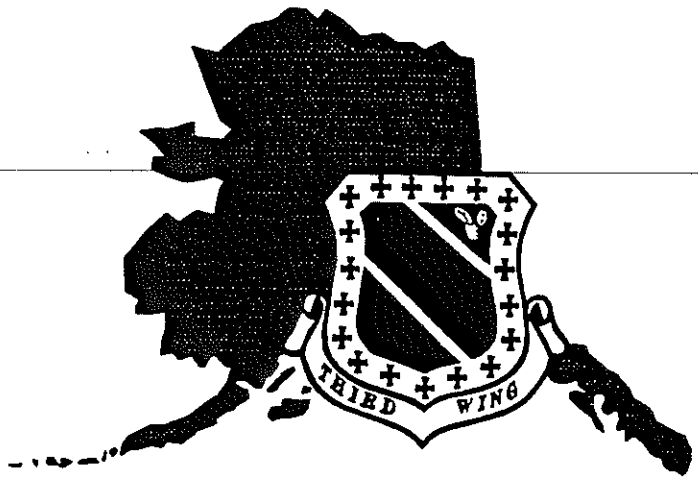


UNITED STATES AIR FORCE
ELMENDORF AIR FORCE BASE, ALASKA

ENVIRONMENTAL COMPLIANCE PROGRAM

SERA PHASE IV
SURFACE SPILLS INVESTIGATION REPORT

FINAL

MARCH 1997

3.0 SS411 - POL SPILL AT BUILDING 32-187

3.1 SS411 Site Background

SS411 is the site of a POL spill northwest of Building 32-187. Surface contamination was identified during soil removal associated with a hydraulic fluid leak. Contamination was identified to extend beyond the excavation limits based on odor and visual inspection. No records of the site exist. The site is currently used for asphalt emulsion staging and equipment maintenance. The site location is shown in Figure 3-1.

Groundwater flow at the site is expected to be to the southwest based on the basewide groundwater monitoring program. There are no known downgradient groundwater receptors within 1 mile of the site.

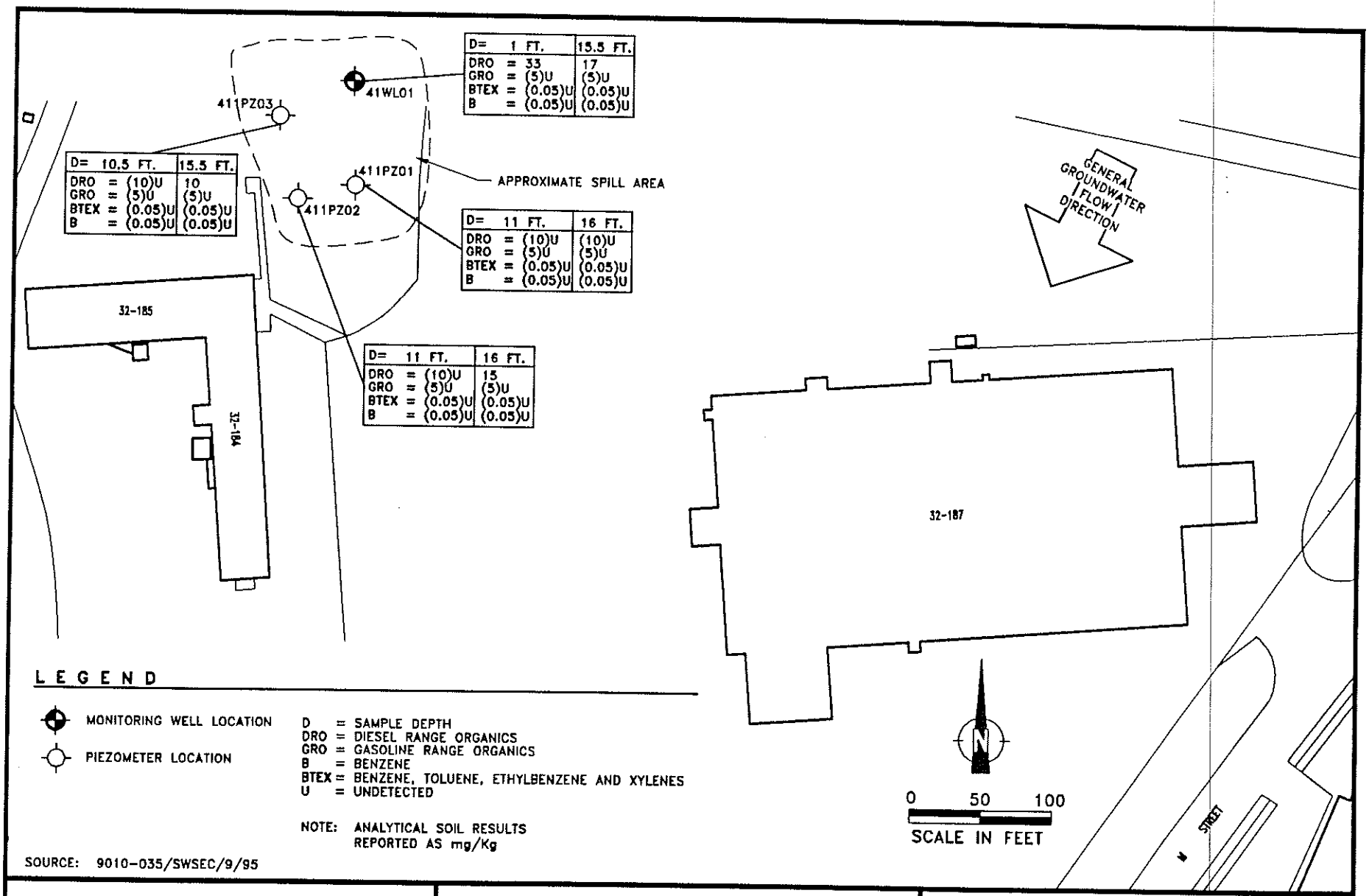
3.2 SS411 Release Investigation Field Program and Results

The site is limited by a road to the east and north, and by a loading ramp to the south. A road oiler was parked 50 to 75 feet west of the site, and two connex boxes containing propane and asphalt solvent (diesel) were at the site. Surface staining typical to equipment staging yards was noted.

Four borings were completed at SS411, including one bioventing air injection well (411WL01) and three soil gas monitoring arrays (411PZ01 through 03). Boring locations and analytical results are displayed in Figure 3-1. Boring details are provided on boring logs in Attachment 3A. Groundwater was encountered at approximately 16 feet below ground surface (bgs). Site soils consist of sand and gravel with fines typical to the Elmendorf outwash plain.

Soil sample ATH/PID readings and odor provided no evidence of petroleum hydrocarbon contamination at SS411. Soil petroleum hydrocarbon analytical results are summarized on Table 3-1 and Figure 3-1, and fully reported in Attachment 3B (Analytical Data). No significant concentrations of petroleum hydrocarbons were detected at the site. Other soil physical and chemical results are presented in Table 3-2.

No bioventing treatability study was conducted at the site due to the low contaminant concentrations.



DRAWING: SS411_1	DRAWN: SSR	FIGURE 3-1 SS411 SITE MAP SHOWING SOIL SAMPLE RESULTS
C/SC: 1:100	DISK: Z 9/96	3RD SPTG/CEVC ELMENDORF AFB, ALASKA
DATE: 3/4/97	CHECK: P.R.	PROJECT 9000-068/080

Table 3-1. SS411 Soil Contaminant Results.*

Sample ID	Benzene EPA 8020a	BTEX EPA 8020a	GRO AK101.0	DRO AK102.0
411PZ01SO11.0N	(0.05) U	(0.05) U	(5) U	(10) U
411PZ01SO16.0N	(0.05) U	(0.05) U	(5) U	(10) U
411PZ02SO11.0N	(0.05) U	(0.05) U	(5) U	(10) U
411PZ02SO16.0N	(0.05) U	(0.05) U	(5) U	15
411PZ03SO10.5N	(0.05) U	(0.05) U	(5) U	(10) U
411PZ03SO15.5N	(0.05) U	(0.05) U	(5) U	10
411WL01SO1.0N	(0.05) U	(0.05) U	(5) U	33
411WL01SO15.5N	(0.05) U	(0.05) U	(5) U	17

* All results in mg/Kg.
U = Not detected (detection limit).

Table 3-2. SS411 Soil Nutrient, TOC, and pH Results.*

Sample ID	Nitrate-Nitrite 353.2	TKN 351.3	Ammonium 350.3	Phosphate 365.3	TOC D4129	pH 150.1
411PZ02SO11.0N	(0.4 U)	83	1.1	(20 U)	0.1	7.9
411WL01SO1.0N	2.8	279	1.4	20	0.18	5.6

* All units mg/Kg except pH.
U = Not detected (detection limit).
TKN = Total Kjeldahl Nitrogen.

3.3 SS411 Conclusions

Based on the results of the release investigation, the USAF recommends SS411 for no further action, as certified on the following disposition recommendation. The ADEC Oil and Hazardous Material Incident Report, Preliminary Risk Evaluation, and Release Investigation Summary Form (draft) are provided in Attachment 3C at the end of this section.

ATTACHMENT 3A

SS411 BORING LOGS

BORING LOG

BORING NUMBER: 411PZ01

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST411
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 17
BORING DIAMETER (in):
WELL DEPTH (ft):
WELL DIAMETER (in):
REFERENCE ELEVATION (ft): 159.02
CASING STICKUP (in):
FIELD PARTY: D. McGee

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 6/10/96
DATE COMPLETED: 6/10/96
NORTHING: 2647318.2
EASTING: 1670681.7

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SW	Gravel and sand surface.	
5				SS	20	0.3			Light brown SAND (SW), fine to medium grained, 10% gravel, moderately graded, medium dense to dense, dry, no hydrocarbon odor.	
10			411 PZ01SO 11.0N	SS	36	0.7		GW	Medium brown GRAVEL (GW), fine to coarse sand, gravel diameter from 5 to 70 mm, very well graded, medium dense, gravel size lignite, dry, no hydrocarbon odor.	
15			411 PZ01SO 16.0N	SS	40	0.6		Sw	Medium brown SAND (SW), fine to coarse grained, 15% gravel, well graded, medium dense, damp to moist, no odor.	
▼									End of boring at 17 feet. Boring completed as piezometer.	
20										

PIEZOMETER DIAGRAM

BORING NUMBER: 411PZ01

CLIENT: U.S. AIR FORCE

PROJECT NAME: SERA IV

SITE: ST411

JOB NUMBER: 9000-068

LOGGED BY: T. BARRETT APPROVED BY: P. RIBBENS

DRILLED BY: HUGHES DRILLING

METHOD: 4.25 IN. HOLLOW STEM AUGER

BORING DEPTH (ft): 17'

