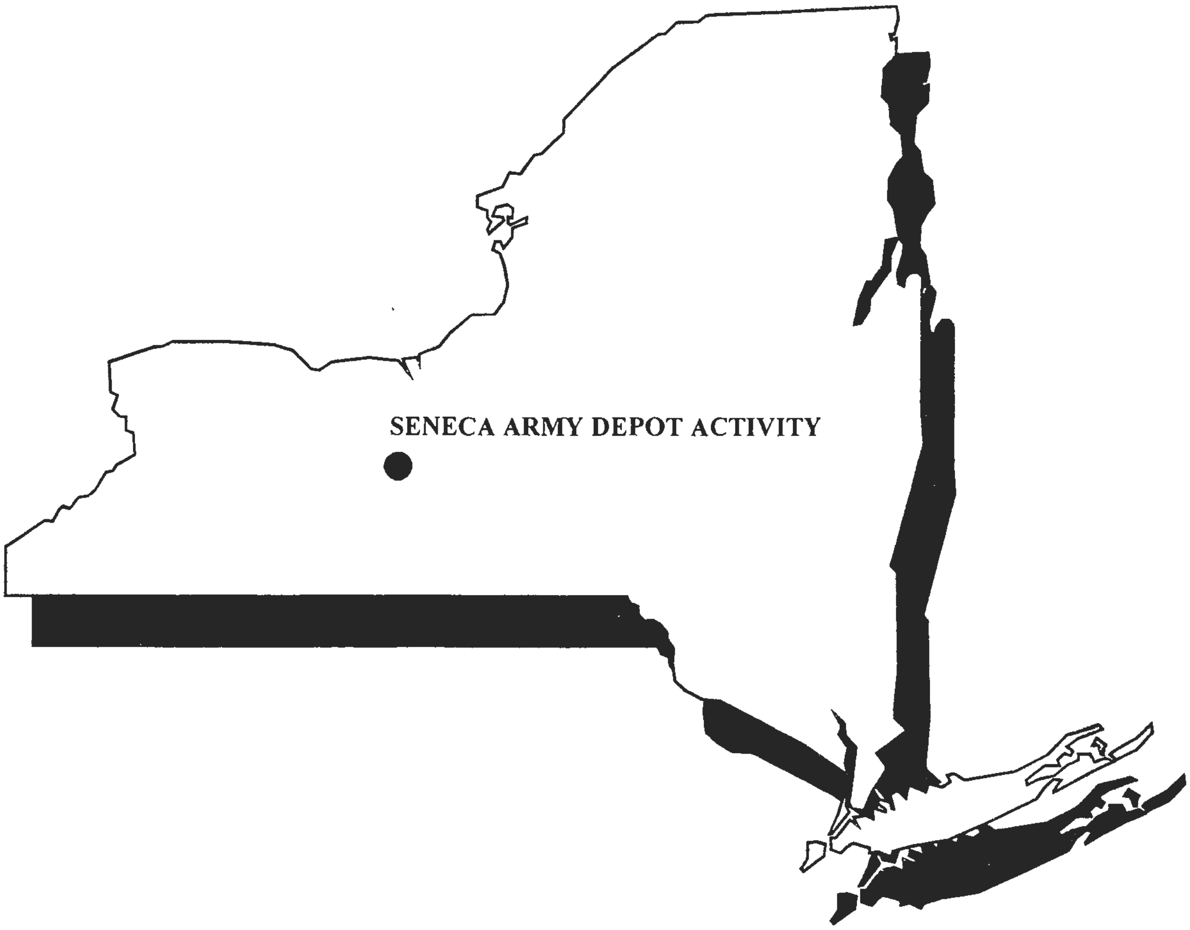
U.S. ARMY ENGINEER DIVISION
HUNTSVILLE, ALABAMA



DRAFT

TECHNICAL SPECIFICATIONS FOR REMOVAL ACTIONS AT SWMUs SEAD-38, SEAD-39, SEAD-40, SEAD-41, AND SEAD-60 SENECA ARMY DEPOT ACTIVITY

CONTRACT NO. DACA87-95-D-0031
TASK ORDER N OF DELIVERY ORDER 14

MARCH 2001

DRAFT
SECTION C TECHNICAL SPECIFICATIONS FOR REMOVAL ACTIONS AT SWMUs SEAD-38, SEAD-39, SEAD-40, SEAD-41 and SEAD-60 SENECA ARMY DEPOT ACTIVITY

Prepared for:

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Romulus, New York

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Contract No. DACA87-95-D-0031
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MARCH 2001

SECTION C
TECHNICAL SPECIFICATION

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SECTION 1
BACKGROUND

The following section describes the known physical and chemical characteristics of five solid waste management units (SWMUs) at Seneca Army Depot Activity (SEDA). These five SWMUs will be remediated according to the plans and specifications discussed in later sections of this document.

1.1 PROJECT LOCATION

SEDA is located in the town of Romulus, in Seneca County, New York. The installation is bounded by State Route 96A to the west and State Route 96 to the east. Four cities surround Seneca Army Depot Activity: Geneva and Rochester to the northwest, Syracuse to the northeast, and Ithaca to the south. Within SEDA, five SWMUs with volatile and/or semi-volatile organic compounds in the soils have been targeted for removal action. These five are the Oil Discharge Area adjusted to Building 609 (SEAD-60) and four boiler blowdown leaching pits (SEAD-38, 39, 40, and 41).

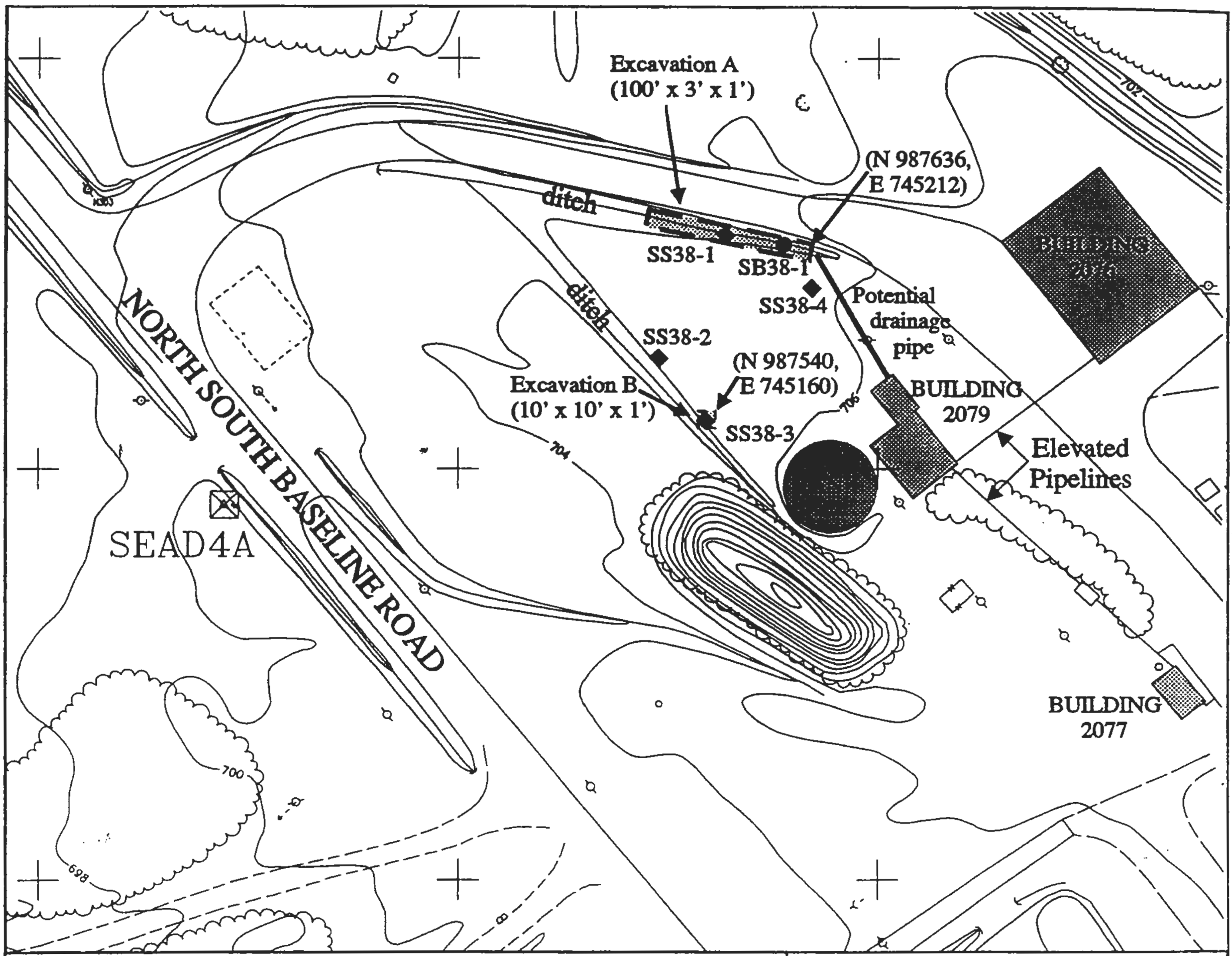
1.2 PROJECT DESCRIPTION

Two types of site investigation programs have been performed at SWMUs SEAD-38, 39, 40 41, and 60. Limited sampling programs and an expanded site investigation (ESI) have characterized the sites as described below.

1.2.1 <u>Site Description</u>

1.2.1.1 SEAD-38

Building 2079 is an abandoned boiler plant located in the southwestern portion of SEDA. SEAD-38 is the blowdown leaching area that is located to the north-northwest of Building 2079 (**Figure 1**). Currently, the leach pit is not visible. A drainage pipe that originates in Building 2079 is suspected to have carried boiler blowdown liquids from the boiler plant to a roadside drainage ditch that is located approximately 100 feet to the northwest of Building 2079 and drains to the west. A second, smaller drainage ditch originates approximately 50 feet to the west of Building 2079 and drains to the northwest where it intercepts the larger roadside drainage ditch discussed



LEGEND

● SOIL BORING LOCATION

◆ SURFACE SOIL SAMPLE

(N 987636, E 745212) NEW YORK STATE PLANE N/E COORDINATES

☒ SURVEY MONUMENT

TELEPHONE POLE

N

PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

DECISION DOCUMENT FOR REMOVAL ACTION

SEAD-38

DEPT. ENVIRONMENTAL ENGINEERING

DWG NO. 727023-01001

FIGURE 1

SAMPLE LOCATIONS AND APPROXIMATE AREA TO BE REMEDIATED

SCALE 1" = 100'

DATE AUGUST 1995

H:\ENG\SENECA\DECISION\VOLATILE\COMMENT\SEAD38A.CDR previously. The area between the Building 2079 and the two drainage ditches is a relatively flat and level, grassy field.

Between the time when the boilers were installed and 1979 – 1980, when all blowdown points were connected to the sanitary sewer system, the boilers discharged a total of 400 to 800 gallons per day. The discharge flow drained partly into nearby drainage ditches and partly into the ground. It is presumed that the boiler blowdown contained water, tannins, caustic soda (sodium hydroxide), and sodium phosphate.

