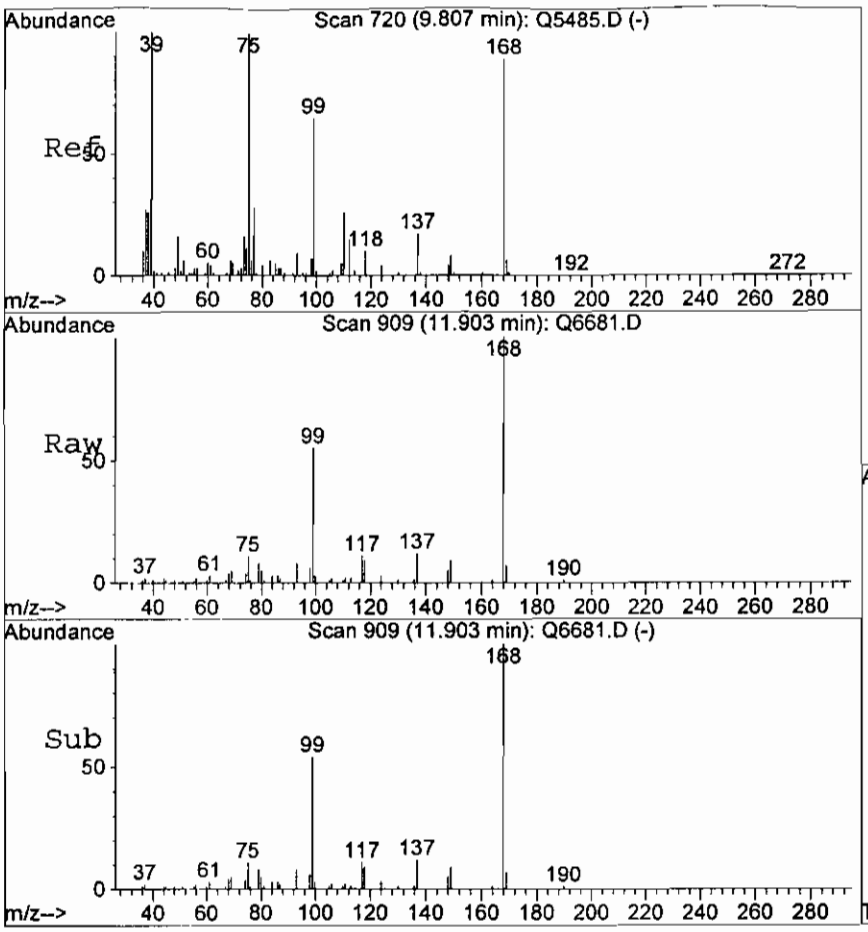
Data File : C:\HPCHEM\1\DATA\Q6681.D
Acq On : 17 Sep 99 5:40 pm
Sample : WP3906-28
Misc : 5970-Q;
Quant Time: Sep 17 18:13 1999

Vial: 13
Operator: KMC
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0917.RES

Method : C:\HPCHEM\1\METHODS\Q82W0917.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Sep 15 14:29:57 1999
Response via : Multiple Level Calibration



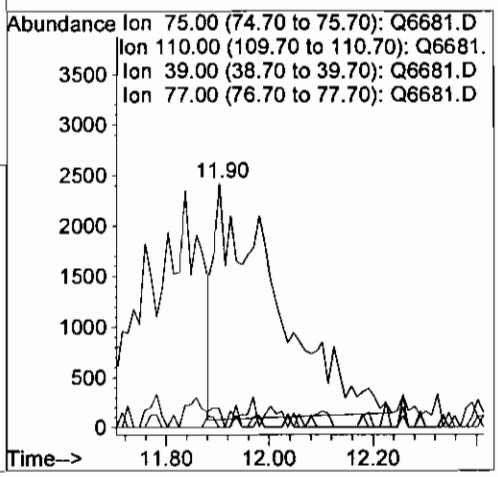
1-203

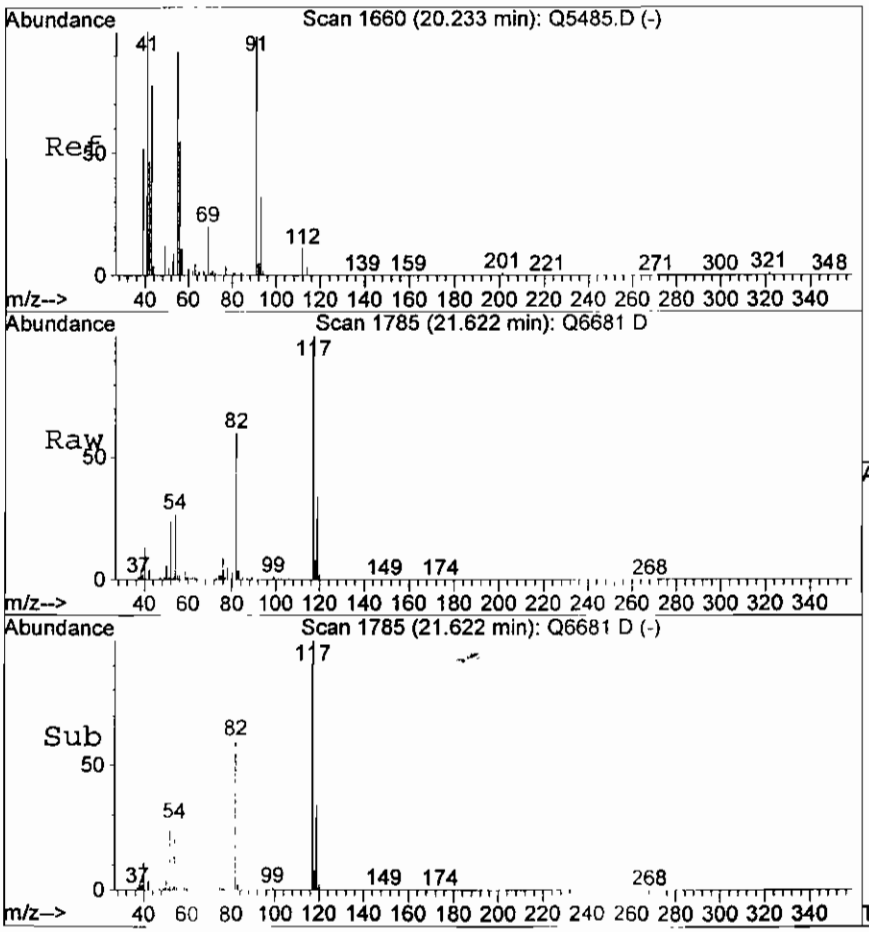


#30
1,1-Dichloropropene
Concen: 2.84 ug/l
RT: 11.90 min Scan# 909
Delta R.T. 0.01 min
Lab File: Q6681.D
Acq: 17 Sep 99 5:40 pm

Tgt Ion:75 Resp: 19244

Ion	Ratio	Lower	Upper
75	100		
110	0.0	20.7	31.1#
39	0.8	64.3	96.5#
77	0.0	22.1	33.1#

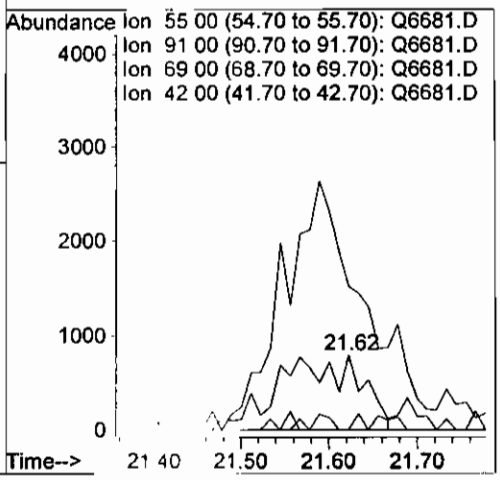




#52
1-ChloroHexane
Concen: 1.32 ug/l
RT: 21.62 min Scan# 1785
Delta R.T. -0.01 min
Lab File: Q6681.D
Acq: 17 Sep 99 5:40 pm

Tgt Ion:55 Resp: 5033

Ion	Ratio	Lower	Upper
55	100		
91	0.0	85.4	128.0#
69	0.0	21.3	31.9#
42	191.6	47.6	71.4#



Quantitation Report (Not Reviewed)

Data File : C:\HPCHEM\1\DATA\Q6423.D
Acq On : 21 Aug 99 2:39 pm
Sample : WP3647-6 36GL680-004
Misc : 5970-Q;
Quant Time: Aug 21 15:12 1999

Vial: 7
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0821.RES

Quant Method : C:\HPCHEM\1\METHODS\Q82W0821.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Aug 18 14:18:02 1999
Response via : Initial Calibration
DataAcq Meth : Q82W0821

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Pentafluorobenzene	10.07	168	939625	50.00 ug/l	0.00
29) 1,4-Difluorobenzene	11.78	114	954323	50.00 ug/l	-0.03
47) Chlorobenzene-d5	20.37	117	751737	50.00 ug/l	-0.04
60) 1,4-Dichlorobenzene-d4	25.16	152	463801	50.00 ug/l	-0.03
System Monitoring Compounds					
27) 1,2-Dichloroethane-d4	10.64	65	410222	45.07 ug/l	-0.04
Surrogate Spike 50.000	Range 65 - 135		Recovery = 90.14%		
28) Dibromofluoromethane	9.84	111	636212	47.30 ug/l	-0.04
Surrogate Spike 50.000	Range 75 - 129		Recovery = 94.60%		
43) Toluene-d8	16.48	98	965740	52.11 ug/l	-0.04
Surrogate Spike 50.000	Range 82 - 120		Recovery = 104.22%		
46) P-Bromofluorobenzene	23.06	95	533322	50.66 ug/l	-0.03
Surrogate Spike 50.000	Range 69 - 125		Recovery = 101.32%		

rget Compounds					Qvalue
3) Chloromethane	2.47	50	3988	0.57 ug/l	91
5) Vinyl Chloride	2.57	62	5476	0.79 ug/l	65
6) Chloroethane	3.28	64	7909	2.30 ug/l NM	73
9) Acetone	4.84	43	2903	1.54 ug/l NM	94
11) Acrolein	4.39	56	1120	2.25 ug/L NM	90
12) Acrylonitrile	6.53	53	517	0.55 ug/l #	1
20) 1,2-Dichloroethene (cis)	8.73	96	6189	0.83 ug/l #	47
24) Tetrahydrofuran	9.15	42	1382	0.80 ug/l	89
30) 1,1-Dichloropropene	10.04	75	80151	5.32 ug/l # NM	23

(#) = qualifier out of range (m) = manual integration

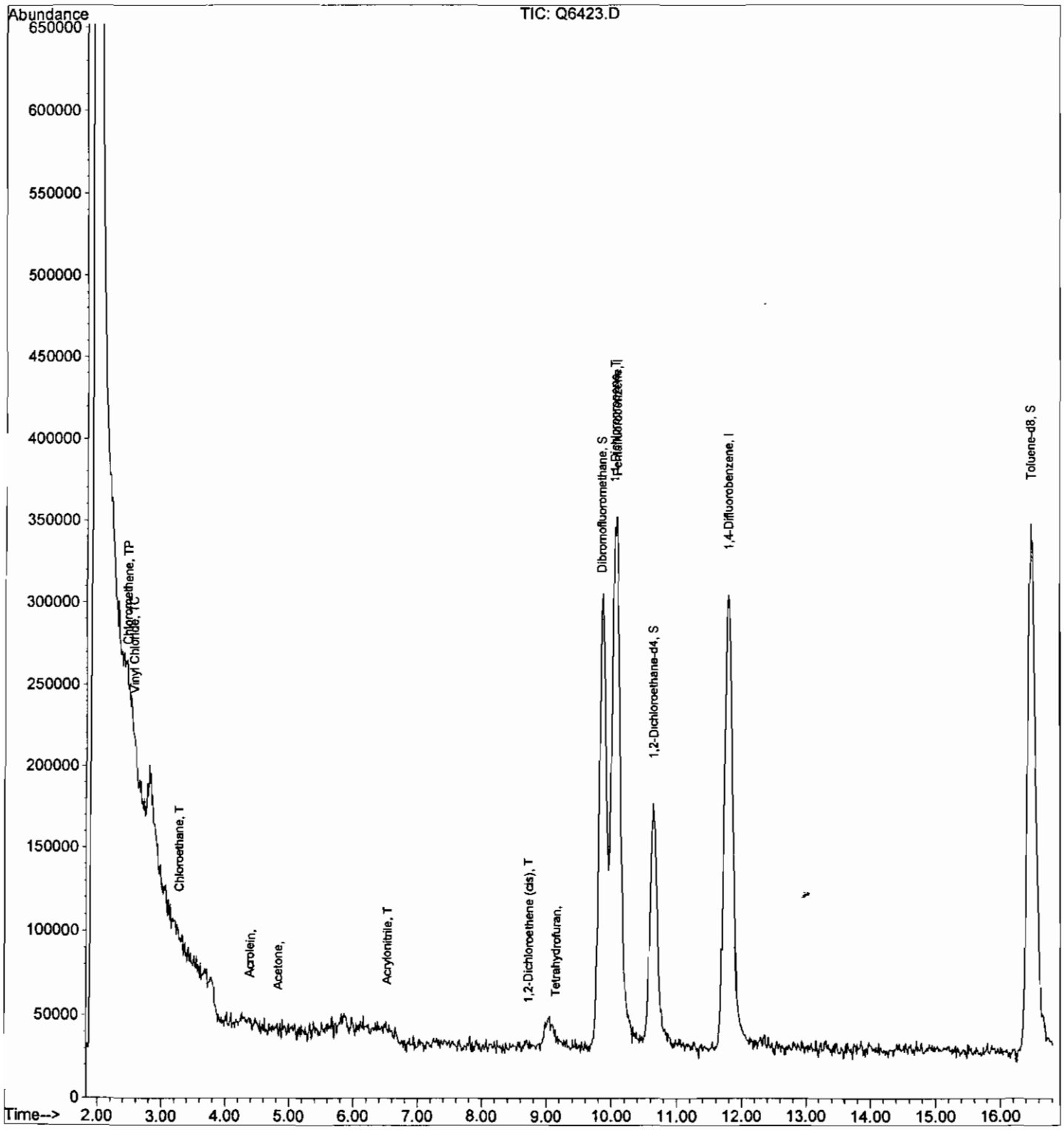
1-205

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6423.D
Acq On : 21 Aug 99 2:39 pm
Sample : WP3647-6
Misc : 5970-Q;
Quant Time: Aug 21 15:12 1999

Vial: 7
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0821.RES

Method : C:\HPCHEM\1\METHODS\Q82W0821.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Aug 18 14:18:02 1999
Response via : Multiple Level Calibration



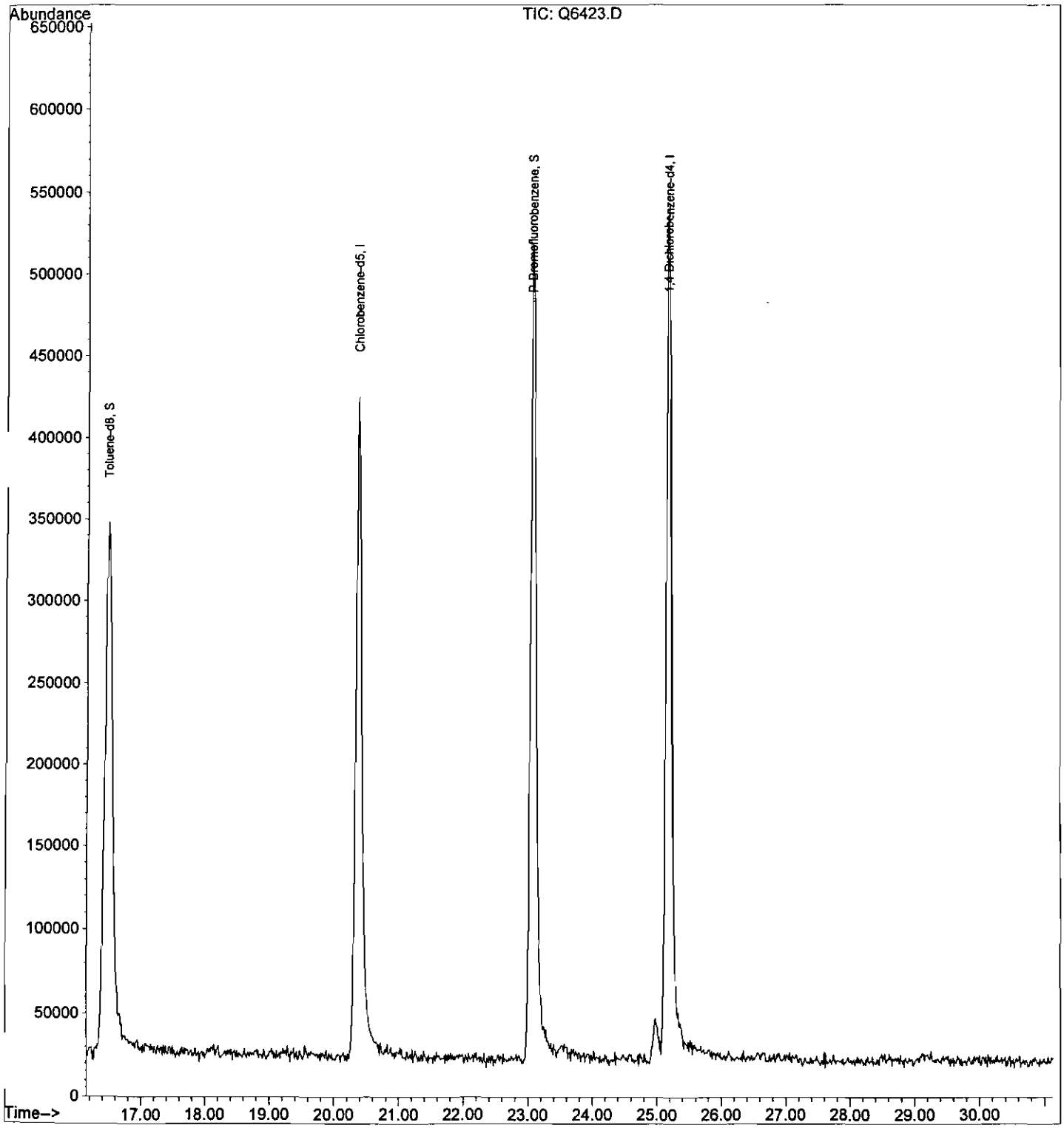
1.206

Quantitation Report

Data File : C:\HPCHEM\1\DATA\Q6423.D
Acq On : 21 Aug 99 2:39 pm
Sample : WP3647-6
Misc : 5970-Q;
Quant Time: Aug 21 15:12 1999

Vial: 7
Operator: HMP
Inst : GC/MS Ins
Multiplr: 1.00
Quant Results File: Q82W0821.RES

Method : C:\HPCHEM\1\METHODS\Q82W0821.M
Title : VOA 8260 + Acrylonitrile AQ Calibration
Last Update : Wed Aug 18 14:18:02 1999
Response via : Multiple Level Calibration



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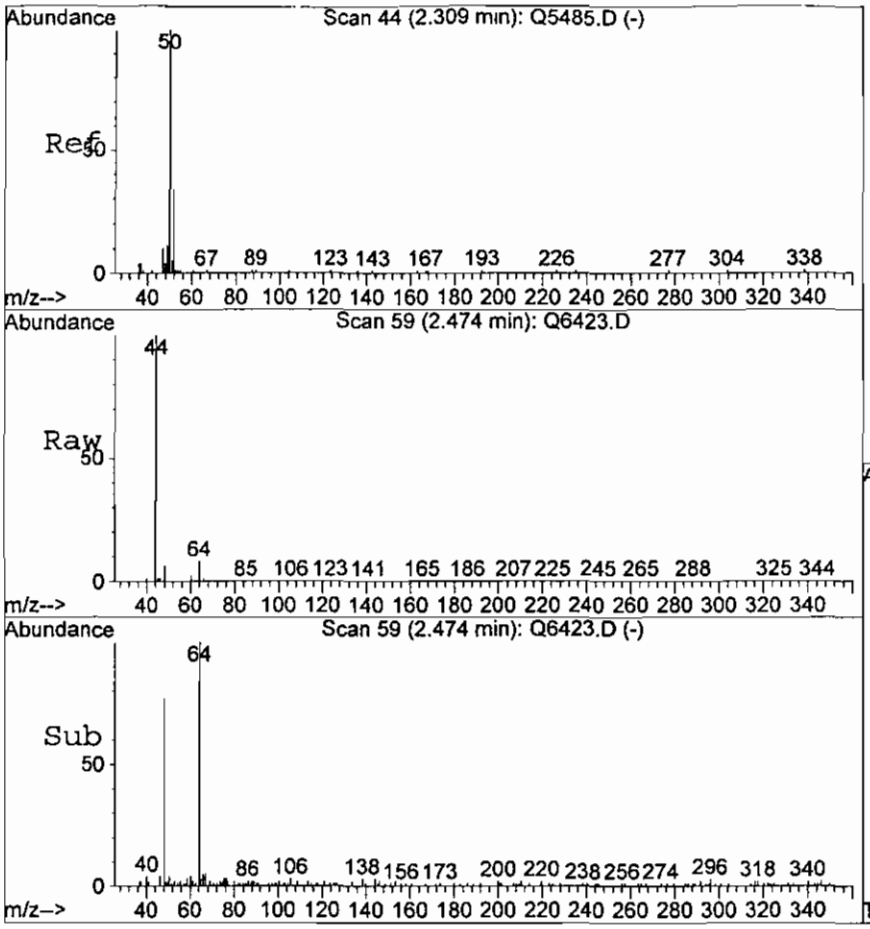
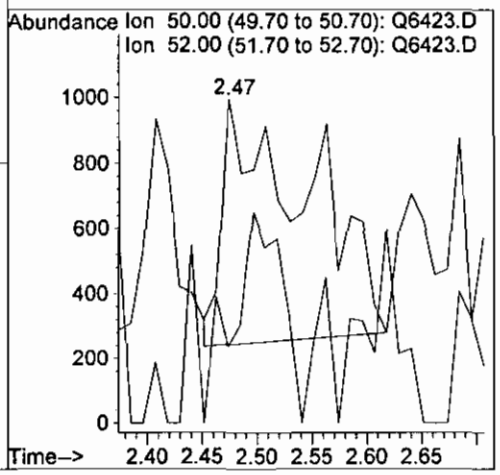
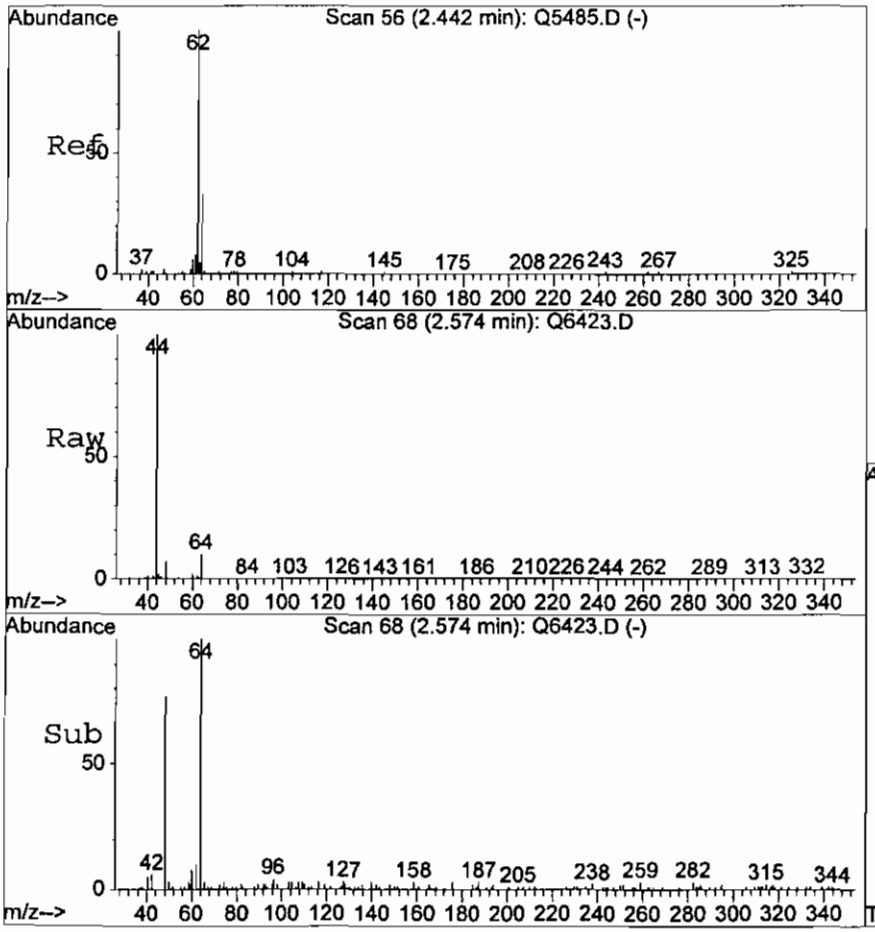


#3
Chloromethane
Concen: 0.57 ug/l
RT: 2.47 min Scan# 59
Delta R.T. 0.02 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:50 Resp: 3988

Ion	Ratio	Lower	Upper
50	100		
52	33.4	8.7	48.7
0	0.0	0.0	0.0
0	0.0	0.0	0.0

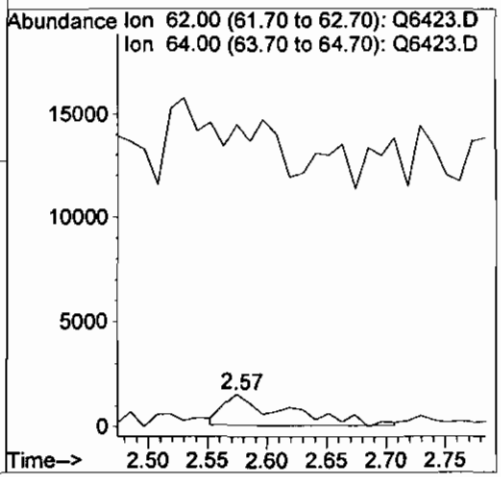




#5
Vinyl Chloride
Concen: 0.79 ug/l
RT: 2.57 min Scan# 68
Delta R.T. -0.00 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:62 Resp: 5476

Ion	Ratio	Lower	Upper
62	100		
64	48.5	9.4	49.4
0	0.0	0.0	0.0
0	0.0	0.0	0.0



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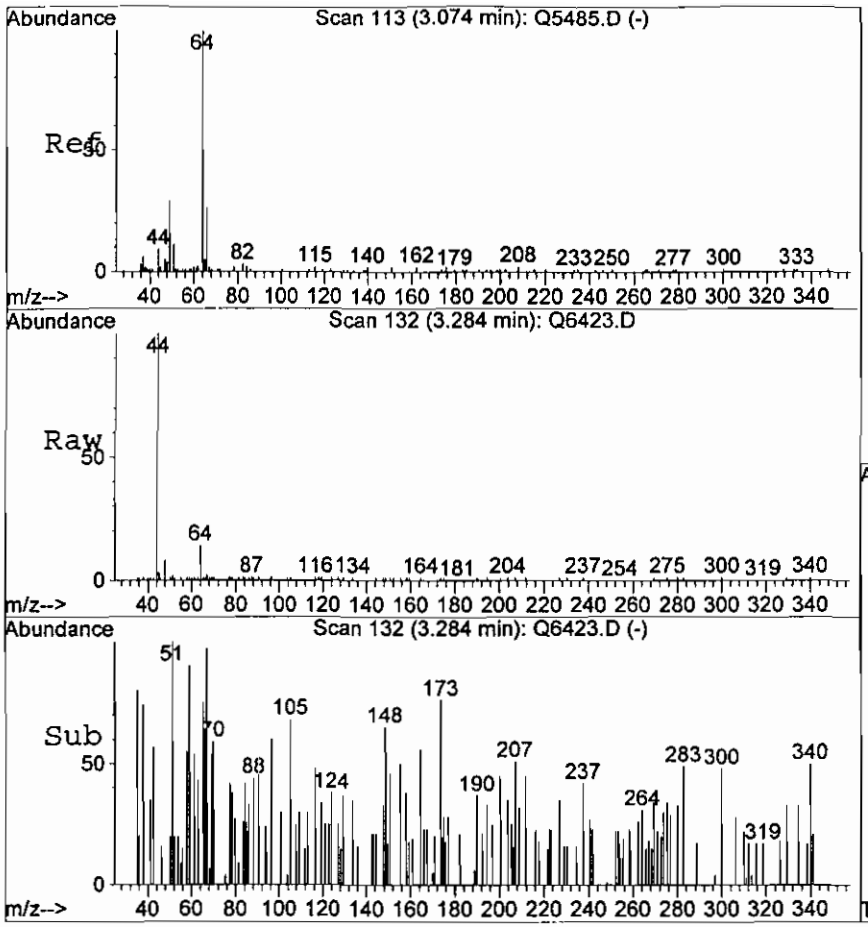
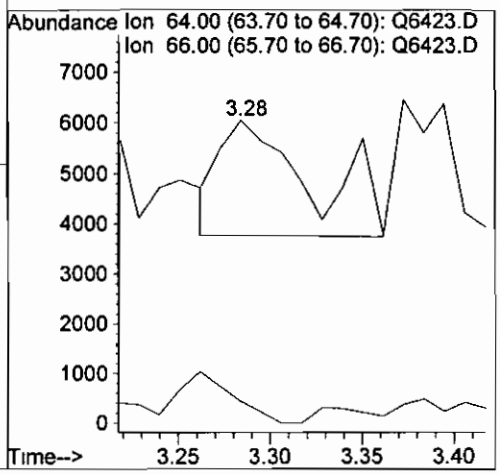
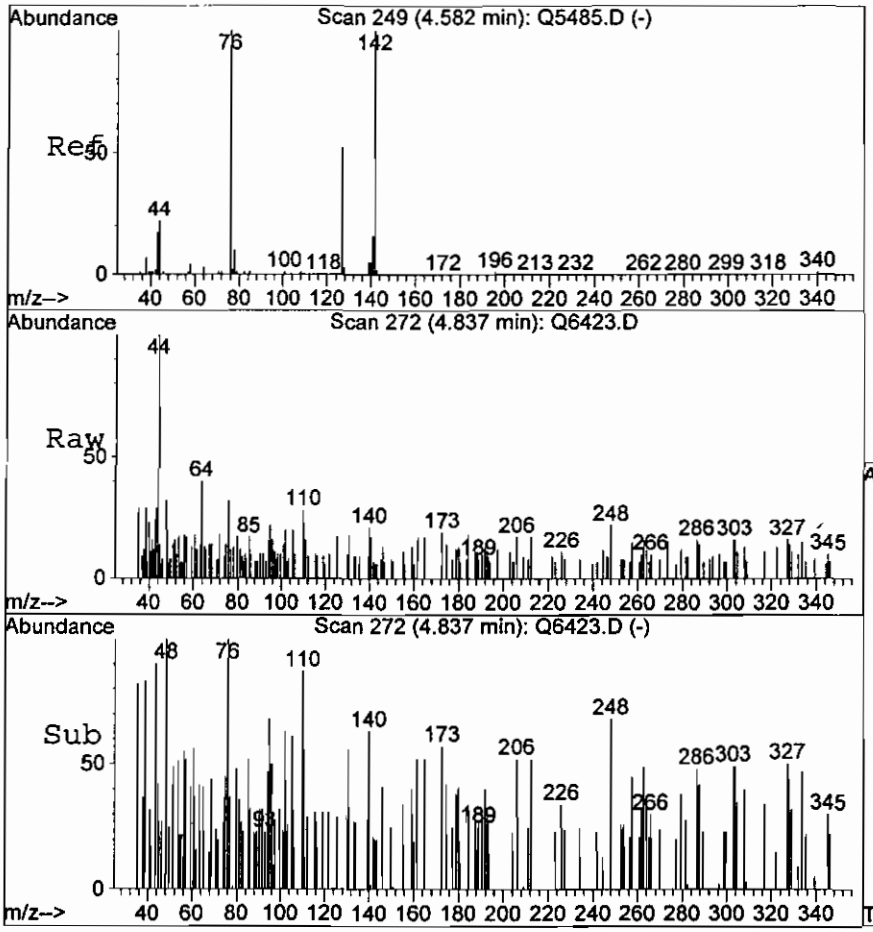