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

REFERENCE ELEVATION (ft):159.02

CASING STICKUP (in): 0

FIELD PARTY: D. McGEE

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

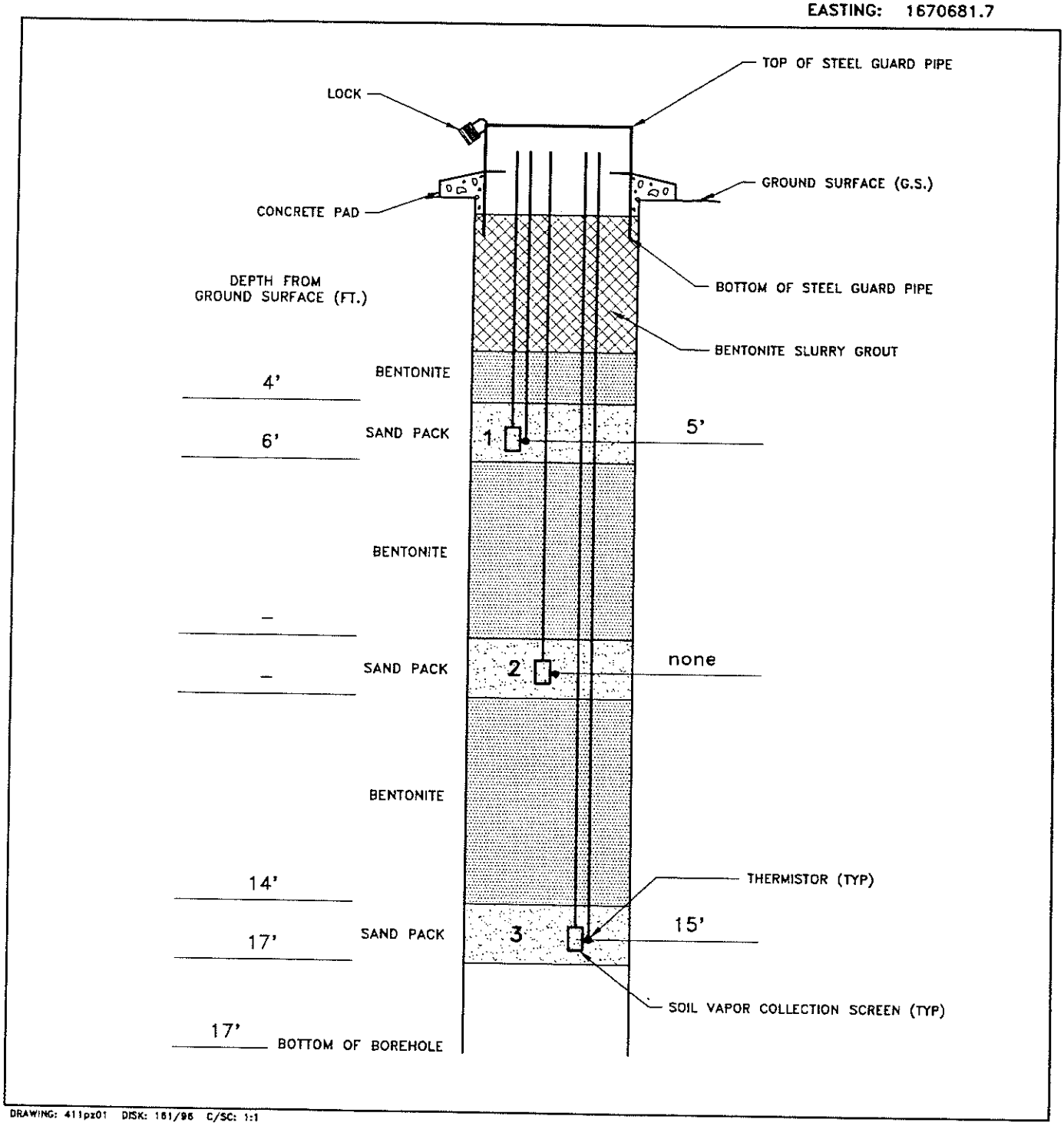
FILTER PACK:

DATE STARTED: 6/10/96

DATE COMPLETED: 6/10/96

NORTHING: 2647318.2

EASTING: 1670681.7



DRAWING: 411pz01 DISK: 161/96 C/SC: 1:1

BORING LOG

BORING NUMBER: 411PZ02

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST411
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 17
BORING DIAMETER (in):
WELL DEPTH (ft):
WELL DIAMETER (in):
REFERENCE ELEVATION (ft): 159.06
CASING STICKUP (in):
FIELD PARTY: D. McGee

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 6/10/96
DATE COMPLETED: 6/10/96
NORTHING: 2647308.5
EASTING: 1670641.2

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								SW	Gravel and sand surface.	
5				SS	22	0.6			Medium brown SAND (SW), fine to medium grained, 20% gravel, well graded, medium dense, dry, no hydrocarbon odor.	
10			411 PZ02SO 11.0N	SS	33	1.2		SW GW	Medium brown SANDY GRAVEL/GRAVELLY SAND (GW/SW), fine to coarse sand, well graded, dense, alternating gravel and sand, damp, no hydrocarbon odor.	
15			411 PZ02SO 16.0N	SS	32	0.9		GW GM	Medium brown GRAVEL (GW), lithology as above grading to ...	
▼									SILTY GRAVEL (GM), at 16.5 feet, saturated.	
									End of boring at 17 feet. Boring completed as piezometer.	
20										

PIEZOMETER DIAGRAM

BORING NUMBER: 411PZ02

CLIENT: U.S. AIR FORCE

PROJECT NAME: SERA IV

SITE: ST411

JOB NUMBER: 9000-068

LOGGED BY: T. BARRETT APPROVED BY: P. RIBBENS

DRILLED BY: HUGHES DRILLING

METHOD: 4.25 IN. HOLLOW STEM AUGER

BORING DEPTH (ft): 17.5'

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

REFERENCE ELEVATION (ft):159.06

CASING STICKUP (in): 0

FIELD PARTY: D. McGEE

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

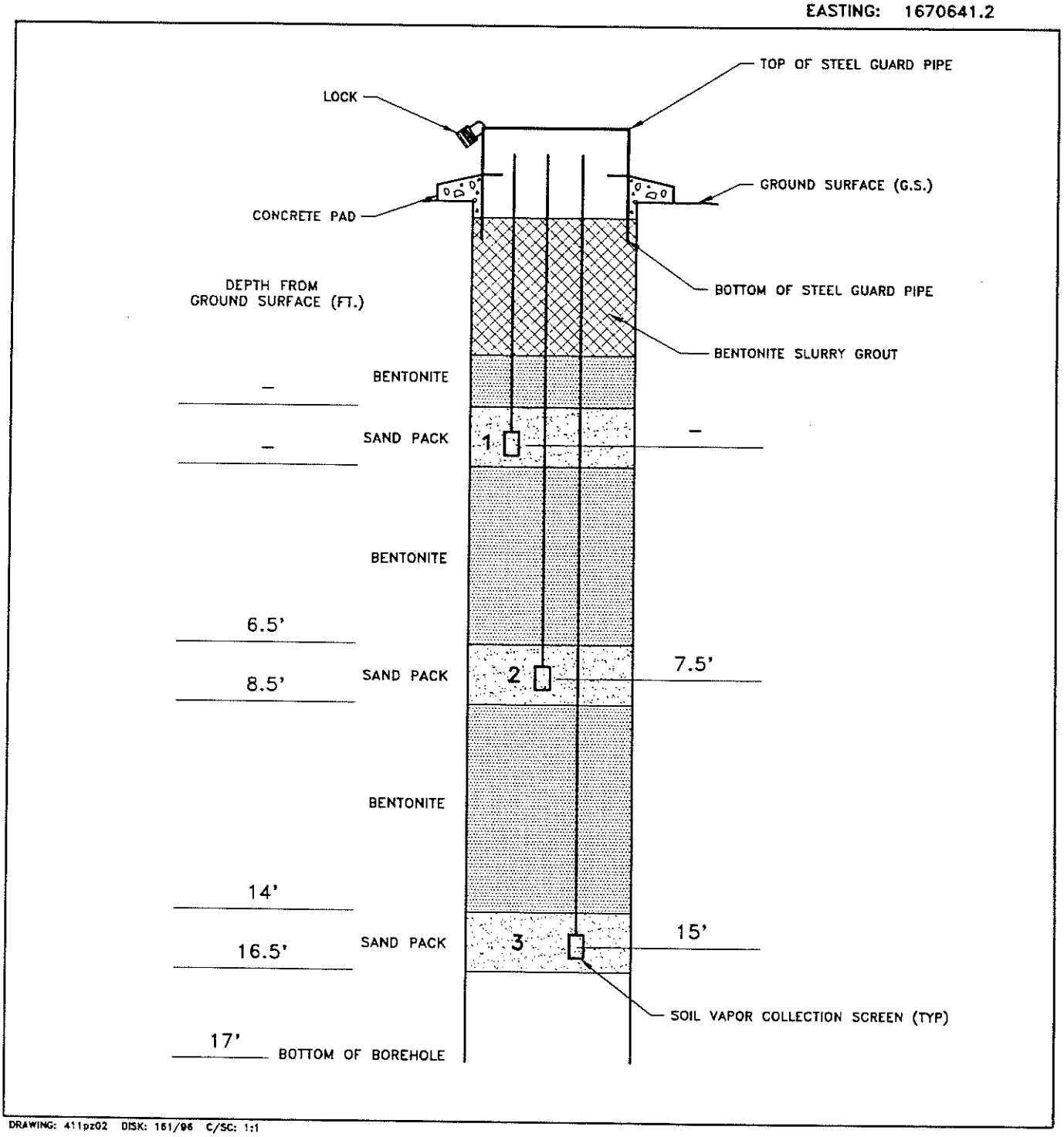
FILTER PACK:

DATE STARTED: 6/10/96

DATE COMPLETED: 6/10/96

NORTHING: 2647308.5

EASTING: 1670641.2



DRAWING: 411pz02 DISK: 161/96 C/SC: 1:1

BORING LOG

BORING NUMBER: 411PZ03

CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST411
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 17
BORING DIAMETER (in):
WELL DEPTH (ft):
WELL DIAMETER (in):
REFERENCE ELEVATION (ft): 158.84
CASING STICKUP (in):
FIELD PARTY: D. McGee

SCREEN LENGTH (ft):
SCREEN TYPE:
SLOT SIZE (in):
FILTER PACK:
DATE STARTED: 6/11/96
DATE COMPLETED: 6/11/96
NORTHING: 2647366.6
EASTING: 1670627.7

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS	WELL DIAGRAM
								GW	Gravel and sand surface.	
5				SS	22	0.6			Tan GRAVEL (GW), 30% fine sand, 10% fines, well graded, gravel diameter 5 to > 75mm, medium dense, damp, no hydrocarbon odor.	
10			411 PZ03S0 10.5N	SS	23	0.6		SW	Medium olive-brown SAND (SW), fine to medium grained, 15% gravel, well graded, medium dense, iron oxide staining, moist, no hydrocarbon odor.	
15			411 PZ03S0 15.5N	SS	21	1.2		GW	Medium brown GRAVEL (GW), 20% fine to coarse sand, lignite, well graded, medium dense, iron oxide staining, saturated at shoe, no odor.	
									End of boring at 17 feet. Boring completed as piezometer.	
20										

PIEZOMETER DIAGRAM

BORING NUMBER: 411PZ03

CLIENT: U.S. AIR FORCE

PROJECT NAME: SERA IV

SITE: ST411

JOB NUMBER: 9000-068

LOGGED BY: T. BARRETT APPROVED BY: P. RIBBENS

DRILLED BY: HUGHES DRILLING

METHOD: 4.25 IN. HOLLOW STEM AUGER

BORING DEPTH (ft): 17'

BORING DIAMETER (in): 8

WELL DEPTH (ft):

WELL DIAMETER (in):

REFERENCE ELEVATION (ft):158.84

CASING STICKUP (in): 0

FIELD PARTY: D. McGEE

SCREEN LENGTH (ft):

SCREEN TYPE:

SLOT SIZE (in):