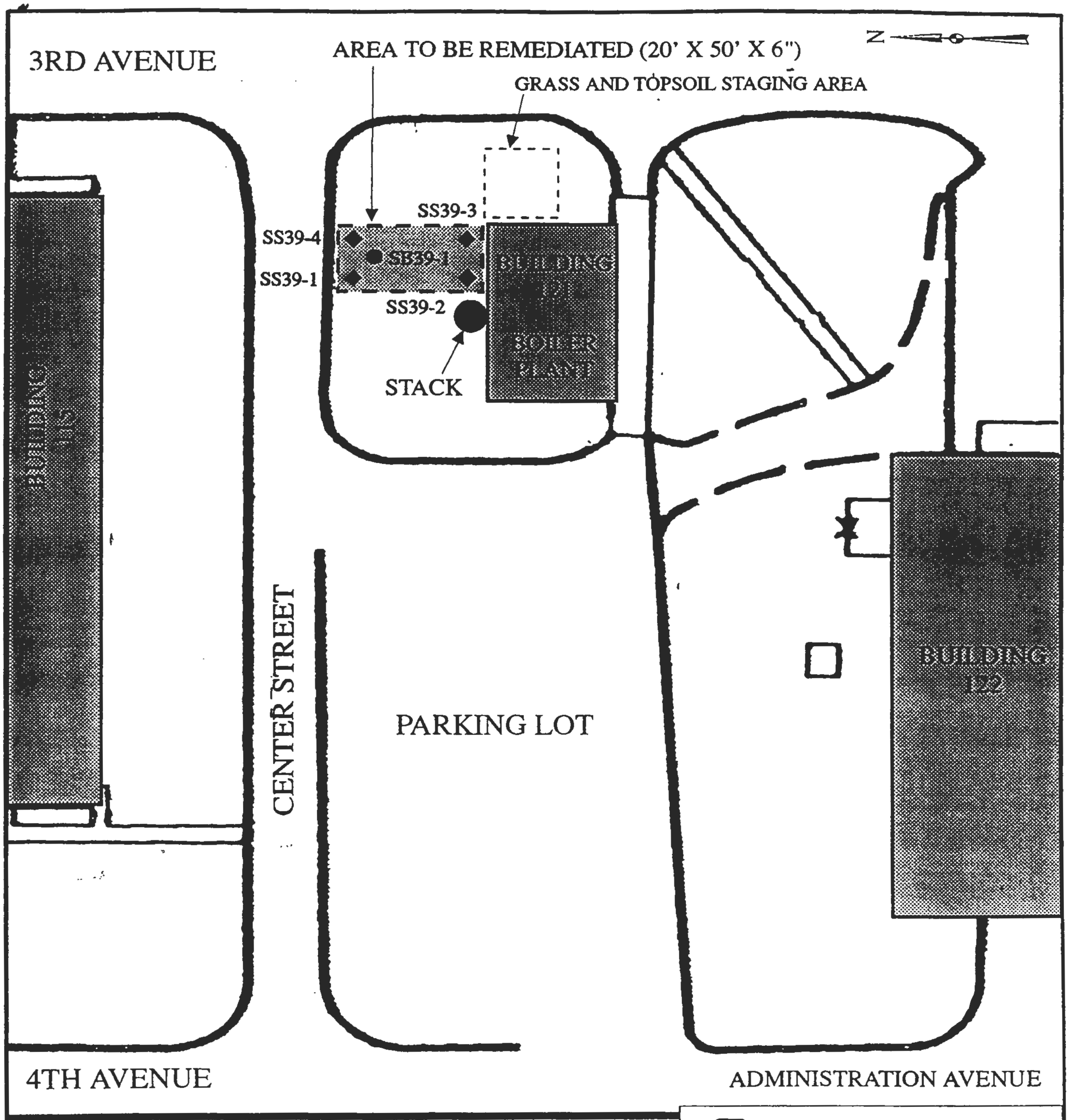
1.2.1.2 SEAD-39

Building 121 is an active boiler plant located in the administrative area (i.e., halfway along the eastern border) of the Seneca Army Depot Activity (SEDA). SEAD-39 is the historic blowdown leaching area that was located exterior to, and immediately north of, Building 121 (**Figure 2**). Use of the leaching area was terminated in approximately 1979 or 1980 when all boiler blowdown points were connected to the sanitary sewer. There is no depression or visible indication of where the historic leaching area was previously located. Center Street, which runs in an east-west direction, is located 50 feet to the north of Building 121 and the suspected location of the former leach pit. The land surface to the north of Building 121 is grass covered and is slightly mounded between the building and the street.

Between the time when the boilers were first installed and 1979 – 1980 when all blowdown points were connected to the sanitary sewer system, the boilers discharged between 400 and 800 gallons of blowdown liquids per day. Blowdown was released three times a day, and the discharged liquid was allowed to flow into the drainage system in the street and partly into the ground. The boiler blowdown is suspected to have contained water, tannins, caustic soda (sodium hydroxide), and sodium phosphate.

1.2.1.3 SEAD-40

Building 319 is an active boiler plant located on First Street at the Seneca Army Depot Activity (SEDA). The historic blowdown leach pit that constitutes SEAD-40 was located in a drainage ditch that was next to the railroad tracks that are located north of Building 319 (**Figure 3**). Currently, evidence of the historic leach pit is not visible. A drainage pipe originating in Building 319 is suspected to have carried blowdown liquids to the drainage ditch, where they were released. The



LEGEND

◆ SURFACE SOIL SAMPLE

● SOIL BORING LOCATION

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

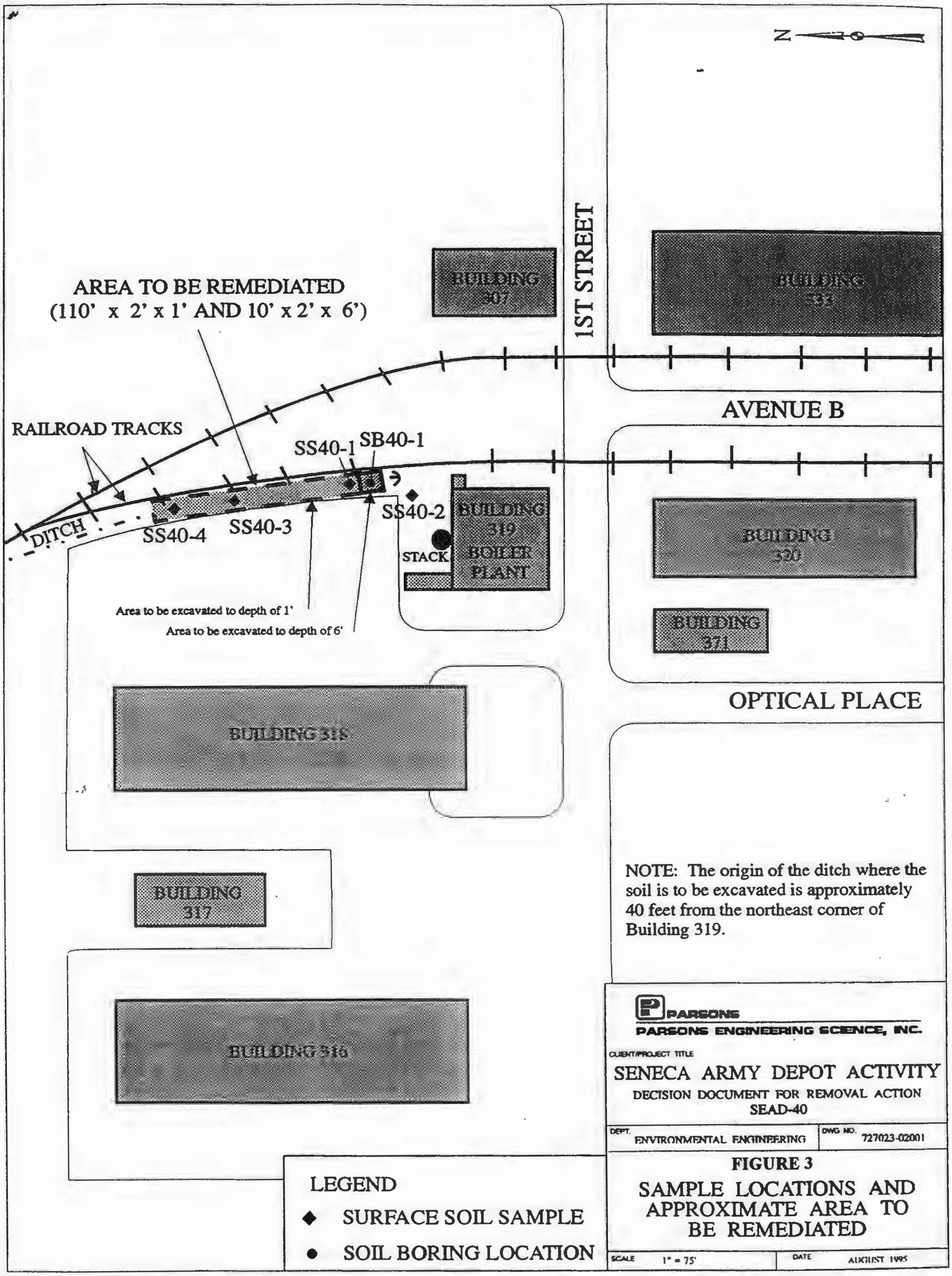
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
DECISION DOCUMENT FOR REMOVAL ACTION
SEAD-39

DEPT. ENVIRONMENTAL ENGINEERING
DWG NO. 727023-01001

FIGURE 2
SAMPLE LOCATIONS AND APPROXIMATE AREA TO BE REMEDIATED

SCALE 1" = 50'
DATE AUGUST 1995

H:\ENG\SENECA\DECISION\VOLAT\SEAD39.CDR



NOTE: The origin of the ditch where the soil is to be excavated is approximately 40 feet from the northeast corner of Building 319.

LEGEND

- ◆ SURFACE SOIL SAMPLE
- ● SOIL BORING LOCATION

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
DECISION DOCUMENT FOR REMOVAL ACTION
SEAD-40

DEPT. ENVIRONMENTAL ENGINEERING
DWG NO. 727023-02001

FIGURE 3
SAMPLE LOCATIONS AND APPROXIMATE AREA TO BE REMEDIATED

SCALE 1" = 75'
DATE AUGUST 1995

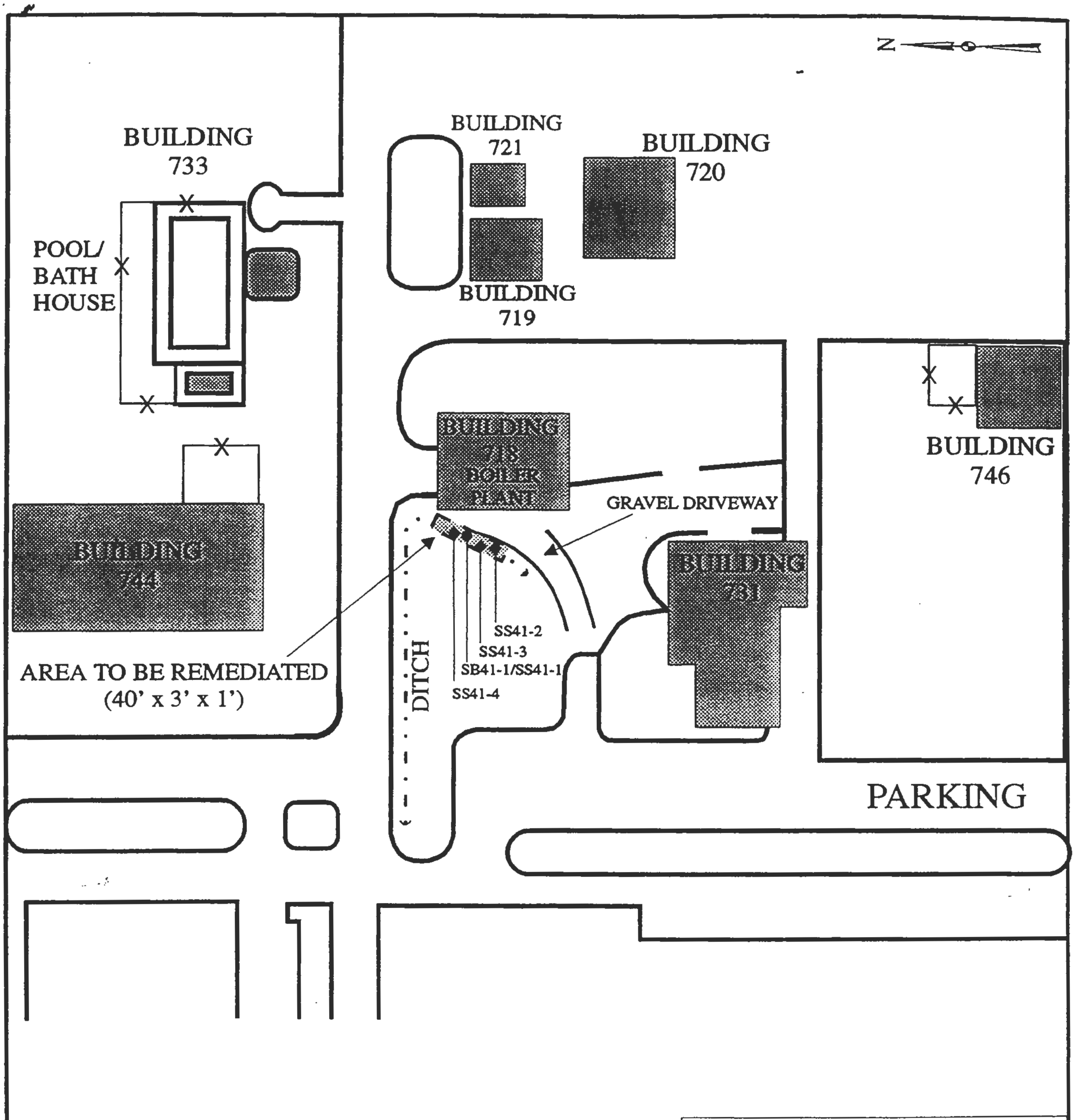
H:\ENG\SENECA\DECISION\VOLAT\SEAD40A.CDR drainage ditch originates at the mouth of the drainage pipe approximately thirty feet northeast of Building 319. The drainage ditch continues for approximately 400 feet to the north where it eventually levels into a grassy field. The ground surface to the north of Building 319 and to the south of the drainage ditch is covered with asphalt.

Between the time when the boilers were first installed and 1979 – 1980, when all blowdown points were connected to the sanitary sewer system, the boilers discharged blowdown three times every 24 hours. It is estimated that the average blowdown flow totaled 400 to 800 gallons per day. The blowdown flow drained partly into drainage ditch and partly into the ground. It is presumed that the boiler blowdown contained water condensate and a small amount of tannins, caustic soda (sodium hydroxide), and sodium phosphate that were used to reduce corrosion and scale in the boiler.