#6
Chloroethane
Concen: 2.30 ug/l
RT: 3.28 min Scan# 132
Delta R.T. 0.03 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:64 Resp: 7909

Ion	Ratio	Lower	Upper
64	100		
66	13.5	7.3	47.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

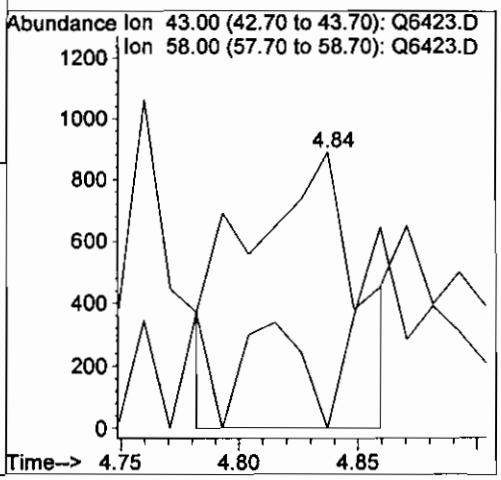




#9
Acetone
Concen: 1.54 ug/l
RT: 4.84 min Scan# 272
Delta R.T. -0.02 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:43 Resp: 2903

Ion	Ratio	Lower	Upper
43	100		
58	20.4	18.5	27.7
0	0.0	0.0	0.0
0	0.0	0.0	0.0



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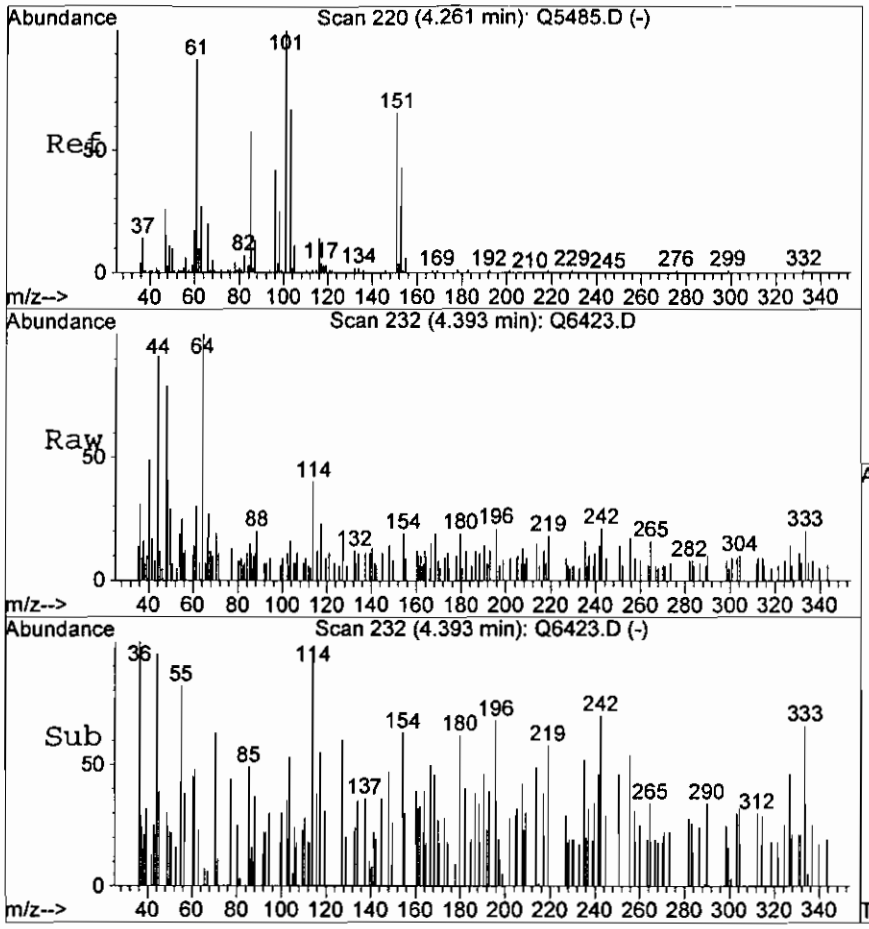
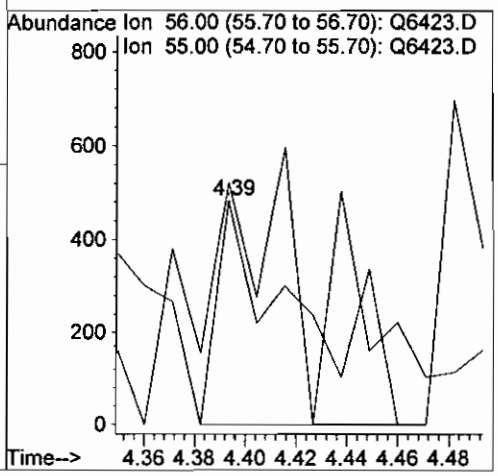
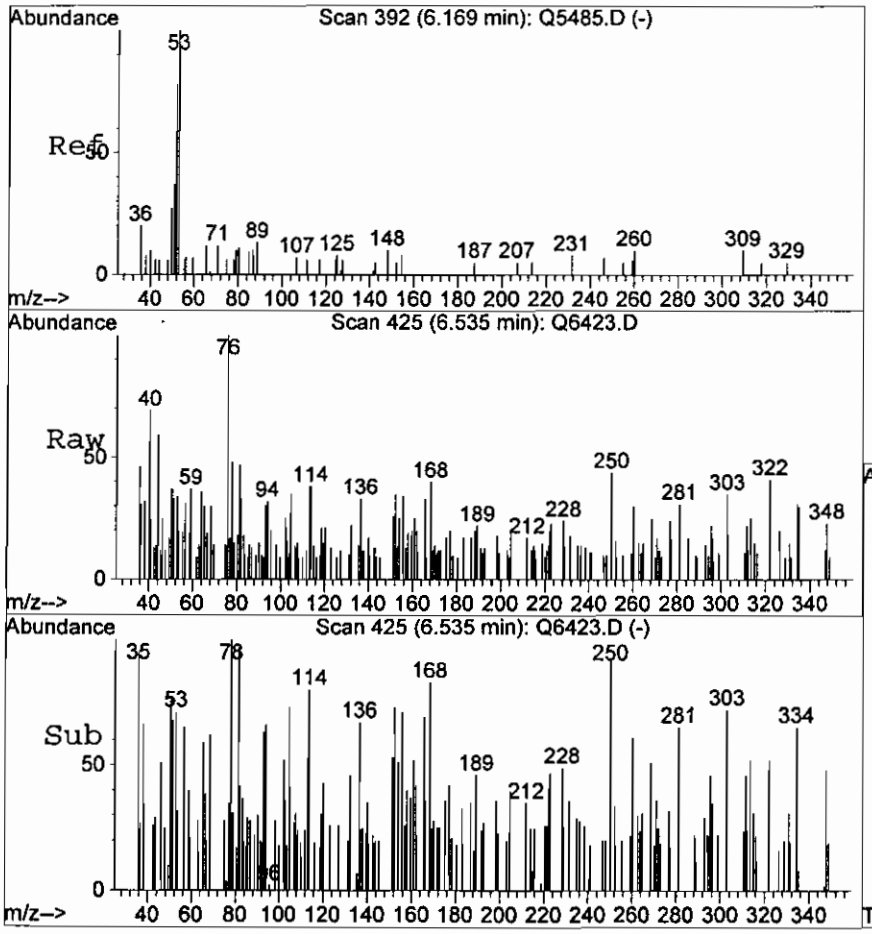


#11
Acrolein
Concen: 2.25 ug/L
RT: 4.39 min Scan# 232
Delta R.T. -0.11 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:56 Resp: 1120

Ion	Ratio	Lower	Upper
56	100		
55	115.0	100.9	151.3
0	0.0	0.0	0.0
0	0.0	0.0	0.0

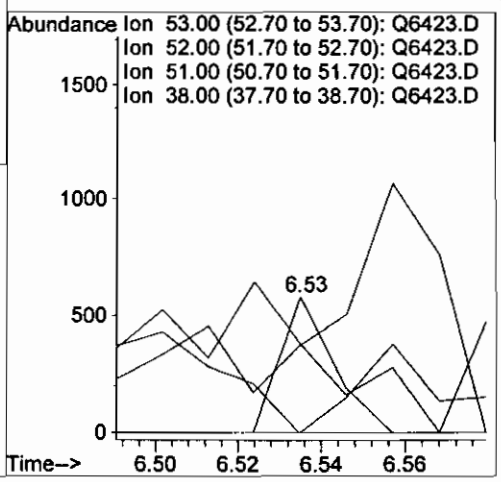




#12
Acrylonitrile
Concen: 0.55 ug/l
RT: 6.53 min Scan# 425
Delta R.T. 0.03 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:53 Resp: 517

Ion	Ratio	Lower	Upper
53	100		
52	202.7	68.8	103.2#
51	391.9	0.0	0.0#
38	0.0	2.6	4.0#



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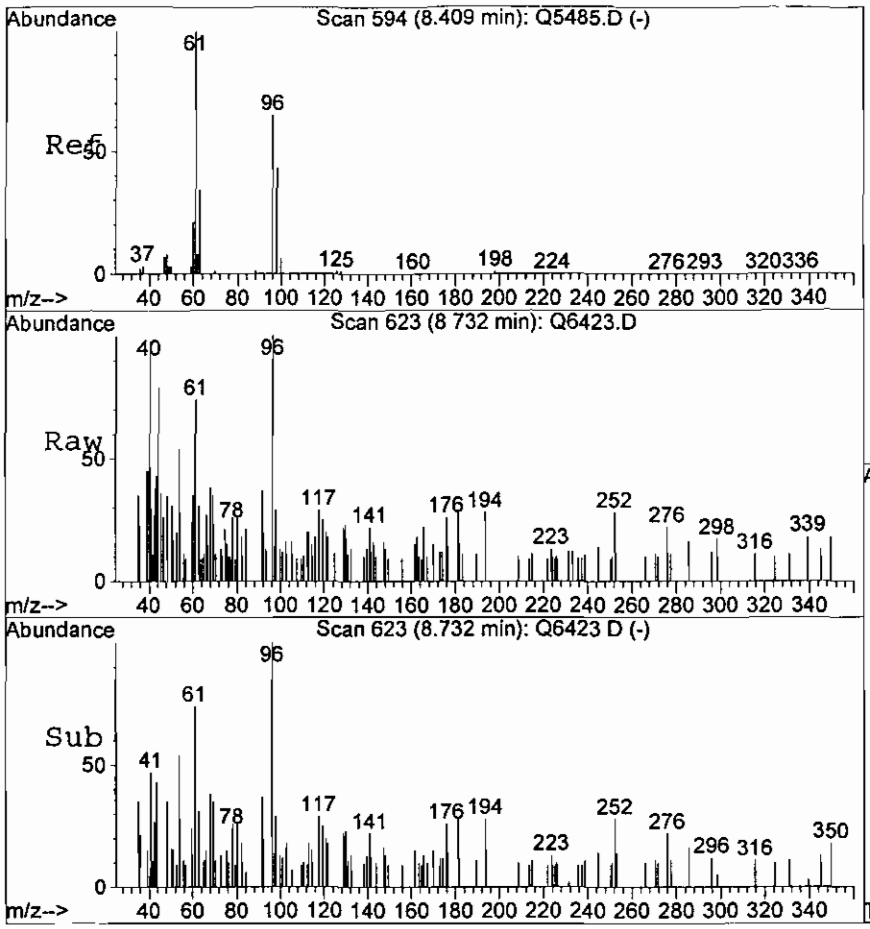
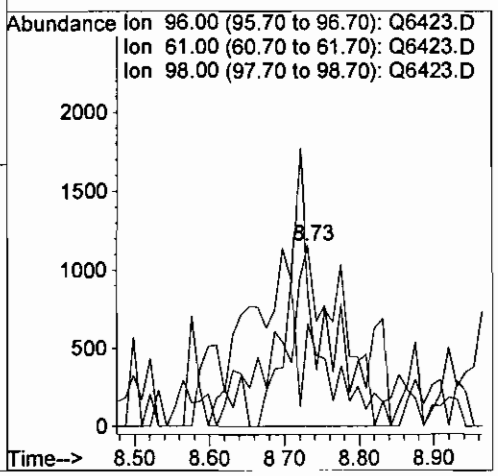
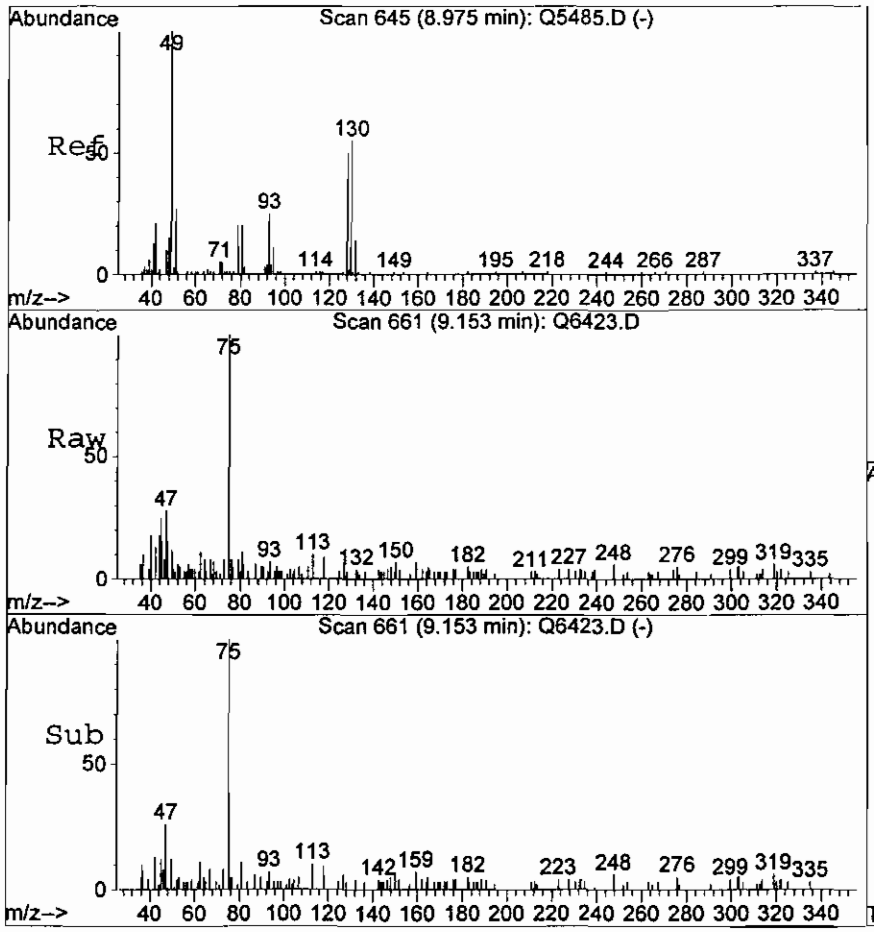


#20
1,2-Dichloroethene (cis)
Concen: 0.83 ug/l
RT: 8.73 min Scan# 623
Delta R.T. 0.00 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:96 Resp: 6189

Ion	Ratio	Lower	Upper
96	100		
61	74.2	134.1	174.1#
98	41.8	50.6	90.6#
0	0.0	0.0	0.0

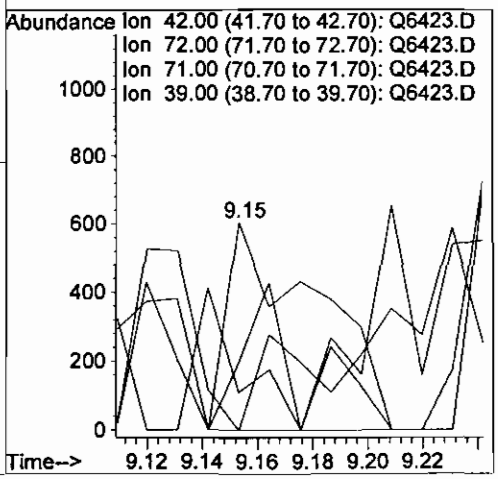


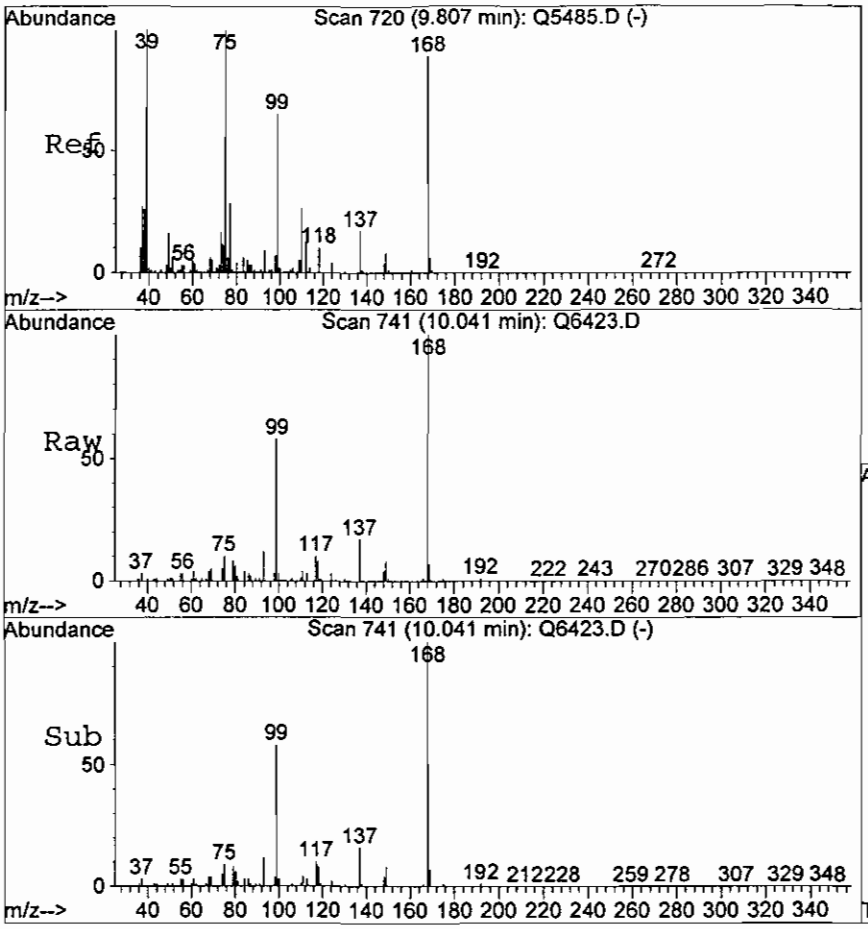


#24
Tetrahydrofuran
Concen: 0.80 ug/l
RT: 9.15 min Scan# 661
Delta R.T. -0.14 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:42 Resp: 1382

Ion	Ratio	Lower	Upper
42	100		
72	28.2	14.8	41.0
71	33.6	14.3	34.9
39	30.2	14.7	31.3

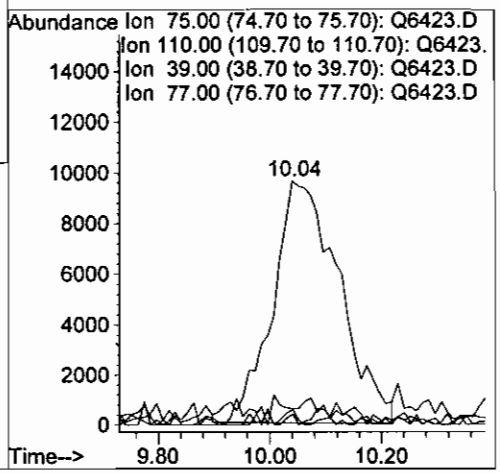




#30
1,1-Dichloropropene
Concen: 5.32 ug/l
RT: 10.04 min Scan# 741
Delta R.T. -0.09 min
Lab File: Q6423.D
Acq: 21 Aug 99 2:39 pm

Tgt Ion:75 Resp: 80151

Ion	Ratio	Lower	Upper
75	100		
110	0.0	26.0	39.0#
39	0.6	68.3	102.5#
77	1.2	24.0	36.0#



10.29 AOC 559, Central Power Station, Building 32; AOC 560, Disinfector, Building 34; and AOC 561, Substation, Building 451B

AOC 559 consists of Building 32 which is a three-story brick and concrete structure with concrete floors. The building was constructed in 1909 for steam and electric generation and still serves that purpose. The power plant has historically burned coal, fuel oil, and diesel fuel. Air emissions from this facility are permitted under CNSY Air Permit No. 0560-0002. AOC 560 is former Building 34 and was labeled as a "disinfector" on base maps during the 1920s and 1930s. No visible evidence of the disinfector remains. It is believed that the disinfector treated water prior to use in the power plant, or treated steam with a rust inhibitor after it was generated. Chlorine or iron-reducing agents are the most likely disinfection agents that may have been used. AOC 561, designated as Building 451B, is a substation that was constructed in 1944. The substation has three parts: a weatherproof metal enclosure containing the switch gear; a pad-mounted, high-voltage transformer with feed towers; and a battery bank housed in a two-room area. The substation is one of the principal feeds for electrical power to the shipyard and the CIA.

Numerous releases have been reported at the central power station. Select information from documents collected in the Environmental Baseline Survey are summarized below.

- Environmental Incident Report No. 85-06: On January 30, 1985, approximately 2 gallons of residual fuel oil spilled from a transfer hose to the ground and a catch basin under the precipitator on the south side of Building 32. Oil absorbent was spread over the spill and the oil was contained in the basin. The spill was ultimately cleaned up on February 4, 1985.

- Environmental Incident Report No. 86-137: On November 7, 1986, a 55-gallon drum of transformer oil dated March 1984 was punctured by a forklift and found leaking on pavement behind Building 32. A PCB screen test run on the oil was negative. The spilled

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oil was picked up with absorbent and the drum was taken to the old corral at Building 1515 to be disposed of as waste oil.

- Environmental Incident Report No. 88-15: On February 19, 1988, an anonymous worker reported antifreeze solution being dumped from diesel generators into the storm drain at Building 32. The storm drain was flushed and a new policy was implemented that directed Shop 03 to drain all coolant into 55-gallon drums and turn them in to Code 106 for disposal.

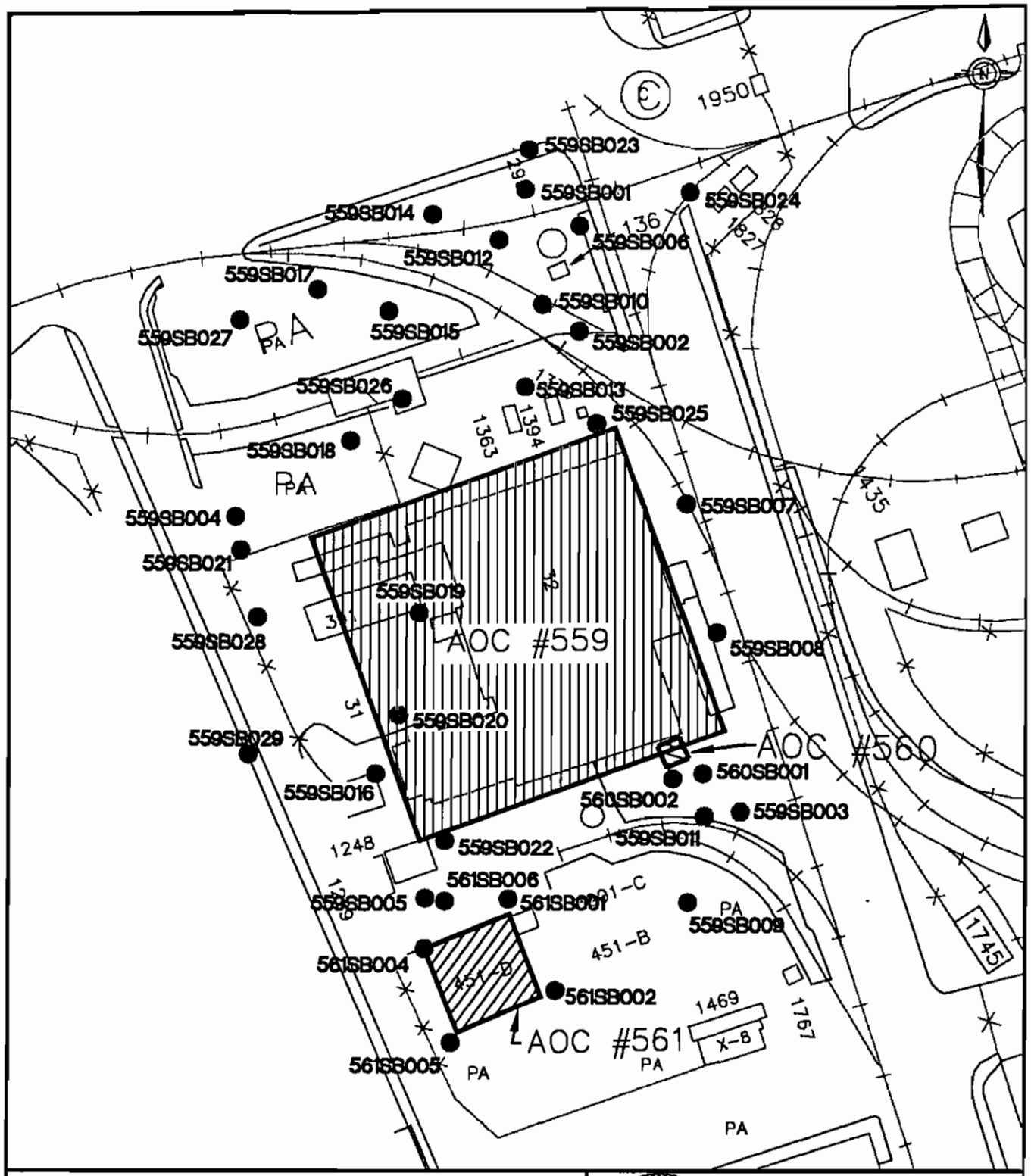
- Environmental Incident Report No. 89-41: On July 12, 1989, approximately 20 gallons of 4 percent hydrochloric acid flush solution leaked out of a boiler onto the deck, and into a storm drain. The spill was secured and sodium bicarbonate was used to neutralize the acid solution.