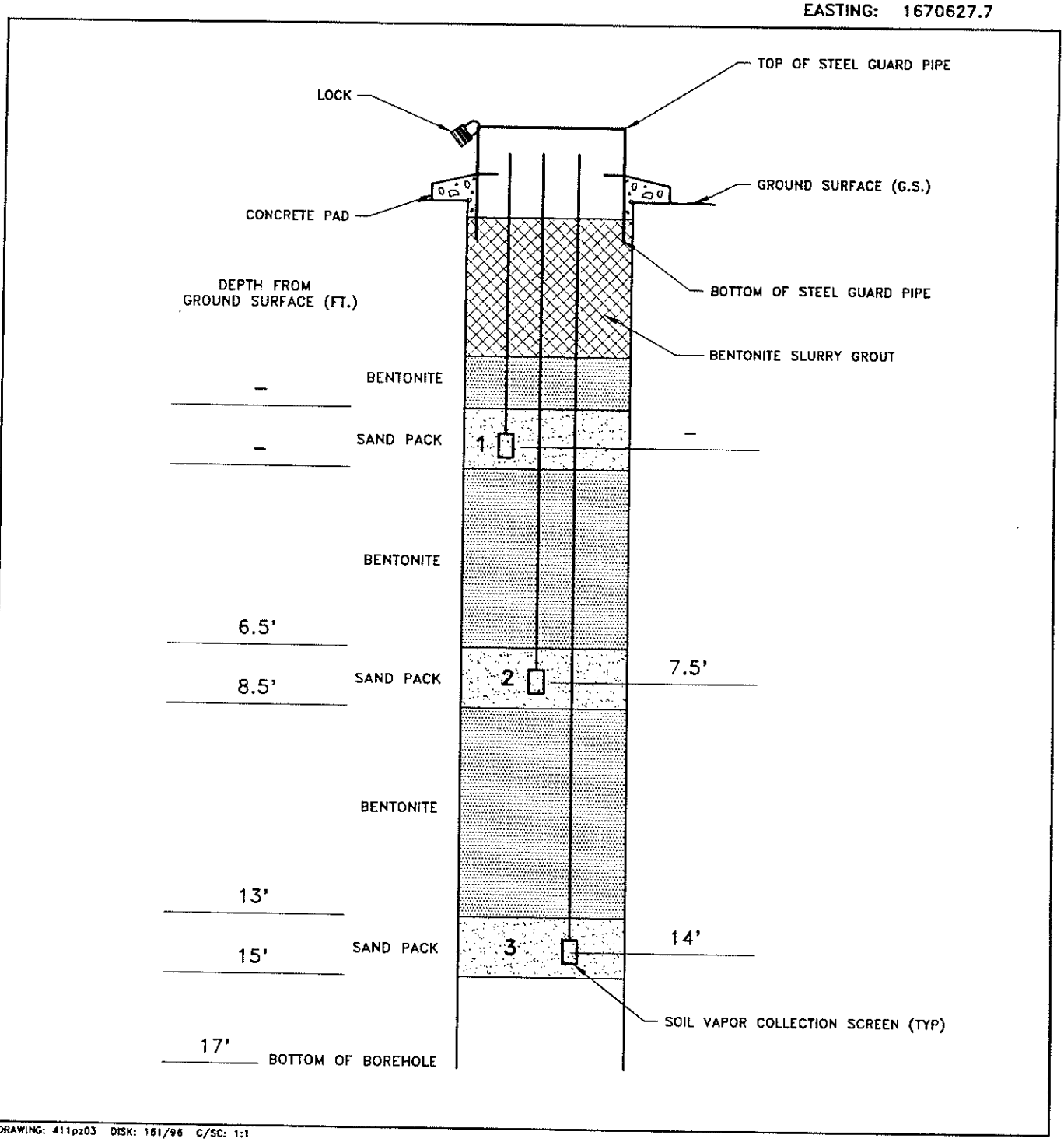
FILTER PACK:

DATE STARTED: 6/11/96

DATE COMPLETED: 6/11/96

NORTHING: 2647366.6

EASTING: 1670627.7



DRAWING: 411pz03 DISK: 181/96 C/SC: 1:1

BORING LOG

BORING NUMBER: 411WL01

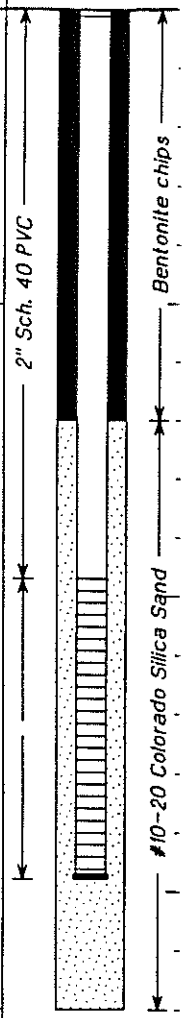
CLIENT: US AIR FORCE
PROJECT NAME: SERA IV
SITE: ST411
JOB NUMBER: 9000-068
LOGGED BY: T. Barrett APPROVED BY: P. Ribbens
DRILLED BY: Hughes Drilling
METHOD: 4.25 in. HOLLOW STEM AUGER

BORING DEPTH (ft): 17
BORING DIAMETER (in):
WELL DEPTH (ft): 14.8
WELL DIAMETER (in): 2
REFERENCE ELEVATION (ft): 159.02
CASING STICKUP (in):
FIELD PARTY: D. McGee

SCREEN LENGTH (ft): 10
SCREEN TYPE: Slotted PVC
SLOT SIZE (in): 0.020
FILTER PACK: 10-20 Colorado Sand
DATE STARTED: 6/11/96
DATE COMPLETED: 6/11/96
NORTHING: 2647391.2
EASTING: 1670680.0

DEPTH feet	LENGTH	RECOVERY	SAMP. NO.	SAMP. TYP.	BLOWS/FT.	PID (ppm)	GRAPHIC LOG	SOIL CLASS	DESCRIPTION AND REMARKS
								SW	Dark brown SANDY FILL (SW), with 20% gravel, fine to medium grained sand, well graded, medium dense, dry, no hydrocarbon odor.
5				SS	34	1.8		GW	Medium brown GRAVEL (GW), gravel diameter from 5 to > 75 mm, 20% fine to coarse sand, well graded, dense, damp, no hydrocarbon odor.
10				SS	33	1.4			Medium brown GRAVEL (GW), 20% of gravel > 75mm, 20% fine to coarse sand, lignite, well graded, dense, no odor.
15			411 WL01SO 15.5N	SS	42	1.0			Medium brown GRAVEL (GW), lithology same as above, iron oxide staining, saturated at shoe.
20									End of boring at 17 feet. Boring completed as a bioventing well.

WELL DIAGRAM



ATTACHMENT 3B

ANALYTICAL DATA

SITE SS411
ELMENDORF AFB ALASKA

SPILL SITE DISPOSITION RECOMMENDATION

ADEC SPILL NUMBER:	952111661
DATE OF SPILL:	15 Jun 1995
USAF SITE NUMBER:	SS411
SITE LOCATION:	Area of Building 32-187, Elmendorf AFB, Alaska. See Figure 3-1 of the Surface Spills Investigation Report.
INVESTIGATION SUMMARY:	A release investigation as described in Section 3.0 of the Surface Spills Investigation Report was conducted at this site and the results of that investigation are detailed therein. No petroleum hydrocarbon contamination above applicable State of Alaska standards was detected through the investigative techniques applied. The data quality objectives for this investigation were met or exceeded.
RECOMMENDATION:	Based on the results of the investigation, Elmendorf AFB recommends that Site SS411 be closed and **No Further Action** be taken with regard to this release.
SIGNATURE:	_____
NAME AND TITLE OF USAF OFFICIAL:	John C. Mahaffey, GS-12 Environmental Project Manager
DATE:	_____
BUSINESS ADDRESS:	3 SPTG/CEVC 22040 Maple Street Elmendorf AFT, AK 99506-3240

SITE SS411
SOIL CONTAMINANT ANALYTICAL RESULTS

SAMPLE ID	LAB ID	MATRIX	ANALYSIS	PARAMETER	RESULT		UNITS	MRL	MDL	DIL	DATE
411PZ01SO11.0N	A96027504	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/10/96
411PZ01SO11.0N	A96027504	SO	AK102	DRO	10	U	MG/KG	10	5	1	6/10/96
411PZ01SO11.0N	A96027504	SO	E160.3M	Solids, Percent	99		PERCENT	0	0	1	6/10/96
411PZ01SO11.0N	A96027504	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ01SO11.0N	A96027504	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ01SO11.0N	A96027504	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ01SO11.0N	A96027504	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/10/96
411PZ01SO16.0N	A96027505	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/10/96
411PZ01SO16.0N	A96027505	SO	AK102	DRO	10	U	MG/KG	10	5	1	6/10/96
411PZ01SO16.0N	A96027505	SO	E160.3M	Solids, Percent	96.5		PERCENT	0	0	1	6/10/96
411PZ01SO16.0N	A96027505	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ01SO16.0N	A96027505	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ01SO16.0N	A96027505	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ01SO16.0N	A96027505	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/10/96
411PZ02SO11.0N	A96027506	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/10/96
411PZ02SO11.0N	A96027506	SO	AK102	DRO	10	U	MG/KG	10	5	1	6/10/96
411PZ02SO11.0N	A96027506	SO	E160.3M	Solids, Percent	97.6		PERCENT	0	0	1	6/10/96
411PZ02SO11.0N	A96027506	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ02SO11.0N	A96027506	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ02SO11.0N	A96027506	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ02SO11.0N	A96027506	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/10/96
411PZ02SO16.0N	A96027507	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/10/96
411PZ02SO16.0N	A96027507	SO	AK102	DRO	15		MG/KG	10	5	1	6/10/96
411PZ02SO16.0N	A96027507	SO	E160.3M	Solids, Percent	94.3		PERCENT	0	0	1	6/10/96
411PZ02SO16.0N	A96027507	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ02SO16.0N	A96027507	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ02SO16.0N	A96027507	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/10/96
411PZ02SO16.0N	A96027507	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/10/96
411PZ03SO10.5N	A96027901	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/11/96
411PZ03SO10.5N	A96027901	SO	AK102	DRO	10	U	MG/KG	10	5	1	6/11/96
411PZ03SO10.5N	A96027901	SO	E160.3M	Solids, Percent	94.3		PERCENT	0	0	1	6/11/96
411PZ03SO10.5N	A96027901	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411PZ03SO10.5N	A96027901	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411PZ03SO10.5N	A96027901	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411PZ03SO10.5N	A96027901	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/11/96
411PZ03SO15.5N	A96027902	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/11/96
411PZ03SO15.5N	A96027902	SO	AK102	DRO	10		MG/KG	10	5	1	6/11/96
411PZ03SO15.5N	A96027902	SO	E160.3M	Solids, Percent	95.7		PERCENT	0	0	1	6/11/96
411PZ03SO15.5N	A96027902	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411PZ03SO15.5N	A96027902	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411PZ03SO15.5N	A96027902	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411PZ03SO15.5N	A96027902	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/11/96
411WL01SO1.0N	A96027903	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/11/96
411WL01SO1.0N	A96027903	SO	AK102	DRO	33		MG/KG	10	5	1	6/11/96
411WL01SO1.0N	A96027903	SO	E160.3M	Solids, Percent	97.1		PERCENT	0	0	1	6/11/96
411WL01SO1.0N	A96027903	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411WL01SO1.0N	A96027903	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411WL01SO1.0N	A96027903	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411WL01SO1.0N	A96027903	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/11/96
411WL01SO15.5N	A96027904	SO	AK101	GRO	5	U	MG/KG	5	0.3	1	6/11/96
411WL01SO15.5N	A96027904	SO	AK102	DRO	17		MG/KG	10	5	1	6/11/96
411WL01SO15.5N	A96027904	SO	E160.3M	Solids, Percent	94.3		PERCENT	0	0	1	6/11/96
411WL01SO15.5N	A96027904	SO	SW8020A	Benzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411WL01SO15.5N	A96027904	SO	SW8020A	Ethylbenzene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411WL01SO15.5N	A96027904	SO	SW8020A	Toluene	0.05	U	MG/KG	0.05	0.01	1	6/11/96
411WL01SO15.5N	A96027904	SO	SW8020A	Xylenes	0.05	U	MG/KG	0.05	0.03	1	6/11/96

NOTES:
MRL = Method Reporting Limit.
MDL = Method Detection Limit.
U = Not-detected at MRL.
B = Analyte detected in associated blank.
J = Value considered an estimate value.
Dil = Dilution.

SITE SS411
SOIL NUTRIENT ANALYTICAL DATA RESULTS

Sample ID	Lab ID	Matrix	Analysis	Parameter	Result		Units	MRL	MDL	Dil
411PZ02SO11.0N	A96027506	SO	350.3	Ammonium	1.1		mg/Kg	0.5	0.4	1
411PZ02SO11.0N	A96027506	SO	353.2	Nitrate-Nitrite	0.4	U	mg/Kg	0.4	0.2	1
411PZ02SO11.0N	A96027506	SO	351.3	TKN	83		mg/Kg	0.5	0.3	1
411PZ02SO11.0N	A96027506	SO	150.1	pH	7.9		units	0	0	1
411PZ02SO11.0N	A96027506	SO	365.3	Phosphate	20	U	mg/Kg	20	20	1
411PZ02SO11.0N	K96344701	SO	D4129	TOC	0.1		Percent	0.05	0.05	1
411WL01SO1.0N	A96027903	SO	350.3	Ammonium	1.4		mg/Kg	0.5	0.4	1
411WL01SO1.0N	A96027903	SO	353.2	Nitrate-Nitrite	2.8		mg/Kg	0.4	0.2	1
411WL01SO1.0N	A96027903	SO	351.3	TKN	279		mg/Kg	0.5	0.3	1
411WL01SO1.0N	A96027903	SO	150.1	pH	5.6		units	NA	NA	1
411WL01SO1.0N	A96027903	SO	365.3	Phosphate	20		mg/Kg	20	20	1
411WL01SO1.0N	K96347501	SO	D4129	TOC	0.18		Percent	0.05	0.05	1

NOTES:
MRL = Method reporting limit.
MDL = Method detection limit.
U = Not-detected at MRL.
Dil = Dilution.