1.2.1.4 SEAD-41

Building 718 is an abandoned boiler plant located in the northern end of SEDA. SEAD-41 is the blowdown leaching area that is suspected to have existed in the drainage ditch that is located approximately 40 west of Building 718 (**Figure 4**). All surface discharge originating along the west side of Building 718 would flow into this ditch. Thirty feet to the north of Building 718 is a street that runs east-west. The drainage ditch is relatively steep-sided near the building and primarily drains to the north where it joins a roadside drainage ditch. Some runoff in the ditch would flow to the southwest where the drainage ditch is cut off by a crushed gravel road leading southwest away from Building 718.

Between the time when the boilers were installed and 1979 – 1980, when all blowdown points were connected to the sanitary sewer system, the boilers discharged a total of 400 to 800 gallons per day. The discharge flow drained partly into nearby drainage ditches and partly into the ground. It is unknown whether the blowdown liquid was discharged directly into the ditch to the west of Building 718, or whether it was discharged next to the building and flowed over the ground into the ditch. It is presumed that the boiler blowdown contained water condense and a small amount of tannins, caustic soda (sodium hydroxide), and sodium phosphate that were used to reduce corrosion and scale in the boiler.



LEGEND

◆ SURFACE SOIL SAMPLE

● SOIL BORING LOCATION

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
DECISION DOCUMENT FOR REMOVAL ACTION
SEAD-41

DEPT. ENVIRONMENTAL ENGINEERING
DWG NO 727023-02001

FIGURE 4

SAMPLE LOCATIONS AND APPROXIMATE AREA TO BE REMEDIATED

SCALE 1" = 100'
DATE AUGUST 1995

H:\ENG\SENECA\DECISION\VOLATILE\SEAD41.CDR

1.2.1.5 SEAD-60

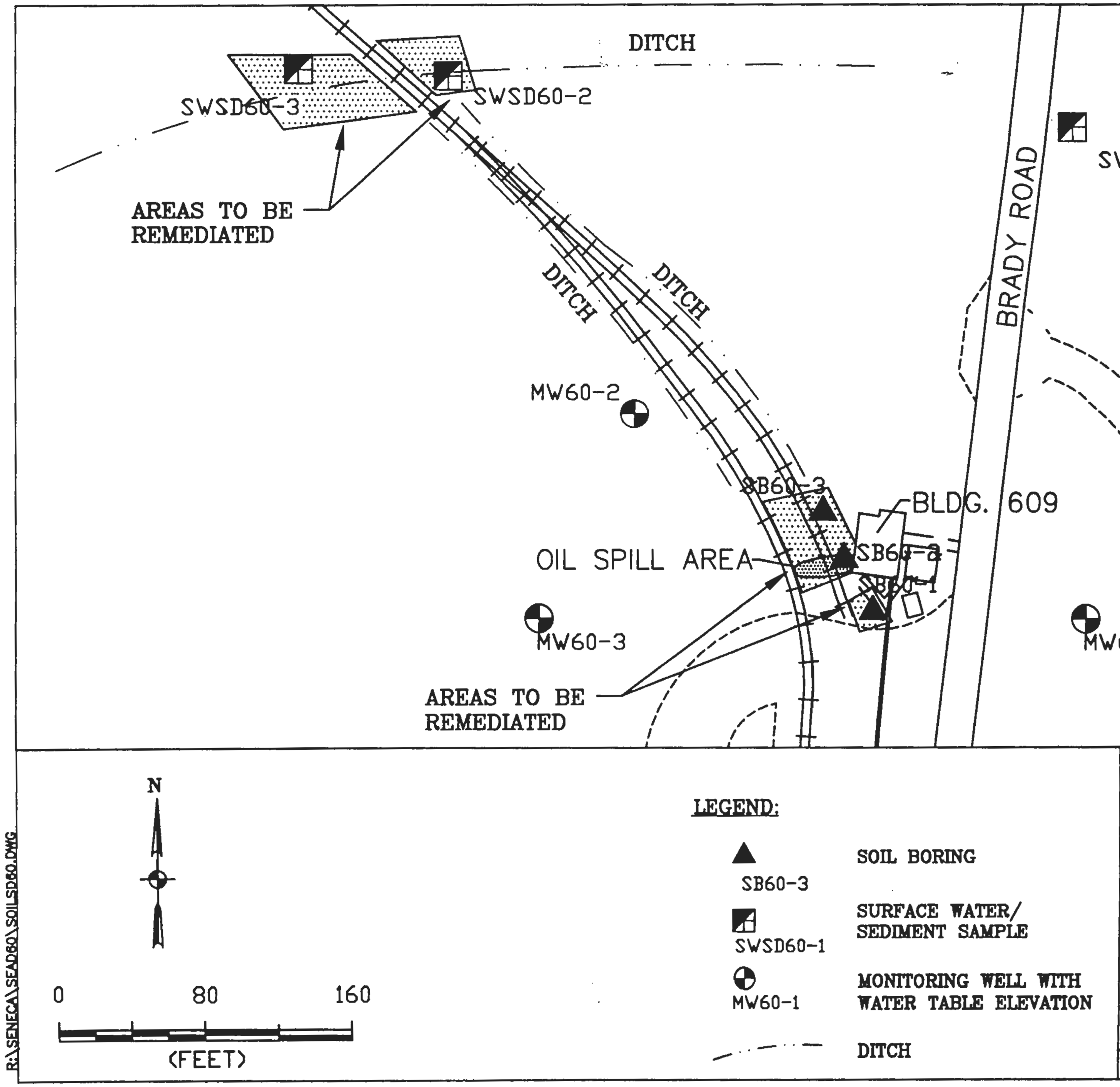
SEAD-60 is located in the southeastern portion of SEDA and represents an area of oil stained soil adjacent to the southwest corner of Building 609. SEAD-52 is adjacent to the southern boundary of the SWMU area, and SEAD-62 is located to the east. The site is located within the ammunition storage area and access to the site is restricted. The site plan is shown in **Figure 5**.

The surrounding areas are characterized as developed and undeveloped land. The developed areas consist of Building 609, which is located immediately west of Brady Road, and two SEDA railroad spurs. A single railroad track enters the developed area from the northwest and splits into two spur lines approximately 300 feet northwest of Building 609. The two spurs transect the site to the west of Building 609. The eastern spur line passes within a few feet of Building 609 and ends just south of Building 609. The western spur ends at the northern side of Building 612 that is south of Building 609.

The undeveloped areas are located north, west and east of SEAD-60, and consist of grassy fields with sparse brush. A grassy mounded area is also located north-northwest of the site. Building 612, which is part of SEAD-52, is located approximately 120 feet south of the site of SEAD-60. Building 609 is the boiler house for Building 612. Elevated pipes, which include steam pipes, run parallel to Brady Road and connect Buildings 609 and 612. A tall emissions stack protrudes from the southeastern corner of Building 609. A paved driveway is located immediately south of Building 609 and provides vehicular access to the western portion of the site from Brady Road. There are also paved access routes on the eastern and northern sides of the building.

The spill area, evidenced by visibly stained soils, measures approximately 6 feet by 30 feet in size and extends west of the easternmost railroad spur. No vegetation is present in the visibly stained soil area.

The topography in the immediate vicinity of the Building 609 is variable but the most notable feature is a low-lying area that is defined by the western wall of Building 609 and the easement of the easternmost railroad spur. The local topography within an approximately 50-foot radius slopes toward this area while the regional topography slopes to the west. In the northern portion of the site, the topography slopes toward an east-west trending intermittent stream that flows to the west. Drainage swales, which parallel each side of the railroad spurs, flow north intersecting the intermittent stream approximately 300 feet northwest of Building 609.



PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

DECISION DOCUMENT FOR REMOVAL ACTION
SEAD-60

DEPT.	Dwg. No.
ENVIRONMENTAL ENGINEERING	734605-01001

FIGURE 5

SAMPLE LOCATIONS AND APPROXIMATE AREA TO BE REMEDIATED

SCALE	DATE	REV
AS NOTED	FEBRUARY 1999	A

Surface water flow resulting from precipitation events at SEAD-60 is controlled by the local topography. Surface water flows primarily westward following the regional topographic slope in this area. There are no sustained surface water bodies present at SEAD-60, although intermittent drainage ditches are present to the north, northwest and west of the site. The two drainage ditches, which flow to the northwest along the railroad spurs, originate near the oil spill area.

Three monitoring wells were installed at SEAD-60 as part of the ESI program. Groundwater elevations were measured in the three monitoring wells and the results are presented in the referenced ESI Report. Based on these data, the groundwater flow direction is primarily west across SEAD-60.

Most of the historical information for SEAD-60 is related to a release of oil on the site. Building 609 has historically been a boiler house for Building 612, which is located south of Building 609. It is believed that overflow from an aboveground storage tank located in Building 609 was discharged from a pipe in the wall of Building 609 resulting in a spill adjacent to the southwest corner of the building. According to SEDA personnel, the aboveground storage tank contains No. 2 fuel oil. No information is available on the date of the spill or the volume of oil released.

1.2.2 Previous Investigations

These removal actions are being conducted by the Army under the requirements of the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA), as amended. The removal action sites have been the subjects of several previous investigations, the analytical results of which are discussed in the following sections.

1.2.2.1 SEAD-38

A limited sampling program was performed in 1993 and 1994 to obtain evidence of a release. One soil boring (i.e., SB38-1) was advanced in the roadside drainage ditch north-northwest of the northeast corner of Building 2079. The soil boring was located at the discharge end of the drainage pipe that originates in Building 2079 and is suspected to have historically transmitted blowdown liquids from the boilers to the ditch. The boring was terminated in weathered bedrock at a depth of 6.3 feet below grade surface (bgs) due to spoon refusal. The water table was not encountered. No volatile organic compounds were detected with the field screening instrument, and no staining of the soil was observed, so the deepest sample recovered with sufficient sample volume (i.e., 2-4 ft bgs) was submitted to the laboratory for chemical analysis.

One surface soil sample (SS38-1, 0-2 in bgs) was collected from the base of the roadside drainage ditch downstream of the soil boring location and three surface soil samples (i.e., SS38-2 through 38-4, all 0-2 inches bgs) were collected from the grassy field between Building 2079 and the roadside drainage ditch. Chemical analyses completed on the recovered samples consisted of soil pH by Environmental Protection Agency (EPA) SW-846[1] Method 9045 and total recoverable petroleum hydrocarbons (TRPH) by EPA Method 418.1[2]. The sample locations are shown in **Figure 1**.

The results of the limited soil sampling program are presented in **Table 1**. Petroleum hydrocarbons were detected in the subsurface soil sample and in each of the surface soil samples. Surface soil samples SS38-2 and SS38-4 contained 104 and 110 ppm of TRPH, respectively, and surface soil samples SS38-1 and SS38-3 contained significantly higher concentrations of 1840 and 1940 ppm, respectively. The subsurface soil sample SB38-1 contained 85 ppm TRPH. The pH of the soil samples ranged from 7.35 to 7.47 in the surface soil samples and was 8.93 in the subsurface soil sample.

The detection of petroleum hydrocarbons in all of the samples indicates that a release did occur. The low concentration of petroleum hydrocarbons in the subsurface sample suggests that the petroleum hydrocarbon impacts diminish with depth. NYSDEC has not defined a clean-up criteria value for TRPH in soil, but has published a guidance to remediate petroleum-contaminated soils. This guidance, *STARS Memo #1*, provides direction on the handling, disposal and/or reuse of non-hazardous petroleum contaminated soils. *STARS Memo #1* is included in Appendix F of this document.

1.2.2.2 SEAD-39

A limited sampling program was performed in 1993 and 1994 to obtain evidence of a release. One soil boring (i.e., SB39-1) was advanced to the north of the northeast corner of Building 121, part

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[1] US EPA Publication SW-846, "*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*"

[2] EPA 600/4-79-020, "*Methods for Chemical Analysis of Water and Wastes.*"

08/24/95

TABLE 1

SURFACE AND SUBSURFACE SOIL ANALYSIS RESULTS
SENECA ARMY DEPOT ACTIVITY
SEAD-38 LIMITED SAMPLING PROGRAM

Compound	Matrix Location Depth (ft) Date ES ID Lab ID Units	Maximum Result	NYSDEC TAGM #4046 value (2)	Number Above TAGM #4046 value	Soil SEAD-38 0-0.2 12/17/93 SB38-1 207135	Soil SEAD-38 0-0.2 12/17/93 SB38-2 207135	Soil SEAD-38 0-0.2 12/17/93 SB38-3 207135	Soil SEAD-38 0-0.2 12/17/93 SS38-4 207135	Soil SEAD-38 2-4 1/09/94 SB38-1 207135
Total Petroleum Hydrocarbons	mg/Kg	1940	NA	NA	1840	104	1940	110	85
pH	standard units	8.93	NA	NA	7.36	7.46	7.47	7.4	8.93
Total Solids	%W/W	88.8	NA	NA	60.2	79.8	80.1	86	88.8

NOTES :

(1) Laboratory results are from Sample Delivery Group (SDG) 41726.