Materials of concern identified in the *Final Zone E RFI Work Plan* include: at AOC 559, solvents, heavy metals, lube oil, morpholene, PCBs, acids/caustics, oils/oily wastes, and trisodium phosphate; at AOC 560, iron-reducing agent and chlorine; and at AOC 561, dielectric fluid. Potential receptors that may be exposed to site contaminants include current and future building users and any site workers this area may support following base closure.

To fulfill the RFI objectives for AOCs 559, 560, and 561, soil, groundwater, and concrete surface samples were collected in accordance with the *Final Zone E RFI Work Plan*, and Section 3 of this report to determine whether any contamination resulted from onsite activities.

10.29.1 Soil Sampling and Analysis

Soil was sampled in two rounds at AOCs 559, 560 and 561 from the locations shown in Figure 10.29.1. The *Final Zone E RFI Work Plan*, proposed collecting 24 soil samples from



LEGEND

- ● – SOIL BORINGS
- Ⓒ – CORE SAMPLES
- ◒ – DEEP MONITORING WELLS
- ◓ – SHALLOW MONITORING WELLS
- ▲ – SEDIMENT SAMPLES
- Ⓣ – THICKNESS SAMPLES
- Ⓦ – WIPE SAMPLES
- Ⓢ – SURFACE WATER SAMPLES

GRAPHIC SCALE 100 0 100 200

ZONE E
RFI REPORT
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 10.29.1
SOIL BORING LOCATIONS
AOC #559, CENTRAL POWER STATION
AOC #560,DISINFECTOR,FRMR BLDG 34
AOC #561, SUBSTATION, BLDG 451-B

DWG DATE: 09/02/97 | DWG NAME: 10-29-1

the upper interval and 24 samples from the lower interval. Soil samples were also collected at both intervals from the five shallow monitoring well locations proposed at this site.

First-round Sampling — During the first round of sampling, 28 of the proposed 29 upper-interval samples were collected and twenty-six of the proposed 29 lower-interval samples were collected.

At AOC 561, both intervals at sample location 561SB003 were abandoned due to its' close proximity to an electrical substation. A lower-interval sample at AOC 561 was also abandoned due a subsurface obstruction. Finally, one lower-interval sample from AOC 559 was not collected due to a subsurface obstruction in the form of large rocks.

All first-round samples were submitted for analysis at DQO Level III for the standard suite of parameters which includes VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. Four upper-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which includes the suite of parameters proposed for the site, plus a more comprehensive list of VOCs, SVOCs, as well as herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. Table 10.29.1.1 summarizes the first-round of soil sampling.

Table 10.29.1.1
AOCs 559, 560, and 561
First-Round Soil Sampling Summary

Interval	Samples Proposed	Samples Collected	Analyses Proposed	Analyses Collected	Deviations
Upper	29	28	Standard Suite[a]	Standard Suite[a]	One sample was abandoned.
Lower	29	26	Standard Suite[a]	Standard Suite[a]	Subsurface obstructions prevented the collection of two samples, and one sample was abandoned.

Note:
a = Standard Suite includes VOCs, SVOCs, metals, cyanide, and pesticides/PCBs

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Second-round Sampling — Second-round sampling was performed at AOCs 559 and 561 after first-round analytical results were compared to USEPA Region III RBCs (April 1996). Parameters exceeding RBCs included SVOCs, metals, and pesticides/PCBs. Section 10.29.2 details specific parameters and locations which exceeded RBCs.

Seven upper and seven lower-interval samples were proposed during second-round sampling to determine the extent of constituents detected during the initial round of sampling. All seven of the seven proposed upper-interval and lower-interval samples were collected.

All second-round samples were submitted for analysis at DQO Level III for the standard suite of parameters which includes VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. Three upper-interval samples selected as duplicates were analyzed at DQO Level IV for Appendix IX analytical parameters, which includes the suite of parameters proposed for the site, plus a more comprehensive list of VOCs, SVOCs, as well as herbicides, hexavalent chromium, organophosphorus pesticides, and dioxins. Table 10.29.1.2 summarizes the second round of soil sampling.

Table 10.29.1.2
AOCs 559, 560, and 561
Second-Round Soil Sampling Summary

Interval	Samples Proposed	Samples Collected	Analyses Proposed	Analyses Collected	Deviations
Upper	7	7	Standard Suite[a]	Standard Suite[a]	None
Lower	7	7	Standard Suite[a]	Standard Suite[a]	None

Note:
a = Standard Suite includes VOCs, SVOCs, metals, cyanide, and pesticides/PCBs

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10.29.2 Nature of Contamination in Soil

Organic compound analytical results for soil are summarized in Table 10.29.2.1. Inorganic analytical results for soil are summarized in Table 10.29.2.2. Appendix H contains the complete data report for all samples collected in Zone E.

Table 10.29.2.1
AOC 559
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC
VOCs (μg/kg)						
Acetone	Upper	13/35	3.00 - 200	61.8	20,000,000	0
	Lower	10/33	23.0 - 1200	184	NA	NA
2-Butanone (MEK)	Upper	2/35	4.00 - 6.00	5.00	100,000,000	0
	Lower	4/33	4.00 - 26.0	17.5	NA	NA
Carbon disulfide	Upper	1/35	1.000	1.000	20,000,000	0
Methylene chloride	Upper	7/35	2.00 - 44.0	9.29	760,000	0
	Lower	2/33	2.00 - 3.00	2.50	NA	NA
Tetrachloroethene	Upper	1/35	2.00	2.00	110,000	0
Toluene	Upper	5/35	1.000 - 22.0	6.60	41,000,000	0
	Lower	1/33	2.00	2.00	NA	NA
1,1,1-Trichloroethane	Upper	3/35	1.000 - 3.00	2.00	7,200,000	0
	Lower	2/33	2.00	2.00	NA	NA
Trichlorofluoromethane	Upper	2/7	1.000 - 12.0	6.50	61,000,000	0
Xylene (Total)	Upper	2/35	2.00 - 3.00	2.50	100,000,000	0
	Lower	1/33	3.00	3.00	NA	NA
SVOCs (μg/kg)						
Acenaphthene	Upper	6/35	44.0 - 98,000	16,500	12,000,000	0
	Lower	3/33	73.0 - 880	354	NA	NA

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Table 10.29.2.1
AOC 559
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC
SVOCs (μg/kg)						
Acenaphthylene	Upper	2/35	69.0 - 490	280	8,200,000	0
	Lower	2/33	47.0 - 140	93.5	NA	NA
Anthracene	Upper	11/35	48.0 - 240,000	22,200	61,000,000	0
	Lower	4/33	220 - 2,000	703	NA	NA
Benzo(g,h,i)perylene	Upper	21/35	75.0 - 89,000	4,930	8,200,000	0
	Lower	8/33	61.0 - 1,400	488	NA	NA
Benzoic acid	Upper	1/35	54.0	54.0	100,000,000	0
	Lower	1/33	63.0	63.0	NA	NA
bis(2-Ethylhexyl)phthalate	Upper	12/35	56.0 - 6,800	772	410,000	0
	Lower	7/33	45.0 - 580	295	NA	NA
Butylbenzylphthalate	Upper	1/35	580	580	41,000,000	0
Carbazole	Upper	1/7	440	440	290,000	0
4-Chloro-3-methylphenol	Upper	1/35	83.0	83.0	NA	NA
2-Chlorophenol	Upper	1/35	79.0	79.0	1,000,000	0
Dibenzofuran	Upper	6/35	37.0 - 49,000	8,280	820,000	0
	Lower	3/33	45.0 - 430	177	NA	NA
Di-n-butylphthalate	Upper	1/35	48.0	48.0	20,000,000	0
	Lower	2/33	54.0 - 62.0	58.0	NA	NA
Diethylphthalate	Lower	1/33	260	260	NA	NA
2,4-Dimethylphenol	Upper	1/35	2,900	2,900	4,100,000	0
Fluoranthene	Upper	22/35	120 - 550,000	26,300	8,200,000	0
	Lower	11/33	43.0 - 5,100	1,370	NA	NA

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Table 10.29.2.1
AOC 559
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC
SVOCs (μg/kg)						
Fluorene	Upper	6/35	44.0 - 92,000	15,500	8,200,000	0
	Lower	3/33	53.0 - 790	307	NA	NA
2-Methylnaphthalene	Upper	8/35	46.0 - 25,000	3,250	8,200,000	0
	Lower	3/33	60.0 - 200	115	NA	NA
2-Methylphenol (o-Cresol)	Upper	1/35	1,300	1,300	10,000,000	0
4-Methylphenol (p-Cresol)	Upper	1/35	4,000	4,000	1,000,000	0
Naphthalene	Upper	9/35	43.0 - 76,000	8,530	8,200,000	0
	Lower	2/33	90.0 - 610	350	NA	NA
N-Nitrosomethylethylamine	Upper	1/7	2,100	2,100	260	1
Phenanthrene	Upper	22/35	59.0 - 600,000	28,000	8,200,000	0
	Lower	10/33	75.0 - 5,100	879	NA	NA
Phenol	Upper	1/35	1,200	1,200	100,000,000	0
Pyrene	Upper	24/35	130 - 430,000	19,400	6,100,000	0
	Lower	14/33	41.0 - 4,500	1,080	NA	NA
SVOCs (B(a)P Equivalents) (μg/kg)						
B(a)P Equiv.	Upper	24/35	0.220 - 337,000	15,400	780	9
	Lower	10/33	9.70 - 3,820	1,100	NA	NA
Benzo(a)anthracene	Upper	21/35	68.0 - 260,000	13,200	7,800	1
	Lower	8/33	120 - 2,800	930	NA	NA
Benzo(b)fluoranthene	Upper	19/35	82.0 - 320,000	18,400	7,800	1
	Lower	8/33	75.0 - 2,800	1,040	NA	NA
Benzo(k)fluoranthene	Upper	14/35	110 - 5,700	1,260	78,000	0
	Lower	8/33	54.0 - 1,900	671	NA	NA

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Table 10.29.2.1
AOC 559
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC
SVOCs (B(a)P Equivalents) (μg/kg)						
Benzo(a)pyrene	Upper	21/35	120 - 210,000	11,000	780	8
	Lower	8/33	140 - 2,300	905	NA	NA
Chrysene	Upper	23/35	90.0 - 260,000	12,300	780,000	0
	Lower	9/33	83.0 - 2,900	896	NA	NA
Dibenz(a,h)anthracene	Upper	15/35	38.0 - 60,000	4,370	780	4
	Lower	5/33	100 - 900	362	NA	NA
Indeno(1,2,3-cd)pyrene	Upper	20/35	76.0 - 84,000	4,810	7,800	1
	Lower	9/33	46.0 - 1,300	393	NA	NA
Pesticides/PCBs (μg/kg)						
beta-BHC	Lower	1/33	3.30	3.30	NA	NA
delta-BHC	Lower	1/33	1.60	1.60	NA	NA
alpha-Chlordane	Upper	11/35	1.90 - 27.0	6.92	4,400	0
	Lower	3/33	1.80 - 30.0	11.5	NA	NA
gamma-Chlordane	Upper	17/35	1.50 - 62.0	11.5	4,400	0
	Lower	4/33	2.50 - 28.0	9.28	NA	NA
4,4'-DDD	Upper	7/35	3.50 - 400	64.5	24,000	0
	Lower	3/33	7.40 - 110	43.1	NA	NA
4,4'-DDE	Upper	21/35	3.70 - 740	51.4	17,000	0
	Lower	6/33	3.50 - 33.0	14.3	NA	NA
4,4'-DDT	Upper	23/35	3.20 - 38.0	14.2	17,000	0
	Lower	2/33	4.20 - 13.0	8.60	NA	NA
Dieldrin	Upper	4/35	3.60 - 19.0	7.93	360	0
	Lower	1/33	3.10	3.10	NA	NA

Table 10.29.2.1
AOC 559
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC
Pesticides/PCBs (μg/kg)						
Endosulfan sulfate	Upper	2/35	3.30 - 6.40	4.85	1,200,000	0
Endrin	Upper	1/35	13.0	13.0	61,000	0
Endrin aldehyde	Upper	1/35	6.90	6.90	61,000	0
	Lower	2/33	6.90 - 9.20	8.05	NA	NA
Endrin ketone	Upper	4/35	3.00 - 13.0	5.78	61,000	0
Heptachlor	Upper	7/35	1.60 - 7.40	2.84	1,300	0
	Lower	1/33	1.50	1.50	NA	NA
Heptachlor epoxide	Upper	5/35	2.10 - 3.30	2.64	630	0
	Lower	1/33	3.70	3.70	NA	NA
Methoxychlor	Upper	2/35	51.0 - 55.0	53.0	1,000,000	0
	Lower	1/33	18.0	18.0	NA	NA
Aroclor-1254	Upper	2/35	150 - 1,400	775	740	1
	Lower	1/33	78.0	78.0	NA	NA
Aroclor-1260	Upper	7/35	200 - 1,000	473	740	1
	Lower	2/33	66.0 - 84.0	75.0	NA	NA
Dioxins (ng/kg)						
Dioxin Equiv.	Upper	7/7	0.0166 - 3.51	1.08	43.0	0
123789-HxCDD	Upper	1/7	2.22	2.22	NA	NA
1234678-HpCDD	Upper	5/7	8.63 - 108	48.7	NA	NA
1234678-HpCDF	Upper	6/7	2.01 - 32.7	12.8	NA	NA
123678-HxCDD	Upper	2/7	2.53 - 3.00	2.77	NA	NA
123478-HxCDF	Upper	1/7	4.04	4.04	NA	NA
123678-HxCDF	Upper	2/7	0.996 - 4.95	2.97	NA	NA

Table 10.29.2.1
AOC 559
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC
Dioxins (ng/kg)						
OCDD	Upper	7/7	15.4 - 1,070	346	NA	NA
OCDF	Upper	5/7	1.20 - 93.7	32.9	NA	NA

Notes:
μg/kg = Micrograms per kilogram
ng/kg = Nanograms per kilogram
RBC = Risk-based concentration
NA = No industrial RBC established

Table 10.29.2.2
AOCs 559, 560, and 561
Inorganic Detections for Soil (mg/kg)

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC and RC
Aluminum (Al)	Upper	35/35	1,920 - 7,450	4,160	100,000	26,600	0
	Lower	33/33	798 - 15,400	5,850	NA	41,100	NA
Antimony (Sb)	Upper	22/35	0.470 - 7.20	1.97	82.0	1.77	0
	Lower	8/33	0.570 - 4.40	1.36	NA	1.60	NA
Arsenic (As)	Upper	35/35	0.810 - 225	26.8	3.80	23.9	9
	Lower	32/33	1.20 - 56.9	13.6	NA	19.9	NA
Barium (Ba)	Upper	30/35	6.60 - 163	33.8	14,000	130	0
	Lower	28/33	4.00 - 152	31.5	NA	94.1	NA
Beryllium (Be)	Upper	33/35	0.110 - 1.80	0.419	1.30	1.70	1
	Lower	30/33	0.130 - 1.50	0.510	NA	2.71	NA
Cadmium (Cd)	Upper	27/35	0.110 - 3.80	0.750	100	1.50	0
	Lower	14/33	0.140 - 1.40	0.559	NA	0.960	NA

Table 10.29.2.2
AOCs 559, 560, and 561
Inorganic Detections for Soil (mg/kg)

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC and RC
Calcium (Ca)	Upper	35/35	893 - 194,000	50,600	NA	NA	NA
	Lower	33/33	459 - 244,000	51,200	NA	NA	NA
Chromium (Cr)	Upper	35/35	1.90 - 42.0	16.7	1,000	94.6	0
	Lower	33/33	1.60 - 48.1	17.4	NA	75.2	NA
Cobalt (Co)	Upper	33/35	0.360 - 42.4	6.49	12,000	19.0	0
	Lower	31/33	0.530 - 15.0	2.92	NA	14.9	NA
Copper (Cu)	Upper	35/35	1.60 - 791	69.2	8,200	66.0	0
	Lower	32/33	0.840 - 2,520	96.7	NA	152	NA
Cyanide (CN)	Upper	1/35	0.310	0.310	4,100	0.500	0
	Lower	1/33	0.700	0.700	NA	NA	NA
Iron (Fe)	Upper	35/35	1,090 - 35,300	7,020	61,000	NA	0
	Lower	33/33	1,010 - 30,400	8,980	NA	NA	NA
Lead (Pb)	Upper	35/35	5.20 - 526	110	1,300	265	0
	Lower	32/33	3.50 - 179	43.5	NA	173	NA
Magnesium (Mg)	Upper	34/35	90.0 - 3,640	1,290	NA	NA	NA
	Lower	32/33	96.2 - 5,800	1,750	NA	NA	NA
Manganese (Mn)	Upper	34/35	6.60 - 236	74.3	4,700	302	0
	Lower	32/33	9.00 - 692	114	NA	881	NA
Mercury (Hg)	Upper	34/35	0.0400 - 2.20	0.267	61	2.60	0
	Lower	31/33	0.0200 - 0.700	0.129	NA	1.59	NA
Nickel (Ni)	Upper	35/35	0.720 - 134	16.6	4,100	77.1	0
	Lower	33/33	0.800 - 55.0	9.87	NA	57.0	NA
Potassium (K)	Upper	26/35	47.9 - 1,400	692	NA	NA	NA
	Lower	24/33	164 - 2,440	971	NA	NA	NA
Selenium (Se)	Upper	19/35	0.670 - 3.90	1.31	1,000	1.70	0
	Lower	18/33	0.620 - 2.80	1.41	NA	2.40	NA

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Table 10.29.2.2
AOCs 559, 560, and 561
Inorganic Detections for Soil (mg/kg)

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC and RC
Silver (Ag)	Upper	6/35	0.320 - 12.6	6.18	1,000	NA	0
	Lower	1/33	4.30	4.30	NA	NA	NA
Sodium (Na)	Upper	21/35	29.6 - 687	330	NA	NA	NA
	Lower	19/33	19.3 - 942	358	NA	NA	NA
Thallium (Tl)	Upper	3/35	0.570 - 2.00	1.10	16	2.80	0
	Lower	3/33	0.660 - 1.70	1.32	NA	NA	NA
Tin (Sn)	Upper	10/35	6.20 - 45.8	16.2	100,000	59.4	0
	Lower	5/33	7.10 - 13.9	9.66	NA	9.23	NA
Vanadium (V)	Upper	35/35	1.80 - 23.3	12.3	1,400	94.3	0
	Lower	33/33	2.00 - 67.7	18.8	NA	155	NA
Zinc (Zn)	Upper	34/35	9.10 - 982	189	61,000	827	0
	Lower	32/33	4.60 - 677	96.0	NA	886	NA

Notes:
mg/kg = Milligrams per kilogram
RBC = Risk-based concentration
RC = Reference concentration
NA = No industrial RBC or RC established

Volatile Organic Compounds in Soil

Nine VOCs were detected in soil samples collected at AOCs 559, 560, and 561. Thirty-six detections occurred in the upper interval and 20 in the lower interval. No VOC exceeded its respective industrial RBC in the upper interval or respective SSL in the lower interval.

Semivolatile Organic Compounds in Soil

Thirty-one SVOCs were detected in soil samples collected at AOCs 559, 560, and 561. Two hundred and eighty-four detections occurred in the upper interval and 129 occurred in the lower interval. Six SVOCs — benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene,

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indeno(1,2,3-cd)pyrene, benzo(a)pyrene, and n-nitrosomethylethylamine — exceeded their respective industrial RBC in the upper interval. Additionally, two SVOCs — benzo(a)anthracene and chrysene — exceeded their respective SSL in the lower interval.

Benzo(a)anthracene was detected in 21 of 35 upper-interval samples with a range of 68 to 260,000 μg/kg and a mean of 13,200 μg/kg. One upper-interval sample (559SB019, 260,000 μg/kg) exceeded the benzo(a)anthracene industrial RBC of 7,800 μg/kg. Benzo(a)anthracene was detected in eight of 33 lower-interval samples with a range of 120 to 2,800 μg/kg and a mean of 930 μg/kg. Three lower-interval samples (559SB012, 1,600 μg/kg; 559SB019, 2,800 μg/kg; and 559SB025, 1,600 μg/kg) exceeded the benzo(a)anthracene SSL of 700 μg/kg.

Benzo(b)fluoranthene was detected in 19 of 35 upper-interval samples with a range of 82 to 320,000 μg/kg and a mean of 18,400 μg/kg. One upper-interval sample (559SB019, 320,000 μg/kg) exceeded the benzo(b)fluoranthene industrial RBC of 7,800 μg/kg.

Benzo(a)pyrene was detected in 21 of 35 upper-interval samples with a range of 120 to 210,000 μg/kg and a mean of 11,000 μg/kg. The following eight upper-interval samples exceeded the benzo(a)pyrene industrial RBC of 780 μg/kg:

559SB002 (1,300 μg/kg)	559SB012 (3,500 μg/kg)	559SB023 (830 μg/kg)
559SB006 (3,400 μg/kg)	559SB015 (2,000 μg/kg)	559SB025 (5,300 μg/kg)
559SB010 (910 μg/kg)	559SB019 (210,000 μg/kg)	

In accordance with recent cPAH guidance, BEQs were calculated for cPAHs at AOCs 559, 560, and 561. The upper-interval BEQ was calculated for 24 samples with a range of 0.220 to

337,000 μg/kg and a mean of 15,400 μg/kg. The following nine upper-interval samples exceeded the benzo(a)pyrene industrial RBC of 780 μg/kg:

559SB002 (2,169 μg/kg)	559SB012 (5,833 μg/kg)	559SB020 (1,047μg/kg)
559SB006 (5,554 μg/kg)	559SB015 (2,894 μg/kg)	559SB023 (1,205 μg/kg)
559SB010 (1,482 μg/kg)	559SB019 (337,000 μg/kg)	559SB025 (7,794 μg/kg)

Chrysene was detected in nine of 33 lower-interval samples with a range of 83 to 2,900 μg/kg and a mean of 896 μg/kg. Three lower-interval samples (559SB012, 1,600 μg/kg; 559SB019, 2,900 μg/kg; and 559SB025, 1,800 μg/kg) exceeded the chrysene SSL of 1,000 μg/kg.

Dibenz(a,h)anthracene was detected in 15 of 35 upper-interval samples with a range of 38 to 60,000 μg/kg and a mean of 4,370 μg/kg. Four upper-interval samples (559SB006, 950 μg/kg; 559SB012, 1,100 μg/kg; 559SB019, 60,000 μg/kg; and 559SB025, 1,200 μg/kg) exceeded the dibenz(a,h)anthracene industrial RBC of 780 μg/kg.

Indeno(1,2,3-cd)pyrene was detected in 20 of 35 upper-interval samples with a range of 76 to 84,000 μg/kg and a mean of 4,810 μg/kg. One upper-interval sample (559SB019, 84,000 μg/kg) exceeded the indeno(1,2,3-cd)pyrene industrial RBC of 7,800 μg/kg.

n-Nitrosomethylethylamine was detected in one of seven upper-interval samples at 2,100 μg/kg. One upper-interval sample (559SB013, 2,100 μg/kg) exceeded the n-nitrosomethylethylamine industrial RBC of 260 μg/kg.

Pesticides and PCBs in Soil

Fifteen pesticides were detected in soil samples collected at AOCs 559, 560, and 561. One hundred and five detections occurred in the upper interval and 26 occurred in the lower interval.

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No pesticide exceeded its respective industrial RBC in the upper interval. However, two pesticides — dieldrin and beta-BHC — exceeded their respective SSL in the lower interval.

Beta-BHC was detected in one of 33 lower-interval samples at 3.30 μg/kg. One lower-interval sample (559SB027,3.30 μg/kg) exceeded the beta-BHC SSL of 2.0 μg/kg.

Dieldrin was detected in one of 33 lower-interval samples at 3.10 μg/kg. One lower-interval sample (559SB008, 3.10 μg/kg) exceeded the dieldrin SSL of 1.0 μg/kg.

Two PCBs were detected in soil samples collected at AOCs 559, 560, and 561. Nine detections occurred in the upper interval and three occurred in the lower interval. Two PCBs — Aroclor-1254 and Aroclor-1260 — exceeded their respective industrial RBC in the upper interval. No SSL has been established for Aroclor-1254 and Aroclor-1260.

Aroclor-1254 was detected in two of 35 upper-interval samples with a range of 150 to 1,400 μg/kg and a mean of 775 μg/kg. One upper-interval sample (559SB020, 1,400 μg/kg) exceeded the Aroclor-1254 industrial RBC of 740 μg/kg.

Aroclor-1260 was detected in seven of 35 upper-interval samples with a range of 200 to 1,000 μg/kg and a mean of 473 μg/kg. One upper-interval sample (561SB001, 1,000 μg/kg) exceeded the Aroclor-1260 industrial RBC of 740 μg/kg.

Other Organic Compounds in Soil

Eight dioxins were detected in the duplicate upper-interval soil samples collected at AOCs 559, 560, and 561. Twenty-nine detections occurred in the upper interval. No lower-interval duplicate soil samples were collected for dioxin analysis. No industrial RBCs have been established for the detected dioxins.

In accordance with recent dioxin guidance, TEQs (dioxin equivalent) were calculated. The TEQ was calculated for seven samples with a range of 0.0166 to 3.51 ng/kg and a mean of 1.08 ng/kg. All TEQ calculations were below the TEQ industrial RBC of 1,000 ng/kg.

Inorganic Elements in Soil

Twenty-five metals were detected in soil samples collected at AOCs 559, 560, and 561. Six-hundred and eighty-two detections occurred in the upper interval and 603 occurred in the lower interval. Two metals — arsenic and beryllium — exceeded both their respective industrial RBC and RC in the upper interval. Additionally, the same two metals — arsenic and barium — exceeded both their respective SSL and RC in the lower interval.

Arsenic was detected in 35 of 35 upper-interval soil samples with a range of 0.810 to 225 mg/kg and a mean of 26.8 mg/kg. The following nine upper-interval samples exceeded both the arsenic industrial RBC of 3.8 mg/kg and the RC of 23.9 mg/kg:

559SB002 (129 mg/kg)	559SB012 (225 mg/kg)	559SB023 (36.4 mg/kg)
559SB006 (27 mg/kg)	559SB016 (62.5 mg/kg)	559SB025 (26.8 mg/kg)
559SB010 (69.9 mg/kg)	559SB021 (118 mg/kg)	561SB001 (24.1 mg/kg)

Arsenic was detected in 32 of 33 lower-interval samples with a range of 1.20 to 56.9 mg/kg and a mean of 13.6 mg/kg. The following eight lower-interval samples exceeded both the arsenic SSL of 15 mg/kg and the RC of 19.9 mg/kg:

559SB002 (23.4 mg/kg)	559SB015 (56.2 mg/kg)	559SB023 (38.2 mg/kg)
559SB006 (23.4 mg/kg)	559SB017 (21.5 mg/kg)	559SB028 (56.9 mg/kg)
559SB014 (25.2 mg/kg)	559SB021 (40.8 mg/kg)	

Barium was detected in 28 of 33 lower-interval samples with a range of 4.0 to 152 mg/kg and a mean of 31.5 mg/kg. One lower-interval sample (559SB015, 152 mg/kg) exceeded both the barium SSL of 32 mg/kg and the RC of 94.1 mg/kg.

Beryllium was detected in 33 of 35 upper-interval samples with a range of 0.110 to 1.80 mg/kg and a mean of 0.419 mg/kg. One upper-interval sample (559SB016, 1.8 mg/kg) exceeded both the beryllium industrial RBC of 1.30 mg/kg and the RC of 1.70 mg/kg.