ATTACHMENT 3C

ADEC FORMS

ALASKA DEPT. OF ENVIRONMENTAL CONSERVATION
LUST NOTIFICATION

NOTE: Outlined areas for DEC use only

PILL #	FILE #	LC
PERSON REPORTING	PHONE NUMBER: (907) 552-8057	FAX NUMBER: (907) 552-1533
DATE/TIME OF SPILL Unknown	DATE/TIME REPORTED DATE/TIME DISCOVERED Unknown	**SUBSTANCE RELEASED** POL

LOCATION
Building 32-187, Elmendorf AFB

POTENTIAL RESPONSIBLE PARTY OWNER OPERATOR	OTHER POTENTIAL RESPONSIBLE PARTIES, IF ANY
NAME: SPTG/CEVC ADDRESS: 22040 Maple Street Elmendorf, AK 99506 TELEPHONE: (907) 552-8057	

SOURCE OF RELEASE
Suspected surface spill (SS411)

CAUSE OF RELEASE
Unknown

INITIAL ABATEMENT ACTIONS
Unknown

AREA AFFECTED: TANKS, PIPING DISPENSERS	HAS GROUNDWATER BEEN IMPACTED? [ ] YES [X] NO [ ] UNKNOWN		
	DEPTH TO GROUNDWATER?	16	Feet (BGS)

HAS IMPACTED SOIL BEEN STOCKPILED? YES NO VOLUME? WHERE IS STOCKPILE LOCATED?
No

COMMENTS

See attached reported for additional information.

PREPARED BY	DATE REPORT PREPARED

SS411
ADEC Storage Tank Program
Site Assessment and Release Investigation Summary Form

This document summarizes information from site assessments and release investigation reports that are required by Alaska's Underground Storage Tanks Regulations (18 AAC 78). It is intended to ensure minimum requirements are met when submitting full reports to ADEC. It cannot be substituted for comprehensive site assessment or release investigation reports. Site assessments (as defined in AS 56.03.450) are conducted to check for the presence or absence of petroleum contamination. If contamination of soil or groundwater is identified, then a release investigation is required. Site assessments and release investigations must be conducted by a qualified impartial third party (as defined in 18 AAC 78) and in accordance with chapter two of the Underground Storage Tanks Procedures Manual (UST Manual).

How to fill out this form
Type or print in ink the requested information and sign in ink the "signature" blocks on page 7. Please attach this form to the comprehensive site assessment or release investigation report (or include it in the report introduction) and submit it to the nearest ADEC field operations office (Juneau, Anchorage, Fairbanks, or Soldotna).

1. General Information

Purpose of Site Assessment/ Release Investigation: Release Investigation
(closure, Change in service, suspected or confirmed release, compliance check, other)

Owner of Site: USAF — (907) 552-8057
Name of company/legal entity that owns the site — Phone number

3 SPTG/CEVC
22040 Maple Street — Elmendorf, AK 99506-3240
Mailing address — City, State, Zip Code

Operator of Site: Same — Same
Name of company/legal entity that owns the site — Phone number

Same — Same
Mailing address — City, State, Zip Code

Location of Site: Elmendorf AFB — Same
Name of site (e.g., John Doe's Service Station) — Phone number

Building 32-187 — City, State, Zip Code
Physical address of site (be as specific as possible)

Legal description of site — Section/township/range

Military — Facility ID#/Tank ID number(s)
Type of business at site

Financial Assistance Applications filed
☐ Site assessment/ tightness test ☐ Tank cleanup ☐ Tank upgrade ☐ Tank closure

Reports on file with ADEC
☐ Tightness test ☐ Closure notice ☐ Other _____

2. System and Tank Status

Describe the status, size, and contents of the tanks that have been at the site:

Tank ID Number:	Tank No.	Tank No.	Tank No.	Tank No.
Tank status (check one)				
Temporarily closure				
Closed/left in place				
Closed/removed				
Total capacity (gallons)				
Contents (diesel, etc.)				

3. Firm Conducting Site Assessment and Release Investigation

ENSR Corporation
Name of firm

(907) 561-5700
Phone number

4600 Business Park Boulevard, Suite 22
Mailing address

Anchorage, AK 99503-7143
City, State, Zip Code

Peter Ribbens
Site assessment supervisor(s)

Tom Barrett
Person(s) collecting samples

4. Site History

Based on the best available knowledge, please check the appropriate box below:

Y	N	
X		Was soil contamination observed or identified?
	X	Was groundwater contamination observed or identified?
		Did inventory control or prior tank repairs indicate a possible release?
		Has a tank tightness test been performed on any USTs on the site?
		Have any of the facility's USTs or piping ever failed a tightness test?
X		Have there been any previous site assessments performed at this site?
X		Do previous site assessments indicate any contamination has occurred?

If the answer to any of these questions is yes, please describe (or attach copy of report discussion). Give dates and circumstances, use continuation sheet, if necessary:

See attached report.

5. **Field Screening Analysis**

Date(s) of field screening: 6/11/96, 6/12/96 Temperature(s) during screening: 47°F - 61°F

Estimated wind speeds: 3 - 13 knots Weather (clear, raining, etc.): Light rain

Type of field detection instrument used: PID

Brand: MSA Model: Passport Date calibrated: Daily

Number of tests: 13 Range of results: 0.0 - 2.8 ppm

If an instrument was not used, what field detection method was used? N/A

Number of tests: N/A Range of results: N/A

6. **Collection of Soil Samples**

For site assessments done for USTs remaining in place:
Check the appropriate boxes below (if not applicable, leave blank):

Y	N	
____	____	Were samples taken from borings (or test pits) within 5 feet of the UST?
____	____	Were samples collected from within 2 feet below the bottom of the UST?
____	____	Were dispensers connected to the UST system?
____	____	Were samples taken from borings (or test pits) adjacent to dispensers?
____	____	Were samples taken from borings (or test pits) adjacent to piping?

How many borings/pits were made? ____ How many samples were analyzed? ____

For site assessments done at excavation and removal of USTs:
Check the appropriate boxes below (if not applicable, leave blank):

Y	N	
____	____	Were any areas of obvious contamination identified or observed?
____	____	Were samples taken from areas of obvious contamination?
____	____	Were at least two discrete analytical samples taken from excavated pit area?
____	____	Was at least one sample taken from below each dispensing island's piping?
____	____	Was at least one sample taken from the piping trench?
____	____	Were the samples referenced above collected from native soil within 2 feet below the bottom of the tank pit or dispenser/piping trench?
____	____	If multiple tanks were removed, were at least three samples collected?
____	____	Were additional samples collected for each 250 square feet of excavated pit over 250 square feet?

Number of distinct points sampled: ____ Estimated excavation's surface area: ____

For all site assessments:
Check the appropriate boxes below:

Y	N	
____	____	Were field duplicate samples collected and analyzed?
____	____	Were all samples kept at the appropriate temperature until analysis?
____	____	Were all samples extracted and analyzed within recommended holding times?
____	____	Did chain-of-custody/transfer logs accompany samples to laboratory?

7. **Laboratory Analysis of Soil Samples**
(see Table 1 of UST Procedures Manual or Table G of 18 AAC 78.800[b])

Identify the possible contaminants (gasoline, BTEX, diesel, etc.): POL

Please list the analytical methods used to detect these contaminants in the soil samples, the number of samples analyzed by each method, and the range of results for each method:

Possible product	Analytical method	Number of samples	Range of results	Location(s) of sample points(s) with highest level of contamination
DRO	AK102.1	8	ND - 33 mg/Kg	WL01 @ 1'
GRO	AK101.1	8	ND	
BTEX	EPA 8020	8	ND	
Benzene	EPA 8020	8	ND	

8. **Groundwater Investigation**
Check the appropriate boxes below:

Y	N	
____	____	Was groundwater encountered during the excavation or drilling work?
____	____	Were borings drilled/pits dug at least 5 feet below the USTs bottom?
____	____	Is groundwater or seasonal high water table known or suspected to exist within 5 feet of the bottom of the USTs?
____	____	Were samples taken from borings drilled/test pits dug to this water level?
____	____	Were all these samples analyzed within recommended holding times?

How many groundwater/saturated-soil samples were collected and analyzed? ____

How many of these samples were taken from the top 6 inches of water table? ____

How many field QC samples were analyzed?

Trip blanks ____ Duplicates ____ Decon blanks ____

9. Laboratory Analysis of Water Samples
(see Table 1 of UST Procedures Manual or Table G of 18 AAC 78.800[b])

Identify the possible contaminants at the site: _____

Identify the analytical methods used to detect these contaminants in the water samples, the number of samples analyzed by each method, and the range of results for each method:

Analytical Method	Number of Samples	Range of Results (ppm)	Location(s) of Sample Point with Highest Level of Contamination

10. Disposal of Material

Check the appropriate boxes below (if not applicable, leave blank):

Y	N	
____	____	Were tanks cleaned in accordance with API 2015 (Cleaning Petroleum Storage Tanks)?
____	____	Were the tanks and piping removed and disposed in accordance with API 1604 (Removal and Disposal of Used Petroleum Storage Tanks)?

Where were the tanks and piping disposed?

_____

Where was the tank sludge and rinse water disposed?

_____

11. Stockpiles

Check the appropriate boxes below (if not applicable, leave blank):

Y	N	
____	____	Is any soil stockpiled at the site?
____	____	Are soils stockpiled in accordance with 18 AAC 78.311?

12. Release Investigation

Check the appropriate boxes below:

Y	N	
X		Was any petroleum contamination identified during site assessment? (Answer "yes" if any evidence a release occurred; if no, proceed to item 13).

If contamination was found, what was matrix score for site? N/A
(Attach completed matrix score sheet to this form)

When did release occur? Unknown (Date and time) When was release confirmed? _____ (Date and time)

When was ADEC notified? _____ (Date and time) List ADEC staff notified: _____ (Name)

What is status of UST that prompted the investigation _____ In use _____ Out of use, product still in system _____ Out of use, system empty _____ Permanently closed

Briefly describe (or attach copy of report discussion) the steps taken to prevent further migration of the release and steps taken to monitor and mitigate fire and safety hazards:

Release investigation conducted, no further action recommended

13. Site Sketch

Sketch the site in the space below. Alternatively, attach a site map to the back of the form. The sketch (or accompanying narrative) should include the following information:

- locations of all USTs, piping, and dispensers
- distances from tanks to nearby structures
- property line locations
- location and dimensions of excavation(s)
- type of backfill used to surround system
- locations of any known historical releases
- locations of any observed contamination
- location of any boreholes and test pits
- soil types
  - field screening locations and readings
  - sampling locations, depths, and sample ID numbers
  - water wells and monitoring wells (if present)
- depth to groundwater/seasonal high groundwater
- locations of any stockpiled soils
  - north arrow
- bar scale (specify feet or meters)

For release investigations, in addition to the above information, show the groundwater gradient, surface drainages (including potential hydraulic connections with groundwater), and utility trenches.

See attached report.

14. Quality Assurance

Check the appropriate boxes below:

Y	N	
____	____	Were there deviations from Chapter 2 of the UST Procedures Manual? (Note that any deviations must be documented in a section of the comprehensive report.)
____	____	Is a field quality control summary included in the reports?
____	____	Is a laboratory QC summary included in the report for all samples used to verify cleanup levels have been met? A laboratory QC is included for all samples.