(2) The New York State Department of Environmental Conservation's Technical and Administrative Guidance Memorandum HWR-94-4046 (or TAGM #4046) does not contain guidance values for these compounds.

way between the building and the Center Street. The boring was terminated in weathered bedrock at split-spoon refusal, 5.7 feet below grade surface (bgs). The water table was encountered 5.2 feet bgs. Volatile organic compounds were not detected with the field-screening instrument, and no stained soil was observed. One sample, collected from a depth of 3-5 feet bgs, immediately above the local water table, was submitted to the lab for chemical analysis.

Physical characterization of the split-spoon samples collected from soil boring SB39-1 indicated that the top six inches of the ground is filled topsoil. This accounts for the mounding of the ground surface that exists between Building 121 and Center Street. As this mounding makes the ground surface higher in elevation than the historic discharge point of the blowdown liquid, surface soil samples were not considered representative of the impacts caused by the release of the blowdown liquids. Therefore, four soil samples (SS39-1 through SS39-4) were collected by driving a split-spoon to a depth of 0-2 feet bgs at four corner locations surrounding the soil boring. One sample was collected from each sampling location and submitted for chemical analyses. Analytical determinations consisted of soil pH, analyzed by Environmental Protection Agency (EPA) SW-846[1] Method 9045 and total recoverable petroleum hydrocarbons (TRPH) by EPA Method 418.1[2]. The sample locations are shown in **Figure 2**.

The results of the soil sampling program are presented in **Table 2**. Petroleum hydrocarbons were detected in all of the soil samples collected from SEAD-39. All of the soil samples, with the exception of SS39-1 contained TRPH concentrations of less than 100 parts per million (ppm). SS39-1 contained 118 ppm TRPH. The pH of the soil samples ranged from 7.9 to 8.9.

Detection of petroleum hydrocarbons in all of the samples indicates that a release did occur; however, the concentrations detected in each of the samples are low. The approximate area of soil that appears to be impacted is 20 feet by 50 feet. This area is outlined on **Figure 2**.

NYSDEC has not defined a clean-up criteria value for TRPH in soil, but has published a guidance to remediate petroleum-contaminated soils. This guidance, *STARS Memo #1*, provides direction on the handling, disposal and/or reuse of non-hazardous petroleum contaminated soils. *STARS Memo #1* is included in Appendix F of this document.

TABLE 2

SURFACE AND SUBSURFACE SOIL ANALYSIS RESULTS
SENECA ARMY DEPOT ACTIVITY
SEAD-39 LIMITED SAMPLING PROGRAM

Compound	Matrix	Maximum Result	NYSDEC TAGM #4046 value (2)	Number Above TAGM #4046 value	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
	Location				SEAD-39	SEAD-39	SEAD-39	SEAD-39	SEAD-39	SEAD-39	SEAD-39	SEAD-39
	Depth (ft)				0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	0-0.2	3-5	3-5
	Date				1/12/94	1/12/94	1/24/94	1/12/94	1/12/94	1/12/94	12/16/93	12/16/93
	ES ID				SS39-1	SS39-1	SS39-5	SS39-2	SS39-3	SS39-4	SB39-1.1	SB39-1.2
	Lab ID				208403	209343	209345	208404	208405	208406	207131	207133
	QA/QC						Dup. SS39-1					Dup. SB39-1.1
	Units											
Total Petroleum Hydrocarbons	mg/Kg	118	NA	NA	98	118	90	71	63	65	89	72
pH	standard units	8.9	NA	NA	7.9	7.91	8.18	8.9	8.34	8.03	7.2	7.39
Total Solids	%W/W	84.6	NA	NA	83.2	82.1	82.5	79.8	84.6	83.9	85.8	84.7

NOTES :

(1) Laboratory results are from Sample Delivery Group (SDG) 41726.

(2) The New York State Department of Environmental Conservation's Technical and Administrative Guidance Memorandum HWR-94-4046 (or TAGM #4046) does not contain guidance values for these compounds.

1.2.2.3 SEAD-40

A limited sampling program was performed in 1993 and 1994 to obtain evidence of a release. One soil boring was advanced in the ditch near the mouth of the drainage pipe. The boring was terminated in weathered bedrock at spoon-spoon refusal, 5.8 feet below grade surface. The water table was not encountered. Volatile organic compounds were not detected with the field-screening instrument, and no stained soil was observed. One sample, collected from a depth of 4-6 feet bgs was submitted to the lab for chemical analysis. Four surface samples (0-2 inches bgs) were also collected. One surface sample was collected at the mouth of the drainage pipe near SB40-1, another was collected between Building 319 and the drainage ditch, and the remaining two were collected in the drainage ditch approximately 50 an 100 feet downstream of the mouth of the discharge pipe. Chemical analyses consisted of pH analyzed by Environmental Protection Agency (EPA) SW-846[1] Method 9045 and total recoverable petroleum hydrocarbons (TRPH) by EPA Method 418.1[2]. The sample locations are shown in **Figure 3**.

The results of the soil sampling program are presented in **Table 3**. Petroleum hydrocarbons were detected in all of the soil samples collected from SEAD-40. The subsurface sample SB40-1.1 and the surface soil sample SS40-3 contained 1,270 and 1,640 parts per million (ppm) petroleum hydrocarbons, respectively. The surface soil samples SS40-1, SS40-2, and SS40-4 contained 300, 420 and 680 ppm petroleum hydrocarbons, respectively. The pH of the soil samples ranged from 7.29 to 7.86.

The detection of petroleum hydrocarbons in all of the samples shows that a release did occur. The subsurface soil sample demonstrates that the petroleum impacts have penetrated to six feet near the mouth of the discharge pipe. The surface soil samples collected show that the petroleum impacts persists downstream of the point at which the blowdown liquids were discharged.

NYSDEC has not defined a clean-up criteria value for TRPH in soil, but has published a guidance to remediate petroleum-contaminated soils. This guidance, *STARS Memo #1*, provides direction on the handling, disposal and/or reuse of non-hazardous petroleum contaminated soils. *STARS Memo #1* is included in Appendix F of this document.

TABLE 3

SURFACE AND SUBSURFACE SOIL ANALYSIS RESULTS
SENECA ARMY DEPOT ACTIVITY
SEAD-40 LIMITED SAMPLING PROGRAM

Compound	Matrix Location Depth (ft) Date ES ID Lab ID QA/QC Units	Maximum Result	NYSDEC TAGM #4046 value (2)	Number Above TAGM #4046 value	Soil SEAD-40 4-6 12/16/93 SB40-1.1 207134	Soil SEAD-40 0-0.2 12/17/93 SS40-1 207139	Soil SEAD-40 2-4 12/17/93 SS40-5 207144 Dup.SS40-1	Soil SEAD-40 0-0.2 12/17/93 SS40-2 207141	Soil SEAD-40 0-0.2 12/17/93 SS40-3 207142	Soil SEAD-40 2-4 12/17/93 SS40-4 207143
Total Petroleum Hydrocarbons	mg/Kg	1640	NA	NA	1270	300	270	420	1640	680
pH	standard units	8.15	NA	NA	7.37	7.86	8.15	7.64	7.54	7.29
Total Solids	%W/W	91.8	NA	NA	85.4	90.8	91.8	89.2	81.1	69.99

NOTES :

(1) Laboratory results are from Sample Delivery Group (SDG) 41726.

(2) The New York State Department of Environmental Conservation's Technical and Administrative Guidance Memorandum HWR-94-4046 (or TAGM #4046) does not contain guidance values for these compounds.

1.2.2.4 SEAD-41

A limited sampling program was performed in 1993 and 1994 to obtain evidence of a release. One soil boring was advanced in the drainage ditch immediately to the west of the location where blowdown liquids were suspected to have been discharged from Building 718. The boring was terminated in weathered bedrock at split-spoon refusal, 6.3 feet below grade surface (bgs). The water table was encountered 4.0 feet bgs. No volatile organic compounds were detected with the field screening instrument, and no stained soil was observed, so the sample collected from immediately above the water table (2-4 feet bgs) was submitted to the lab for chemical analysis. A second soil sample (SS41-1) collected from the 0-2 foot bgs interval at the same location was also submitted for analyses. Three additional shallow soil samples were also collected from the interval of 0 to 2 feet bgs using a split-spoon at other locations along the base of the drainage ditch. One sample was collected from each split-spoon sample. Chemical analyses completed on the recovered samples consisted of soil pH by Environmental Protection Agency (EPA) SW-846[1] Method 9045 and total recoverable petroleum hydrocarbons (TRPH) by EPA Method 418.1[2]. The sample locations are shown in **Figure 4**.

The results of the soil sampling program are presented in **Table 4**. Petroleum hydrocarbons were detected in all of the soil samples collected from SEAD-41. The surface soil samples SS41-1 and SS41-3 contained 144 and 300 ppm of TRPH, respectively. The surface soil samples SS41-2 and SS41-4 contained significantly less at 40 and 70 ppm TRPH, respectively. The subsurface soil sample SB41-1 contained 66 ppm TRPH. The pH of the soil samples ranged from 8.19 to 8.74.

The detection of petroleum hydrocarbons in all of the samples shows that a release did occur. The surface samples collected nearest the point where the blowdown liquids are suspected of being discharged contained the greatest concentration of petroleum hydrocarbons. Since the sample collected at depth from location SB41-1 and the two surface soil samples collected up- and down-gradient of the presumed release point contained lower concentrations of petroleum hydrocarbons, it appears that the extent petroleum-impacted soil is localized to the suspected point of release of the blowdown liquids. This area is outlined in **Figure 4**.

NYSDEC has not defined a clean-up criteria value for TRPH in soil, but has published a guidance to remediate petroleum-contaminated soils. This guidance, *STARS Memo #1*, provides direction on the handling, disposal and/or reuse of non-hazardous petroleum contaminated soils. *STARS Memo #1* is included in Appendix F of this document.

TABLE 4

SURFACE AND SUBSURFACE SOIL ANALYSIS RESULTS
SENECA ARMY DEPOT ACTIVITY
SEAD-41 LIMITED SAMPLING PROGRAM

Compound	Matrix Location Depth (ft) Date ES ID Lab ID Units	Maximum Result	NYSDEC TAGM #4046 value (2)	Number Above TAGM #4046 value	Soil SEAD-41 0-0.2 1/11/94 SS41-1 208407	Soil SEAD-41 0-0.2 1/11/94 SS41-2 208408	Soil SEAD-41 0-0.2 1/11/94 SB41-3 208409	Soil SEAD-41 0-0.2 1/12/94 SS41-4 208410	Soil SEAD-41 2-4 1/11/94 SB41-1 208402
Total Petroleum Hydrocarbons	mg/Kg	300	NA	NA	144	40	300	70	66
pH	standard units	8.74	NA	NA	8.74	8.57	8.49	8.19	8.64
Total Solids	%W/W	88.3	NA	NA	88.3	86.5	84.4	84	85.1

NOTES :

(1) Laboratory results are from Sample Delivery Group (SDG) 41726.

(2) The New York State Department of Environmental Conservation's Technical and Administrative Guidance Memorandum HWR-94-4046 (or TAGM #4046) does not contain guidance values for these compounds.

1.2.2.5 SEAD-60

Soil, surface water, sediment and groundwater were sampled as part of the Expanded Site Inspection (ESI) conducted at SEAD-60 in 1994. Sampling and analyses were based upon historical information of an oil release on site. The results of this investigation were detailed in the draft ESI Seven Low Priority SWMUs report (Parsons ES, April 1995).

Three surface and six subsurface soil samples were collected at SEAD-60 in the immediate vicinity of the oil-stained soil. To assess the potential impact from surface water runoff, three surface water and sediment samples were collected in drainage ditches north of the site that are suspected to receive surface water runoff from the site; one of these three sample locations (SWSD60-1) is an upstream sample. Three monitoring wells were also sampled as part of this investigation. The sample locations are shown in **Figure 5**. The analytical data collected during the ESI for SEAD-60 are presented in **Table 5**.

All the samples were analyzed for the following: the Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) metals and cyanide according to the New York State Department of Environmental Conservation (NYSDEC) Contract Laboratory Program (CLP) Statement of Work (SOW). Nitrates were analyzed by EPA Method 352.2[2] and total recoverable petroleum hydrocarbons (TRPH) were analyzed by EPA Method 418.1[2].