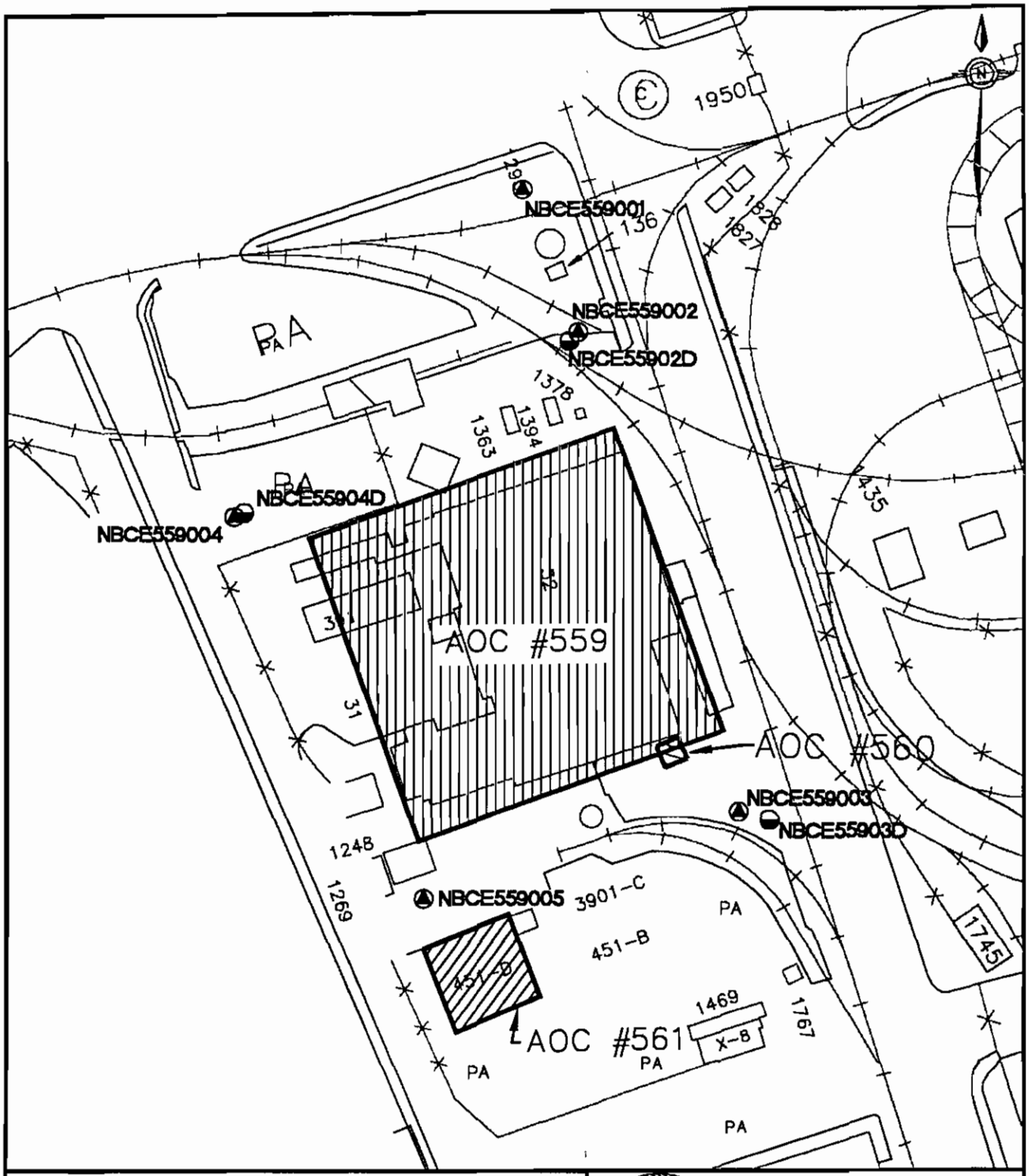
10.29.3 Groundwater Sampling and Analysis

Three deep monitoring wells and five shallow monitoring wells were installed and sampled to assess groundwater quality at AOCs 559, 560, and 561 as shown in Figure 10.29.2. The wells were installed as follows:

- Shallow Wells — NBCE559001, NBCE559002, NBCE559003, NBCE559004, NBCE559005

- Deep Wells — NBCE55902D, NBCE55903D, NBCE55904D

Groundwater samples were submitted for analysis at DQO Level III for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, chlorides, sulfates, and TDS. One deep groundwater sample was selected as a duplicate and analyzed at DQO Level III for Appendix IX analytical parameters, which includes the suite of parameters proposed for this site plus a more comprehensive list of VOCs and SVOCs as well as herbicides, hexavalent chromium, organophosphorus pesticides, and



LEGEND

- ● – SOIL BORINGS
- Ⓒ – CORE SAMPLES
- ◒ – DEEP MONITORING WELLS
- ◭ – SHALLOW MONITORING WELLS
- ▲ – SEDIMENT SAMPLES
- Ⓣ – THICKNESS SAMPLES
- Ⓦ – WIPE SAMPLES
- Ⓢ – SURFACE WATER SAMPLES

GRAPHIC SCALE 100 0 100 200

ZONE E
RFI REPORT
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 10.29.2
MONITORING WELL LOCATIONS
AOC #559, CENTRAL POWER STATION
AOC #560, DISINFECTOR, FRMR BLDG 34
AOC #561, SUBSTATION, BLDG 451-B

DWG DATE: 09/02/97 | DWG NAME: 10-29-2

dioxins. Table 10.29.3.1 summarizes groundwater sampling and analysis at AOCs 559, 560, and 561.

Table 10.29.3.1
AOCs 559, 560, and 561
Groundwater Sampling Summary

Depth	Wells Proposed	Wells Installed	Analyses Proposed	Analyses Collected	Deviations
Shallow	5	5	Standard Suite[a], chlorides, sulfates, and TDS	Standard Suite[a], chlorides, sulfates, and TDS	None
Deep	3	3	Standard Suite[a], chlorides, sulfates, and TDS	Standard Suite[a], chlorides, sulfates, and TDS	None

Note:
a = Standard Suite includes VOCs, SVOCs, metals, cyanide, pesticides, and PCBs

The shallow monitoring wells were installed at 12.5 to 13.5 feet bgs in the surficial aquifer. The deep wells were installed at 27, 28.2, and 29.7 feet bgs at the base of the surficial aquifer. All wells were installed in accordance with Section 3.3 of this report.

10.29.4 Nature of Contamination in Groundwater

Organic compound analytical results for shallow and deep groundwater are summarized in Tables 10.29.4.1 and 10.29.4.2, respectively. Inorganic analytical results for shallow and deep groundwater are summarized in Tables 10.29.4.3 and 10.29.4.4, respectively. Appendix H contains the complete data report for all samples collected in Zone E.

Table 10.29.4.1
AOCs 559, 560, and 561
Organic Compounds Detected in First Quarter Groundwater (μg/L)
Shallow Monitoring Wells

Compound	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap-Water RBC	MCL	Number of Samples Exceeding RBC
VOCs						
Benzene	1/5	12.0	12.0	0.360	5.00	1
Chlorobenzene	1/5	3,200	3,200	3.90	NA	1
1,2-Dichloroethene (total)	1/5	5.00	5.00	5.50	70.0	0
Ethylbenzene	1/5	2.00	2.00	130	700	0
SVOCs						
2-Chlorophenol	1/5	9.00	9.00	18.0	NA	0
1,2-Dichlorobenzene	1/5	230	230	27.0	600	1
1,4-Dichlorobenzene	1/5	240	240	0.440	75.0	1
Isophorone	1/5	3.00	3.00	71.0	NA	0
Naphthalene	1/5	2.00	2.00	150	NA	0

Notes:
μg/L = Micrograms per liter
RBC = Risk-based concentration
MCL = Maximum contaminant level
NA = No MCL established

Table 10.29.4.2
AOCs 559, 560, and 561
Organic Compounds Detected in First Quarter Groundwater (μg/L)
Deep Monitoring Wells

Compound	Freq. Of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap-Water RBC	MCL	Number of Samples Exceeding RBC
VOCs						
Chloroform	1/3	1.000	1.000	0.150	100	1
1,2-Dichloroethene (total)	1/3	1.000	1.000	5.50	70.0	0

Table 10.29.4.2
AOCs 559, 560, and 561
Organic Compounds Detected in First Quarter Groundwater (μg/L)
Deep Monitoring Wells

Compound	Freq. Of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap-Water RBC	MCL	Number of Samples Exceeding RBC
VOCs						
Tetrachloroethene	1/3	1.000	1.000	1.10	5.00	0
Trichloroethene	1/3	3.00	3.00	1.60	5.00	1

Notes:
μg/L = Micrograms per liter
RBC = Risk-based concentration
MCL = Maximum contaminant level

Table 10.29.4.3
AOCs 559, 560, and 561
Inorganic Detections for First Quarter Groundwater (μg/L)
Shallow Monitoring Wells

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap-Water RBC	Reference Conc.	MCL	Number of Samples Exceeding RBC and RC
Aluminum (Al)	1/5	2,830	2,830	3,700	2,810	NA	0
Arsenic (As)	2/5	8.60 - 11.9	10.3	0.0450	18.7	50.0	0
Beryllium (Be)	1/5	0.320	0.320	0.0160	0.43	4.00	0
Calcium (Ca)	4/5	30,700 - 104,000	66,200	NA	NA	NA	NA
Chromium (Cr)	1/5	15.6	15.6	18.0	12.3	100	0
Copper (Cu)	1/5	5.40	5.40	150	2.7	1,300	0
Iron (Fe)	5/5	313 - 14,500	5,550	1,100	NA	NA	2
Lead (Pb)	1/5	3.00	3.00	NA	4.8	15.0*	0
Magnesium (Mg)	5/5	2,590 - 34,000	17,300	NA	NA	NA	NA
Manganese (Mn)	2/5	150 - 301	226	84.0	2,560	NA	0
Nickel (Ni)	1/5	2.30	2.30	73.0	15.2	100	0

Table 10.29.4.3
AOCs 559, 560, and 561
Inorganic Detections for First Quarter Groundwater (μg/L)
Shallow Monitoring Wells

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap-Water RBC	Reference Conc.	MCL	Number of Samples Exceeding RBC and RC
Vanadium (V)	1/5	15.1	15.1	26.0	11.4	NA	0
Zinc (Zn)	1/5	23.4	23.4	1,100	27.3	NA	0

Notes:
μg/L = Micrograms per liter
RBC = Risk-based concentration
MCL = Maximum contaminant level
RC = Reference concentration
NA = No RBC, MCL, or RC established
* = TTAL

Table 10.29.4.4
AOC 559, 560, and 561
Inorganic Detections for First Quarter Groundwater (μg/L)
Deep Monitoring Wells

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap-Water RBC	Reference Conc.	MCL	Number of Samples Exceeding RBC and RC
Arsenic (As)	2/3	3.50 - 11.4	7.45	0.0450	16.4	50.0	0
Barium (Ba)	3/3	12.3 - 33.7	25.0	260	218	2,000	0
Calcium (Ca)	3/3	59,400 - 71,800	66,100	NA	NA	NA	NA
Cyanide (CN)	1/3	2.70	2.70	73.0	37.3	200	0
Iron (Fe)	3/3	200 - 2,030	1,030	1,100	NA	NA	1
Magnesium (Mg)	3/3	15,600 - 27,800	20,300	NA	NA	NA	NA
Manganese (Mn)	3/3	78.0 - 134	100	84.0	869	NA	0
Nickel (Ni)	1/3	0.970	0.970	73.0	42.2	100	0
Potassium (K)	3/3	5,860 - 6,850	6,400	NA	NA	NA	NA
Sodium (Na)	3/3	85,600 - 219,000	139,000	NA	NA	NA	NA
Thallium (Tl)	1/3	3.90	3.90	0.290	NA	2.00	1
Zinc (Zn)	1/3	13.5	13.5	1,100	11.8	NA	0

Notes:
μg/L = Micrograms per liter
RBC = Risk-based concentration
MCL = Maximum contaminant level
RC = Reference concentration
NA = No RBC, MCL, or RC established

Volatile Organic Compounds in Groundwater

Shallow Groundwater

Four VOCs were detected in shallow groundwater samples collected at AOC 559 (no shallow wells were installed at AOC 560 or 561). Two VOCs — benzene and chlorobenzene — exceeded their respective tap-water RBCs.

Benzene was detected in one of five samples in well NBCE559005 (12.0 μg/L), exceeding its tap-water RBC of 0.360 μg/L. The detection also exceeded the benzene MCL of 5.00 μg/L.

Chlorobenzene was detected in one of five samples in well NBCE559005 (3,200 μg/L), exceeding its tap-water RBC of 3.90 μg/L. No MCL exists for chlorobenzene.

Deep Groundwater

Four VOCs were detected in deep groundwater samples collected at AOC 559 (no deep wells were installed at AOC 560 or 561). Two VOCs — chloroform and trichloroethene — exceeded their respective tap-water RBCs.

Chloroform was detected in one of three samples in well NBCE55904D (1.0 μg/L), exceeding its tap-water RBC 0.150 μg/L. The detection did not exceed the chloroform MCL of 100 μg/L.

Trichloroethene was detected in one of three samples in well NBCE55903D (3.0 μg/L), exceeding its tap-water RBC of 1.60 μg/L. The detection did not exceed the trichloroethene MCL of 5.00 μg/L.

Semivolatile Organic Compounds in Groundwater

Shallow Groundwater

Five SVOCs were detected in shallow groundwater samples collected at AOC 559. Two SVOCs — 1,2-dichlorobenzene and 1,4-dichlorobenzene — exceeded their respective tap-water RBCs.

1,2-Dichlorobenzene was detected in one of five samples in well NBCE559005 (230 μg/L), exceeding its tap-water RBC of 27 μg/L. The detection did not exceed the 1,2-dichlorobenzene MCL of 600 μg/L.

1,4-Dichlorobenzene was detected in one of five samples in well NBCE559005 (240 μg/L), exceeding its tap-water RBC of 0.440 μg/L. The detection also exceeded the 1,4-dichlorobenzene MCL of 75.0 μg/L.

Inorganic Elements in Groundwater

Shallow Groundwater

Thirteen metals were detected in shallow groundwater samples collected at AOC 559. One metal — iron — exceeded its tap-water RBC.

Iron was detected in five of five samples with a range of 313 to 14,500 μg/L and a mean of 5,550 μg/L. Two samples from wells NBCE559004 (11,900 μg/L) and NBCE559005 (14,500 μg/L) exceeded the iron tap-water RBC of 1,100 μg/L. No shallow groundwater RC or MCL has been established for iron.

Deep Groundwater

Twelve metals were detected in deep groundwater samples collected at AOC 559. Two metals — iron and thallium — exceeded both their respective tap-water RBC and deep groundwater RC (where available).

Iron was detected in three of three samples with a range of 200 to 2,030 μg/L and a mean of 1,030 μg/L. One sample from well NBCE55904D (2,030 μg/L) exceeded the iron tap-water RBC of 1,100 μg/L. No deep groundwater RC or MCL has been established for iron.

Thallium was detected in one of three samples in well NBCE55903D (3.90 μg/L), exceeding the thallium tap-water RBC of 0.290 μg/L and MCL of 2.00 μg/L. No deep groundwater RC has been established for thallium.

10.29.5 Wipe Sampling and Analysis

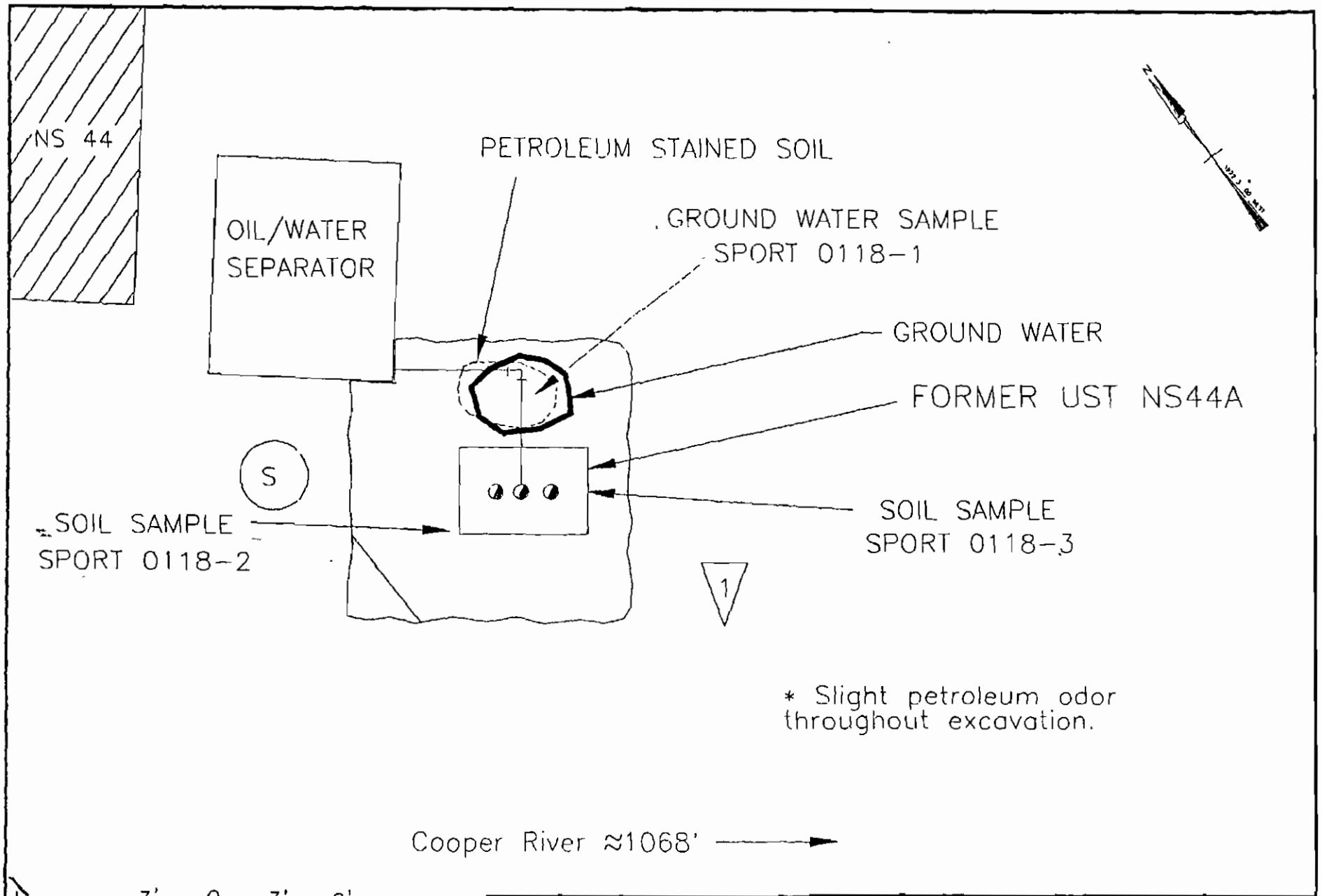
Wipe samples were collected at AOC 559 from the locations shown in Figure 10.29.3. The *Final Zone E RFI Work Plan* proposed the collection of nine wipe samples at AOC 559. All nine wipe samples were collected and submitted for PCB analysis. Table 10.29.5.1 summarizes wipe sampling activity for AOC 559.

Table 10.29.5.1
AOC 559
Wipe Sampling Summary

Samples Proposed	Samples Collected	Analyses Proposed	Analyses Performed	Deviations
9	9	PCB	PCB	None

10.29.6 Nature of Contamination in Dust

Table 10.29.6.1 summarizes the wipe sample analytical results for AOC 559. Sample locations were determined in the field and were biased in an attempt to identify worst case situations. Sample locations were selected in the field based on the location of PCB-containing equipment and visual evidence of spills and leaks. Appendix H contains the complete data report for all samples collected in Zone E.

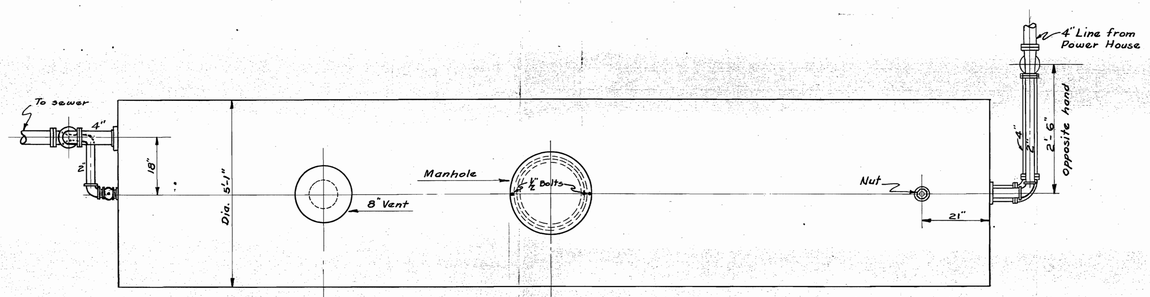


Sile Map 4
UST NS 44A
Charleston Naval Base
Charleston, SC

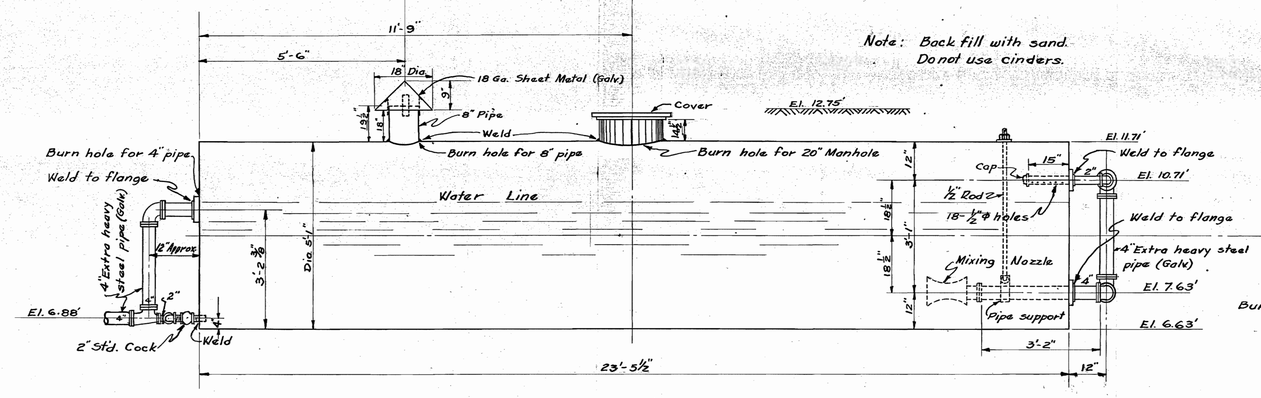
SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

DWG DATE: 25 Nov 96 | DWG NAME. NS44_4

1-240

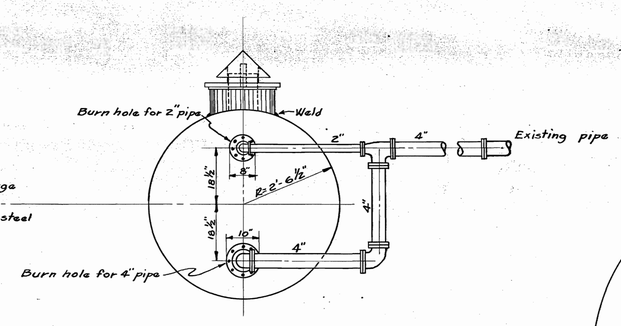


PLAN



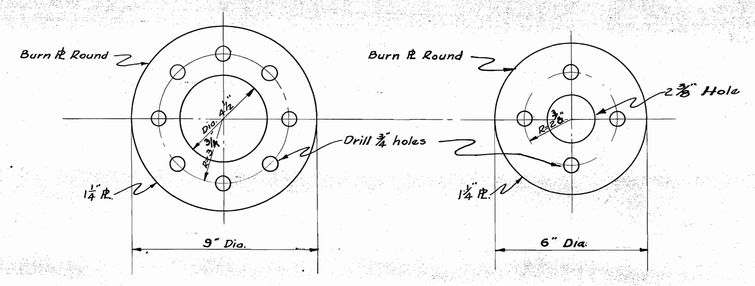
Note: Back fill with sand. Do not use cinders.

ELEVATION
Scale: 1/2"=1'-0"



END ELEVATION

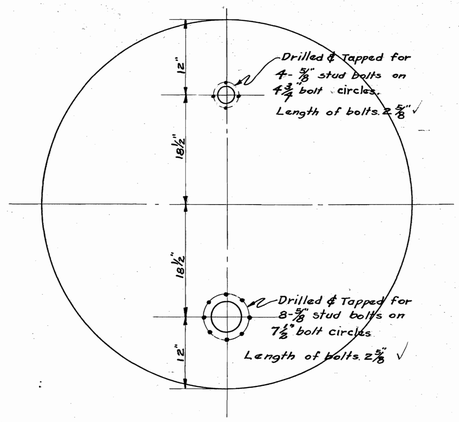
Note:- Standard Cast Iron Fittings



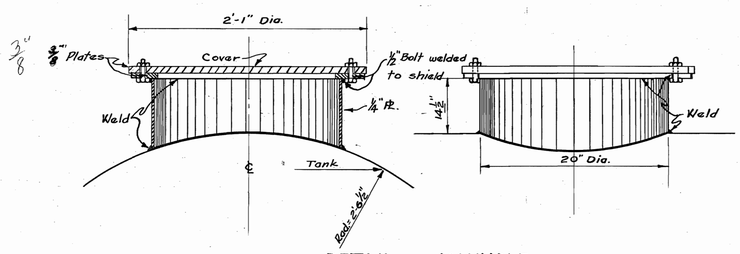
2 Required

1 Required

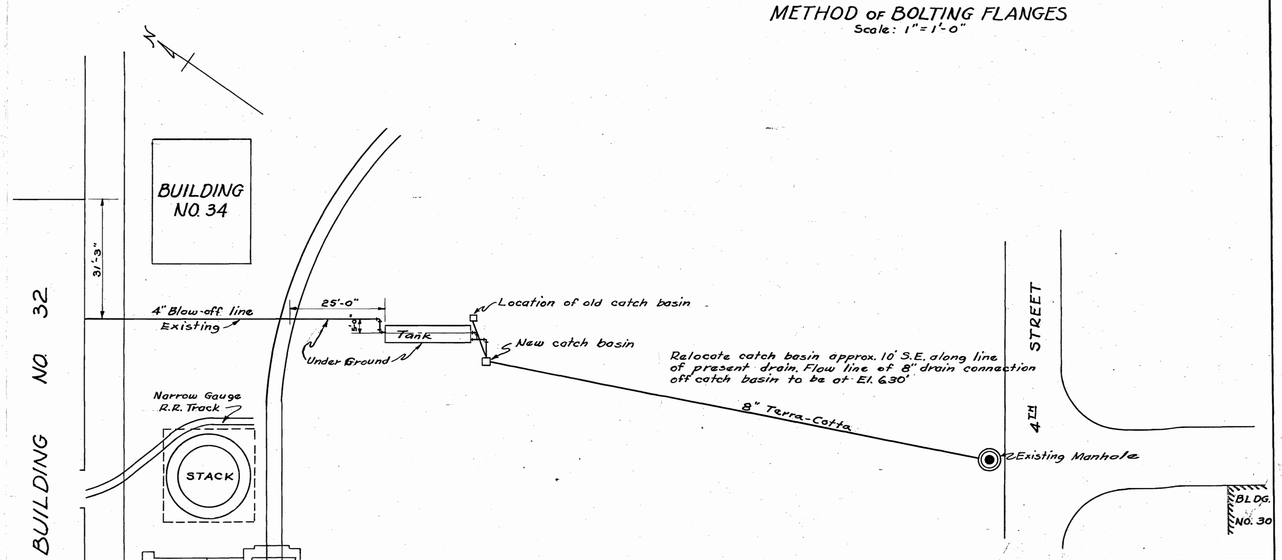
DETAIL OF FLANGES
Scale: 3"=1'-0"



METHOD OF BOLTING FLANGES
Scale: 1"=1'-0"



DETAIL OF MANHOLE
Scale: 1 1/2"=1'-0"



LOCATION PLAN
Scale: 1"=20'-0"

Drawn by R.A.I.	NAVY YARD, CHARLESTON, S.C.
Traced by I.D.R.	BLOW-OFF TANK FOR POWERHOUSE BOILERS
Checked by A.E.M.	
Chief D'f'm'n.	
In Charge A.E.M.	
Design Supt.	
P.W. Drawing No. H32-913	Approved May 27, 1940
Scale: As shown	Public Works Officer

NS 44A

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LABORATORY DIVISION
CHARLESTON NAVAL SHIPYARD
CODE 134, BLDG 13
CHARLESTON, S.C. 29408-6100

GENERAL LABORATORY REPORT

Date: 30 September 1995

To: Code 300C.9, Bldg. NS 44

Subj: ANALYSIS OF WASTE OIL / UST 00061LO (TANK# NS 44A)

Ref: (a) Job Order: 37-160-05117
(b) Report NO: 95CH01472 : REM- 427
(c) ECP #2

1. As authorized by reference (a) and requested by reference (b), one (1) sample of **WASTE OIL / UST 00061LO (TANK# NS 44A)** was analyzed per reference (c).

2. The results follow :

TEST	RESULT
Arsenic, mg/l	< 1
Chromium, mg/l	3.2
Cadmium, mg/l	1.3
Lead, mg/l	92
PCB's, ppm	< 2
Flash Point, °F	215
Total Halogens, ppm	530
pH	< 1

334-38981

Jerry L Lewis 9/30/95 Analyst

P A Bonick 10-3-95 Head, LABORATORY DIVISION

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CERTIFICATE OF ANALYSIS

NS 44

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196

Report Date: August 08, 1996

Sample ID	: SPORT0118-1
Lab ID	: 9607572-01
Matrix	: GroundH2O
Date Collected	: 07/29/96
Date Received	: 07/30/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1000	2000	ug/l	1000	JGS	08/02/96	1406	88130	1
Ethylbenzene	U	0.00	1000	2000	ug/l	1000					
Toluene	U	0.00	1000	2000	ug/l	1000					
Xylenes (TOTAL)	U	0.00	1000	2000	ug/l	1000					
Naphthalene	U	0.00	1000	2000	ug/l	1000					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	100	200	ug/l	20.	JCB	08/06/96	1631	88140	2
Acenaphthylene	U	0.00	100	200	ug/l	20.					
Anthracene	U	0.00	100	200	ug/l	20.					
Benzo(a)anthracene	U	0.00	100	200	ug/l	20.					
Benzo(a)pyrene	U	0.00	100	200	ug/l	20.					
Benzo(b)fluoranthene	U	0.00	100	200	ug/l	20.					
Benzo(ghi)perylene	U	0.00	100	200	ug/l	20.					
Benzo(k)fluoranthene	U	0.00	100	200	ug/l	20.					
Chrysene	U	0.00	100	200	ug/l	20.					
Dibenzo(a,h)anthracene	U	0.00	100	200	ug/l	20.					
Fluoranthene	U	0.00	100	200	ug/l	20.					
Fluorene	U	0.00	100	200	ug/l	20.					
Indeno(1,2,3-c,d)pyrene	U	0.00	100	200	ug/l	20.					
Naphthalene	U	0.00	100	200	ug/l	20.					
Phenanthrene	U	0.00	100	200	ug/l	20.					
Pyrene	U	0.00	100	200	ug/l	20.					
Metals Analysis											
Mercury		0.564	0.0148	0.500	ug/l	1.0	RMT	08/02/96	1232	88085	N
Silver	U	0.705	2.49	10.0	ug/l	1.0	NRM	08/05/96	1426	88078	3
Arsenic		66.3	1.86	10.0	ug/l	1.0					

9607572-01

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

ce: NPWC00196 Report Date: August 08, 1996

Sample ID : SPORT0118-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		301	0.0663	10.0	ug/l	1.0					
Cadmium	J	4.30	0.0970	5.00	ug/l	1.0	NRM	08/05/96	1426	88078	3
Chromium		58.4	0.596	10.0	ug/l	1.0					
Lead		392	1.13	5.00	ug/l	1.0					
Selenium	J	3.93	1.43	5.00	ug/l	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		42.0	2.00	2.00	mg/l	1.0	SDW	08/02/96	1200	88131	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	TNF	08/01/96	0925	88140	5
Mercury	RMJ	08/01/96	2015	88085	6
TRACE	FGD	08/01/96	1530	88078	7

Comments:
A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interferences. As a result the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(43.0 - 108.)
Nitrobenzene-d5	M610	0.00*	(35.0 - 111.)
p-Terphenyl-d14	M610	0.00*	(33.0 - 125.)
Bromofluorobenzene	BTEX-8260	93.9	(80.0 - 128.)
Dibromofluoromethane	BTEX-8260	91.0	(67.7 - 135.)
Toluene-d8	BTEX-8260	92.0	(76.8 - 122.)
Bromofluorobenzene	NAP-8260	93.9	(80.0 - 128.)
Dibromofluoromethane	NAP-8260	91.0	(67.7 - 135.)
Toluene-d8	NAP-8260	92.0	(76.8 - 122.)