15. Certification

The following certification is to be signed by the assessment firm's principal investigator or Quality Assurance Officer:

> I certify that I have personally examined and am familiar with the information in this and all attached documents and based on my inquiry of the individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Peter Ribbens _____ Principal Investigator _____
(Print name) (Title)

_____ _____
(Signature) (Date)

The following certification is to be signed by the UST owner/operator (or designated representative):

> I certify that except as specifically noted in this report, all statements and data appearing in this report are in conformance with the provisions of Chapter 2 of the UST Procedures Manual.

_____ _____
(Print name) (Specify if owner, operator, representative)

_____ _____
(Signature) (Date)

_____ _____
(Street address) (City, State, Zip)

16. Attachments

Please check the boxes showing any comprehensive reports attached to this summary:

_____ Site Assessment Report (include if no release investigation is needed)

X Release Investigation Report (include if release investigation is needed) (pending)

Alaska Department of Environmental Conservation
Underground Storage Tank Program
Preliminary Risk Evaluation Form

Purpose of this form
This form is used only for sites with Underground Storage Tanks that are regulated by AS 46.03.450(12). The form is based on the "Alaska Hazard Ranking Model," which the Department uses to prioritize its investigation and cleanup efforts. It is sued to collect preliminary information on the relative risk a contaminated site may pose to human health and the environment.

Explanation of how sites are scored
The box below explains how a site will be scored after the Department receives this form. Note that although the form contains values for "unknown" elements, a minimum combination of the following data elements are needed for adequately distinguishing between sites: toxicity, quantity, air exposure, groundwater exposure, and surface water exposure. Also note that scores cannot be calculated in the following instances:

1. If too many data elements are unknown; or
2. If both the toxicity and the quantity data elements are unknown; or
3. If all exposure elements are unknown.

Scoring procedure for risk evaluation form
The Preliminary Risk Evaluation Form contains 14 different questions. Each question deals with a particular "data element" (shown below) that is considered in scoring the site. The alternatives to each question are assigned a value and then these values are entered into the formulas below to calculate the final score.

Question #	Data Element
1.	Toxicity
2.	Quantity
3.	Release Information
4.	Size Access
5.	Air Exposure
6a.	Population Density (within 1 mile)
6b.	Population Proximity (500 feet)
7.	Groundwater Usage
8.	Groundwater Exposure
9.	Surface Water Use
10.	Surface Water Exposure
11.	Surface Water Environment
12.	Environmental/Recreational Area
13.	Observed Environmental Impact
14.	Multiple Sources or Contaminants

Scoring

Ranking Score = Substance Factor x (Human Target + Environmental Target)

Substance Factor = (#1) x (#2) x (#3)

Human Target = (#4 + Air Target Population + Adj. Groundwater Use + Adj. Surface Water Use)
Air Target Population = (#5) x (#6a) x (#6b)
Adj. Groundwater Use = (#7) x (#8) x (#6a)
Adj. Surface Water Use = (#9)x(#10)x(#6a)

Environmental Target = (#11) + (#12)
or, if (#11) + (#12) = 0, use value in (#13)

If there are **multiple contaminants** (answer is "yes" to #14), multiply Ranking Score by 1.2.

(Numbers in parentheses refer to the 14 "data elements" identified above.)

Return completed form to:

ADEC Underground Storage Tank Financial Assistance Program
555 Cordova Street, Anchorage, AK 99501
Phone (907) 269-7504 Fax (907) 269-7507

SS411
ADEC Underground Storage Tank Program
Preliminary Risk Evaluation Form

Please type, or print in ink, all the requested in formation on this page.

General Information

Name of Site: Elmendorf AFB

Facility ID Number: Building 32-187

Tax ID Number:

Applicant:

Name: 3 SPTG/CEVC

Address: 22040 Maple Street

Elmendorf, AK 99506-3240

Phone: (907) 522-8057

Facility:

Name: Elmendorf Air Force Base

Address:

Phone:

Owner of Tank (if not same as applicant):

Name:

Address:

Phone:

Owner of Land (if not same as applicant):

Name:

Address:

Phone:

Facility:

For State Use Only

RECKEY #

Preparer:

Name: Peter Ribbens

Title: Project Manager

Firm: ENSR Corporation

Phone: (907) 561-5700

Please provide any additional information that may assist in processing the Preliminary Risk Evaluation Form (i.e., directions to the site if it does not have a physical address, uncertainties over how to answer particular questions, etc.). Please use additional pages, if necessary.

ADEC Underground Storage Tank Program
Preliminary Risk Evaluation Form

(Values for scoring are in parentheses following each option)

On pages 3-7, please fill in the letter of the correct choice in the box preceding each question.

For State Use Only

1._____

2._____

3._____

N/A **1. What type of product was released or detected?**

If more than one substance is present, use the one that will score the highest substance factor.

a. Chlorinated solvents, other halogenated hydrocarbons, synthetic chlorinated organic pesticides. (4)

b. Metals, gasoline, aviation gas, naphtha, non-chlorinated pesticides. (3)

c. Unknown substances. (2.1)

d. Diesel fuel, jet fuels (JP-4, JP-5), kerosene, non-chlorinated phenols, non-chlorinated solvents, crude oil. (2)

e. Waste lubricating oils, heavy fuel oils (no. 6, etc.), inorganic acids/bases, tar. (1)

c **2. What quantity of product was released?**

a. < 10 drums or 549 drum or tank gallons, < 500 spilled gallons, < 100 cubic yards or tons, < 100 ft^2. (1)

b. 10 - 99 drums or 550 - 5,499 drum or tank gallons, 500 - 9,000 spilled gallons, 100 - 499 cubic yards or tons, 100 - 9.999 ft^2. (2)

c. Unknown quantity. (2.1)

d. 100 - 999 drums or 5,500 - 54,999 drum or tank gallons, 10,000 - 39,000 spilled gallons, 500 - 1,999 cubic yards or tons, 10,000 - 43,559 ft^2. (3)

e. ≥ 1,000 drums or ≥ 50,000 drum or tank gallons, ≥ 40,000 spilled gallons, ≥ 2,000 cubic yards or tons, ≥ 1 acre (43,560 ft^2. (4)

Note:
< means "less than" (i.e., 1 <10, or one is less than ten)
> means "greater than" (i.e., 10 >1, or 10 is greater than one)
≥ means "greater than or equal to" (i.e., 11 ≥ = 10, or 11 is greater than or equal to 10)

d **3. Has a release at the site been documented?**

a. Documented releases indicate contamination due to disposal practices or failure of containment at the site, regardless of quantity. (1)

b. Containment management practices exist, which may pose a significant threat, but there is no documentation of a release. (.5)

c. An unknown potential for site release exists, or, off-site contamination is not clearly linked to the site. (.2)

d. There is a documented absence of a release at the site. (.1)

For State Use Only	
4._____	[c]
5._____	[c]
6a._____	[b]
6b._____	[a]

4. **How controlled is access to this site?**
   a. A school is present within 500 feet, and site access is partially controlled or uncontrolled, and wastes are present at the surface. (3)
   b. Access to the site is uncontrolled, and wastes are present at the surface. (2)
   c. Access to the site is partially controlled, or surrounding features restrict site access, or contaminated soil is stockpiled (presumed covered) on site. (1)
   d. There is an underground tank, or waste is not present at the surface, or access to the site is completely controlled. (0)

5. **Have contaminants been released to the atmosphere?**
   a. A documented release of particulate or gases from the site has been confirmed. (1)
   b. A release may have occurred at the site based on existing physical evidence, including uncovered stockpiles of excavated soils. (.2)
   c. No significant air releases have been identified at the site and waste management practices indicate no substantial possibility. (.1)

6a. **What is the predominant population density within 1 mile radius?**
   a. Urban residential use (in or adjacent to population >35,000, single family lots <¼ acre). (10)
   b. Suburban residential areas (lots ¼ - 1 acre), or cities with population between 2,000 - 35,000, or industrial/commercial areas. (8)
   c. Villages (<2,000 people), or low density housing (one unit per acre), or low density commercial use, or few permanent residents, but intensive seasonal use. (5)
   d. Rural use with some occupied buildings. No villages or associated commercial/ industrial areas within 1 mile. (3)
   e. Isolated areas with no population present. (0)

6b. **What is the predominant population in proximity to the site (within 500 feet)?** (*Also count workers at site, residents of military barracks or lodges, and students at a school.*)
   a. Occupied buildings or dwellings present within 500 feet of site. (1)
   b. No occupied buildings within 500 feet. (0.5)

For State Use Only

7._____

d

7. What is the groundwater usage within 1 mile?

a. Within a 1 mile radius, a majority of the population is served by municipal wells or other public water supply wells serving >25 individuals. (1)

b. Within a 1 mile radius, a majority of the population is served primarily by community or private wells. (.8)

c. A majority of the population is served by drinking water supplies originating greater than a mile from the site, but other public water supply wells serving more than 25 individuals are located within 1 mile of the site. (.6)

d. A majority of the population is served by drinking water supplies that are >1 mile from the site, or there are no known wells within 1 mile, but the possibility of use of groundwater as a source of drinking water exists. (.4)

e. Groundwater is not available for drinking water or is not used. (.1)

8._____

d

8. Has there been any documentation of groundwater contamination?

a. Documented contamination of a drinking water supply at the tap exceeds the MCL. (4)

b. Documented contamination of a drinking water supply at the top does not exceed the MCL. (2)

c. Groundwater contamination has been detected, but actual contamination at the tap has not been documented. (1)

d. Groundwater contamination is unknown either at the tap or at the groundwater source. (.4)

e. Groundwater water is documented to be free of contamination, or waste and site characteristics indicate a low potential for contamination. (0)

9._____

c

9. What is the primary use of surface water within 1 mile?

a. Surface water is used as a drinking water source supplied by intakes within 1 mile of site. Assign this value if surface drinking water supplies within 1 mile of the site have been abandoned due to site contamination. (1)

b. Use of surface water as a source of drinking water from intakes within 1 mile is unknown, but likely. (.5)

c. Use of surface water as a source of drinking water is unknown but is unlikely, or there is no use of surface water as a drinking water source within a 1 mile radius (.2)

For State Use Only
10.____
11.____
12.____

d 10. **Has surface water been contaminated by a release from the site?**

a. Documented contamination of surface drinking water supply at the tap exceeds the MCL due to releases of hazardous material from the site. (4)

b. Documented contamination of surface drinking water supply at the tap does not exceed the MCL. (2)

c. Surface water contamination has been detected at a drinking water source, but actual contamination of drinking water supply at the tap has not be documented. (1)

d. Surface water contamination is unknown. (.4)

e. Surface water is not used as a source of drinking water, or surface water is documented to be free of contamination, or site and waste characteristics indicate a low potential for contamination of surface water. (0)

d 11. **What type of surface water environment exists within ¼ mile of the site?**

a. Fresh or marine water or wetlands are present within ¼ mile and evidence of death or stress to fish or wildlife exists, which is strongly suspected as a result of the presence of hazardous substances. (5)

b. Fresh or marine waters or wetlands are present within ¼ mile and evidence of death or stress to plants exists, which is strongly suspected as a result of the presence of hazardous substances. (3)

c. Fresh or marine waters or wetlands area are present within ¼ mile, but there is no evidence of death or stress to fish, wildlife, or plants. (2)

d. No fresh or marine waters or wetlands are present within ¼ mile. (0)

d 12. **Is the site in an environmental/recreation area?**

a. The site is in an environmental/recreation area and evidence exists of death or stress to fish or wildlife, which is strongly suspected as a result of the presence of hazardous substances. (5)

b. The site is an environmental/recreation area and evidence exists of death or stress to plants, which is strongly suspected as a result of the presence of hazardous substances. (3)

c. The site is an environmental/recreation area and there is no evidence of death or stress to fish, wildlife, or plants. (2)

d. The site is not in an environmental/recreation area. (0)

If your answer to both questions 11 and 12 was "d," and there are documented impacts to the environment, which are not within ¼ mile of surface waters or located within ¼ mile of an environmental or recreation area, then proceed to questions number 13. Otherwise skip 13, and proceed to question 14.