The ESI conducted at SEAD-60 identified an area that had been impacted by a release of fuel oil to the ground surface immediately west of Building 609. The results of the soil sampling program are presented in **Table 5**. The surface soils in this area have been impacted primarily by petroleum hydrocarbons and PAHs, and to a lesser extent by PCB compounds. At the location of the oil release, surface soils (0 to 0.2 feet below grade surface) are the most significantly impacted media. TPH concentrations of 218,000 mg/kg and 50,900 mg/kg were found in the area of the oil-stained soil. Concentrations of PAHs (up to 27,000 mg/kg) correlated spatially with the elevated TPH concentrations in the surface soils. Measured concentrations of PAHs in excess of NYSDEC TAGM levels were most numerous in the surface soil samples where eight concentrations reported for benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(a)pyrene, and dibenz(a,h)anthracene were in excess of defined state soil guidance limits were found. Only a

TABLE 5

SENECA ARMY DEPOT ACTIVITY
SEAD-60 RI/FS SCOPING PLAN
SOIL ANALYSIS RESULTS FROM THE ESI

	MATRIX					SOIL	SOIL	SOIL	SOIL	SOIL
	LOCATION					SEAD-60	SEAD-60	SEAD-60	SEAD-60	SEAD-60
	DEPTH (FEET)					0-0.2	0-2	2-4	0-0.2	2-4
	SAMPLE DATE					05/27/94	02/28/94	02/28/94	06/07/94	06/08/94
	ES ID					SB60-1-00	SB60-1 01	SB60-1.02	SB60-2-00	SB60-2-02
	LAB ID					222473	212883	212884	223339	223513
	SDG NUMBER	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	44410	42510	42510	44410	44694
COMPOUND	UNITS									
VOLATILE ORGANICS										
Methylene Chloride	ug/Kg	54	56%	100	0	12 U	11 U	11 U	27 J	11 U
Acetone	ug/Kg	170	11%	200	0	12 U	11 U	11 U	170 J	11 U
Carbon Disulfide	ug/Kg	2	22%	2700	0	12 U	11 U	11 U	1 J	11 U
2-Butanone	ug/Kg	26	11%	300	0	12 U	11 U	11 U	26 J	11 U
2-Hexanone	ug/Kg	1	11%	NA	NA	12 U	11 U	1 J	11 UJ	11 U
Tetrachloroethene	ug/Kg	3	11%	1400	0	12 U	11 U	11 U	11 UJ	11 U
Toluene	ug/Kg	13	33%	1500	0	12 U	11 U	11 U	13 J	2 J
Ethylbenzene	ug/Kg	4	11%	5500	0	12 U	11 U	11 U	4 J	11 U
Xylene (total)	ug/Kg	9	11%	1200	0	12 U	11 U	11 U	9 J	11 U
SEMIVOLATILE ORGANICS										
Naphthalene	ug/Kg	38	11%	13000	0	38 J	370 U	370 U	18000 U	360 U
2-Methylnaphthalene	ug/Kg	1100	11%	36400	0	390 U	370 U	370 U	1100 J	360 U
Acenaphthene	ug/Kg	1400	33%	50000*	0	59 J	370 U	370 U	1400 J	360 U
Dibenzofuran	ug/Kg	29	11%	6200	0	29 J	370 U	370 U	18000 U	360 U
Fluorene	ug/Kg	1300	22%	50000*	0	48 J	370 U	370 U	1300 J	360 U
Phenanthrene	ug/Kg	8900	44%	50000*	0	570 J	25 J	370 U	8900 J	360 U
Anthracene	ug/Kg	2000	22%	50000*	0	98 J	370 U	370 U	2000 J	360 U
Carbazole	ug/Kg	79	11%	50000*	0	79 J	370 U	370 U	18000 U	360 U
Di-n-butylphthalate	ug/Kg	1500	33%	8100	0	390 U	370 U	370 U	1500 J	360 U
Fluoranthene	ug/Kg	14000	67%	50000*	0	1100 J	33 J	370 U	14000 J	27 J
Pyrene	ug/Kg	27000	78%	50000*	0	700 J	31 J	37 J	27000 J	27 J
Benzo(a)anthracene	ug/Kg	340	11%	220	1	340 J	370 U	370 U	18000 U	360 U
Chrysene	ug/Kg	17000	44%	400	2	400	370 U	370 U	17000 J	18 J
bis(2-Ethylhexyl)phthalate	ug/Kg	380	44%	50000*	0	54 J	370 U	380 J	18000 U	360 U
Benzo(b)fluoranthene	ug/Kg	16000	33%	1100	2	730 J	370 U	370 U	16000 J	360 U
Benzo(k)fluoranthene	ug/Kg	190	11%	1100	0	190 J	370 U	370 U	18000 U	360 U
Benzo(a)pyrene	ug/Kg	350	11%	61	1	350 J	370 U	370 U	18000 U	360 U
Indeno(1,2,3-cd)pyrene	ug/Kg	1100	33%	3200	0	220 J	370 U	370 U	18000 U	360 U
Dibenz(a,h)anthracene	ug/Kg	1100	33%	14	3	110 J	370 U	370 U	18000 U	360 U
Benzo(g,h,i)perylene	ug/Kg	1600	33%	50000*	0	220 J	370 U	370 U	18000 U	360 U

TABLE 5

SENECA ARMY DEPOT ACTIVITY
SEAD-60 RI/FS SCOPING PLAN
SOIL ANALYSIS RESULTS FROM THE ESI

COMPOUND		MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM					
	MATRIX					SOIL	SOIL	SOIL	SOIL	SOIL
	LOCATION					SEAD-60	SEAD-60	SEAD-60	SEAD-60	SEAD-60
	DEPTH (FEET)					0-0.2	0-2	2-4	0-0.2	2-4
	SAMPLE DATE					05/27/94	02/28/94	02/28/94	06/07/94	06/08/94
	ES ID					SB60-1-00	SB60-1.01	SB60-1.02	SB60-2-00	SB60-2-02
	LAB ID					222473	212883	212884	223339	223513
	SDG NUMBER					44410	42510	42510	44410	44694
	UNITS									
PESTICIDES/PCB										
alpha-BHC	ug/Kg	5	11%	110	0	4 UJ	1.9 U	1.9 U	5 J	1.8 U
Aldrin	ug/Kg	16	11%	41	0	4 UJ	1.9 U	1.9 U	16 J	1.8 U
Endosulfan I	ug/Kg	34	33%	900	0	3.2 J	1.9 U	1.9 U	34 J	1.8 U
4,4'-DDE	ug/Kg	110	44%	2100	0	110 J	2.7 J	3.7 U	31 J	3.6 U
4,4'-DDD	ug/Kg	100	22%	2900	0	7.8 UJ	3.7 U	3.7 U	55 J	3.6 U
4,4'-DDT	ug/Kg	130	22%	2100	0	84 J	3.7 U	3.7 U	130 J	3.6 U
Endrin ketone	ug/Kg	14	11%	NA	NA	7.8 UJ	3.7 U	3.7 U	14 J	3.6 U
alpha-Chlordane	ug/Kg	27	22%	540	0	4 UJ	1.9 U	1.9 U	27 J	1.8 U
gamma-Chlordane	ug/Kg	10	11%	540	0	4 UJ	1.9 U	1.9 U	10 J	1.8 U
Aroclor-1242	ug/Kg	970	11%	1000/10000(a)	0	78 UJ	37 U	37 U	970 J	36 U
Aroclor-1248	ug/Kg	2100	11%	1000/10000(a)	1	78 UJ	37 U	37 U	2100 J	36 U
Aroclor-1260	ug/Kg	4400	22%	1000/10000(a)	1	78 UJ	37 U	37 U	4400 J	36 U
METALS										
Aluminum	mg/Kg	14100	100%	14593	0	10800	8440	13300	9420	6850 J
Antimony	mg/Kg	1.8	78%	3.59	0	0.28 J	0.43 J	0.36 J	1.8 J	0.29 J
Arsenic	mg/Kg	8.1	100%	7.5	1	5.3	4.1 J	6.2 J	8.1	4.6
Barium	mg/Kg	679	100%	300	2	77.6	98.3	85.8	679	71.7 J
Beryllium	mg/Kg	0.67	100%	1	0	0.47 J	0.43 J	0.67 J	0.42 J	0.26 J
Cadmium	mg/Kg	2	100%	1	2	0.58 J	0.36 J	0.27 J	2	0.32 J
Calcium	mg/Kg	102000	100%	101904	1	65800	75100	64000	56200	90900 J
Chromium	mg/Kg	23.3	100%	22	2	18.3	14.2	19.4	18.8	12 J
Cobalt	mg/Kg	13.1	100%	30	0	9.6	8.3 J	10.8	9.5 J	8.1 J
Copper	mg/Kg	190	100%	25	3	24.9	21.3	21.7	190	16.6 J
Iron	mg/Kg	32100	100%	26627	1	22800	18900	23900	22800	15600 J
Lead	mg/Kg	66.7	100%	30	3	17.1	47.5 J	12.6 J	66.7	7.2
Magnesium	mg/Kg	25400	100%	12222	5	13300	11300	17200	12200	25400 J
Manganese	mg/Kg	536	100%	669	0	422	333	431	317	536 J
Mercury	mg/Kg	0.08	89%	0.1	0	0.06 J	0.08 J	0.03 J	0.03 J	0.03 J
Nickel	mg/Kg	44.3	100%	34	1	30.9	23.5	29.1	29.5	23.5 J
Potassium	mg/Kg	1920	100%	1762	7	1920 J	1470	1820	1870 J	1860
Selenium	mg/Kg	1.5	33%	2	0	0.43 U	0.32 U	0.31 U	1.5 J	0.54 U
Sodium	mg/Kg	140	100%	104	8	105 J	75 J	129 J	127 J	119 J
Vanadium	mg/Kg	26.2	100%	150	0	18.6	14.8	21.9	21.2	13.7 J
Zinc	mg/Kg	569	100%	83	5	85	58.6	101	569	43.7 J
OTHER ANALYSES										
Total Petroleum Hydrocarbons	mg/Kg	218000	89%	NA	NA	87 J	29 U	87 J	218000	283
Total Solids	%W/W					85.4	88.4	87.7	90.1	91.8

TABLE 5

SENECA ARMY DEPOT ACTIVITY
SEAD-60 RI/FS SCOPING PLAN
SOIL ANALYSIS RESULTS FROM THE ESI

COMPOUND	MATRIX	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	SOIL	SOIL	SOIL	SOIL
	LOCATION					SEAD-60	SEAD-60	SEAD-60	SEAD-60
	DEPTH (FEET)					6-8	0-0.2	4-6	6-8
	SAMPLE DATE					06/07/94	06/08/94	06/08/94	06/08/94
	ES ID					SB60-2-04	SB60-3.00	SB60-3 03	SB60-3.04
	LAB ID					223340	223499	223500	223501
	SDG NUMBER					44665	44665	44665	44665
	UNITS								
VOLATILE ORGANICS									
Methylene Chloride	ug/Kg	54	56%	100	0	3 J	21	54	1 J
Acetone	ug/Kg	170	11%	200	0	11 U R	14 U	11 U	11 U
Carbon Disulfide	ug/Kg	2	22%	2700	0	11 U R	14 U	11 U	2 J
2-Butanone	ug/Kg	26	11%	300	0	11 U R	14 U	11 U	11 U
2-Hexanone	ug/Kg	1	11%	NA	NA	11 U R	14 U	11 U	11 U
Tetrachloroethene	ug/Kg	3	11%	1400	0	3 J	14 U	11 U	11 U
Toluene	ug/Kg	13	33%	1500	0	2 J	14 U	11 U	11 U
Ethylbenzene	ug/Kg	4	11%	5500	0	11 U R	14 U	11 U	11 U
Xylene (total)	ug/Kg	9	11%	1200	0	11 U R	14 U	11 U	11 U
SEMIVOLATILE ORGANICS									
Naphthalene	ug/Kg	38	11%	13000	0	350 U	2200 U	350 U	350 U
2-Methylnaphthalene	ug/Kg	1100	11%	36400	0	350 U	2200 U	350 U	350 U
Acenaphthene	ug/Kg	1400	33%	50000*	0	32 J	2200 U	350 U	350 U
Dibenzofuran	ug/Kg	29	11%	6200	0	350 U	2200 U	350 U	350 U
Fluorene	ug/Kg	1300	22%	50000*	0	350 U	2200 U	350 U	350 U
Phenanthrene	ug/Kg	8900	44%	50000*	0	350 U	680 J	350 U	350 U
Anthracene	ug/Kg	2000	22%	50000*	0	350 U	2200 U	350 U	350 U
Carbazole	ug/Kg	79	11%	50000*	0	350 U	2200 U	350 U	350 U
Di-n-butylphthalate	ug/Kg	1500	33%	8100	0	350 U	2200 U	81 J	94 J
Fluoranthene	ug/Kg	14000	67%	50000*	0	29 J	1300 J	350 U	350 U
Pyrene	ug/Kg	27000	78%	50000*	0	62 J	2000 J	350 U	350 U
Benzo(a)anthracene	ug/Kg	340	11%	220	1	350 U	2200 U	350 U	350 U
Chrysene	ug/Kg	17000	44%	400	2	350 U	1100 J	350 U	350 U
bis(2-Ethylhexyl)phthalate	ug/Kg	380	44%	50000*	0	43 J	2200 U	350 U	160 J
Benzo(b)fluoranthene	ug/Kg	16000	33%	1100	2	350 U	1500 J	350 U	350 U
Benzo(k)fluoranthene	ug/Kg	190	11%	1100	0	350 U	2200 UJ	350 U	350 U
Benzo(a)pyrene	ug/Kg	350	11%	61	1	350 U	2200 U	350 U	350 U
Indeno(1,2,3-cd)pyrene	ug/Kg	1100	33%	3200	0	46 J	1100 J	350 U	350 U
Dibenz(a,h)anthracene	ug/Kg	1100	33%	14	3	27 J	1100 J	350 U	350 U
Benzo(g,h,i)perylene	ug/Kg	1600	33%	50000*	0	43 J	1600 J	350 U	350 U