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

Sample ID : SPORT0118-1

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9070A
M 5	EPA 3510
M 6	EPA 7470
M 7	EPA 3005

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 08, 1996

Sample ID : SPORT0178-1

GEL Laboratory Certifications		EPI Laboratory Certifications	
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790	WV - 236		

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakney at (803) 769-7386.

Karen Blakney

Analytical Report Specialist

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hjem

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: August 08, 1996 |

Sample ID : SPORT0118-2
Lab ID : 9607572-02
Matrix : Soil
Date Collected : 07/29/96
Date Received : 07/30/96
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	40.0	80.0	ug/kg	40.	MKP	08/02/96	1103	88049	1
Ethylbenzene	U	3.36	40.0	80.0	ug/kg	40.					
Toluene	U	14.4	40.0	80.0	ug/kg	40.					
Xylenes (TOTAL)	U	0.00	40.0	80.0	ug/kg	40.					
Naphthalene	U	0.00	40.0	80.0	ug/kg	40.					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	1670	3330	ug/kg	10.	BDG	08/06/96	1439	88234	2
Acenaphthylene	U	0.00	1670	3330	ug/kg	10.					
Anthracene	U	0.00	1670	3330	ug/kg	10.					
Benzo(a)anthracene	U	0.00	1670	3330	ug/kg	10.					
Benzo(a)pyrene	U	0.00	1670	3330	ug/kg	10.					
Benzo(b)fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	1670	3330	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Chrysene	U	0.00	1670	3330	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	1670	3330	ug/kg	10.					
Fluoranthene	J	1930	1670	3330	ug/kg	10.					
Fluorene	U	0.00	1670	3330	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1670	3330	ug/kg	10.					
Naphthalene	U	0.00	1670	3330	ug/kg	10.					
Phenanthrene	U	0.00	1670	3330	ug/kg	10.					
Pyrene	J	3300	1670	3330	ug/kg	10.					
Metals Analysis											
Mercury	J	0.0367	0.00207	0.200	mg/kg	1.0	RMJ	08/01/96	1741	88109	N
Silver	U	62.4	247	990	ug/kg	2.0	WCC	08/02/96	1207	88135	3
Arsenic		6640	184	990	ug/kg	2.0					

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1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 08, 1996

Sample ID : SPORT0118-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		28100	6.56	990	ug/kg	2.0					
Cadmium		650	9.60	495	ug/kg	2.0	WCC	08/02/96	1207	88135	3
Chromium		29100	59.0	990	ug/kg	2.0					
Lead		120000	112	495	ug/kg	2.0					
Selenium	J	472	142	495	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		3830	10.0	50.0	mg/kg	1.0	JEN	08/06/96	1400	88318	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	TNF	08/05/96	1030	88234	5
Mercury	RMJ	08/01/96	1340	88109	6
TRACE	FGD	08/01/96	1500	88135	7

Comments:
A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interferences. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	130.*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	117.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	85.6	(74.0 - 128.)
Toluene-d8	BTEX-8260	101.	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	117.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	85.6	(74.0 - 128.)
Toluene-d8	NAP-8260	101.	(53.4 - 163.)

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 08, 1996

Sample ID : SPORT0118-2

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002

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Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 08, 1996

Sample ID : SPORT0118-2

GEL Laboratory Certifications		EPI Laboratory Certifications	
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790	WV - 236		

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney

Analytical Report Specialist

9607572-02

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: August 08, 1996 |

Sample ID	: SPORT0118-3
Lab ID	: 9607572-03
Matrix	: Soil
Date Collected	: 07/29/96
Date Received	: 07/30/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	40.0	80.0	ug/kg	40.	MKP	08/02/96	1132	88049	1
Ethylbenzene	U	0.00	40.0	80.0	ug/kg	40.					
Toluene	U	18.8	40.0	80.0	ug/kg	40.					
Xylenes (TOTAL)	U	0.00	40.0	80.0	ug/kg	40.					
Naphthalene	U	0.00	40.0	80.0	ug/kg	40.					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	1670	3330	ug/kg	10.	BDG	08/06/96	1511	88234	2
Acenaphthylene	U	0.00	1670	3330	ug/kg	10.					
Anthracene	U	0.00	1670	3330	ug/kg	10.					
Benzo(a)anthracene	U	0.00	1670	3330	ug/kg	10.					
Benzo(a)pyrene	U	0.00	1670	3330	ug/kg	10.					
Benzo(b)fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	1670	3330	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Chrysene	U	0.00	1670	3330	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	1670	3330	ug/kg	10.					
Fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Fluorene	U	0.00	1670	3330	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1670	3330	ug/kg	10.					
Naphthalene	U	0.00	1670	3330	ug/kg	10.					
Phenanthrene	U	0.00	1670	3330	ug/kg	10.					
Pyrene	U	0.00	1670	3330	ug/kg	10.					
Metals Analysis											
Mercury	J	0.0277	0.00207	0.200	mg/kg	1.0	RMJ	08/01/96	1743	88109	N
Silver	U	-13.3	247	990	ug/kg	2.0	WCC	08/02/96	1211	88135	3
Arsenic		5160	184	990	ug/kg	2.0					

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 08, 1996

Sample ID : SPORT0118-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		11600	6.56	990	ug/kg	2.0					
Cadmium	J	360	9.60	495	ug/kg	2.0	WCC	08/02/96	1211	88135	3
Chromium		13600	59.0	990	ug/kg	2.0					
Lead		28000	112	495	ug/kg	2.0					
Selenium	J	266	142	495	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	-20.0	10.0	50.0	mg/kg	1.0	JEN	08/06/96	1400	88318	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	TNF	08/05/96	1030	88234	5
Mercury	RMJ	08/01/96	1340	88109	6
TRACE	FGD	08/01/96	1500	88135	7

Comments:
A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interferences. As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	97.2	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	79.2	(74.0 - 128.)
Toluene-d8	BTEX-8260	95.6	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	97.2	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	79.2	(74.0 - 128.)
Toluene-d8	NAP-8260	95.6	(53.4 - 163.)

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: August 08, 1996 |

Sample ID : SPORT0118-3

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002

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Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 | Report Date: August 08, 1996 |

Sample ID : SPORT0118-3

GEL Laboratory Certifications		EPI Laboratory Certifications	
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790	WV - 236		

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney

Analytical Report Specialist

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 06, 1996

Sample ID	: SPORT0118-4
Lab ID	: 9607572-04
Matrix	: GroundH2O
Date Collected	: 07/29/96
Date Received	: 07/30/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	JGS	08/02/96	0155	88130	1
Ethylbenzene	U	0.00	1.00	2.00	ug/l	1.0					
Toluene	U	0.00	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	101.	(80.0 - 128.)
Dibromofluoromethane	BTEX-8260	102.	(67.7 - 135.)
Toluene-d8	BTEX-8260	99.5	(76.8 - 122.)
Bromofluorobenzene	NAP-8260	101.	(80.0 - 128.)
Dibromofluoromethane	NAP-8260	102.	(67.7 - 135.)
Toluene-d8	NAP-8260	99.5	(76.8 - 122.)

M = Method	Method Description
M 1	EPA 8260

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 06, 1996

Sample ID : SPORT0118-4

M = Method	Method-Description

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790	WV - 236		

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: August 06, 1996

Sample ID : SPORT0118-4

GEL Laboratory Certifications EPI Laboratory Certifications

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer F. Green

Analytical Report Specialist

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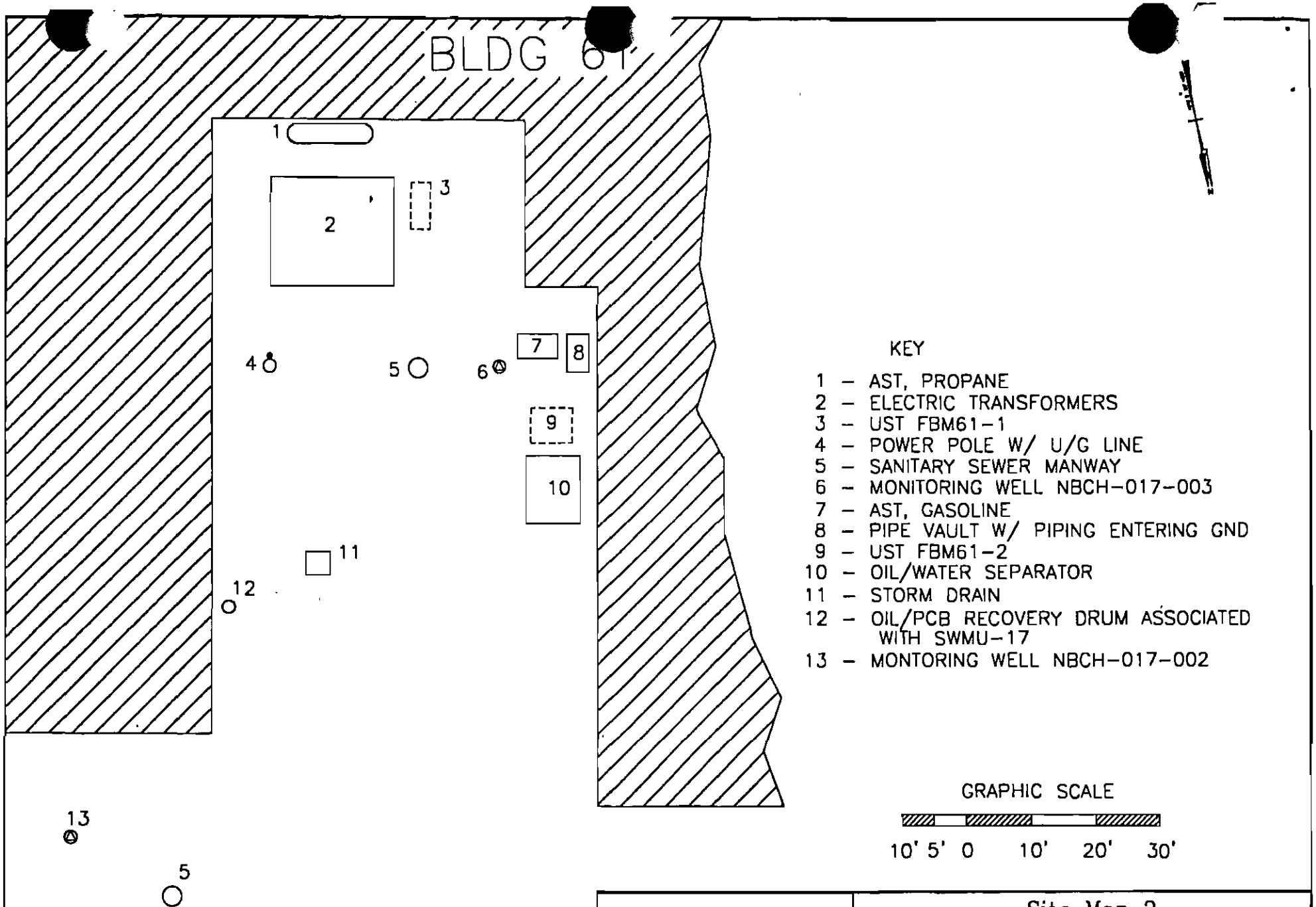
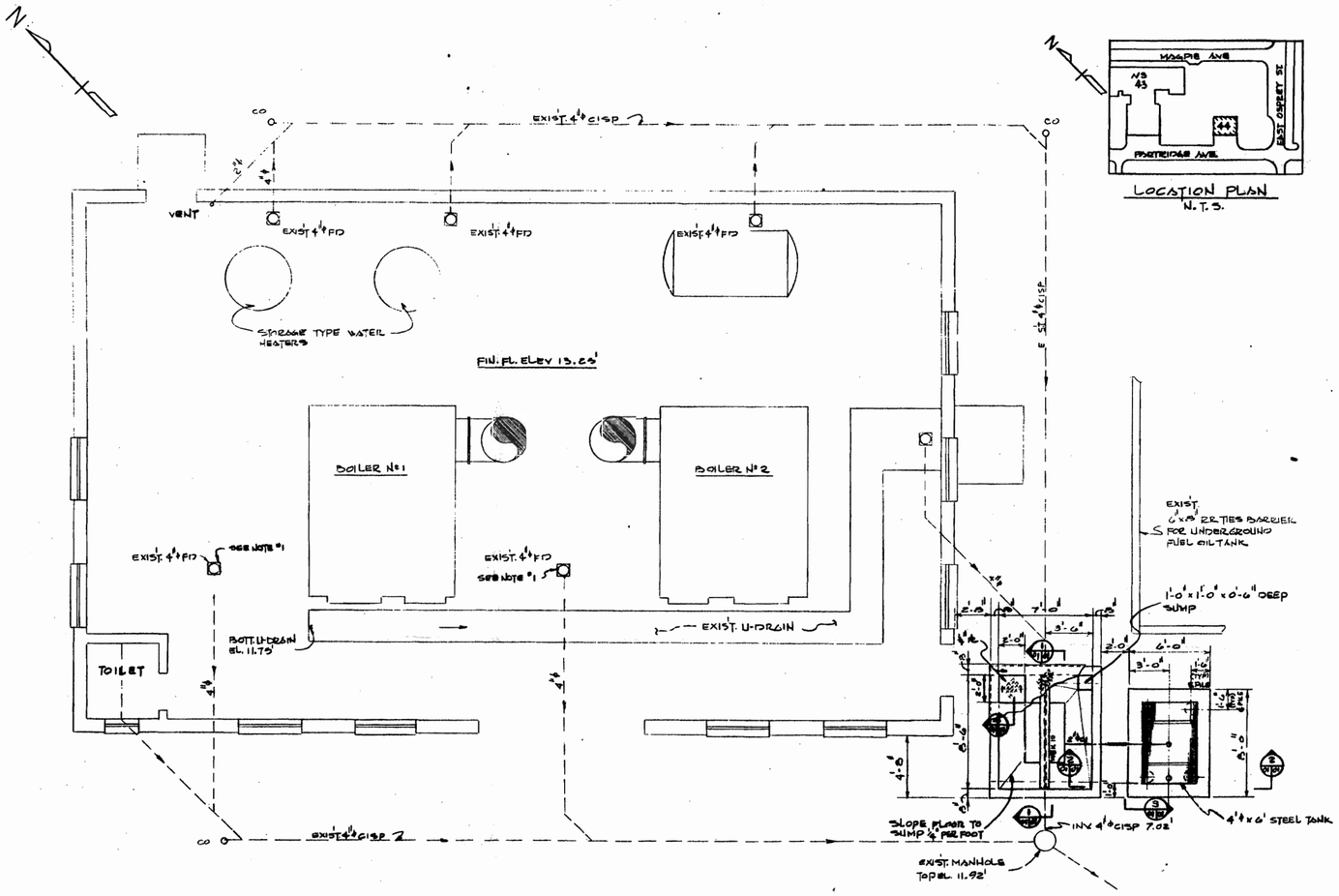


SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC
29405-2108
Ph. (803) 743-6777

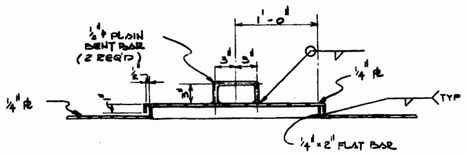
Site Map 2
USTs FBM61-1 & FBM61-2
Charleston Naval Base
Charleston, SC

DWG DATE: 6 NOV 97 | DWG NAME: FBM61_2



PLAN
SCALE - 1/4" = 1'-0"

LOCATION PLAN
N.T.S.



SECTION 4 / 01/01
SCALE - 1 1/2" = 1'-0"

NOTES:

1) REMOVE SLOTTED DRAIN COVER & REPLACE WITH SOLID COVER WELD COVER WATER TIGHT.

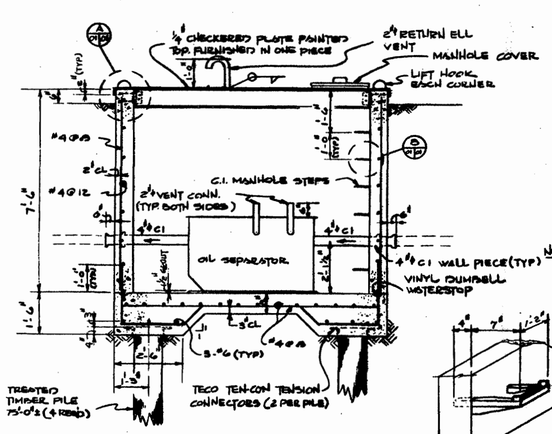
2) CONT'R. TO VERIFY ELEV. OF PIPE IN FIELD PRIOR TO CONST.

3) ALL STEEL NOT NOTED SHALL BE HOT DIPPED GALVANIZED IN COMPLIANCE W/ASTM A386-67

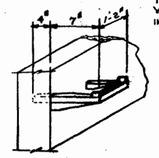
4) 28 DAY COMPRESSIVE STRENGTH OF CONC. SHALL BE 4,000 P.S.I

5) REINF. SHALL BE ASTM A615 GRADE 60

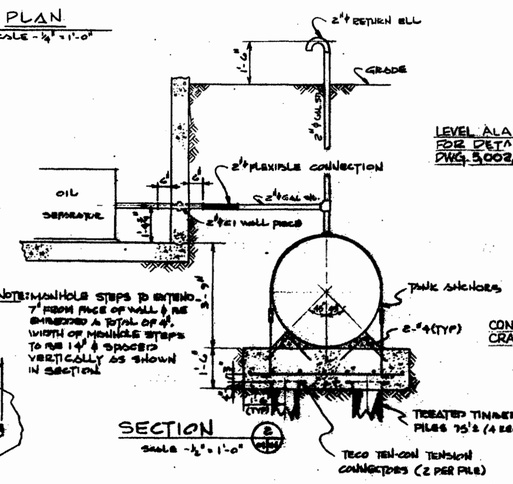
6) ALL UNDERGROUND STEEL SURFACES TO BE PROTECTED WITH BITUMINOUS COATING.



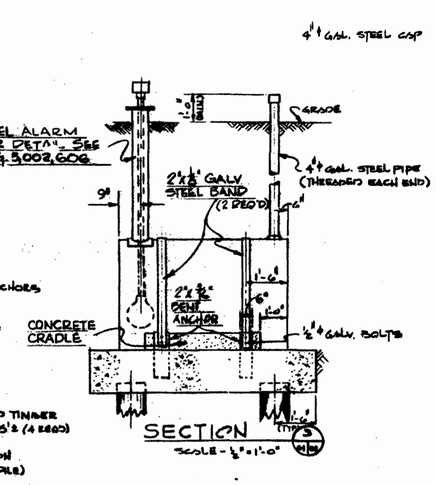
SECTION 1 / 01/01
SCALE - 1/2" = 1'-0"



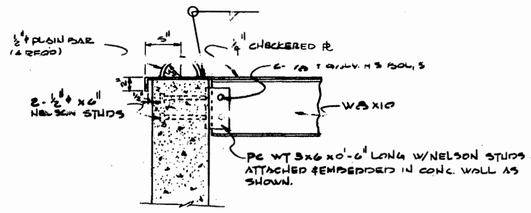
DETAIL 5 / 01/01
SCALE - 1 1/2" = 1'-0"
(TYP. C.I. MANHOLE STEP)



SECTION 2 / 01/01
SCALE - 1/2" = 1'-0"



SECTION 3 / 01/01
SCALE - 1/2" = 1'-0"



DETAIL A / 01/01
SCALE - 1 1/2" = 1'-0"

GRAPHIC SCALE

1/4" = 1'-0" 0 4' 8' 12'
1/2" = 1'-0" 0 1' 2' 3' 4' 5' 6'
1 1/2" = 1'-0" 0 3' 6' 9' 12'

SYMBOL	DESCRIPTION	DATE	APPROVAL
1	AS BUILT NO CORRECTIONS	3-7-77	AMZ

REVISIONS

NOONAN & OF SOUTH CAROLINA
CONSULTANTS
GREENVILLE, S.C.

R.E. DWG. NO. NS-44-19
DESIGNED W.E.H.
DRAWN W.E.H.
CHECKED C.B.S.
R.E. ENGR. L. Parker 5/6/76
R.E. ARCH. 5/6/76
R.E. MECH. 5/7/76
R.E. ELEC. 5/11/76
R.E. CIVIL 5/12/76

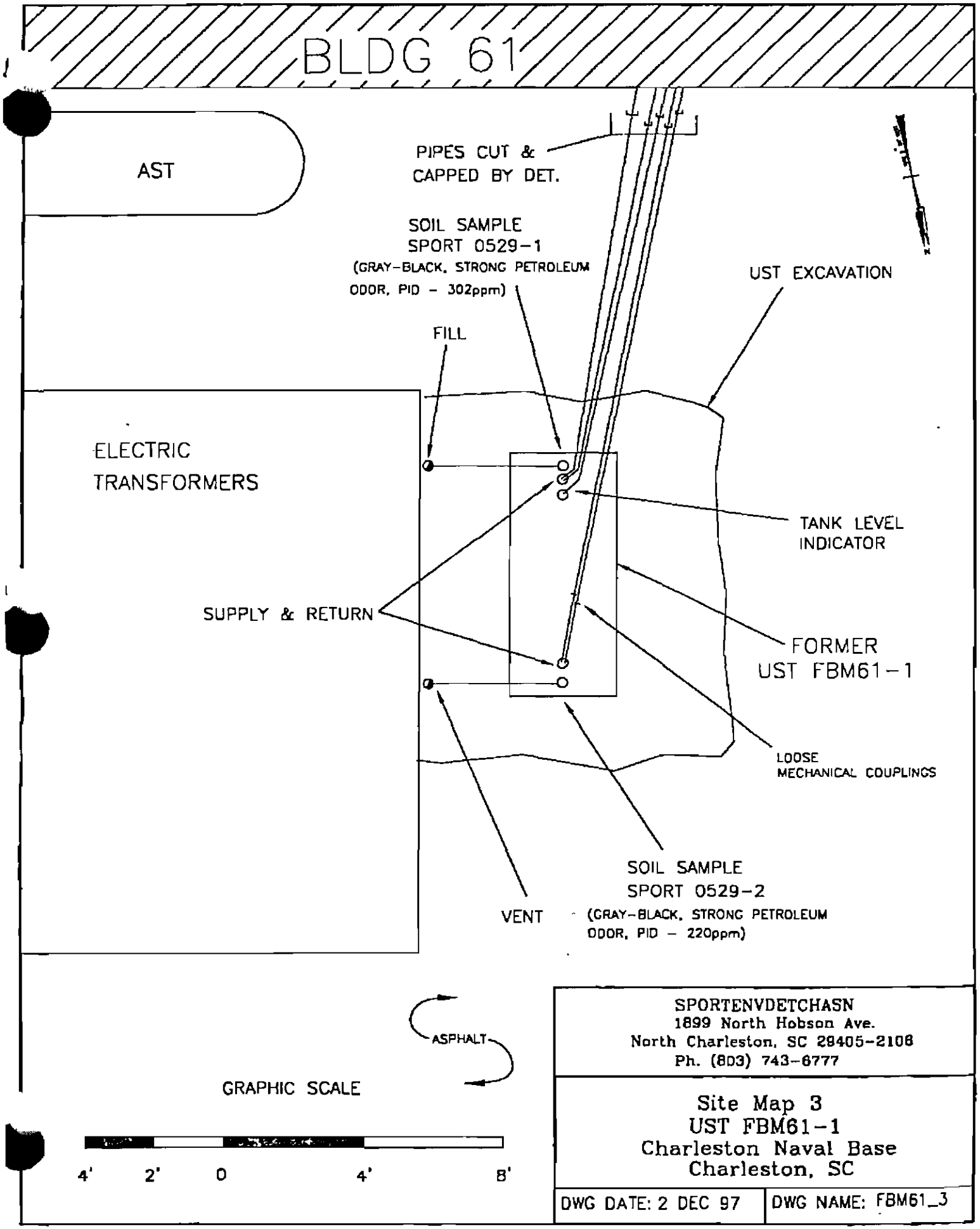
R.E.N.O.C. JOB NO. 6-048-10
R.E.N.O.C. DWG. NO. 66-3-7-01

DEPARTMENT OF THE NAVY NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON NAVAL SHIPYARD, CHARLESTON, S.C.