For State Use Only		
13.____	C	13. **What are the observed environmental impacts to surface waters not within ¼ mile, or which are not within environmental/recreational areas?** a. There is evidence of death or stress to fish or wildlife, which is strongly suspected as a result of the presence of hazardous substances. (5) b. There is evidence of death or stress to plant life, which is strongly suspected as a result of the presence of hazardous substances. (3) c. There is no evidence of death or stress to wildlife or plant life. (0)
14.____	No	14. **Are there multiple sources of contamination present at the site? Yes or N.** (*A yes answer will result in the final score being multiplied by 1.2, otherwise there will be no adjustment to the final score.*)

For State Use Only
Scores assigned by:
Date:

Q

DATA ASSESSMENT REPORT

To: FILE/Anchorage
Date: November 1996
From: Quality Assurance Section Manager
File: 9000-080/-068
re: SERA Phase IV Surface Spills Investigation at EAFB
cc: Project Manager

TABLE OF CONTENTS

TABLE OF CONTENTS
(Cont'd)

LIST OF TABLES

LIST OF ACRONYMS

ADEC	Alaska Department of Environmental Conservation
B	Benzene
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
C	Celsius
CCV	Continuing Calibration Verification
COC	Chain of Custody
CVAA	Cold Vapor Atomic Absorption
DAR	Data Assessment Report
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DQO	Data Quality Objectives
DRO	Diesel Range Organics
E	Ethylbenzene
ECD	Electron Capture Detector
EDF	Electronic Data Format
ENSR	ENSR Corporation
EPA	U.S. Environmental Protection Agency
FID	Flame Ionization Detector
GC	Gas Chromatography
GFAA	Graphite Furnace Atomic Absorption
GRO	Gasoline Range Organics
GC/MS	Gas Chromatograph/Mass Spectrometer
ICP	Inductively Coupled Plasma Spectrometer
LCS	Laboratory Control Samples
LECL	Laboratory-established Control Limit
LGN	Laboratory Group Number
MRL	Method Reporting Limit
MS	Matrix Spike
ND	Non-detected
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
T	Toluene
TAS	Target Analyte Summary
TOC	Total Organic Carbon
UCM	Unresolved Complex Mixture
VOC	Volatile Organic Compound
X	Total Xylenes

1. SUMMARY

This Data Assessment Report (DAR) has been prepared to address the data quality control (QC) and quality assurance (QA) procedures for data collection activities performed under release investigations at Elmendorf Air Force Base (EAFB), referred to as SERA Phase IV Surface Spills Investigations.

The objective of this report is to evaluate, through assessment of the QA/QC procedures, if the generated data adequately confirm and define areas of contamination at each site, and verify the source areas where contamination was found.

- No data were qualified as a result of data validation procedures.
- No data were rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria.
- QA goals for laboratory precision and accuracy were met.
- The quantitative completeness goal of 90 percent was met.
- Data is considered valid to assess the contamination at the site.

1.1. Field Sample Management

Project samples were collected at EAFB beginning May 23 through August 24, 1996.

Project samples were analyzed by Columbia Analytical Services (CAS) located in Anchorage, Alaska. Samples received at CAS were organized as "batches" of samples and are referred to as laboratory group numbers (LGNs). LGNs included batch-specific QC elements to assess the precision and accuracy of analysis.

QC samples were collected during the sampling activities to evaluate field sample handling, transportation, analytical procedures, and variability. The QC samples consisted of blind replicate samples and transfer trip blanks for volatiles analysis. Blind replicate samples were analyzed by CAS as project field samples.

1.2. Analytical Program

Analytical methods are defined by State of Alaska (ADEC 1995) and U.S. Environmental Protection Agency (EPA 1987) methodology. The following brief narrative describes the analytical technique and instrument detection method.

Analysis of samples for petroleum hydrocarbons was performed by gas chromatography (GC) technique with flame ionization detector (FID). Methodology is defined by State of Alaska Department of Environmental Conservation (ADEC) guidance (1995) as "Method for the Determination of Diesel Range Organics" (DRO; AK102.0), Method for the Determination of Residual Range Organics" (RRO; AK103.0), and "Method for the Determination of Gasoline Range Organics" (GRO; AK101.0). Project samples for the volatile aromatic compounds benzene (B), toluene (T), ethylbenzene (E), and xylenes (X) (collectively known as the BTEX compounds) were analyzed by SW-846 8020a (EPA 1987) methodology, utilizing in-series photoionization detection before GRO FID analysis.

Project samples for BTEX/GRO AK101.0 analysis were extracted in the field with methanol to maintain hydrocarbon integrity and minimize analyte volatilization. ADEC has referenced an American Petroleum Institute study (API 1991) and others (Urban et al. 1989) where soil samples methanol-extracted in the field can be held for up to 28 days at 4°C with no apparent volatile component losses.

Volatile organic compounds (VOCs) were assessed in selected samples and analyzed by EPA-846 method 8260A, a gas chromatography mass spectrometry (GC/MS) technique.

Semivolatile organic compounds (SVOCs) were assessed in selected samples and analyzed by EPA SW-846 method 8270B, a GC/MS technique.

General chemistry inorganic nutrient analysis was performed by EPA "Methods for Chemical Analysis of Water and Wastes" (EPA 1983).

2. DATA ASSESSMENT PROCEDURES

2.1. Data Verification Procedures

Data verification procedures were performed to ensure the competency of the reported results. A complete cross-checking of laboratory identification numbers with ENSR identification numbers was performed to ensure that analysis had been performed as specified by the chain-of-custody (COC) documentation. Missing information regarding samples or any quality control procedures were noted and resolved with laboratory personnel.

CAS additionally supplied the analytical results on 3.5-inch electronic media. The U.S. Army Corps of Engineers (USACE) North Pacific Division Laboratory (NPDL) Electronic Deliverable Format (EDF) was supplied as ASCII text files containing comma-delimited fields. Version 1.2 (July 1995) EDFs are five relational database-structured files and are organized by LGN according to the sequential receipt of samples at the laboratory.

Each EDF was compiled in Microsoft Access and secured as a "verified" database after corrections were identified and resolved by the Data Management Task Manager. Data verification procedures were performed by comparing a printout of the database values to the hardcopy analytical report provided.

EXCEL 5.0 was used to extract data from the Microsoft Access verified database for generation of target analyte summary (TAS) tables provided in the Site Assessment report. Verified TAS tables were "posted" by date by the Data Management Task Manager.

- No discrepancies in analytical results with the laboratory hardcopy and EDF files were identified.

2.2. Data Validation Procedures

Descriptive data categories (EPA 1993) have been developed to address various data uses and the QA/QC elements required to achieve the desired level of quality. Analytical data was generated for this project as definitive data (EPA 1993). The validation effort applied for definitive data is described as:

- Verification of sample locations and identifications.
- Verification of holding times, COC forms, and sample identification.
- Confirmation of 10 percent of the samples collected and submitted for analysis for precision, accuracy, method detection limit, and error determination (using SW-846 criteria).

- Evaluation of results of 10 percent of the samples in the analytical data packages for all of the elements listed under QA requirements in the respective Sampling and Analysis QA/QC Plan or Task Quality Assurance Plan (QAP). Blank contamination and detection capability to be reviewed for the remaining samples.

Data validation procedures were performed on the analytical results for a systematic and independent verification to determine method compliance and assess data quality. Validation was performed from the laboratory-provided sample result sheets, summary QC sheets, and available raw data.

2.3. Chemical Data Quality Evaluation

Quantitative QA goals and sensitivity requirements were specified in an analytical scope of services and are presented in Table 2-1.

2.3.1. Sample Receipt and Integrity

A "Cooler Receipt and Preservation Form" was completed for project samples received at CAS. These forms checklisted COC documentation requirements, cooler temperature, sample labeling, and general sample integrity at receipt to the laboratories.

LGNs logged for analysis, the verified-time-of-sample-receipt (VTSR) and the temperature of project samples received at the laboratory are:

• A9600275	6/11/96	1.6°C.
• A9600279	6/11/96	3.4°C.
• A9600283	6/12/96	5.3°C.
• A9600319	6/21/96	5.8°C.
• A9600325	6/24/96	1.9°C.
• A9600331	6/25/96	4.0°C.
• A9600358	7/1/96	4.6°C.
• A9600367	7/2/96	4.1°C.
• A9600371	7/3/96	3.2°C.

Coolers met preservation temperature goal of receipt at the laboratory at 4°C plus or minus 2°C. COC doumentation matched sample jar label identification.

Table 2-1
Quantitative QA Objectives

Parameters	Method Extraction/ Analysis	Sensitivity Requirement[a]	Precision RPD[b]	Accuracy % Recovery	Completeness %
Soil/Sediment					
Gasoline Range Organics: GRO[c] and BTEX[f]	AK 101.0	5 mg/Kg GRO 0.025 mg/Kg BTEX	± 20	60 - 120	90
Gasoline Range Organics: GRO[c]	AK 101.0	5 mg/Kg	± 20	60 - 120	90
Diesel Range Organics: DRO[d]	AK 102.0	10.0 mg/Kg	± 20	60 - 120	90
Total Organic Carbon	9060	10 mg/Kg	± 50	75 - 125	90
Nitrogen as Nitrate-Nitrite	353.2 mod$_e$	5 mg/Kg	± 30	N/A	90
Nitrogen, Total Kjeldahl	351.2 mod$_e$	20 mg/Kg	± 30	N/A	90
Phosphate, Total	365.2 mod$_e$	20 mg/Kg	± 30	N/A	90
Ammonia, Ion Salicylate	350.1 mod$_e$	5 mg/Kg	± 30	N/A	90
pH (Soil)	9045	0.1 pH unit	± 30	N/A	90
Grain Size Distribution	ASTM C117 & C136	1.001 mm	± 20	N/A	90

Notes:

ASTM = Methods in American Standards for Testing Materials
N/A = Not applicable

[a] Sensitivity requirement is the project-specific quantitation limit. Reported quantitation limits may differ by sample results adjustment for percent moisture and sample dilution.
[b] RPD = relative percent difference calculated from replicate (duplicate) measurements.
[c] GRO = Gasoline Range Organics: Analytical protocol will follow ADEC Method AK101.0.
[d] DRO = Diesel Range Organics: Analytical protocol will follow ADEC Method AK102.0.
[e] Method modified for soil matrix.
[f] Benzene, Toluene, Ethylbenzene, and Total Xylenes.

2.3.2. Sample Holding Times

Holding time goals for petroleum hydrocarbon analysis are referenced in ADEC methodology (1995) as:

GRO 14 days to analysis
28 days to analysis with field methanol preservation (AK101.0)

BTEX 14 days to analysis (EPA method 8020a)

DRO 14 days to extraction/40 days to analysis (AK 102.0)
RRO 14 days to extraction/40 days to analysis (AK 103.0)

ADEC-recommended holding times were met for the analyses in the reviewed LGNs with the following exceptions:

- LGN A9600275 sample -008 representing an aqueous trip blank exceeded the holding time goal of 14 days to analysis by 2 days for BTEX/GRO analysis. All target analytes were reported as ND at the MRL. No data were flagged or qualified.

- LGN A9600279 aqueous sample -007 trip blank exceeded the holding time goal of 14 days to analysis by 1 day for BTEX and GRO analysis. All target analytes were reported as ND at the MRL. All project samples within the LGN were also reported as ND at the MRL.

EPA recommended holding times were met for analysis in the reviewed LGNs.

2.3.3. Sensitivity Goals

Sensitivity goals are referenced in Table 2-1 and were met for the methods of analysis.

2.3.4. Data Quality Assessment Samples

QC samples were included in the analytical scheme to assess data quality.

Laboratory control samples (LCS) were an internal QC check applied by the laboratory for BTEX/GRO, DRO, RRO, VOCs, and SVOCs analyses. Project bias or accuracy was assessed by preparing and analyzing duplicate LCS. Duplicate laboratory control samples (DLCS) were prepared and analyzed for every batch of 20 samples submitted or at a minimum frequency of 10 percent.