TABLE 5

SENECA ARMY DEPOT ACTIVITY
SEAD-60 RI/FS SCOPING PLAN
SOIL ANALYSIS RESULTS FROM THE ESI

COMPOUND	MATRIX	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	SOIL	SOIL	SOIL	SOIL
	LOCATION					SEAD-60	SEAD-60	SEAD-60	SEAD-60
	DEPTH (FEET)					6-8	0-0.2	4-6	6-8
	SAMPLE DATE					06/07/94	06/08/94	06/08/94	06/08/94
	ES ID					SB60-2-04	SB60-3.00	SB60-3.03	SB60-3.04
	LAB ID					223340	223499	223500	223501
	SDG NUMBER					44665	44665	44665	44665
	UNITS								
PESTICIDES/PCB									
alpha-BHC	ug/Kg	5	11%	110	0	1.8 U	2.9 UJ	1.8 U	1.8 U
Aldrin	ug/Kg	16	11%	41	0	1.8 U	2.9 UJ	1.8 U	1.8 U
Endosulfan I	ug/Kg	34	33%	900	0	1.8 U	6.3 J	1.8 U	1.8 U
4,4'-DDE	ug/Kg	110	44%	2100	0	3.5 U	28 J	3.5 U	3.5 U
4,4'-DDD	ug/Kg	100	22%	2900	0	3.5 U	100 J	3.5 U	3.5 U
4,4'-DDT	ug/Kg	130	22%	2100	0	3.5 U	5.6 UJ	3.5 U	3.5 U
Endrin ketone	ug/Kg	14	11%	NA	NA	3.5 U	5.6 UJ	3.5 U	3.5 U
alpha-Chlordane	ug/Kg	27	22%	540	0	1.8 U	3 J	1.8 U	1.8 U
gamma-Chlordane	ug/Kg	10	11%	540	0	1.8 U	2.9 UJ	1.8 U	1.8 U
Aroclor-1242	ug/Kg	970	11%	1000/10000(a)	0	35 U	56 UJ	35 U	35 U
Aroclor-1248	ug/Kg	2100	11%	1000/10000(a)	1	35 U	56 UJ	35 U	35 U
Aroclor-1260	ug/Kg	4400	22%	1000/10000(a)	1	35 U	220 J	35 U	35 U
METALS									
Aluminum	mg/Kg	14100	100%	14593	0	8320	14100	6980	13200
Antimony	mg/Kg	1.8	78%	3.59	0	0.22 UJ	0.49 J	0.26 J	0.18 UJ
Arsenic	mg/Kg	8.1	100%	7.5	1	3.8	7	4	5.6
Barium	mg/Kg	679	100%	300	2	90.1	416	64	50.1
Beryllium	mg/Kg	0.67	100%	1	0	0.38 J	0.66 J	0.35 J	0.63 J
Cadmium	mg/Kg	2	100%	1	2	0.33 J	1.5 J	0.35 J	0.72
Calcium	mg/Kg	102000	100%	101904	1	72300 J	23700 J	102000 J	50600 J
Chromium	mg/Kg	23.3	100%	22	2	14.1	23.3	12	22.7
Cobalt	mg/Kg	13.1	100%	30	0	7.9 J	13.1 J	8.2	12.7
Copper	mg/Kg	190	100%	25	3	20.5	74.1	19.8	30.6
Iron	mg/Kg	32100	100%	26627	1	17700	25700	15500	32100
Lead	mg/Kg	66.7	100%	30	3	9.5	50.6	8.2	15.3
Magnesium	mg/Kg	25400	100%	12222	5	19000	8570	18000	11400
Manganese	mg/Kg	536	100%	669	0	368	443	417	378
Mercury	mg/Kg	0.08	89%	0.1	0	0.07 J	0.02 U	0.02 J	0.01 J
Nickel	mg/Kg	44.3	100%	34	1	23.6	31.3	22.9	44.3
Potassium	mg/Kg	1920	100%	1762	7	1820 J	1820 J	1690 J	1920 J
Selenium	mg/Kg	1.5	33%	2	0	0.47 U	1.2 J	0.43 U	0.65 J
Sodium	mg/Kg	140	100%	104	8	119 J	118 J	113 J	140 J
Vanadium	mg/Kg	26.2	100%	150	0	14.5	26.2	12.9	19.3
Zinc	mg/Kg	569	100%	83	5	64.4	314	56.3	266
OTHER ANALYSES									
Total Petroleum Hydrocarbons	mg/Kg	218000	89%	NA	NA	332	50900	57	34
Total Solids	%W/W					94.2	59.1	93.1	93.8

NOTES:
a) The TAGM value for PCBs is 1000ug/Kg for surface soils and 10,000 ug/Kg for subsurface soils.
b) * = As per proposed TAGM, total VOCs < 10 ppm, total SVOs < 500 ppm, and individual SVOs < 50 ppm
c) NA = Not Available.
d) U = The compound was not detected below this concentration.
e) J = The reported value is an estimated concentration.
f) UJ = The compound may have been present above this concentration, but was not detected due to problems with t
g) R = The data was rejected during the data validation process.

single concentration (i.e., 27 J ug/Kg) of dibenz(a,h)anthracene was found at a level in excess of its NYSDEC TAGM value in deeper soils (i.e., SB60-2-04, 6 to 8 feet bgs).

While the concentrations of volatile organic compounds, pesticides, and PCBs present in the two surface soil samples from the release area were generally below TAGM values, two PCBs (Aroclor 1248 and Aroclor 1260) were found at concentrations above their respective TAGM values. Both of these high PCB concentrations were recorded in the shallow soil sample (i.e., SB60-2-00) that also indicated the highest concentration of TPH. Heavy metals concentrations above TAGM values were present in all of the samples. While the surface soil samples from the two soil borings located near the oil release area generally had more TAGM exceedences for heavy metals; no consistent pattern in the spacial distribution of these exceedences was evident.

Sediment downgradient of SEAD-60 has also been impacted by the release of the fuel oil. Concentrations of semivolatile organic compounds, primarily including PAHs were reported in the analytical results of the two sediment samples collected downgradient of the oil-stained soil. The concentrations of several of these semivolatile organic compounds exceed their respective TAGMs. TPH was also reported in one of the two, downgradient sediment samples at a level of 149 mg/Kg.

NYSDEC has not defined a clean-up criteria value for TRPH in soil, but has published a guidance to remediate petroleum-contaminated soils. This guidance, *STARS Memo #1*, provides direction on the handling, disposal and/or reuse of non-hazardous petroleum contaminated soils. *STARS Memo #1* is included in Appendix F of this document.

The analytical results also indicate that TPH has impacted the groundwater beneath the oil release area, even though the concentrations of TPH found in soil were dramatically reduced at depth. A TPH concentration of 1.22 mg/L was detected in the monitoring well (MW60-2) located hydraulically downgradient of the oil release area.

Monitoring well MW60-1, which is located hydraulically upgradient of the known oil release area and approximately 130 feet east of the Building 609, contained TPH at a higher concentration (i.e., 2.2 mg/L) than that was found in the downgradient well (i.e., MW60-2). NYSDEC has not yet defined a TRPH groundwater guidance value, however, TRPH is considered to be an indicator of petroleum impacts. Concentrations exceeding TAGM and Federal Drinking Water criteria were also reported for four metals (aluminum, iron, manganese, and sodium) in groundwater samples; all of the listed metals exceeded criteria values in the upgradient well, and the first three contaminants were also found at high levels in the two downgradient wells.

Surface water at the site has not been significantly impacted by any of the constituents that were analyzed for during the investigation.

These results indicate that a release of TPH and PAHs in the near surface soils has occurred at SEAD-60.

1.2.3 Description of Affected Media

1.2.3.1 Soils

The extent of the soil to be treated during this removal action is shown on **Figures 1** through 5. There are approximately 246 cubic yards of soil to be excavated, transported to the SEAD-17 Low Temperature Thermal Desorption (LTTD) soil treatment unit and treated. The majority of affected soil, approximately 195 cubic yards, is located at SEAD-60.

1.2.3.2 Wastewaters

There are two sources of wastewater at these sites that must be handled during the removal action; groundwater and precipitation. The total quantity of groundwater and precipitation to be disposed of is estimated to range from 1,270 to 2,675 gallons. This estimate is based on a total of 6 to 10 gallons of water per cubic yard of soil excavated.

SECTION 2
OBJECTIVES

2.0 OBJECTIVES

2.0.1 The overall objective of this project is the excavation, management, and disposal of petroleum-contaminated soil and sediment that has been identified at the Seneca Army Depot Activity (SEDA). Petroleum-contaminated soil and sediment has been identified at five historic solid waste management units (SWMUs), designated as SEADs 38, 39, 40, 41 and 60. The soil and sediment identified at each of the SEADs represents a source of a potential threat to human health.

The petroleum-hydrocarbon contaminated soil and sediment must be excavated to the cleanup requirements established in New York State Department of Environmental Conservation (NYSDEC) Spill Technology and Remediation Series (STARS) Memo #1 Petroleum-Contaminated Soil Guidance Policy, dated August 1992.

Petroleum-contaminated soil and sediment located at SEAD-60 was previously excavated and used as the feed stock for a low temperature thermal desorption treatability demonstration conducted at the Army's APE-1236 deactivation furnace, which is located in SEAD-17. Analytical results of the treated soil and sediment indicate that the concentration of petroleum hydrocarbons contained in the treated soil and sediment has been reduced. The excavation at SEAD-60 remains open and requires backfill.

2.0.2 This document identifies and describes the technical requirements needed within a service contract that is intended to implement and complete the removal, disposal, and backfill actions at four sites (i.e., SEADs 38, 39, 40, and 41) at the Seneca Army Depot Activity where petroleum hydrocarbon contamination has been identified in the soil and sediment. Addtionally, this document identifies and describes operations that are needed to backfill and re-contour the excavation that exists at SEAD-60 where soil and sediment has previously been excavated by the Army. The service contract will encompass all aspects of the design and implementation of the removal action including:

- the establishment and maintenance of necessary site security in the area of the planned excavations;
- the definition and implementation of dust and vapor suppression procedures to minimize air-borne releases or particulates, dusts or vapors during the excavation operations;
- the excavation and removal of the contaminated soil and sediment from the sites;

- the establishment and maintenance of stockpiles containing clean fill or contaminated soil and sediment during temporary on-site staging operations;
- the handling and on-site management of excavated soil pending its transport and disposal off-site;
- the collection and analysis of any required air samples to document that the action has been completed in accordance with prevailing air pollution requirements;
- the collection and analysis of samples necessary to characterize the soil and sediment for waste disposal purposes;
- assisting the Oversight Contractor during the collection and analysis of samples needed to confirm that the excavation and removal action has resulted in the elimination of the petroleum-contaminated soil and sediment at the site;
- the selection of an off-site disposal site that is approved by the Army and the oversight regulatory authorities for the receipt of the excavated and characterized soil and sediment;
- the transportation of the excavated soil and sediment to the designated off-site disposal site;
- the off-site disposal of the petroleum-contaminated soil and sediment;
- the identification and characterization of clean fill material that can be used to backfill open excavations at the five SEADs;
- backfill of open excavations at five solid waste management units (SWMUs), designated as SEADs 38, 39, 40, 41 and 60; and
- the implementation and maintenance of all records and paperwork (e.g., sample chain-of-custody records, analytical results, monitoring records, bills of lading, disposal manifests, survey records, daily reports, etc.) needed to document the removal, disposal, and backfill operations at each of the sites.

2.0.3 Cleanup requirements for contaminated soil and sediment are derived from the NYSDEC STARS Memo #1, identified above. Cleanup guidance values have been established for the principle volatile organic and polynuclear aromatic contaminants of concern. These guidance levels are presented in **Table 6**.