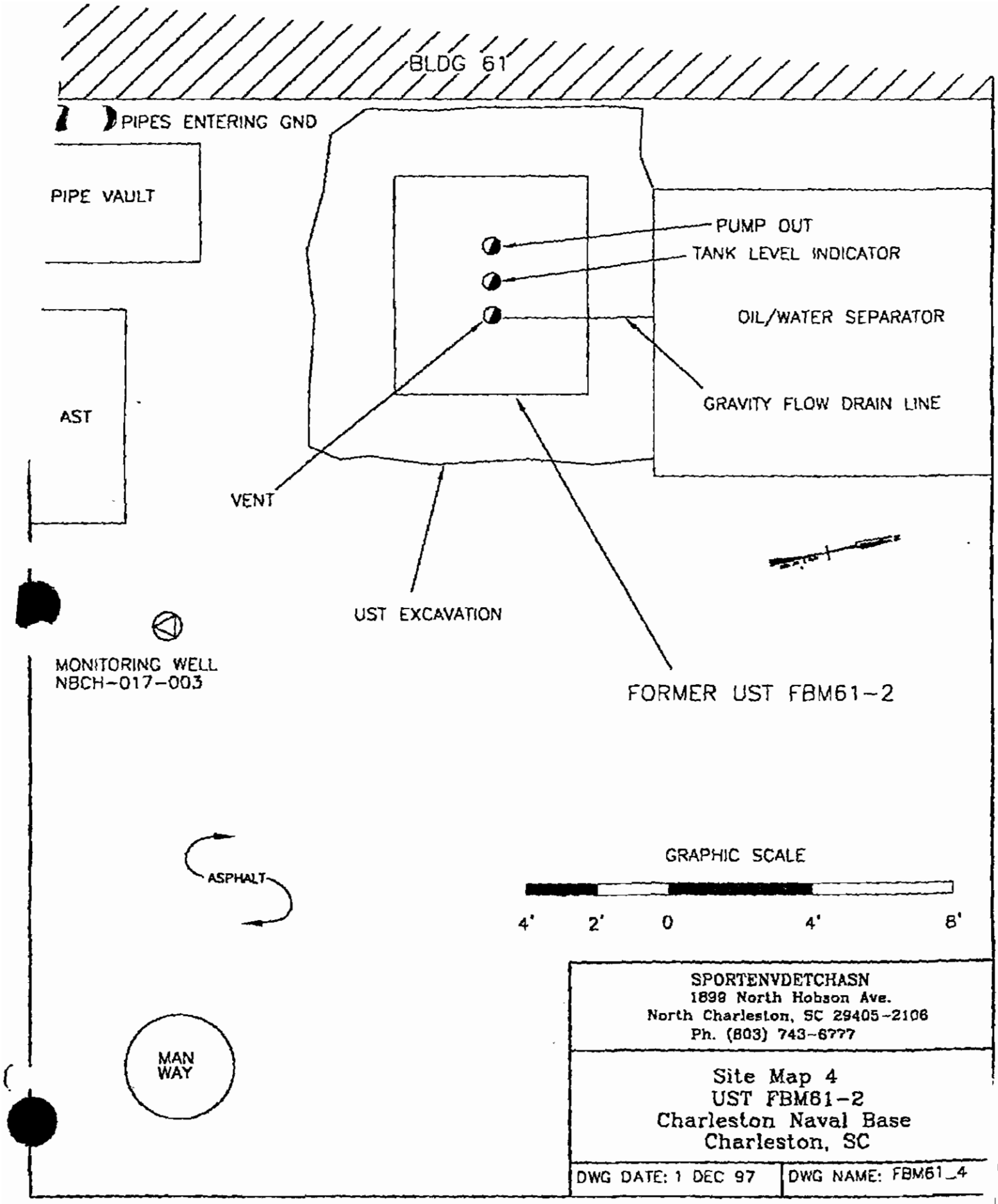
BUILDING NS-44
OIL/WATER SEPARATOR SYSTEM
PLAN, SECTIONS & DETAILS

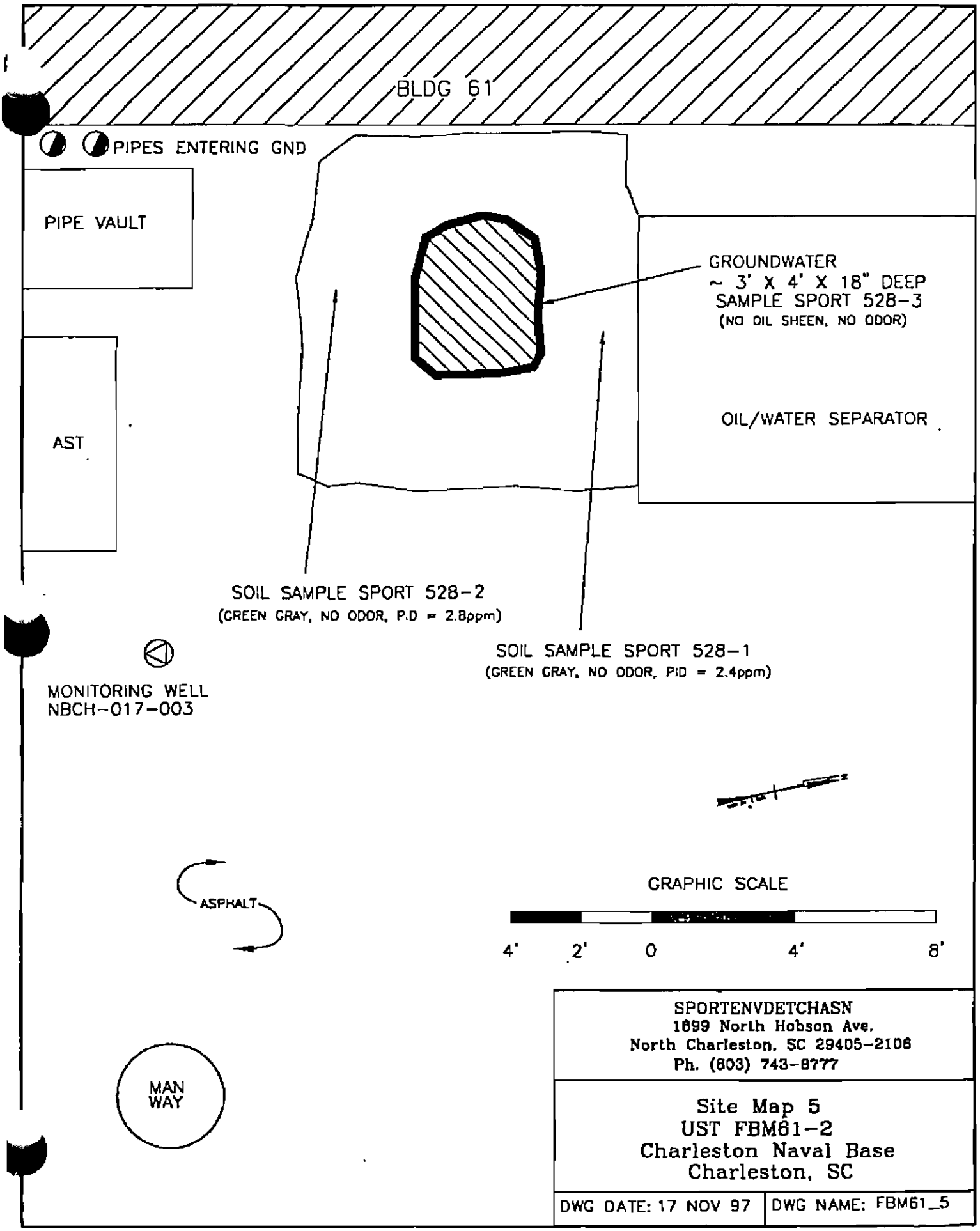
SIZE F CODE IDENT NO. NAVAL FACILITIES ENGINEERING COMMAND DWG. NO. 5002,606
CHARLESTON NAVAL SHIPYARD DWG. NO. 1-4-4-1-2-0130
SCALE NOTED SPECOS-2-0130 SHEET 1 OF 3

0022817


BLDG 61
AST
PIPES CUT & CAPPED BY DET.
SOIL SAMPLE SPORT 0529-1
(GRAY-BLACK, STRONG PETROLEUM ODOR, PID - 302ppm)
UST EXCAVATION
FILL
ELECTRIC TRANSFORMERS
TANK LEVEL INDICATOR
SUPPLY & RETURN
FORMER UST FBM61-1
LOOSE MECHANICAL COUPLINGS
SOIL SAMPLE SPORT 0529-2
(GRAY-BLACK, STRONG PETROLEUM ODOR, PID - 220ppm)
VENT
ASPHALT
GRAPHIC SCALE
4' 2' 0 4' 8'
SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC 29405-2108
Ph. (803) 743-6777
Site Map 3
UST FBM61-1
Charleston Naval Base
Charleston, SC
DWG DATE: 2 DEC 97
DWG NAME: FBM61_3

1-258


BLDG 61
PIPES ENTERING GND
PIPE VAULT
AST
PUMP OUT
TANK LEVEL INDICATOR
OIL/WATER SEPARATOR
GRAVITY FLOW DRAIN LINE
VENT
UST EXCAVATION
MONITORING WELL
NBCH-017-003
FORMER UST FBM61-2
ASPHALT
GRAPHIC SCALE
4' 2' 0 4' 8'
MAN WAY
SPORTENVDETCHASN
1898 North Hobson Ave.
North Charleston, SC 29405-2106
Ph. (803) 743-6777
Site Map 4
UST FBM61-2
Charleston Naval Base
Charleston, SC
DWG DATE: 1 DEC 97
DWG NAME: FBM61_4


BLDG 61
PIPES ENTERING GND
PIPE VAULT
AST
GROUNDWATER
~ 3' X 4' X 18" DEEP
SAMPLE SPORT 528-3
(NO OIL SHEEN, NO ODOR)
OIL/WATER SEPARATOR
SOIL SAMPLE SPORT 528-2
(GREEN GRAY, NO ODOR, PID = 2.8ppm)
SOIL SAMPLE SPORT 528-1
(GREEN GRAY, NO ODOR, PID = 2.4ppm)
MONITORING WELL
NBCH-017-003
ASPHALT
GRAPHIC SCALE
4' 2' 0 4' 8'
MAN WAY
SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC 29405-2106
Ph. (803) 743-8777
Site Map 5
UST FBM61-2
Charleston Naval Base
Charleston, SC
DWG DATE: 17 NOV 97
DWG NAME: FBM61_5

1-260

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	DPI
FL	E87156/X1294	E87472/37453
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1599 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NFWC00197 Report Date: October 03, 1997

Sample ID	: SPORT0528-1
Lab ID	: 9709572-01
Matrix	: Soil
Date Collected	: 09/24/97
Date Received	: 09/24/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	TCL	09/30/97	1758	108654	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 15 items											
Acenaphthene	U	0.00	164	330	ug/kg	1.0	HNM	09/29/97	2232	108587	2
Acenaphthylene	U	0.00	164	330	ug/kg	1.0					
Anthracene	U	0.00	164	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	164	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	164	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	164	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	164	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	164	330	ug/kg	1.0					
Chrysene	U	0.00	164	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	164	330	ug/kg	1.0					
Fluoranthene	U	0.00	164	330	ug/kg	1.0					
Fluorene	U	0.00	164	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	164	330	ug/kg	1.0					
Naphthalene	U	0.00	164	330	ug/kg	1.0					
Phenanthrene	U	0.00	164	330	ug/kg	1.0					
Pyrene	U	0.00	164	330	ug/kg	1.0					
Metals Analysis											
Mercury	J	0.0181	0.0158	0.0333	mg/kg	1.0	RMJ	09/25/97	1602	108364	N
Silver	U	13.9	60.1	485	ug/kg	2.0	MBL	09/26/97	1147	108429	3
Arsenic		1760	289	485	ug/kg	2.0					

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9709572-01

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Laboratory Certifications

STATE	GEL	EPA
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10512
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 | Report Date: October 03, 1997 |

Sample ID : SPORT0528-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		5170	32.2	485	ug/kg	2.0					
Cadmium	U	3.59	20.2	485	ug/kg	2.0	MBL	09/26/97	1147	108429	3
Chromium		4560	70.7	485	ug/kg	2.0					
Lead		3810	65.8	485	ug/kg	2.0					
Selenium	J	278	136	485	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	-40.0	10.0	50.0	mg/kg	1.0	SDW	09/30/97	1200	108651	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	GWL	09/29/97	1600	108587	5
Mercury	RMJ	09/25/97	1230	108364	6
TRACE	CRB	09/25/97	1500	108429	7

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	59.8	(30.0 - 115.)
Nitrobenzene-d5	M610	62.2	(23.0 - 120.)
p-Terphenyl-d14	M610	74.8	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	96.7	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	95.7	(63.4 - 136.)
Toluene-d8	BTEX-8260	108.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	96.7	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	95.7	(63.4 - 136.)
Toluene-d8	NAP-8260	108.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071A
M 5	EPA 3550

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SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hietz

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 | Report Date: October 03, 1997 |

Sample ID : SPORT0528-1

M = Method	Method-Description
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen D Blakeney
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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 03, 1997

Sample ID : SPORT0528-2
Lab ID : 9709572-02
Matrix : Soil
Date Collected : 09/24/97
Date Received : 09/24/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	TCL	09/30/97	1828	108654	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.620	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.630	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	164	330	ug/kg	1.0	HNM	09/29/97	2302	108587	2
Acenaphthylene	U	0.00	164	330	ug/kg	1.0					
Anthracene	U	0.00	164	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	164	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	164	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	164	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	164	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	164	330	ug/kg	1.0					
Chrysene	U	0.00	164	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	164	330	ug/kg	1.0					
Fluoranthene	U	0.00	164	330	ug/kg	1.0					
Fluorene	U	0.00	164	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	164	330	ug/kg	1.0					
Naphthalene	U	0.00	164	330	ug/kg	1.0					
Phenanthrene	U	0.00	164	330	ug/kg	1.0					
Pyrene	U	0.00	164	330	ug/kg	1.0					
Metals Analysis											
Mercury	U	0.0167	0.0171	0.0333	mg/kg	1.0	RMJ	09/25/97	1604	108364	N
Silver	U	-47.8	57.4	463	ug/kg	2.0	MBL	09/26/97	1152	108429	3
Arsenic		543	276	463	ug/kg	2.0					

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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NFWC00197 Report Date: October 03, 1997

Sample ID : SPORT0528-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		3780	30.7	463	ug/kg	2.0					
Cadmium	U	-30.1	19.3	463	ug/kg	2.0	MBL	09/26/97	1152	108429	3
Chromium		4130	67.5	463	ug/kg	2.0					
Lead		2400	62.8	463	ug/kg	2.0					
Selenium	U	81.5	129	463	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons	U	-30.0	10.0	30.0	mg/kg	1.0	SOW	09/30/97	1200	108651	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	GWL	09/29/97	1600	108587	5
Mercury	RMJ	09/25/97	1230	108364	6
TRACE	CRB	09/25/97	1500	108429	7

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	40.8	(30.0 - 115.)
Nitrobenzene-d5	M610	43.5	(23.0 - 120.)
p-Terphenyl-d14	M610	73.3	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	95.2	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	74.2	(63.4 - 136.)
Toluene-d8	BTEX-8260	116.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	95.2	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	74.2	(63.4 - 136.)
Toluene-d8	NAP-8260	116.	(72.1 - 137.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 6010A
M4	EPA 9071A
M5	EPA 3550

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NC	235	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 03, 1997

Sample ID : SPORT0528-2

M = Method	Method-Description
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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Karen Blakeney
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North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 | Report Date: October 03, 1997 |

Sample ID : SPORT0528-3
Lab ID : 9709572-03
Matrix : GroundH2O
Date Collected : 09/24/97
Date Received : 09/24/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	TCL	09/30/97	1757	108615	1
Ethylbenzene	U	0.00	1.00	2.00	ug/l	1.0					
Toluene	U	0.00	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene		26.5	5.95	11.9	ug/l	1.0	WAM	09/30/97	1730	108580	2
Acenaphthylene	U	0.00	5.95	11.9	ug/l	1.0					
Anthracene		30.9	5.95	11.9	ug/l	1.0					
Benzo(a)anthracene	U	0.00	5.95	11.9	ug/l	1.0					
Benzo(a)pyrene	U	0.00	5.95	11.9	ug/l	1.0					
Benzo(b)fluoranthene	U	0.00	5.95	11.9	ug/l	1.0					
Benzo(ghi)perylene	U	0.00	5.95	11.9	ug/l	1.0					
Benzo(k)fluoranthene	U	0.00	5.95	11.9	ug/l	1.0					
Chrysene	J	8.36	5.95	11.9	ug/l	1.0					
Dibenzo(a,h)anthracene	U	0.00	5.95	11.9	ug/l	1.0					
Fluoranthene		20.8	5.95	11.9	ug/l	1.0					
Fluorene		16.5	5.95	11.9	ug/l	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	5.95	11.9	ug/l	1.0					
Naphthalene		12.3	5.95	11.9	ug/l	1.0					
Phenanthrene		44.5	5.95	11.9	ug/l	1.0					
Pyrene		13.9	5.95	11.9	ug/l	1.0					
Metals Analysis											
Mercury		0.921	0.104	0.200	ug/l	1.0	BMJ	09/29/97	1030	108521	N
Silver	U	-3.73	3.10	25.0	ug/l	5.0	MBL	09/26/97	1341	108425	3
Arsenic		76.3	14.9	25.0	ug/l	5.0					

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SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 03, 1997

Sample ID : SPORT0528-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		384	1.66	25.0	ug/l	5.0					
Cadmium	J	1.78	1.04	25.0	ug/l	5.0	MBL	09/26/97	1341	108425	3
Chromium		291	3.65	25.0	ug/l	5.0					
Lead		368	3.39	25.0	ug/l	5.0					
Selenium	U	6.74	6.99	25.0	ug/l	5.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		10.3	2.00	2.00	mg/l	1.0	JEN	09/30/97	1205	108658	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	TSD	09/29/97	1500	108580	5
Mercury	CRB	09/26/97	1630	108521	6
TRACE	FGD	09/25/97	1130	108425	7

Surrogate Recovery	Test	Percent %	Acceptable Limits
2-Fluorobiphenyl	M610	50.4	(43.0 - 108.)
Nitrobenzene-d5	M610	54.5	(35.0 - 111.)
p-Terphenyl-d14	M610	49.0	(33.0 - 125.)
Bromofluorobenzene	BTEX-8260	91.9	(73.8 - 128.)
Dibromofluoromethane	BTEX-8260	76.6	(63.9 - 139.)
Toluene-d8	BTEX-8260	89.4	(77.1 - 121.)
Bromofluorobenzene	NAP-8260	91.9	(73.8 - 128.)
Dibromofluoromethane	NAP-8260	76.6	(63.9 - 139.)
Toluene-d8	NAP-8260	89.4	(77.1 - 121.)

M = Method	Method-Description
M1	EPA 8260
M2	EPA 8270
M3	EPA 6010A
M4	EPA 9070A
M5	EPA 3510

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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 03, 1997

Sample ID	: SPORT0528-3

M = Method	Method-Description
M 6	EPA 7470
M 7	EPA 3005

Notes:
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* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 | Report Date: October 03, 1997 |

Sample ID	: SPORT0528-4
Lab ID	: 9709572-04
Matrix	: GroundH2O
Date Collected	: 09/24/97
Date Received	: 09/24/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/l	1.0	JEB	10/01/97	1443	108615	1
Ethylbenzene	U	0.00	1.00	2.00	ug/l	1.0					
Toluene	U	0.00	1.00	2.00	ug/l	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/l	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/l	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	100.	(73.8 - 128.)
Dibromofluoromethane	BTEX-8260	87.8	(63.9 - 139.)
Toluene-d8	BTEX-8260	95.5	(77.1 - 121.)
Bromofluorobenzene	NAP-8260	100.	(73.8 - 128.)
Dibromofluoromethane	NAP-8260	87.8	(63.9 - 139.)
Toluene-d8	NAP-8260	95.5	(77.1 - 121.)

M = Method	Method-Description
M 1	EPA 8260

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NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 03, 1997

Sample ID : SPORT0528-4

M = Method	Method-Description

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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NC	203	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: October 03, 1997

Sample ID	: SPORT0528-S
Lab ID	: 9709572-05
Matrix	: Soil
Date Collected	: 09/24/97
Date Received	: 09/24/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	TCL	09/30/97	1858	108654	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	91.4	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	83.7	(63.4 - 136.)
Toluene-d8	BTEX-8260	103.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	91.4	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	83.7	(63.4 - 136.)
Toluene-d8	NAP-8260	103.	(72.1 - 137.)

M = Method	Method Description
M 1	EPA 8260

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Laboratory Certifications

STATE	GEL	EPI
FL	E17156/87294	E87472/87451
NC	239	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 03, 1997

Sample ID : SPORT0528-5

M = Method	Method-Description

Notes:
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CHAIN OF CUSTODY RECORD

9709572

Page 1 of 1

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDET CHASN

SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

CCL 29119

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	RCRA METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	BTEX + NAP	Cyanide	Coliform - specify type	TPH	PAH	Remarks
-01	SPORTØ528-1	9/24/97	1330		X		X	4							X						X			X	X	UST FBM 61-2-1 Soil .1
-02	SPORTØ528-2	9/24/97	1352		X		X	4							X						X			X	X	UST FBM 61-2-2 Soil .1
-03	SPORTØ528-3	9/24/97	1440				X	8							X						X			X	X	UST FBM 61-2-3 GW .4
-04	SPORTØ528-4	9/24/97	1250				X	3													X					WATER TRIP BLANK .2
-05	SPORTØ528-5	9/24/97	1255		X		X	1													X					Soil TRIP BLANK .3

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
W. R. Hines, Jr.	9/24/97	1530	W. R. Hines, Jr.	W. R. Hines, Jr.	9/24/97	1551	Catharine Hall
Catharine Hall	9/24/97	1655	Karen Blakeney				

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
Catharine Hall	9/24/97	1655	Karen Blakeney	9/24/97	1655	

White = sample collector Yellow = file Pink = with report

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STATE	GEL	BPI
FL	E87156/87294	E87472/87451
NC	233	
SC	10120	10542
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: October 07, 1997

Sample ID	: SPORT0529-1
Lab ID	: 9709639-01
Matrix	: Soil
Date Collected	: 09/26/97
Date Received	: 09/26/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 6 items											
Benzene	U	0.00	500	1000	ug/kg	500	RMB	10/02/97	1944	108724	1
Ethylbenzene	U	0.00	500	1000	ug/kg	500					
Toluene	U	0.00	500	1000	ug/kg	500					
Xylenes (TOTAL)	U	0.00	500	1000	ug/kg	500					
Naphthalene	U	0.00	500	1000	ug/kg	500					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	1670	3330	ug/kg	10.	HNM	09/30/97	0002	108587	2
Acenaphthylene	U	0.00	1670	3330	ug/kg	10.					
Anthracene	U	0.00	1670	3330	ug/kg	10.					
Benzo(a)anthracene	U	0.00	1670	3330	ug/kg	10.					
Benzo(a)pyrene	U	0.00	1670	3330	ug/kg	10.					
Benzo(b)fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	1670	3330	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Chrysene	U	0.00	1670	3330	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	1670	3330	ug/kg	10.					
Fluoranthene	U	0.00	1670	3330	ug/kg	10.					
Fluorene	J	1820	1670	3330	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1670	3330	ug/kg	10.					
Naphthalene	J	3030	1670	3330	ug/kg	10.					
Phenanthrene		4390	1670	3330	ug/kg	10.					
Pyrene	U	0.00	1670	3330	ug/kg	10.					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds

GWL 09/29/97 1600 108587 3

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NC	233	
SC	10120	10532
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 07, 1997

Sample ID : SPORT0529-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M

Comments:
A dilution was required for Volatile Organics due to matrix interference.
As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	88.0	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	97.0	(63.4 - 136.)
Toluene-d8	BTEX-8260	118.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	88.0	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	97.0	(63.4 - 136.)
Toluene-d8	NAP-8260	118.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: October 07, 1997

Sample ID : SPORT0529-1

M = Method	Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7385.

Karen Blakeney
Reviewed By

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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 07, 1997

Sample ID	: SPORT0529-2
Lab ID	: 9709639-02
Matrix	: Soil
Date Collected	: 09/26/97
Date Received	: 09/26/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	500	1000	ug/kg	500	RMB	10/02/97	2013	108724	1
Ethylbenzene	U	0.00	500	1000	ug/kg	500					
Toluene	U	0.00	500	1000	ug/kg	500					
Xylenes (TOTAL)	U	0.00	500	1000	ug/kg	500					
Naphthalene	U	0.00	500	1000	ug/kg	500					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	6540	13100	ug/kg	40.	WAM	09/30/97	1459	108587	2
Acenaphthylene	U	0.00	6540	13100	ug/kg	40.					
Anthracene	U	0.00	6540	13100	ug/kg	40.					
Benzo(a)anthracene	U	0.00	6540	13100	ug/kg	40.					
Benzo(a)pyrene	U	0.00	6540	13100	ug/kg	40.					
Benzo(b)fluoranthene	U	0.00	6540	13100	ug/kg	40.					
Benzo(ghi)perylene	U	0.00	6540	13100	ug/kg	40.					
Benzo(k)fluoranthene	U	0.00	6540	13100	ug/kg	40.					
Chrysene	U	0.00	6540	13100	ug/kg	40.					
Dibenzo(a,h)anthracene	U	0.00	6540	13100	ug/kg	40.					
Fluoranthene	U	0.00	6540	13100	ug/kg	40.					
Fluorene	U	0.00	6540	13100	ug/kg	40.					
Indeno(1,2,3-c,d)pyrene	U	0.00	6540	13100	ug/kg	40.					
Naphthalene	J	12400	6540	13100	ug/kg	40.					
Phenanthrene	U	0.00	6540	13100	ug/kg	40.					
Pyrene	U	0.00	6540	13100	ug/kg	40.					

The following prep procedures were performed:
GC/MS Base/Neutral Compounds GWL 09/29/97 1600 108587 3

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NC	Z33	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NFWC00197 Report Date: October 07, 1997

Sample ID : SPORT0529-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M

Comments:
A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	87.7	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	95.4	(63.4 - 136.)
Toluene-d8	BTEX-8260	116.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	87.7	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	95.4	(63.4 - 136.)
Toluene-d8	NAP-8260	116.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 07, 1997

Sample ID : SPORT0529-2

M = Method	Method-Description

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
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NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 07, 1997

Sample ID	: SPORT0529-3
Lab ID	: 9709639-03
Matrix	: Soil
Date Collected	: 09/26/97
Date Received	: 09/26/97
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	RMB	10/01/97	1941	108724	1
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					

Surrogate Recovery	Test	Percent %	Acceptable Limits
Bromofluorobenzene	BTEX-8260	86.4	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	76.2	(63.4 - 136.)
Toluene-d8	BTEX-8260	100.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	86.4	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	76.2	(63.4 - 136.)
Toluene-d8	NAP-8260	100.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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STATE	GEL	EPI
FL	E87156/87294	E87472/87458
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hicks

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: October 07, 1997

Sample ID : SPORT0529-3

M = Method Method-Description

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

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CHAIN OF CUSTODY RECORD

9709639

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDETCHASN

SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods

Use P or P in the boxes to indicate whether sample was filtered and/or preserved

CCL 29163

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type	BTEX/MTBE	PAH	Remarks	
.01	SPORT 0529-1	9-26-97	0910		X		X	2																X	X	UST FBM 61-1-1 SOIL	.1
.02	SPORT 0529-2	9-26-97	0938		X		X	2																X	X	UST FBM 61-1-2 SOIL	.1
.03	SPORT0529-3	9-26-97	0800		X		X	1																X		SOIL TRIP BLANK	.2

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
[signature]	9/26/97	1015	[signature]	[signature]	9/26/97	1505	[signature]
Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:	
[signature]	9-26-97	3:30 15:30	Karen Blakeney	9/26/97	1530		

White = sample collector Yellow = file Pink = with report

2.0 Site History

SWMU 17 (Figure 1) is the site of an oil leak in 1987 that released approximately 14,000 gallons of fuel from a ruptured underground boiler fuel supply line leading to Building FBM 61 from an above ground tank located just north of the building. In an effort to recover as much of the product as possible, the Navy installed three sumps around the wing of the building where the release occurred. The sumps were constructed by welding together 55 gallon drums end to end and placed vertically below ground. Other site features at SWMU 17 which are considered possible sources of the contamination identified during the RFI are an oil/water separator (OWS) and electrical transformer, both of which are located on the north side of FBM 61. Figure 2 is a site map presenting locations from which soil and groundwater samples were collected during the RFI.

The RFI identified polynuclear aromatic hydrocarbons (PAHs) expressed as benzo(a)pyrene equivalents (BEQs) and the polychlorinated biphenyl (PCB), Arochlor 1260, as the contaminants of concern (COCs) driving unacceptable levels of risk in soil at SWMU 17. Benzidine and various chlorobenzenes were identified as the risk drivers for groundwater. Non-aqueous phase liquids (NAPLs) were discovered in two of the monitoring wells during groundwater sampling events subsequent to those used to generate the data used in the risk assessment.

Aroclor 1260 was detected by the Navy in 1987 during an investigation of the spill and also was widely detected during the RFI. Figures 3 and 4 present contours of Aroclor 1260 concentrations in soil samples collected as part of the Zone H RFI. Whether the Aroclor present at SWMU 17 is the result of transformer fluid spillage or as part of the fuel oil is unclear since the highest areas of contamination can are closely associated with the AST, the fuel lines, and the transformer vault as indicated on the figures. Dense non-aqueous phase liquid (DNAPL) found in monitoring well 017002 was found to contain approximately 38% Arochlor 1260.

4.4 SWMU 17

SWMU 17 is the site of an oil spill from a ruptured underground fuel pipe beneath Building FBM 61. The 1987 rupture released approximately 14,000 gallons of fuel oil beneath the northcentral extension of Building FBM 61. Soil sampling after the spill identified PCBs in the soil. The building was used for submarine training. Submarine trainers often have PCB oil in their cooling and hydraulic systems. A large bank of transformers is on the north side of the building.

Soil and groundwater were sampled at SWMU 17 to determine whether there was residual contamination from previous oil spills and other spills which may have occurred near SWMU 17.

4.4.1 Soil Sampling and Analysis

Soil was sampled in three phases at SWMU 17 at locations shown on Figure 4.4.1 in accordance with procedures outlined in Section 2.2 of this report. Organic and inorganic analytical data for soil are presented in Tables 4.4.1 and 4.4.2. Appendix I contains a complete analytical report for the samples collected at SWMU 17.

During primary soil sampling, 20 soil samples were collected from 11 locations. Eleven were from the 0- to 1-foot depth interval and nine were from the 3- to 5-foot depth interval. Sample locations were selected on each side of the building extension and on the southern side of Building FBM 61. Locations were selected to detect any impact to soil or groundwater which may have occurred at SWMU 17. Samples were analyzed for VOCs, SVOCs, cyanide, metals, TPH, and pesticides/PCBs. Four samples were selected for duplicate analysis of herbicides, organophosphate pesticides, hexavalent chromium, and dioxins, in addition to the standard suite of analyses.

During the second sampling event, 29 samples were collected from 15 additional locations. Fifteen from the 0- to 1-foot depth interval and 14 from the 3- to 5-foot interval were analyzed for SVOCs, PCBs, metals, and TPH.

During the third round of soil sampling, 16 samples were collected from the upper and lower intervals of eight additional locations. These samples were analyzed for dioxins and PCBs.