Project bias or accuracy was assessed by preparing and analyzing matrix spike (MS) samples and duplicate matrix spike (DMS) samples for BTEX/GRO, DRO, RRO, VOCs, and SVOCs analyses. MS samples were prepared and analyzed to represent each site matrix investigated.

System monitoring compounds, also referred to as surrogate spikes, were used to fortify all project samples, blanks, LCS, DLCS, MS, and DMS samples prior to sample preparation and analysis for BTEX/GRO, VOCs, DRO, RRO and SVOCs analysis. The surrogate recovery, expressed as a percent recovery, was calculated and compared against EPA (1988, 1991), ADEC (1992), and/or laboratory-established control limits (LECL).

Field duplicates were included in the analytical scheme and submitted "blind" to the laboratory to assess a total measurement error determination of overall sampling and analytical variability. This includes variability due to sample matrix differences, sampling, and the analytical measurement system. Field duplicate samples are two samples collected from the same location, stored in separate containers, and analyzed independently.

2.3.4.1. Blanks: Method/Trip/Methanol

The method (reagent) blank is used to monitor laboratory contamination. The method blank must contain less than the method reporting limit (MRL) for the target compounds or corrective measures are initiated. A minimum of one method blank was prepared and analyzed every day for each batch of 20 samples processed.

Trip (transfer) blanks were submitted for an assessment of cross-contamination occurring during sample shipment or storage. Trip blanks were included within each cooler submitted with project samples for BTEX/GRO analysis.

Methanol blanks were submitted as specified by ADEC guidance (1995). All methanol blank results were reported as ND at the MRL.

Method, and trip blanks were reported as ND at the MRL.

2.3.4.2. Instrument Calibration

Laboratory quality control summaries were reviewed and compared against analytical methodology requirements.

AK101.0, AK102.0, and EPA 8020a methods specify that the initial calibration relative standard deviation (RSD) be less than 25 percent. The percent difference (%D) between the initial calibration and continuing calibration verification (CCV) standards must be less than 25 %D for GRO and DRO analysis, and less than 15 %D by method 8020a specifications.

Instrument calibration criteria were met.

2.3.4.3. System Monitoring Compounds

System monitoring compounds, also referred to as surrogate spikes, were used to fortify all project samples, blanks, LCS, DLCS, MS, and DMS samples prior to sample preparation and analysis for BTEX/GRO, VOCs, DRO, and SVOCs analysis. The surrogate recovery, expressed as a percent recovery, was calculated and compared to method and laboratory-established control limits.

Soil samples were preserved in the field with methanol per ADEC AK 101.0 methodology (1995) to maintain sample integrity and minimize the loss of volatiles. The methanol solution included an additional surrogate monitoring compound 1,4-Difluorobenzene (DFB) to assess analyte losses due to field sample handling and shipment. The surrogate monitoring compound bromofluorobenzene (BFB) was added to BTEX/GRO samples just prior to analysis of the samples to monitor instrument performance.

CAS Surrogate Control Limits

	Surrogate Compound	% Recovery
BTEX (soils) field surrogate	1,4-Difluorobenzene (DFB):	69 - 120
BTEX (soils) lab surrogate	4-Bromofluorobenzene (BFB):	76 - 120
GRO (soils) field surrogate	1,4-Difluorobenzene (DFB):	57 - 137
BTEX (waters)	4-Bromofluorobenzene:	76 - 120
DRO (soils, waters)	p-Terphenyl:	50 - 150
RRO (soils)	n-triacontane	50 - 150

Data qualification exception DILUTION: Recovery values of surrogate spikes were not determined when project samples required dilution. The dilutions are necessary for correct sample quantitation within the established standard calibration range of the instrument. As a consequence, the surrogates are diluted as well, and the resulting surrogate concentrations are too low for accurate determination of recoveries. No further corrective action at the laboratory is warranted.

Data qualification exception MATRIX INTERFERENCE: Recovery values of surrogate spikes were not determined when project samples exhibited high levels of target analytes that interfered with the surrogate compound. Laboratory narratives described these sample matrix interferences. Project chromatograms were reviewed to confirm target analyte interferences. No further corrective action at the laboratory is warranted.

BTEX/GRO, DRO, RRO, VOCs, and SVOCs surrogate recoveries were within LECL.

2.3.4.4. Matrix Spike Sample Analysis

Project bias or accuracy was assessed by preparing and analyzing MS and DMS samples. Results are expressed as the percent recovery result of the spiked compounds or analyte (diesel, lead, etc.) of the sum of the expected value.

CAS MS Control Limits

		% Recovery
8020a (soils, waters)	Benzene	60 - 130
8020a (soils, waters)	Toluene	60 - 130
8020a (soils, waters)	Ethylbenzene	60 - 130
AK101.0	Gasoline	50 - 150
DRO (soils)	Diesel #2	60 - 120
RRO (soils)	Motor Oil	60 - 100

Data qualification exception TARGET ANALYTE MASKING: Recovery values of MS samples were not determined when project samples exhibited high levels of the targeted analytes at significant values above the amount of analyte spiked to project samples. Laboratory narratives described these high levels of target analytes masking the determination of spike recovery. Project chromatograms were reviewed to confirm target analyte interferences. No further corrective action at the laboratory is warranted.

- LGN A9600275 MS sample (-002MS) reported target analyte recovery for ethylbenzene at 164 percent, which is greater than the LECL of 130 percent. The LCS and DLCS recoveries associated with the LGN are within LECL of 71 to 122 percent recovery. No data were qualified as a result of the MS high recovery.

- LGN A9600279 MS sample (-001DMS) reported DRO target recovery for diesel at 30 percent, which is below the LECL of 60 percent. The MS recovery was acceptable at 94 percent recovery. The LCS and DLCS recoveries associated with the LGN were within the LECL of 60 to 120 percent recovery. No data were qualified as a result of the low DMS high recovery.

- LGN A9600331 Batch QC MS/DMS sample (A960332-002DMS) reported RRO recovery for motor oil at 109 percent and 105 percent, which are slightly greater than the LECL of 00 percent. The LCS recovery associated with the LGN (A960626-SL1) was within the LECL of 60 to 100 percent recovery. No data were qualified as a result of the MS and DMS high recovery.

2.3.4.5. Laboratory Control Sample Analysis

Laboratory control samples (LCS), also referred to as blank spikes, were an internal quality control check applied by the laboratory for BTEX/GRO, VOCs, DRO, RRO, and SVOCs analyses. Project bias or accuracy was assessed by preparing and analyzing duplicate LCS. Duplicate laboratory control samples (DLCS) were prepared and analyzed for every batch of 20 samples submitted or a minimum frequency of 10 percent.

CAS LCS/DLCS Control Limits

		% Recovery
GRO AK 101.0 (soils)	Gasoline	67 - 129
8020a (soils)	Benzene	71 - 128
	Toluene	74 - 125
	Ethylbenzene	71 - 122
	Xylenes	not specified
8020a (waters)	Benzene	85 - 115
	Toluene	85 - 115
	Ethylbenzene	85 - 115
	Xylenes	not specified
DRO AK 102.0 (soils, waters)	Diesel #2	60 - 120
RRO AK 103.0 (soils)	Motor Oil	60 - 100

Data qualification exception LCS: Recovery values of laboratory LCS/DLCS outside of LECL are associated with results from project MS and DMS samples in the same LGN. If the MS/DMS results are within LECL, no further assessment of the effect of recovery bias from LCS results is made.

GRO, VOCs, SVOCs, DRO, and RRO LCS/DLCS recoveries were within the LECL.

BTEX LCS/DLCS recoveries were within the LECL with the exception:

- LGN A9600371 LCS and DLCS (A960708-SL2) reported recovery for benzene at 61 percent and 67 percent, which are below the LECL of 71 percent. MS and DMS recovery for sample A9600371-001DMS was within the LECL. No data were qualified as a result.

2.3.4.6. Inorganic Spike Sample Analysis

The spike sample analysis is designed to provide information about the effect of the sample matrix on the digestion and measurement methodology. The spike is added before digestion or extraction prior to analysis.

Spike sample analysis was prepared at the laboratory and analyzed for a minimum of 5 percent of samples submitted for metals (lead) and general chemistry analysis. The control limits for the analysis are presented below.

CAS Matrix Spike Control Limits

	Method	% Recovery
TOC (soils)	ASTM D4129-82M	75 - 125
Ammonia as Nitrogen (soil)	350.3	75 - 125
Nitrate+Nitrite as Nitrogen	353.2	75 - 125
Nitrogen, Total Kjeldahl	351.3	75 - 125
Phosphate	365.3	75 - 125
Lead (total) soil	6010A	75 - 125

CAS LCS/DLCS Control Limits

	Method	% Recovery
Ammonia as Nitrogen (water)	350.3	85 - 115
Nitrate+Nitrite as Nitrogen	353.2	85 - 115
Nitrogen, Total Kjeldahl	351.3	85 - 115
pH	150.1	85 - 115
Phosphate	365.3	85 - 115
Lead (total) soil	6010A	80 - 120

No QC defeciencies were noted in inorganic spike and LCS analysis.

2.3.5. Field Duplicate Sample Results

Field duplicates (replicates) were included in the analytical scheme and submitted "blind" to the laboratory to assess a total measurement error determination of overall sampling and analytical variability. This includes variability due to sample matrix differences, sampling, and the analytical measurement system. Field duplicate samples are two samples collected from the same location, stored in separate containers, and analyzed independently.

Quantitative QA objectives goals developed in the QAPP (ENSR 1995) for precision were assessed through evaluation of field duplicates as:

- For soil matrices, the field duplicates should have a relative percent difference (RPD) less than or equal to 100 percent when both sample and duplicate are greater than 5 times the detection limit, or less than or equal to 200 percent when sample and/or duplicate is less than 5 times the detection limit but greater than the detection limit.

The variability in duplicate sample results can be greater at ranges closer to the detection limits.

Specific review criteria for evaluating field duplicate analysis comparability is scarce. General guidelines were found in data validation guidance for the U.S. Naval Energy and Environmental Support Activity (NEESA) Installation Restoration Program.

- For soil matrices, RPDs greater than 100 percent for soil should be noted in the data validation summary, but no qualification of the data shall be performed (NEESA 1991).

Field duplicate results are summarized in the Quality Control Sample Summary (Attachment A).

RPDs were not calculated when one sample was reported as ND at the MRL, and the field replicate was detected at below or less than 5 times the MRL.

Soil field duplicates results met the QA objectives, with both results greater than five times the MRL.

3. QUALITATIVE HYDROCARBON INTERPRETATION

Project DRO/RRO chromatograms for samples exhibiting a detectable response (approximately 50 mg/Kg) were capable of interpretation and are included in Attachment B.

3.1. Qualitative Identification

Gas chromatography traces (chromatograms) obtained from the DRO/RRO analysis were interpreted to help identify and differentiate between refined petroleum product types (gasoline, diesel fuel, JP-8, motor oil, etc.), biogenic hydrocarbons (waxy plant paraffins), or laboratory contamination origin.

Chromatograms were compared to a normal alkane standard analyzed with each LGN batch of samples to define the specific hydrocarbon range of contamination found present.

When a petroleum hydrocarbon response was observed, the fingerprint was classified by generic product ranges of increasing molecular weight as:

- light distillate refined petroleum products,
- middle distillate refined petroleum products,
- heavy residual oil product, and
- biogenic waxy plant paraffins.

Interpretation of DRO/RRO results should be approached with some caution, since the analysis targets all extractable organic compounds between defined hydrocarbon ranges with a non-specific universal detector. The sum of the resolved saturated and aromatic compounds and unresolved complex mixture (UCM) contribute to the total response and fingerprint trace observed. Interpretation of the fingerprint trace (chromatogram) is subjective in identifying detected compounds as refined petroleum products, biogenic hydrocarbons, or field- and laboratory-introduced contamination.

DRO/RRO chromatograms for samples exhibiting sufficient detectable response for interpretation are:

- LGN A9600325 sample -002 (418BH01SO1.5N) exhibited a trace UCM in the approximated hydrocarbon range of n-C_{10} to n-C_{24}. The observed fingerprint pattern exhibits the characteristics of a weathered middle distillate product.