Table 6

Clean-up Criteria for Petroleum Product Contaminated Soil

Compound Name	EPA Method	Gasoline Contaminated Soil/Sediment			Fuel Oil Contaminated Soil/Sediment				
		TCLP Extraction Guidance Value (ppb)	TCLP Alternative Guidance Value (ppb)	Human Health Guidance Value (ppb)	TCLP Extraction Guidance Value (ppb)	TCLP Alternative Guidance Value (ppb)	Human Health Guidance Value (ppb)	Sediment Guidance Value (ppb) Fresh	Sediment Guidance Value (ppb) Marine
Benzene	8021 (8020)	0.7	14	2.4 x 10^{4}	0.7	14	2.4 x 10^{4}		
Ethylbenzene	8021 (8020)	5	100	8.0 x 10^{6}	5	100	8.0 x 10^{6}		
Toluene	8021 (8020)	5	100	2.0 x 10^{7}	5	100	2.0 x 10^{7}		
o-Xylene	8021 (8020)	5	100	2.0 x 10^{8}	5	100	2.0 x 10^{8}		
m-Xylene	8021 (8020)	5	100	2.0 x 10^{8}	5	100	2.0 x 10^{8}		
p-Xylene	8021 (8020)	5	100		5	100			
Mixed Xylene	8021 (8020)	5	100	2.0 x 10^{8}	5	100	2.0 x 10^{8}		
Isopropylbenzene	8021	5	100	***	5	100	***		
n-Propylbenzene	8021	5	100	***	5	100	***		
p-Isopropyltoluene	8021	5	100	***	5	100	***		
1,2,4-Trimethylbenzene	8021	5	100	***	5	100	***		
1,3,5-Trimethylbenzene	8021	5	100	***	5	100	***		
n-Butylbenzene	8021	5	100	***	5	100	***		
Sec-Butylbenzene	8021	5	100	***	5	100	***		
t-Butyl benzene		5	100	***	5	100	***		
Naphthalene	8021 (8270)	10	200	3.0 x 10^{5}	10	200	3.0 x 10^{5}		
Methyl t-butyl ether (MTBE)		50	1000	***	50	1000	***		

Table 6
Clean-up Criteria for Petroleum Product Contaminated Soil

Compound Name	EPA Method	Gasoline Contaminated Soil/Sediment			Fuel Oil Contaminated Soil/Sediment				
		TCLP Extraction Guidance Value (ppb)	TCLP Alternative Guidance Value (ppb)	Human Health Guidance Value (ppb)	TCLP Extraction Guidance Value (ppb)	TCLP Alternative Guidance Value (ppb)	Human Health Guidance Value (ppb)	Sediment Guidance Value (ppb) Fresh	Sediment Guidance Value (ppb) Marine
Anthracene	8270				50	1000	2.0×10^{7}		
Fluorene	8270				50	1000	3.0×10^{6}		
Phenanthrene	8270				50	1000	***		
Pyrene	8270				50	1000	2.0×10^{6}		
Acenapthene	8270				20	400	5.0×10^{6}		
Benzo(a)anthracene	8270				0.002	0.04	220	33	18
Fluoranthene	8270				50	1000	3.0×10^{6}		
Benzo(b)fluoranthene	8270				0.002	0.04 (2)	220	33	18
Benzo(k)fluoranthene	8270				0.002	0.04 (2)	220	33	18
Chrysene	8270				0.002	0.04 (2)	***	33	18
Benzo(a)pyrene	8270				0.002	0.04 (2)	61	33	18
Benzo(g,h,i)perylene	8270				0.002	0.04 (2)	***		
Indeno(1,2,3-cd)pyrene	8270				0.002	0.04 (2)	***		
Dibenz(a,h)anthracene	8270				50	1000	14		

1) Methyl t-butyl ether is not a target compound of the Methods 8021 or 8020, but MTBE may be determined using these methods with appropriate quality assurance and quality control measures.

2) Due to high detection limit for a solid matrix, the TCLP Extraction Method must be used to demonstrate groundwater quality protection for these compounds.

*** No Guidance vlaue identified in EPA HEAST Report.

No petroleum type odors and no individual contaminant in soil greater that 10,000 parts per billion.

SECTION 3
SCOPE OF WORK

A program including all operations needed to remove and dispose of petroleum-contaminated soil, that provides clean replacement backfill to replace the excavated contaminated soil, and that backfills, compacts, and regrades each completed excavation to pre-excavation conditions at four sites (i.e., SEADs 38, 39, 40, and 41) at the Seneca Army Depot Activity (SEDA) in Romulus, New York shall be designed, implemented, conducted, evaluated, and certified by the Contractor. Additionally, the program will include additional necessary actions to backfill, compact, and regrade a fifth existing excavation site (i.e., SEAD-60) with clean backfill. Finally, operations and activities required to recover, store, manage, treat and discharge or dispose of wastewater (e.g., stormwater run-off, groundwater infiltration volumes, decontamination waters, etc.) that may result from excavation site operations will be identified and completed by the Contractor. All removal actions will be completed with the supervision and oversight being provided by the Army and their designated Oversight Contractor.

3.0 GENERAL REQUIREMENTS

The Contractor shall:

- establish and maintain necessary site controls at each of the affected sites for the full period of time during which the excavation remains open and during which temporary piles may be staged at the site;
- establish and maintain dust suppression and vapor control procedures for the full duration of all excavation and soil handling operations;
- design, perform, assess the results of, and record data from an ambient air monitoring program for particulates and organic vapors;
- excavate petroleum-contaminated soil from its current location in the ground at four sites on the Seneca Army Depot Activity, designated as SEADs (i.e., SEADs 38, 39, 40, and 41);
- collect and analyze samples that are needed and required by potential disposal sites to characterize the excavated soil and sediment for disposal;
- assist the Oversight Contractor during the collection and analysis of samples from the base and perimeter of the excavations that are needed to confirm that the required volumes of contaminated soil and sediment have been removed;
- handle and manage the excavated soil pending transport from the four sites to the designated off-site disposal site;

- develop and maintain the necessary documentation to describe the excavation, shipment and disposal of all excavated soil and sediment and other debris and material from SEDA to the final disposal sites;
- transport the excavated soil and sediment from the four sites to the selected, approved off-site disposal site;
- dispose of petroleum-contaminated soil and sediment from the four sites at an authorized disposal site;
- obtain and deliver clean backfill to the each of the four sites excavated as part of this work, and at another location, SEAD-60, where soil excavation was previously conducted by the Army;
- re-grade, compact, and seed, if necessary, all backfilled excavations to re-establish pre-excavation conditions at all five of the designated excavation sites; and
- recover, store, manage, treat and discharge or dispose of wastewater that results from excavation site operations.

The Contractor shall continually evaluate the effectiveness and completeness of the removal action to achieve the required level of soil and sediment remediation needed. All work performed under this contract shall be under the supervision of a Professional Engineer registered in the State of New York.

The following activities are included in the Contractor's scope of work:

- obtain all required environmental permits and authorizations for the identified excavation and disposal activity;
- compliance with applicable state and federal environmental statues and laws;
- develop a site-specific health and safety plan (HSP) that complies with federal, state and Army guidelines and requirements governing removal actions;
- provide institutional control devices to ensure that the excavation and any stockpiled materials are properly secured to eliminate potential danger to surrounding populations;
- identify and mark areas to be excavated;
- identify and mark areas where temporary stockpiles will be established;
- define and mark additional areas where soil excavation is required based on the results of the confirmatory sampling and analysis;
- design and implementation of the necessary ambient air monitoring program and the collection and retention of resulting data;
- excavation of petroleum-contaminated soil and sediment;

- coordinate the extent of excavation of petroleum-contaminated soils at the four SEADs with NYSDEC representatives to ensure that all affected soils are removed during the program;
- stockpile, test, and handle the excavated contaminated soil pending transport and disposal;
- collect samples from soil and sediment stockpiles, arrange for necessary waste disposal chemical and physical analyses, and summarize and provide results of all waste disposal analyses to the Army, the Oversight Contractor and the disposal site;
- maintain records describing sampling that is performed during the excavation and the results that are obtained including sampling locations and sampling results;
- using developed analytical results, classify and segregate excavated soil according to the lowest level of hazard allowable by applicable environmental laws and regulations;
- load the excavated soils onto trucks and transport, in accordance with applicable laws and regulations, the petroleum-contaminated soil to the selected disposal facility;
- obtain, maintain, and provide copies of all records resulting from the transport and disposal of the petroleum-contaminated soil;
- identify an off-site or on-site borrow pit that can be used to provide clean fill to refill the excavations;
- obtain and provide clean fill to the excavation sites as required;
- backfill, compact, and regrade the excavations to original grade using the clean fill; and,
- prepare and submit a draft and a final report detailing the scope and results of the excavation/disposal/closure activities at each of the SEADs.

3.0.1 PROGRAM ORGANIZATION

The required program will be completed under a contract issued by the Army. The Contractor shall conduct all removal action operations in accordance with procedures and requirements that are approved by the Army. All removal action operations shall be conducted under the oversight and review of a third party Oversight Contractor designated and independently contracted by the Army. All removal action operations will be completed in accordance with provisions and requirements of prevailing federal, state and municipal laws governing the environment and the transport, storage and disposal of hazardous or contaminated materials.

3.0.2 SCOPE OF THE BID

Under the base bid, the Contractor shall be required to excavate, manage, transport and dispose of, and to replace and install clean fill to replace, up to 55 cubic yards of petroleum-contaminated soil from SEADs 38, 39, 40 and 41 to acceptable levels. Acceptable levels are defined as the excavation and disposal of soils that have been contaminated by petroleum hydrocarbons. Additionally, the Contractor shall also be required to replace and install clean fill to replace up to 200 cubic yards of soil at an existing excavation performed by the Army in SEAD-60.

The Contractor will also compact and regrade the five excavation sites and remove all temporary measures used during the work.

3.0.3 LABOR, MATERIAL AND EQUIPMENT

The Contractor shall furnish all labor, material, equipment, quality control measures, and health and safety provisions necessary to complete the work described in these specifications for final acceptance by the Army, the Oversight Contractor and federal, state and municipal governments. The work includes the Contractor's design, mobilization, demobilization, construction, and operation and maintenance of the excavation, materials handling, and disposal operations. The Contractor will also be responsible for site restoration.

3.0.3.1 All materials and equipment used to complete the work described in these specifications shall be adequate in capacity for its intended use; shall not create unsafe conditions; and shall meet the requirements of all applicable codes and standards.

3.0.3.2 All equipment and material brought onto the SEDA site shall be decontaminated and in proper working condition at the time of arrival at the SEDA site. All equipment may be inspected by the Army or the Army's representative before it is used at the site. Equipment found to be contaminated or in need of repair shall be removed from the SEDA site by the Contractor immediately. Additional mobilizations of materials or equipment to the SEDA site caused by rejection of faulty or contaminated equipment will be at the Contractor's expense.

3.0.3.3 The Contractor shall be responsible for maintaining the environment in its natural state to the greatest extent possible during the removal action. The Contractor will consider air, surface water, groundwater, and land resources. In order to prevent, and provide for abatement and control of any environmental pollution arising from the Contractor's activities in conducting the removal action, the Contractor, and any subcontractors, shall comply with all applicable federal, state, and local regulations.

3.0.3.4 Assuring compliance with the provisions of this section by subcontractors shall be the responsibility of the Contractor.

3.0.3.5 The Contractor shall be responsible for protecting and maintaining existing structures, roads and fences. The Contractor shall be responsible for locating and protecting any existing utilities within the work area.

3.0.3.6 The land resources within the project boundary and outside the limits of permanent work performed as part of this removal action shall be preserved in their present condition or restored to a condition that will appear to be natural after completion of the removal action. The Contractor shall confine all construction activities to the areas defined by the plans and specifications.

3.0.3.7 The Contractor shall not pollute any streams or wetlands with any hazardous constituents. The Contractor shall comply with all federal, state, and local regulations regarding pollution of surface waters and an emergency response plan is required to prevent pollution caused by inadvertent releases.

3.0.3.8 The Contractor shall take all necessary measures, in addition to those required by federal, state, and local regulations, to minimize the migration of dust, vapors, fumes, mists, etc. off-site. Dust control requirements and air monitoring requirements are described in these specifications.

3.0.3.9 All construction and excavation activities shall be conducted to minimize erosion. The Contractor shall prevent surface water from running onto and entering the excavation, and shall prevent contaminated surface water from running off and leaving the excavation site. Drainage control requirements are described later in these specifications.

3.0.3.10 The Contractor shall provide temporary site utilities as may be needed. All utilities provided at the site by the Contractor shall be removed at the completion of the project. Such utilities may include telephone, electricity, natural gas or propane (if required), water and sanitation.

3.0.3.11 No on-site work shall be permitted until required submittals, if applicable, for that activity have been approved by the Army as provided in the individual sections of these specifications. Work conducted during this removal action by the Contractor shall be limited to execution of the activities defined by these specifications. The Contractor shall employ a professional engineer of the discipline required for specific service on this project licensed in the State of New York. The Contractor shall assume full responsibility for the health and safety of all on-site personnel and the protection of all equipment and materials.

3.0.4 SUPPORT REQUIREMENTS

The Contractor shall provide essential contract support services as part of this contract. Support services include attendance at meetings at which the removal actions are discussed and the preparation of meeting minutes.

3.0.4.1 Meetings

The Contractor shall attend all meetings specified in this section and any other meetings called by the Army Contracting Officer or his representatives. Subcontractors shall attend when involved in the matter to be discussed, or when requested by the Contracting Officer or his representatives or the Contractor.