4.4.1.1 Volatile Organic Compounds in Soil

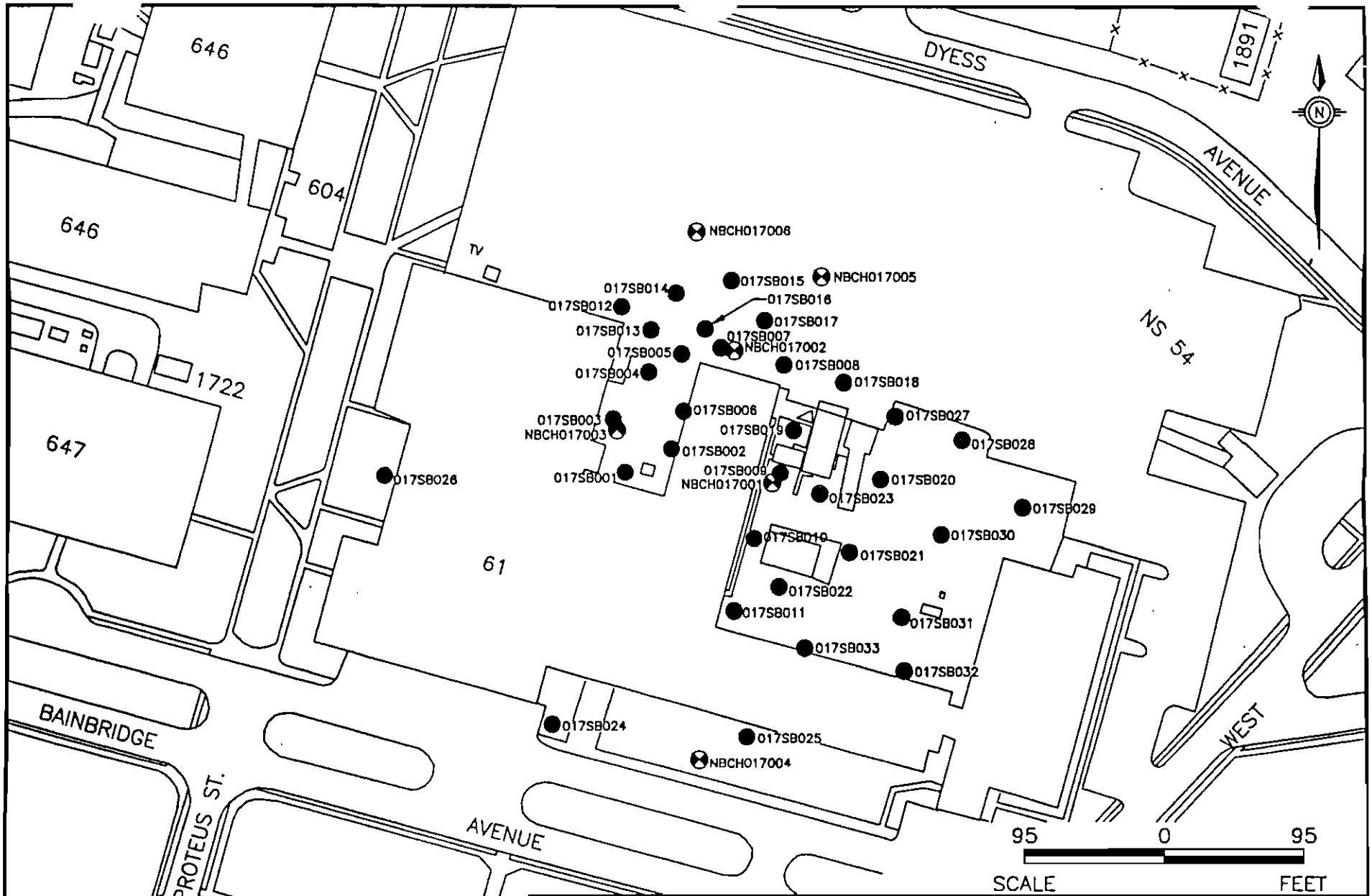
VOCs were detected in 10 of the 11 primary sampling locations, and in 16 of the 20 samples analyzed. Of the 16 samples in which VOCs were detected, six were from the 0- to 1-foot depth and 10 were from the 3- to 5-foot depth. Five VOCs were detected in the soil samples collected at SWMU 17. The concentrations of the VOCs detected ranged from three to five orders of magnitude below their respective RBSLs.

4.4.1.2 Semivolatile Organic Compounds in Soil

SVOCs were detected in 9 of the 11 primary sampling locations, 8 of the 15 secondary sampling locations, and in 20 of the 49 samples analyzed from SWMU 17. Of the 20 samples in which SVOCs were detected, 13 were from the 0- to 1-foot depth interval and seven were from the 3- to 5-foot depth interval. Only one SVOC exceeded its RBSL: benzo(a)pyrene at 116 and 175 μg/kg (RBSL-88 μg/kg) in the two surface interval samples at 017SB009 and 017CB022.

4.4.1.3 Pesticides and PCBs in Soil

Pesticides were detected in soil samples from eight of the 11 sample locations and in nine of the 20 samples analyzed. Of the nine samples in which pesticides were detected, four were from the 0- to 1-foot depth interval and five were from the 3- to 5-foot depth interval. The five pesticides detected in soil samples from SWMU 17 were found at concentrations ranging from one to three orders of magnitude below their RBSLs.



LEGEND

– SOIL SAMPLE LOCATION

– GROUNDWATER SAMPLE LOCATION

ZONE H
FINAL RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, S.C.

FIGURE 4.4.1
SWMU 17
SOIL & GROUNDWATER SAMPLE
LOCATION MAP

DWG DATE: 12/06/95 | DWG NAME: 29CHZH41

1-282

PCBs were detected in eight of the 11 primary sampling locations, 11 of the 13 secondary sampling locations, six of the eight tertiary sampling locations, and in of 35 of the 60 samples analyzed. Of the 35 samples in which PCBs were detected, 25 were from the 0- to 1-foot depth interval and 10 were from the 3- to 5-foot depth interval. Aroclors-1254 and 1260 were the only PCBs detected in the soil samples from SWMU 17. Aroclor-1254 did not exceed its RBSL of 83 μg/kg in the one sample where it was detected at 42 μg/kg. Detections of Aroclor-1260 (RBSL-83 μg/kg) ranged from 36 to 245,000 μg/kg. The highest concentrations (approximately four orders of magnitude greater than RBSLs) of Aroclor-1260 were northwest and east of the Building 61 northcentral wing.

4.4.1.4 Other Organic Compounds in Soil

Analysis indicated the presence of petroleum hydrocarbons in 25 of the 49 samples analyzed. Of the 25 samples where petroleum products were was detected, 13 were from the 0- to 1-foot interval and 12 were from the 3- to 5-foot interval. Petroleum hydrocarbons were detected in the 0- to 1-foot depth interval at concentrations ranging from 12,000 to 1,200,000 μg/kg. Petroleum hydrocarbons in the 3- to 5-foot interval ranged from 22,600 to 820,000 μg/kg. At locations where the analyses targeted specific ranges of petroleum hydrocarbons, indeterminate lubricating oil was the most common type of petroleum hydrocarbon detected.

Herbicide 2,4,5-T was detected in two duplicate analyses at concentrations four orders of magnitude below its RBSL.

No organophosphate pesticides were detected in the four duplicate analyses.

TEQs for dioxin (screening level 1000 pg/g) ranged from 0.869 pg/g to 127.03 pg/g for samples collected at SWMU 17. Duplicate analysis of samples collected during the first two rounds of sampling provided data indicating dioxin compounds in the SWMU 17 vicinity. All third-round soil samples were analyzed for dioxins.

4.4.1.5 Inorganic Elements in Soil

Table 4.4.2 summarizes the inorganic results from the soil samples collected at SWMU 17. The only element with detected concentrations greater than its RBSL and interval-specific UTL was cadmium, which was detected at 4.7 mg/kg (RBSL 3.9, upper-interval UTL 1.05)

Cyanide was detected at three of the 11 locations sampled, and in three of all the 20 samples analyzed. All cyanide detections were at least one order of magnitude below its RBSL of 160 mg/kg.

No hexavalent chromium was detected in the four duplicate sample analyses.

4.4.2 Groundwater Sampling and Analysis

Four shallow monitoring wells were installed during the first round to sample groundwater near SWMU 17 (see Figure 4.4.1). Samples from these wells were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, cyanide, and TPH. Two additional shallow monitoring wells were installed (NBCH017005 and NBCH017006) based on the analytical results for monitoring well NBCH017002. Samples from these monitoring wells were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, and cyanide. Although the two additional wells were installed shortly after second-round groundwater sampling had begun, data from analyses of their initial samples have been included with the first-round sample results. Consequently, no second-round samples were collected from these two wells. Second-round samples from the four original wells at SWMU 17 were analyzed for VOCs, SVOCs, and metals. A first-round groundwater sample from one of the two additional monitoring wells (NBCH017005) was duplicated and submitted for analysis of dioxin, hexavalent chromium, organophosphate pesticides, and herbicides, in addition to the standard suite of parameters. A second-round sample from one of the four original wells was duplicated and analyzed for the same parameters as the primary second-round samples. Tables 4.4.3 and 4.4.4 present analytical results for organics and inorganics,

respectively, in groundwater. Appendix I contains a complete report of the analytical data for groundwater samples collected from SWMU 17.

4.4.2.1 Volatile Organic Compounds in Groundwater

Two VOCs were reported for first-round groundwater samples collected at SWMU 17: acetone at 17.9 μg/L and chlorobenzene at 2.8 μg/L. Both detections came from NBCH017005, one of the two wells installed based on the results of the groundwater samples collected from the first four wells, and both were below their respective RBSLs (acetone=370 μg/L; chlorobenzene=3.9μg/L).

In second-round samples from the four original wells at SWMU 17, chlorobenzene was reported from two wells. It equalled or exceeded its RBSL in samples from NBCH017002 (4,750 μg/L) and NBCH017003 (3.9 μg/L).

4.4.2.2 Semivolatile Organic Compounds in Groundwater

Eight SVOCs were detected in the first-round groundwater samples collected at SWMU 17. The following were detected in the groundwater sample collected from NBCH017002 at concentrations exceeding the corresponding RBSLs for tap water: 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and 1,2,4-trichlorobenzene. Additionally, benzidine was detected in NBCH017005 at a concentration significantly exceeding the RBSL of 0.00029 μg/L. The other three SVOCs detected in the groundwater samples from SWMU 17 did not exceed their respective RBSLs.

In the second sampling round, the same four chlorinated benzene compounds were detected at concentrations exceeding their corresponding RBSLs in the sample from well NBCH017002. 2,4,5-trichlorophenol was reported in the same sample at a concentration of 19 μg/L, well below its RBSL of 370 μg/L. Benzidine was not detected (there was no second-round sample from

NBCH017005), nor were the three SVOCs that were reported at low concentrations in the first round.

4.4.2.3 Pesticides and PCBs in Groundwater

No pesticides or PCBs were detected in the first-round groundwater samples collected from wells at SWMU 17.

4.4.2.4 Other Organic Compounds in Groundwater

No petroleum hydrocarbons were detected in the four first-round groundwater samples that were analyzed for TPH. No herbicides, dioxins, or organophosphate pesticides were detected in the first-round groundwater sample submitted for duplicate analysis.

4.4.2.5 Inorganic Elements in Groundwater

The only element exceeding its corresponding RBSL in first-round groundwater samples collected at SWMU 17 was manganese. All six manganese detections exceeded its RBSL of 18 μg/L, but were well below its UTL. No cyanide or hexavalent chromium was detected in the groundwater samples.

In second-round samples at SWMU 17, manganese, arsenic, and chromium were reported at concentrations exceeding their corresponding RBSLs. All four manganese detections were above the RBSL of 18 μg/L, ranging upward to 896 μg/L in well NBCH017004. Arsenic was detected in samples from two wells, both exceeding its RBSL of 0.037 μg/L: NBCH017002 (3.2 μg/L) and NBCH017004 (4.9 μg/L). Chromium (RBSL-18 μg/L) was detected at 40 μg/L in one sample from well NBCH017001. (*Note:* The chromium RBSL of 18 μg/L is based on hexavalent chromium, which has not been detected in any sample in Zone H. The RBSL for trivalent chromium in tap water is 3700 μg/L.) All manganese and arsenic detections were below their corresponding UTLs. Chromium was not detected enough in background samples to determine a valid UTL.

4.4.3 Deviations from Final Zone H RFI Work Plan

Twenty-four soil samples were proposed for collection in the Final Zone H RFI Work Plan. The actual number of soil samples collected at SWMU 17 was 65 (34 upper interval, 31 lower interval). All proposed upper interval samples were collected. Due to shallow depth to groundwater, only some of the second-interval samples were collected. Based on analytical data for soil samples collected during the initial phase of sampling, additional sample locations were identified. Sampling was attempted at both intervals at each of these additional locations. As with the initial phase of sampling, some of the second-interval samples were not collected due to shallow depth to groundwater.

Groundwater samples were collected from each of the sample locations proposed in the Final Zone H RFI Work Plan and two additional locations that were selected based on results of analysis of samples from the first four wells.

Table 4.0.3 lists the quantities of proposed samples and quantities of actual samples collected.

Table 4.4.1
SWMU 17
Organic Compounds in Soil (μg/kg)

Compound Name	No. of Detections (1st Interval/2nd Interval)	Range of Concentrations for Detections (upper interval/lower interval)	Risk-Based Screening Levels
Volatile Organic Compounds *(23 Samples Collected — 14 Upper Interval Samples, 9 Lower Interval Samples, 4 Samples Duplicated)*			
Acetone	6/9	13-195/12-176	780,000
Chlorobenzene	0/3	0/3.59-827	160,000
2-Butanone (MEK)	0/3	0/14.4-39.4	4,700,000
Toluene	3/0	4.4-9.6/0	1,600,000
Trichloroethene	1/0	1.8/0	47,000
Semivolatile Organic Compounds *(49 Samples Collected — 26 Upper Interval Samples, 23 Lower Interval Samples, 4 Samples Duplicated)*			
Acenaphthene	0/1	0/210	470,000
Benzoic Acid	2/1	146-215/99.1	31,000,000
Benzo(a)anthracene	4/0	53.7-186/0	880
Benzo(b)fluoranthene	4/0	51.6-168/0	880
Benzo(k)fluoranthene	1/0	160/0	8,800
Benzo(g,h,i)perylene	1/0	66.7/0	310,000
Benzo(a)pyrene	2/0	116-175/0	88
bis(2-Ethylhexyl)phthalate (BEHP)	11/2	150-830/546-11,130	46,000
Chrysene	4/1	64.6-221/133	88,000
Dibenzofuran	0/1	0/110	31,000
1,2-Dichlorobenzene	0/1	0/219	700,000
1,3-Dichlorobenzene	1/3	43.6/167-6,680	700,000
1,4-Dichlorobenzene	0/3	0/315-5,840	27,000
2,4-Dichlorophenol	0/1	0/63.7	23,000
Di-n-butylphthalate	2/1	64.2-71.4/131	78,000
Fluoranthene	4/2	57.8-346/192-470	310,000
Fluorene	0/1	0/140	310,000
Hexachlorobenzene	0/1	0/285	400

Table 4.4.1
SWMU 17
Organic Compounds in Soil (μg/kg)

Compound Name	No. of Detections (1st Interval/2nd Interval)	Range of Concentrations for Detections (upper interval/lower interval)	Risk-Based Screening Levels
Semivolatile Organic Compounds *(49 Samples Collected — 26 Upper Interval Samples, 23 Lower Interval Samples, 4 Samples Duplicated)*			
Indeno(1,2,3-cd)pyrene	1/0	80.8/0	880
Di-n-octylphthalate	0/1	0/317	160,000
Naphthalene	0/1	0/140	310,000
Phenanthrene	2/1	63.1-188/510	310,000
1,2,4-Trichlorobenzene	0/3	0/323-49,600	78,000
Pesticides *(20 Samples Collected — 11 Upper Interval Samples, 9 Lower Interval Samples, 4 Samples Duplicated)*			
alpha-Chlordane	2/0	3.4-5.1/0	470 (alpha + gamma)
gamma-Chlordane	3/0	2.8-12.3/0	
4,4'-DDD	1/3	2.9/14.9/75	2,700
4,4'-DDE	4/6	4.6-581/7.77-652	1,900
Endrin	1/0	2.7/0	2,300
Polychlorinated Biphenyls *(61 Samples Collected — 32 Upper Interval Samples, 29 Lower Interval Samples, 4 Samples Duplicated)*			
Aroclor-1254	1/0	42/0	83
Aroclor-1260	26/10	36-180,000/40-245,000	83
Petroleum Hydrocarbons *(49 Samples Collected — 26 Upper Interval Samples, 23 Lower Interval Samples, 4 Samples Duplicated)*			
Total Petroleum Hydrocarbons (Primarily Indeterminate Lubricating Oil)	12/11	100,000-1,200,000/ 120,000-820,000	Not Listed
Herbicides[a] *(4 Duplicate Analyses — 3 Upper Interval Samples, 1 Lower Interval Sample)*			
2,4,5-T	1/1	7.5/9.9	78,000
Organophosphate Pesticides[a] *(4 Duplicate Analyses — 3 Upper Interval Samples, 1 Lower Interval Sample)*			
No organophosphates detected.			
Dioxins *(20 Samples Collected — 11 Upper Interval Samples, 9 Lower Interval Samples, 4 Duplicate Sample Analyses)*			
Total TEQs	11/9	0.869-127.031/1.258-53.920 pg/g	1000 pg/g

Note:
[a] = Analyses performed only on duplicate samples.

Table 4.4.2
SWMU 17
Inorganic Elements in Soil (mg/kg)

Inorganic Elements	Number of Analyses (upper interval/lower interval)	Number of Detections (upper interval/lower interval)	Range of Concentrations for Detections (upper interval/lower interval)	Risk-Based Screening Level	Upper Tolerance Limit of Background[c]
Aluminum[a]	23/20	23/20	938-14,500/5,010-30,100	7,900	25,310/46,180
Iron[a]	23/20	23/20	2,280-17,800/3,050-37,400	Not Listed	30,910/66,170
Lead	23/20	20/19	2.2-41/4.6-32.4	400	118/68.69
Nickel	23/20	13/9	1.1-18.55/1.6-10.20	160	33.38/29.9
Potassium[a]	23/20	6/13	200-1,050/294-2,210	Not Listed	Nutrient[e]
Silver	23/20	2/0	10-34.4/0	39	Not Valid[d]
Sodium[a]	23/20	17/17	41.8-341/72-987	Not Listed	Nutrient[e]
Thallium	23/20	0/0	0/0	0.63	0.63
Antimony	23/20	2/0	2.2-10.1/0	3.1	Not Valid[d]
Arsenic	23/20	20/19	0.90-7.9/2.4-25.6	0.37	14.81/35.52
Barium	23/20	12/9	7.4-23.5/9.3-25.7	550	40.33/43.80
Beryllium	23/20	12/10	0.09-0.64/0.18-1.4	0.15	1.466/1.62
Cadmium	23/20	8/4	0.15-4.7/0.22-0.29	3.9	1.05/1.1
Cobalt	23/20	11/9	0.69-9.8/0.63-5.7	470	5.863/14.88
Copper	23/20	6/3	3.0-74.1/3.5-19.5	290	27.6/31.62
Vanadium	23/20	23/20	4.6-61.8/7.7-66.4	55	77.38/131.62
Zinc	23/20	15/13	3.5-267/6.7-116	2,300	214.3/131.6
Selenium	23/20	0/3	0/0.37-1.9	39	2.0/2.7
Mercury	23/20	14/15	0.02-0.66/0.02-0.3	2.3	0.485/.74
Magnesium[a]	23/20	23/20	214-3790/312-4170	Not Listed	9,592/9,179
Manganese[a]	23/20	21/19	10.7-203/15.3-668	39	636.4/1,412
Calcium	23/20	23/20	1320-347,000/444-984,000	Not Listed	Nutrient[e]
Chromium	23/20	23/19	5.9-34.6/7.4-47.3	39	85.65/83.86
Tin[a]	3/1	0/0	0/0	4,700	Not Valid[d]
Hexavalent Chromium[b]	3/1	0/0	0/0	39	Not Valid[d]
Cyanide	13/9	2/1	1.0-3.0/7.4	160	Not Valid[d]

Notes:
[a] = SW-846 element list and Appendix IX element list do not have these compounds in common.
[b] = Included in duplicate sample analyses only.
[c] = See Appendix J for UTL determination.
[d] = Number of nondetections prevented determination of UTL.
[e] = Elements considered to be nutrients; therefore, UTL was not determined.

1-2-96

Table 4.4.3
SWMU 17
Organic Compounds in Groundwater (μg/L)

Round 1: 6 Samples Collected, 1 Sample Duplicated
Round 2: 4 Samples Collected, 1 Sample Duplicated

Compound Name	Sampling Round	Number of Detections	Range of Concentrations for Detections	Risk-Based Screening Level	Max. Contam. Level
Volatile Organic Compounds					
Acetone	1	1	17.9	370	Not Listed
	2	0	—		
Chlorobenzene	1	1	2.8	3.9	100
	2	2	3.9-4,750		
Semivolatile Organic Compounds					
1,2-Dichlorobenzene	1	1	110	27	600
	2	1	54.5		
1,3-Dichlorobenzene	1	1	750	54	600
	2	1	550		
1,4-Dichlorobenzene	1	1	1,100	0.44	75
	2	1	830		
1,2,4-Trichlorobenzene	1	1	1,000	19	70
	2	1	520		
2,4,5-Trichlorophenol	1	0	—	370	Not Listed
	2	1	19		
Naphthalene	1	1	6.1	150	Not Listed
	2	0	—		
Di-n-butylphthalate	1	2	2.8-3.2	370	Not Listed
	2	0	—		
Benzidine	1	1	56	0.00029	Not Listed
	2	0	—		
2-Methylnaphthalene	1	1	4.0	150[a]	Not Listed
	2	0	—		
Pesticides (Round 1: 6 Samples Collected)					
No pesticides detected.					

1-277

Table 4.4.3
SWMU 17
Organic Compounds in Groundwater (μg/L)

Round 1: 6 Samples Collected, 1 Sample Duplicated
Round 2: 4 Samples Collected, 1 Sample Duplicated

Compound Name	Sampling Round	Number of Detections	Range of Concentrations for Detections	Risk-Based Screening Level	Max. Contam. Level
Polychlorinated Biphenyls (Round 1: 6 Samples Collected)					
No PCBs detected.					
Petroleum Hydrocarbons (Round 1: 4 Samples Collected)					
No petroleum hydrocarbons detected.					
Herbicides (Round 1: 1 Sample Duplicated)					
No herbicides detected.					
Organophosphate Pesticides (Round 1: 1 Sample Duplicated)					
No organophosphate pesticides detected.					
Dioxin (Round 1: 1 Sample Duplicated)					
No dioxin detected.					

Note:
[a] = Naphthalene used as surrogate.

Table 4.4.4
SWMU 17
Inorganic Chemicals in Groundwater (μg/L)

Round 1: 6 Samples Collected, 1 Sample Duplicated
Round 2: 4 Samples Collected, 1 Sample Duplicated

Chemical Name[a]	Sampling Round	Number of Detections	Range of Concentrations for Detections	Risk-Based Screening Level	Upper Tolerance Limit of Background[b]	Max. Contam. Level
Aluminum[c]	1 2	3 1	35.8-522 33.7	3,800	Not Valid	Not Listed
Arsenic	1 2	0 2	— 3.2-4.9	0.037	27.99	50
Barium	1 2	3 4	6.4-15.3 2.9-19.1	260	323	2,000
Calcium[d]	1 2	6	81,700-179,000	Not Listed	Nutrient	Not Listed
Chromium[c]	1 2	0 1	— 40	18[e]	Not Valid	100
Cobalt[c]	1 2	0 1	— 2.7	220	Not Valid	Not Listed
Copper[c]	1 2	1 0	3.0 —	140	Not Valid	Not Listed
Iron	1 2	6 4	987-7,320 1,475-3,860	Not Listed	45,760	Not Listed
Magnesium	1 2	6 4	10,100-156,000 13,500-45,700	Not Listed	3,866,000	Not Listed
Manganese	1 2	6 4	73.3-630 86.2-896	18	3,391	Not Listed
Potassium[d]	1 2	6 4	8,490-63,800 9,690-17,200	Not Listed	Nutrient	Not Listed
Selenium	1 2	0 2	— 3.2-3.9	18	3.154	50
Sodium[d]	1 2	6 4	10,900-1,340,000 23,200-292,000	Not Listed	Nutrient	Not Listed

1-299

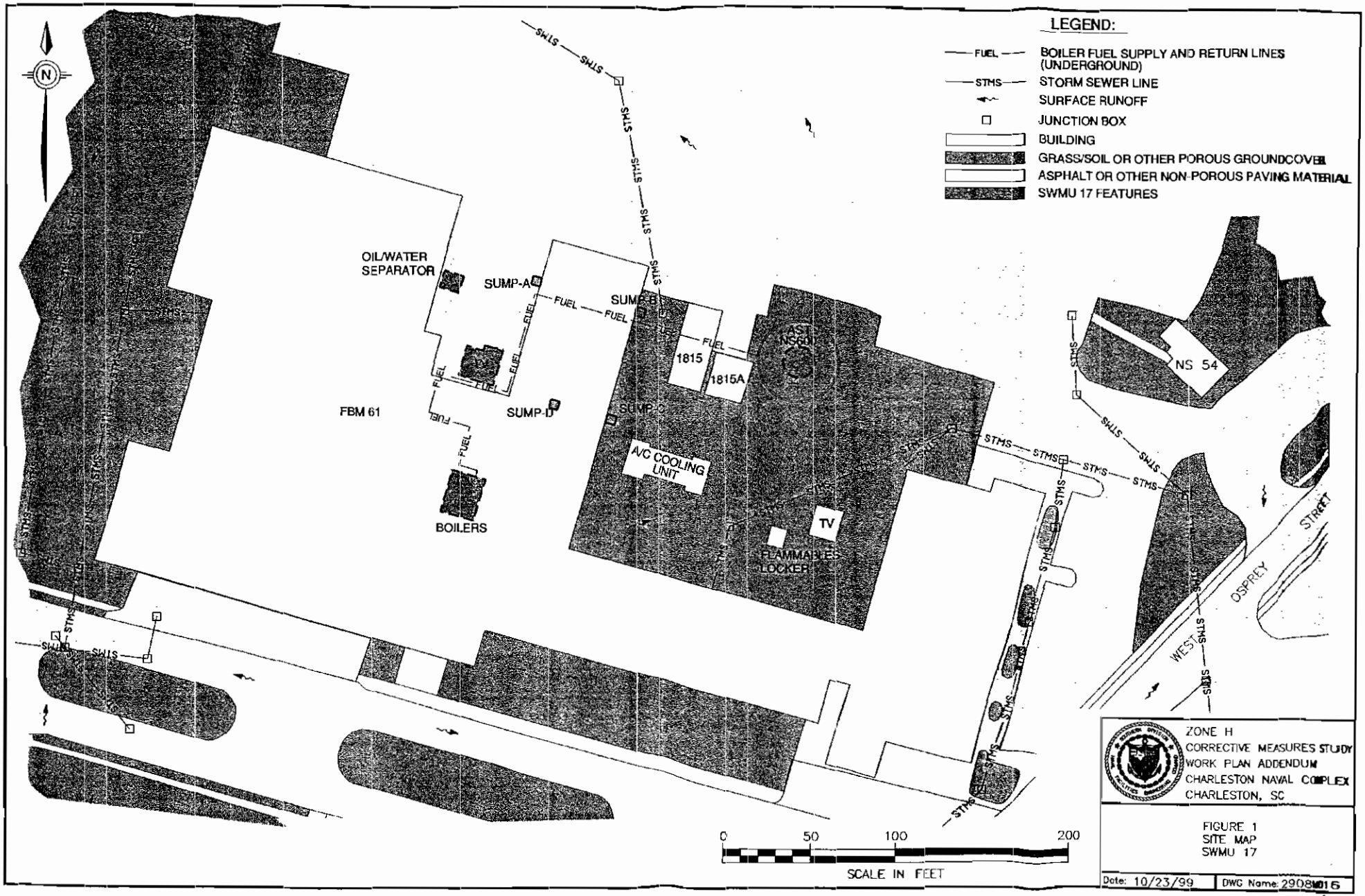
Table 4.4.4
SWMU 17
Inorganic Chemicals in Groundwater (μg/L)

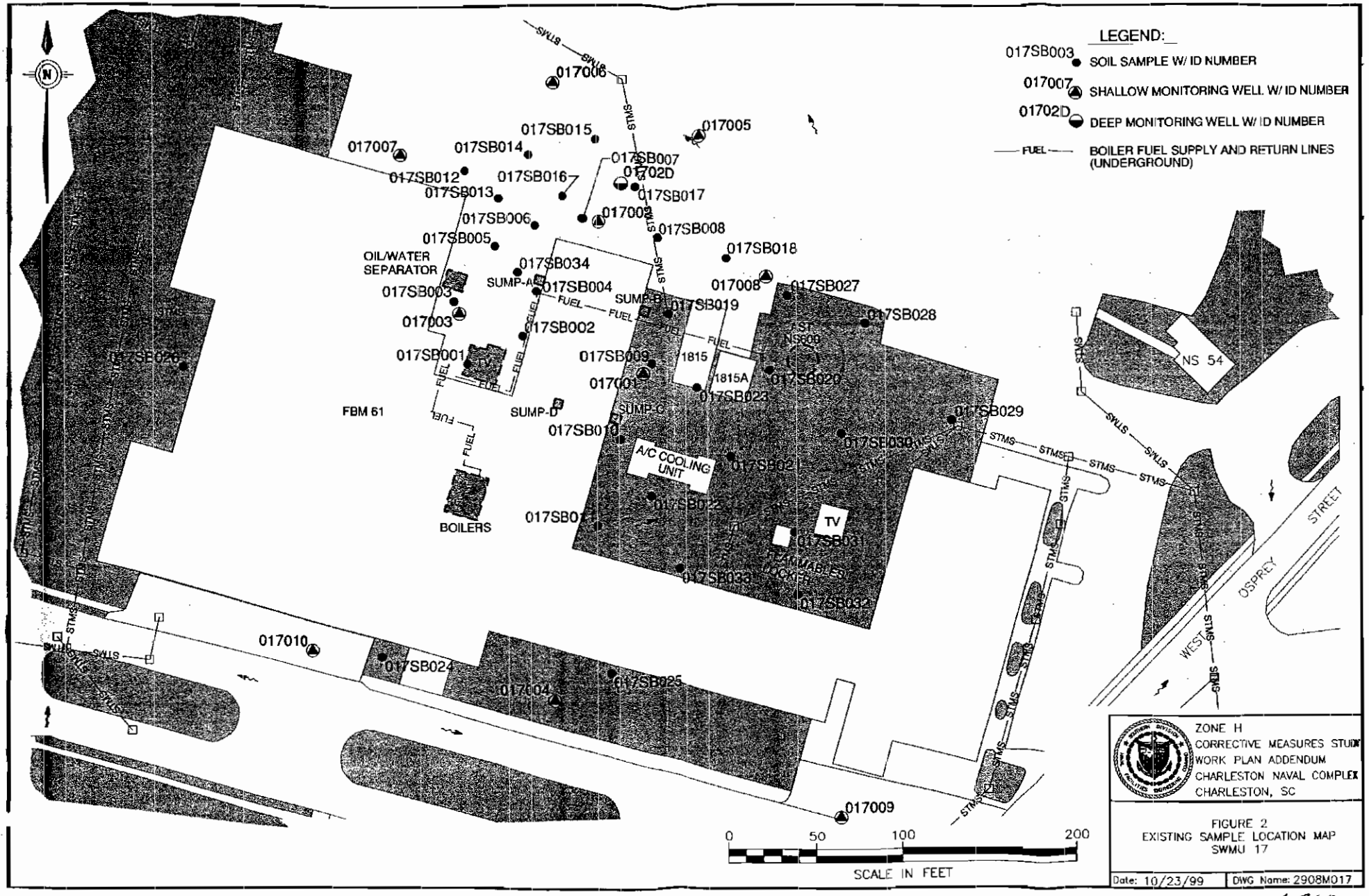
Round 1: 6 Samples Collected, 1 Sample Duplicated
Round 2: 4 Samples Collected, 1 Sample Duplicated

Chemical Name[a]	Sampling Round	Number of Detections	Range of Concentrations for Detections	Risk-Based Screening Level	Upper Tolerance Limit of Background[b]	Max. Contam. Level
Vanadium[c]	1	0	—	26	Not Valid	Not Listed
	2	1	3.4			
Zinc[c]	1	0	—	1100	Not Valid	Not Listed
	2	1	25			
Cyanide	1	Not Detected				
	2	No Analysis				
Hexavalent Chromium	1	Not Detected (1 Sample Duplicated)				
	2	No Analysis				

Notes:
[a] = Only compounds with detections are listed. Cyanide and hexavalent chromium were separate analyses.
[b] = See Appendix J for UTL determinations.
[c] = High percentage of nondetects in background samples prevented determination of UTL.
[d] = Element considered to be a nutrient; therefore, UTL was not determined.
[e] = If trivalent chromium, RBSL-3,700 μg/L.