- LGN A9600331 sample -001 (418WL01SO0.5N) exhibit two distinct chromatographic patterns. A UCM in the approximated hydrocarbon range of n-C_{10} to n-C_{24} exhibits the characteristics of a weathered middle distillate product. An additional UCM is present in the approximated hydrocarbon range of n-C_{24} to n-C_{38} and suggests a heavy residual oil is additioanlly present.

3.2. Hydrocarbon Identification References

Common residential heating oils and diesel fuel oils are considered middle distillate refined petroleum products. Diesel fuel oils are commonly found in three grades: grade no. 1-D, grade no. 2-D, and grade no. 4-D, as defined by the American Society for Testing and Materials (ASTM) Committee D-2 on Petroleum Products and Lubricants (ASTM D975). Grade no. 1-D fuel oil is a grade of light-ended middle distillate fuel used in applications requiring higher volatility than that provided by grade no. 2-D fuels. Because of the ambient mean temperature in Alaska, Diesel Grade No.1-D is predominant.

Upon release of refined petroleum products or crude oils to the environment, the natural processes of evaporation, biodegradation, and photo-oxidation weather the product. This weathering effect or degradation is easily observed in the fingerprint trace. The once-dominant homologous resolved peaks (alkanes) will appear ragged and eventually disappear. Microbial processes will preferentially degrade lower molecular weight alkanes over the lower molecular weight aromatic hydrocarbons (naphthalene) followed by the higher weight alkanes (> n-C_{22}). Highly weathered products will appear as a "hump" with no discernible resolved peaks. Project sample results were described as "weathered," "very-weathered," or "extremely weathered" to differentiate the progressive stages of weathered crude oil or refined product.

Products were interpreted as exhibiting the characteristics of a middle distillate refined petroleum product such as diesel fuel oil (grade No. 1-D or grade no. 2-D) by the criteria:

- Diesel 1-D Fuel Oil: Observation of the chromatographic trace revealed matching the characteristic homologous series of individual resolved peaks representative of normal alkanes above an elevated UCM between the approximated hydrocarbon range of n-C_9 through n-C_{20}.

- Diesel 2-D Fuel Oil: Observation of the chromatographic trace shows the characteristic homologous series of individual resolved peaks representative of normal alkanes above an elevated UCM between the approximated hydrocarbon range of n-C_{10} through n-C_{24}. The evenly spaced resolved peaks of saturated normal alkanes are distributed uniformly over approximately n-C_{16}.

- Jet Fuel JP-8: Observation of the chromatographic trace shows the characteristic homologous series of individual resolved peaks representative of normal alkanes above an elevated UCM between the approximated hydrocarbon range of n-C_9 through n-C_{18}.

- Jet Fuel JP-4: Observation of the chromatographic trace shows the characteristic homologous series of individual resolved peaks representative of normal alkanes above an elevated UCM between the approximated hydrocarbon range of n-C_9 through n-C_{18}. Lighter fraction hydrocarbons are exhibited as individual resolved peaks between the approximated hydrocarbon range of n-C_8 through n-C_{10}. A characteristic UCM is exhibited from n-C_{10} through n-C_{18} .

Products were interpreted as exhibiting the characteristics of a heavy residual oil product such as lubricating motor or turbine oil by the criteria:

- Motor Oil: Observation of the DRO/RRO chromatogram traces revealed matching characteristics of a large UCM in the approximated hydrocarbon range of n-C_{20} through n-C_{34}. This large UCM observed at the hydrocarbon range matches a comparison to laboratory motor oil and/or turbine oil library standards.

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Quality Control Sample Summary

Field Duplicate Results

Field-ID	Lab-ID	Analysis	NAME	RESULT	QUAL	Units	Dilfac	Dup Result	Qual	RPD	Field Duplicate-ID	Lab-ID	Dilfac
415BH03SO16.5N	A96035804	SW8020A	Benzene	0.05	U	MG/KG	1	0.05	U	nc	415BH03SO16.5N DUP	A96035805	1
415BH03SO16.5N	A96035804	SW8020A	Ethylbenzene	0.05	U	MG/KG	1	0.05	U	nc	415BH03SO16.5N DUP	A96035805	1
415BH03SO16.5N	A96035804	SW8020A	Toluene	0.05	U	MG/KG	1	0.05	U	nc	415BH03SO16.5N DUP	A96035805	1
415BH03SO16.5N	A96035804	SW8020A	Xylenes	0.05	U	MG/KG	1	0.05	U	nc	415BH03SO16.5N DUP	A96035805	1
415BH03SO16.5N	A96035804	AK101	Gasoline Range Organics	5	U	MG/KG	1	5	U	nc	415BH03SO16.5N DUP	A96035805	1
415BH03SO16.5N	A96035804	AK102	Diesel Range Organics	14		MG/KG	1	10	U	33	415BH03SO16.5N DUP	A96035805	1
418PZ01SO11.0N	A96036711	SW8020A	Benzene	0.05	U	MG/KG	1	0.05	U	nc	418PZ01SO11.0N DUP	A96036710	1
418PZ01SO11.0N	A96036711	SW8020A	Ethylbenzene	0.05	U	MG/KG	1	0.05	U	nc	418PZ01SO11.0N DUP	A96036710	1
418PZ01SO11.0N	A96036711	SW8020A	Toluene	0.05	U	MG/KG	1	0.05	U	nc	418PZ01SO11.0N DUP	A96036710	1
418PZ01SO11.0N	A96036711	SW8020A	Xylenes	0.05	U	MG/KG	1	0.05	U	nc	418PZ01SO11.0N DUP	A96036710	1
418PZ01SO11.0N	A96036711	AK101	Gasoline Range Organics	5	U	MG/KG	1	5	U	nc	418PZ01SO11.0N DUP	A96036710	1
418PZ01SO11.0N	A96036711	AK102	Diesel Range Organics	11		MG/KG	1	10	U	nc	418PZ01SO11.0N DUP	A96036710	1
418PZ01SO11.0N	A96036711	AK103	Residual Range Organics	40	U	MG/KG	1	48		nc	418PZ01SO11.0N DUP	A96036710	1

FOOTNOTES:
RPD = Relative percent difference.
Dilfac = Dilution factor.
Qual = Qualifier.
nc = RPD not-calculated, results reported as non-detected (ND).

DRO/RRO QUALITATIVE HYDROCARBON INTERPRETATION

FIELD-ID	Analysis	NAME	LAB-ID	INTERPRETATION	HYDROCARBON RANGE	RESULT	QUAL	Units
418BH01SO1.5N	AK102	DRO	A96032502	trace W-MDP	n-C_{10} to n-C_{24}	140		MG/KG
418WL01SO0.5N	AK102	DRO	A96033101	VW - MDP	n-C_{10} to n-C_{22}	1760		MG/KG
418WL01SO0.5N	AK103	RRO	A96033101	residual/lube	n-C_{25} to n-C_{40}	2400		MG/KG

FOOTNOTES:
W = weathered, VW = very weathered, EW = extremely weathered.
LDP = Light distillate product.
MDP = Middle distillate product
Ind res pks = Individual resolved peaks.
UCMP = Unresolved complex mixture present.

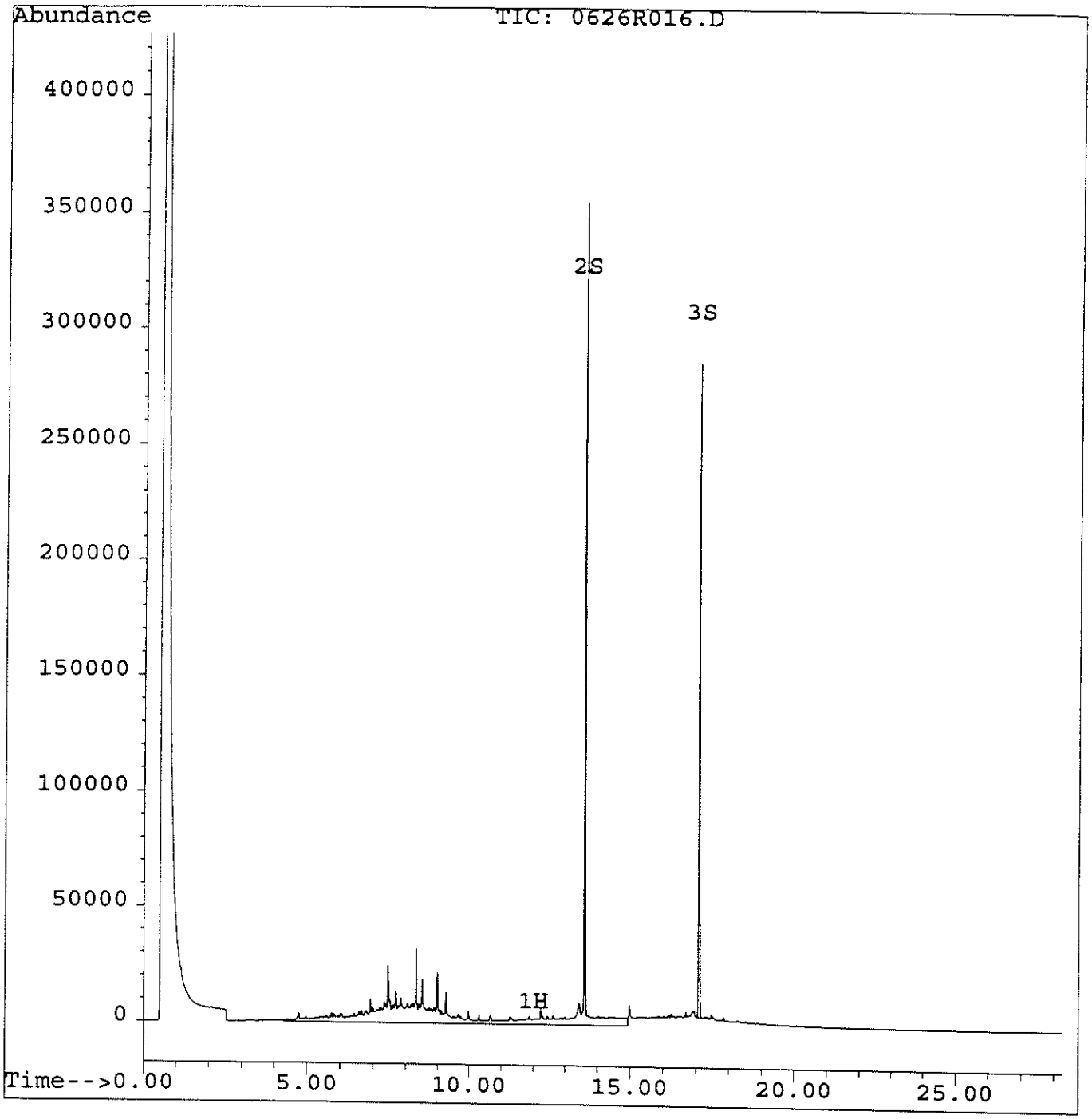
Quantitation Report

Data File : J:\GC02\DATA\062696\0626R016.D
Acq On : 26 Jun 96 11:46 AM
Sample : A9600325-002
Misc :
Quant Time: Jun 26 12:22 1996

Vial: 8
Operator: STEVE\LYN
Inst : BOB
Multiplr: 0.35

Method : J:\GC02\METHODS\CC26JUNB.M
Title : Calibration for AK-102 (14MAY96) Front Column
Last Update : Wed Jun 26 09:08:45 1996
Response via : Single Level Calibration

Volume Inj. :
Signal Phase :
Signal Info :



Quantitation Report

Data File : J:\GC01\DATA\062796.SEC\0627R013.D
Acq On : 27 Jun 96 12:55 PM
Sample : A9600331-001
Misc :
Quant Time: Jun 27 13:26 1996

Vial: 57
Operator: LYNN BASS
Inst : SNOW WHIT
Multiplr: 0.35

Method : J:\GC01\METHODS\CC27JUNE.M
Title : Calibration for AK102 C10-C25 06JUN96 BACK COL.
Last Update : Thu Jun 27 13:25:35 1996
Response via : Single Level Calibration

Volume Inj. : 1microliter
Signal Phase : RTX-5 30M 0.53 BORE
Signal Info :