1-300


LEGEND:
FUEL BOILER FUEL SUPPLY AND RETURN LINES (UNDERGROUND)
STMS STORM SEWER LINE
SURFACE RUNOFF
JUNCTION BOX
BUILDING
GRASS/SOIL OR OTHER POROUS GROUNDCOVER
ASPHALT OR OTHER NON-POROUS PAVING MATERIAL
SWMU 17 FEATURES
N
OIL/WATER SEPARATOR
SUMP-A
SUMP-B
SUMP-C
SUMP-D
FBM 61
BOILERS
1815
1815A
A/C COOLING UNIT
TV
FLAMMABLES LOCKER
NS 54
WEST OSPREY STREET
0 50 100 200
SCALE IN FEET
ZONE H
CORRECTIVE MEASURES STUDY
WORK PLAN ADDENDUM
CHARLESTON NAVAL COMPLEX
CHARLESTON, SC
FIGURE 1
SITE MAP
SWMU 17
Date: 10/23/99
DWG Name: 2908M016

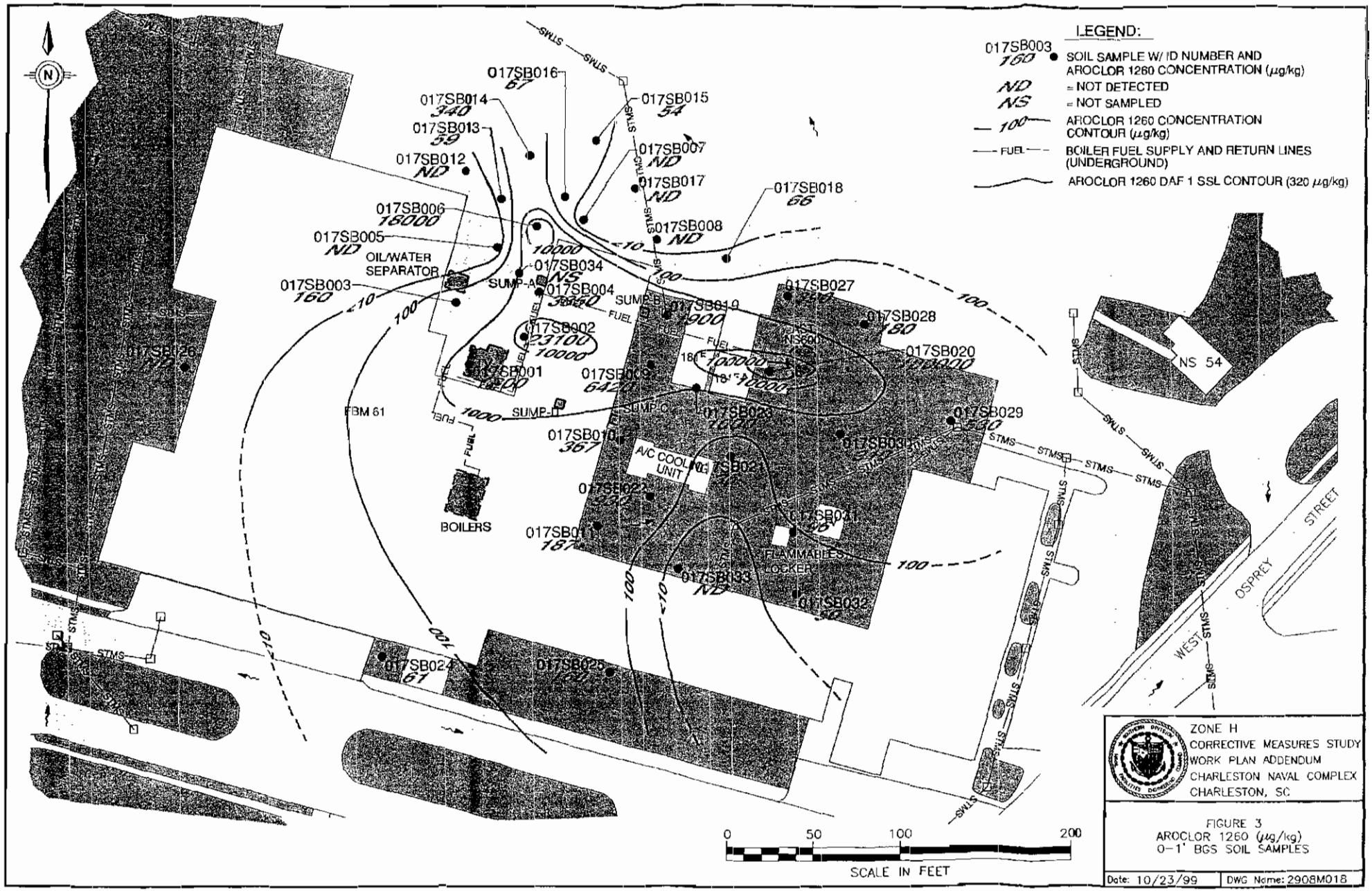


ZONE H
CORRECTIVE MEASURES STUDY
WORK PLAN ADDENDUM
CHARLESTON NAVAL COMPLEX
CHARLESTON, SC

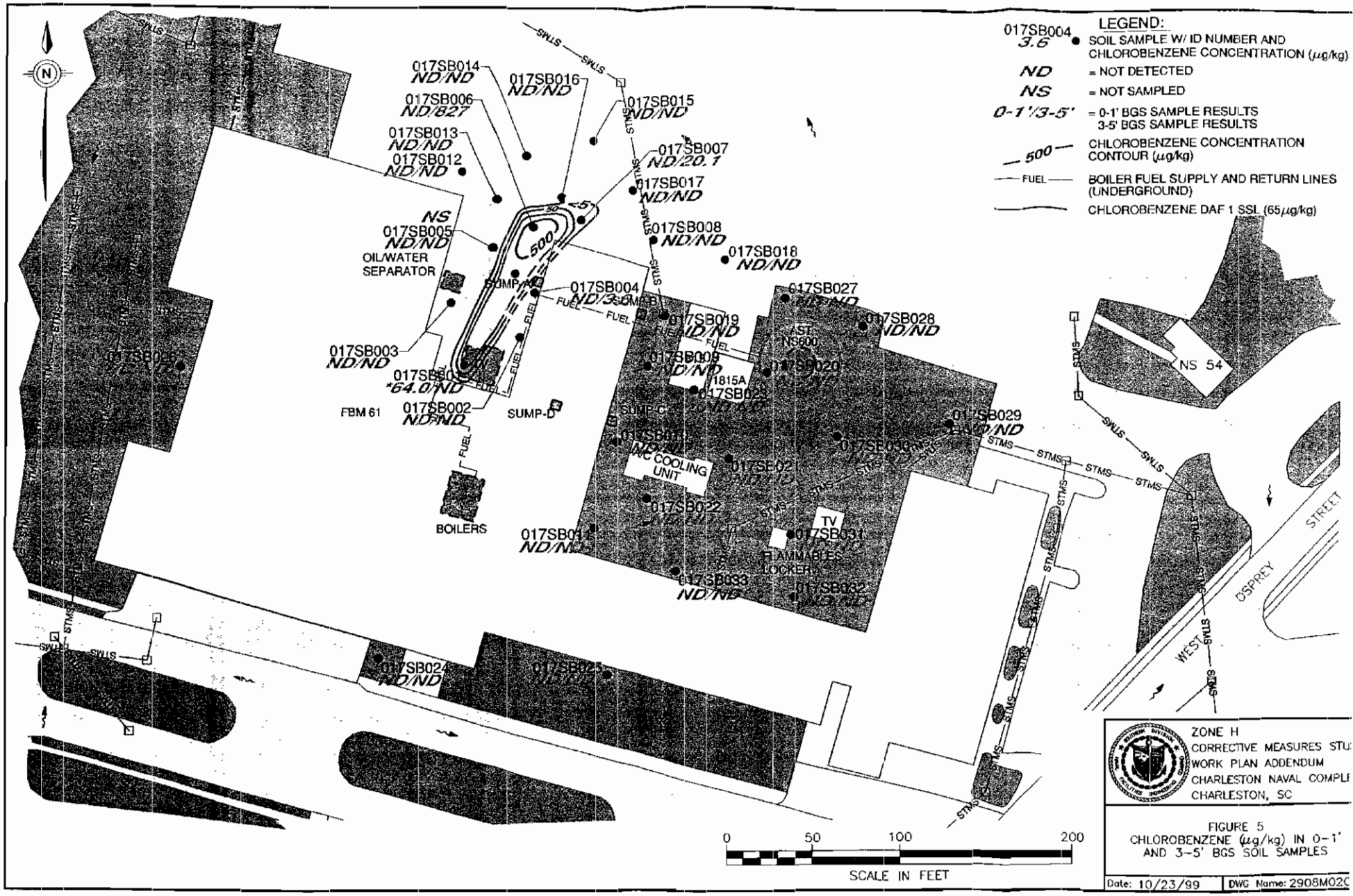
FIGURE 2
EXISTING SAMPLE LOCATION MAP
SWMU 17

Date: 10/23/99 | DWG Name: 2908M017

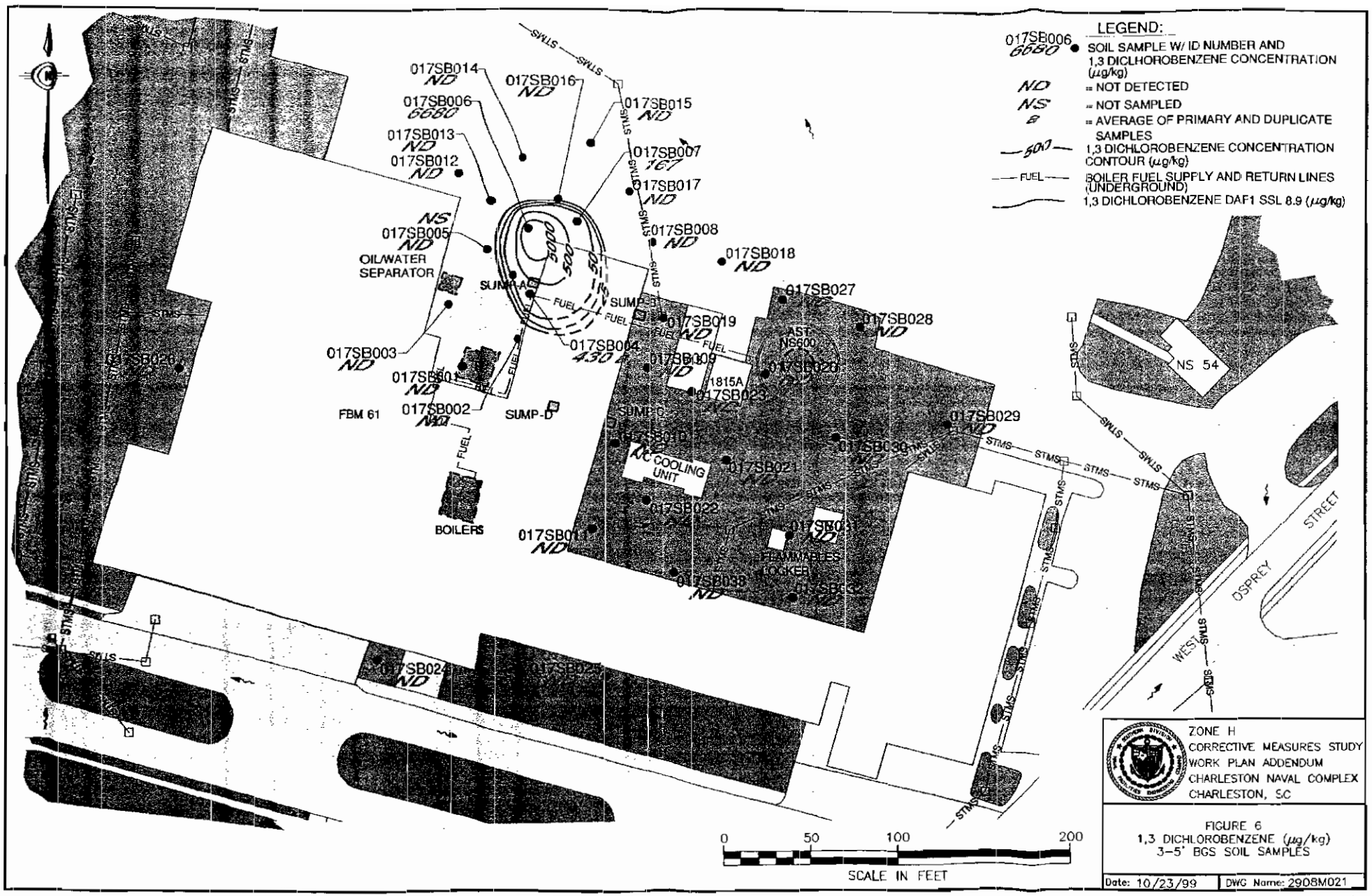
1.302


LEGEND:
017SB003 160 SOIL SAMPLE W/ ID NUMBER AND AROCLOR 1260 CONCENTRATION (µg/kg)
ND = NOT DETECTED
NS = NOT SAMPLED
100 AROCLOR 1260 CONCENTRATION CONTOUR (µg/kg)
FUEL BOILER FUEL SUPPLY AND RETURN LINES (UNDERGROUND)
AROCLOR 1260 DAF 1 SSL CONTOUR (320 µg/kg)
N
017SB016 67
017SB014 340
017SB013 39
017SB012 ND
017SB015 54
017SB007 ND
017SB017 ND
017SB018 66
017SB006 18000
017SB005 ND
017SB008 ND
OIL/WATER SEPARATOR
017SB034 NS
017SB003 160
SUMP-A
017SB004 3640
SUMP-B
017SB019 1900
017SB027
017SB028 180
017SB020
017SB002 23100
10000
017SB001
017SB009 6427
FBM 61
SUMP-C
SUMP-D
017SB023 1200
017SB029 530
017SB010 367
A/C COOLING UNIT
017SB021
017SB022
BOILERS
017SB011 187
017SB041
FLAMMABLES LOCKER
017SB033 ND
017SB032
017SB024 61
017SB025
NS 54
STMS
FUEL
WEST OSPREY STREET
0 50 100 200
SCALE IN FEET
ZONE H
CORRECTIVE MEASURES STUDY
WORK PLAN ADDENDUM
CHARLESTON NAVAL COMPLEX
CHARLESTON, SC
FIGURE 3
AROCLOR 1260 (µg/kg)
0-1' BGS SOIL SAMPLES
Date: 10/23/99
DWG Name: 2908M018

1-303


LEGEND:
017SB004 3.6 SOIL SAMPLE W/ ID NUMBER AND CHLOROBENZENE CONCENTRATION (µg/kg)
ND = NOT DETECTED
NS = NOT SAMPLED
0-1'/3-5' = 0-1' BGS SAMPLE RESULTS 3-5' BGS SAMPLE RESULTS
500 CHLOROBENZENE CONCENTRATION CONTOUR (µg/kg)
FUEL BOILER FUEL SUPPLY AND RETURN LINES (UNDERGROUND)
CHLOROBENZENE DAF 1 SSL (65µg/kg)
017SB014 ND/ND
017SB016 ND/ND
017SB006 ND/827
017SB015 ND/ND
017SB013 ND/ND
017SB012 ND/ND
017SB007 ND/20.1
017SB017 ND/ND
NS 017SB005 ND/ND
017SB008 ND/ND
017SB018 ND/ND
OIL/WATER SEPARATOR
SUMP-A
017SB004 ND/3.6
017SB027 ND/ND
017SB019 ND/ND
017SB028 ND/ND
017SB003 ND/ND
017SB009 ND/ND
017SB020 ND/ND
1815A
017SB023 ND/ND
017SB001 *64.0/ND
FBM 61
017SB002 ND/ND
SUMP-D
SUMP-C
017SB029 ND/ND
017SB030 ND/ND
N/C COOLING UNIT
017SB022 ND/ND
TV
017SB031 ND/ND
HAZARDOUS LOCKER
017SB033 ND/ND
017SB032 ND/ND
BOILERS
017SB011 ND/ND
017SB024 ND/ND
017SB025 ND/ND
NS 54
STMS
SWLS
FUEL
WEST OSPREY STREET
0 50 100 200
SCALE IN FEET
ZONE H
CORRECTIVE MEASURES STU
WORK PLAN ADDENDUM
CHARLESTON NAVAL COMPLE
CHARLESTON, SC
FIGURE 5
CHLOROBENZENE (µg/kg) IN 0-1' AND 3-5' BGS SOIL SAMPLES
Date: 10/23/99
DWG Name: 2908M02C

1-304

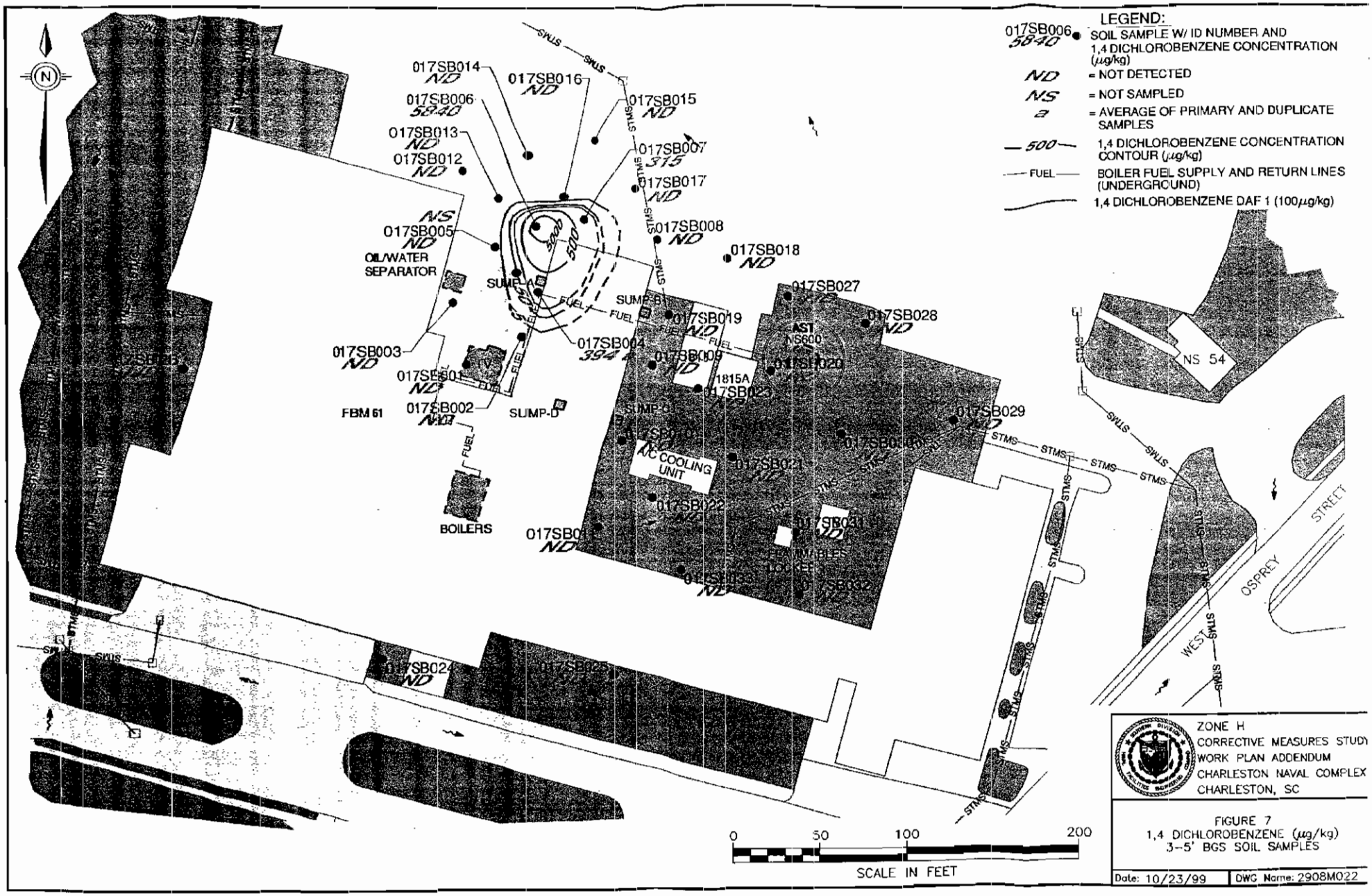


ZONE H
CORRECTIVE MEASURES STUDY
WORK PLAN ADDENDUM
CHARLESTON NAVAL COMPLEX
CHARLESTON, SC

FIGURE 6
1,3 DICHLOROBENZENE (µg/kg)
3-5' BGS SOIL SAMPLES

Date: 10/23/99 | DWG Name: 2908M021

1-305


LEGEND:
017SB006 5840 SOIL SAMPLE W/ ID NUMBER AND 1,4 DICHLOROBENZENE CONCENTRATION (µg/kg)
ND = NOT DETECTED
NS = NOT SAMPLED
a = AVERAGE OF PRIMARY AND DUPLICATE SAMPLES
500 1,4 DICHLOROBENZENE CONCENTRATION CONTOUR (µg/kg)
FUEL BOILER FUEL SUPPLY AND RETURN LINES (UNDERGROUND)
1,4 DICHLOROBENZENE DAF 1 (100µg/kg)
N
017SB014 ND
017SB016 ND
017SB006 5840
017SB015 ND
017SB013 ND
017SB012 ND
017SB007 315
017SB017 ND
017SB005 ND
NS
OIL/WATER SEPARATOR
017SB008 ND
017SB018 ND
5000
500
SUMP-A
SUMP-B
017SB027
017SB019 ND
017SB028 ND
017SB004 394
017SB003 ND
017SB009 ND
AST NS600
1815A
017SB020
017SB023
017SB001 ND
FBM 61
017SB002 ND
SUMP-D
SUMP-C
017SB029 ND
AC COOLING UNIT
017SB021 ND
017SB022 ND
BOILERS
017SB031 ND
PLANMBLES LOCKER
017SB033 ND
017SB024 ND
NS 54
STMS
SWLS
FUEL
OSPREY
WEST
STREET
0 50 100 200
SCALE IN FEET
ZONE H
CORRECTIVE MEASURES STUDY
WORK PLAN ADDENDUM
CHARLESTON NAVAL COMPLEX
CHARLESTON, SC
FIGURE 7
1,4 DICHLOROBENZENE (µg/kg)
3--5' BGS SOIL SAMPLES
Date: 10/23/99
DWG Name: 2908M022

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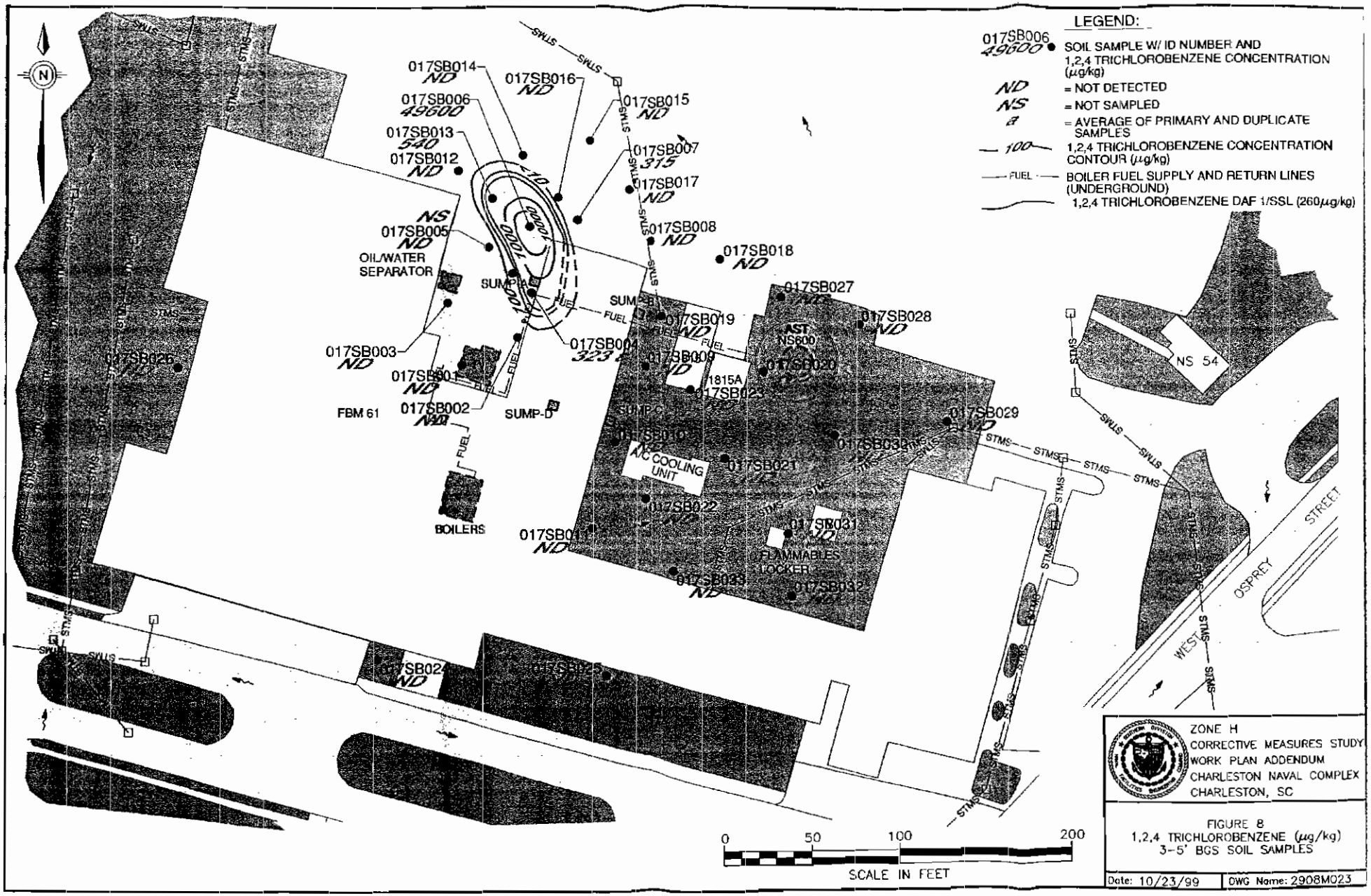

ZONE H
CORRECTIVE MEASURES STUDY
WORK PLAN ADDENDUM
CHARLESTON NAVAL COMPLEX
CHARLESTON, SC

FIGURE 8
1,2,4 TRICHLOROBENZENE (µg/kg)
3-5' BGS SOIL SAMPLES

Date: 10/23/99 | DWG Name: 2908M023

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