3.0.4.1.1 Pre-Construction Conference

A pre-construction conference shall be held prior to Contractor mobilization to SEDA. In addition to the Army and the Contractor, the meeting may be attended by representatives of the third-party Oversight Contractor, and by personnel of the regulatory agencies having jurisdiction over this project. The agenda for this meeting will be determined prior to the meeting.

3.0.4.1.2 Post-Construction Conference

A post-construction conference shall be held prior to final inspection of the work to discuss and resolve all unsettled matters.

3.0.4.1.3 Progress Meetings

Progress meetings shall be held at a frequency of once per month during the performance of the work to review operating performance and to discuss any problems that may arise during performance of the work.

3.0.4.2 Meeting Minutes

The Contractor shall record minutes of each meeting and shall furnish copies to the Contracting Officer or his representatives within 10 working days following the meeting.

3.0.4.3 Meeting Schedule

All meetings shall be held at SEDA, at dates and times to be agreed upon during the pre-construction conference. Changes to the meeting schedule shall be by agreement between the Contracting Officer or his representatives and the Contractor, with appropriate written notice to all parties involved.

3.0.5 DEFINITIONS AND ACRONYMS

This sections contains the definitions of words, phrases, acronyms, and abbreviations used in the text of these specifications and requiring special interpretation.

3.0.5.1 Definitions

Army – This term refers to the United States Department of the Army, including, but not limited to, United States Army Corps of Engineers and Seneca Army Depot Activity personnel and authorized representatives of these groups.

Contaminated Soil – The soil that contains concentrations of volatile organic or polynuclear aromatic compounds in excess of the treatment criteria contained in these specifications.

Exclusion Zone – This is the portion of the project sites where contamination exists or where remedial activities are or will occur. The boundaries of the exclusion zone may vary during the Removal Action.

Hazardous Waste – A substance determined to be a hazardous waste by application of the criteria listed in Title 40 Code of Federal Regulations Part 261.

Project Sites - The sites consist of all areas within the five SWMU boundaries as shown on the drawings.

Regulators – This term refers to all authorized representatives of the United States Environmental Protection Agency, United States Occupational Safety and Health Administration, New York State Department of Environmental Conservation, New York State Department of Health, and any other federal, state, or local government agency with jurisdiction over the site.

Removal Action – The removal action describes this entire project from the notice to proceed until completion, and includes the initial plan preparation, all field work, and final report preparation.

Subcontractor – A subcontractor is any firm or individual contracted by the Contractor to perform a portion of the removal action.

TSD Facility – A hazardous waste treatment, storage, or disposal facility permitted pursuant to the requirements of Title 40 Code of Federal Regulations Parts 260 through 270.

Work Areas – The work areas includes all portions of the project sites affected by the Removal Action. This includes the excavation area, staging area, and decontamination area.

3.0.5.2 Acronyms

ANSI	American National Standards Institute
API	American Petroleum Institute
ASP	Analytical Services Protocols
ASTM	American Society for Testing of Materials
CDAP	Chemical Data Acquisition Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
EE/CA	Engineering Evaluation/Cost Analysis
EPA	United States Environmental Protection Agency
FS	Feasibility Study
HDPE	High-density polyethylene
IEEE	The Institute of Electrical and Electronic Engineers
IPCEA	Insulated Power Cable Engineers Association

µg/kg	micrograms per kilogram
mil	0.001 inch
mm	millimeter
MRD	United States Army Corps of Engineers, Missouri River Division
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Code
NESC	National Electrical Safety Code
NESHAPS	National Emissions Standards for Hazardous Air Pollutants
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
PID	Photo-ionization Detector
QA	Quality Assurance
QC	Quality Control
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act
SEDA	Seneca Army Depot Activity
SHSO	Site Health and Safety Officer
SOP	Standard Operating Procedure
SV	Semi-Volatile Organic Compound
SWMU	Solid Waste Management Unit
TAGM	Technical and Administrative Guidance Memorandum
TCLP	Toxicity Characteristic Leaching Procedure
TSD	Treatment, Storage, or Disposal
VOA	Volatile Organic Compound

3.1 ENVIRONMENTAL STATUTES AND REGULATIONS

CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) is the controlling legislation in the performance of the identified removal actions. In addition to any other applicable federal, state, and local regulations, the following regulations also form a part of this specification:

3.1.1 FEDERAL ENVIRONMENTAL REGULATIONS

40 CFR 50	Ambient air quality standards
40 CFR 58	Ambient air quality surveillance
40 CFR 61	National emissions standards for hazardous air pollutants (NESHAPS)
40 CFR 260	Hazardous waste management system - general
40 CFR 261	Identification and listing of hazardous waste
40 CFR 262	Standards applicable to generators of hazardous waste
40 CFR 263	Standards applicable to transporters of hazardous waste
40 CFR 264	Standards for owners and operators of hazardous waste treatment, storage, and disposal facilities
40 CFR 265	Interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities
40 CFR 300 - 310	National Oil and Hazardous Substances Pollution Contingency Plan

3.1.2 NEW YORK STATE ENVIRONMENTAL REGULATIONS

6 NYCRR 360	NYSDEC rules for solid waste management facilities
6 NYCRR 364	NYSDEC rules for transport of regulated waste
6 NYCRR 375	NYSDEC rules for inactive hazardous waste sites

3.1.3 UNITED STATES ARMY CORPS OF ENGINEERS ENVIRONMENTAL REQUIREMENTS

ER-1110-1-263	Chemical Data Quality for Hazardous Waste Remedial Activities

3.1.4 OTHER REGULATORY REQUIREMENTS

- Federal Facility Agreement under CERCLA Section 120 in the matter of Seneca Army Depot, Romulus, New York Docket No. II-CERCLA-FFA-00202
- 29 CFR 1910 and 1926 Occupational safety and health standards
- 49 CFR 171-177 Hazardous material transportation regulations
- Spill Technology and Remediation Series (STARS), Memo #1
- All other relevant New York State Regulations

- All local regulations regarding transport of hazardous materials

3.1.5 OTHER APPLICABLE STANDARDS AND CODES

The Contractor shall comply with all applicable codes and standards. At a minimum, the Contractor will comply with the following codes and standards:

- National Fire Protection Association (NFPA) Standards.
- National Electrical Manufacturers Association (NEMA).
- The American National Standards Institute (ANSI).
- The Institute of Electrical and Electronic Engineers (IEEE).
- Insulated Power Cable Engineers Association (IPCEA).
- National Electrical Code (NEC).
- National Electrical Safety Code (NESC).

3.2 PROJECT PLANNING

These specification provide basic information regarding the scope of the work that the Contractor is to perform and the procedures and requirements that must be used during the completion of the requested work. Nevertheless, the Contractor shall prepare the following documents that will serve as the basis of the work that will be conducted.

3.2.1. DOCUMENT FORMATS

All work plans, documents and deliverables prepared for the identified scope of work shall be prepared in a neat, clear, legible, and concise manner. Consistent formats shall be developed and used for all presentations.

3.2.1.1 All project documents (e.g., work plans and final report) shall be produced using 8.5 by 11 inch pages with oversized drawings and tables folded, if necessary, to meet this size specification.

3.2.1.2 All project documents shall be provided to the Army, and other receiving parties, as bound documents. The preferred binding method is contained within a vinyl, three-ringed binder, but other means including staples, binder clips, or GBC binding may be used with prior approval of the Contracting Officer.

3.2.1.3 All large project documents (e.g., work plans, final reports, etc) shall include a document cover and a title page that shall identify the Contractor, the Corps of Engineers, Huntsville Division, and the data. The Contractor's name and any corporate logo or emblem shall not dominate the cover or the title page.

3.2.1.4 All large project documents (e.g., work plans, final reports, etc.) shall include a table of contents, a list of tables, a list of figures, a list of appendices, and a list of attachments, as are appropriate and applicable.

3.2.1.5 A decimal paragraphing system shall be used for the test of each document, with each section or paragraph of the report having a unique decimal designation.

3.2.1.6 All pages of reports shall be stamped either with the word "DRAFT" or "FINAL" to indicate the version of the document.

3.2.1.7 Submittals shall include all previous review comments accepted by the Contractor as well as a section describing the disposition of each comment. Disposition of comments submitted with the final report shall be separate from the report document.

3.2.1.8 Each report shall identify the members and title of the Contractor's staff that had significant, specific input into the report's preparation or review.

3.2.1.9 All final drawings shall be of engineering quality in drafted form with sufficient details to show interrelations of major features on the installation site map. When drawings are required, data may be combined to reduce the number of drawings.

3.2.1.10 All final submittals shall be sealed by the registered Professional Engineer-In-Charge.

3.2.2 WORK PLAN

The Contractor shall prepare and submit for approval a Work Plan under which all required work shall be performed. The Work Plan shall fully describe the work to be conducted for the removal actions. The contents of the work plan are described below. At a minimum, the Work Plan will discuss the following items:

Title Page with approval signatures,
Organization chart and description of roles of key personnel,
Project Schedule,
Excavation, backfilling, compaction, and grading plan,
Erosion/dust control plan,
Site control and security (including exclusion zone) plan,
Air monitoring plan,
Mobilization (including decontamination procedures)/demobilization,
Excavated soil sampling plan, and a
Site layout.

The dates for submission and requirements are described in the Contract Data Requirements List shown in Appendix D and the Data Items Description shown in Appendix E.

3.2.2.1 Excavation, Backfill, Compaction, and Grading Plan

Prior to commencement of excavation, the Contractor shall submit an Excavation, Backfill, Compaction, and Grading Plan as part of the Work Plan describing the excavations that will be accomplished. The plan shall include the following:

- the proposed sequence of operations;
- the type, rated capacity, and quantity of equipment to be used in the excavation phase;
- plans showing locations and configuration of proposed temporary stockpiles;
- the drainage and dewatering plans, which show the control and removal of surface water and groundwater flowing toward and tending to collect in excavations;
- provisions for controlling the amount of air emissions at the down-wind air monitoring station by controlling the size of the open excavations;
- equipment and personnel decontamination procedures; and
- borrow source and haul routes.

3.2.2.2 Erosion/Dust Control Plan

The Contractor shall discuss proposed erosion/dust controls including run-on and run-off control and management of stockpiled soil.

3.2.2.3 Site Control and Security Plan

The Contractor shall describe and discuss procedures that will be used to secure and control access to the work areas and that will comply with all SEDA security requirements. The plan shall describe all site security measures that will be implemented to control personnel, wildlife and vehicular traffic to and through the excavation site and any associated stockpiles.

3.2.2.4 Air Monitoring Plan

The Contractor shall discuss the proposed air monitoring program and how the results of the program will be assessed and evaluated. The program shall indicate how the Contractor intends to comply with NYSDEC's TAGM HWR-89-4031 "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites" (October 1989), and is separate from the air monitoring and action level requirements for the site-specific health and safety plan.

3.2.2.5 Mobilization/Demobilization and Site Restoration Plan

The Contractor shall discuss his proposed mobilization procedures including temporary site utility and decontamination facilities. The demobilization plan shall discuss site cleanup and site restoration activities.

3.2.2.6 Excavated Soil Sampling Plan

The Contractor shall provide its plan to sample and analyze excavated soils and to determine how these samples shall be evaluated for disposal at off-site facilities. The number of samples that will be collected and the analyses that will be completed on each sample will be specified and explained.

3.2.2.7 Project Drawings

The Contractor shall provide the following drawings as required by these specifications.

- Overall site plan showing stockpile areas, equipment storage areas, and decontamination areas.
- Final project record drawings showing the limits of soil excavated by type and the locations of all in-situ confirmatory sampling. The Contractor shall be responsible for collecting all

surveying data and developing the project record drawings.

All drawings shall be a minimum of 11 inches x 17 inches.

3.2.2.8 Site Specific Health and Safety Plan (HASP)

The Contractor shall prepare and submit a site-specific Health and Safety Plan (HASP) that describes the safety, health and emergency response procedures that will be implemented, as needed, during the proposed removal action. The Contractor shall maintain a copy of the site-specific Health and Safety Plan on-site at all times.

Protocols necessary for protecting workers and potential on-site and off-site receptors from hazards posed by the removal action activities shall be specified. The dates for submission and requirements are described in the Contract Data Requirements List shown in Appendix D and the Data Items Description shown in Appendix E.

3.2.2.8.1 The Health and Safety Plan shall contain discussions of the following minimal subject areas.

- Health and safety organization
- Hazard assessment
- Training
- Medical surveillance
- Site control
- Standard operating procedures
- Personal protective equipment
- Personal hygiene and decontamination
- Equipment decontamination
- Air monitoring
- Emergency equipment and first aid requirements
- Emergency response/contingency plans and procedures
- Heat/cold stress monitoring
- Fall protection
- Trenching and shoring
- Confined space entry
- Logs, reports, and record keeping

- Site description and evaluation.

3.2.2.8.2 The Health and Safety Plan developed by the Contractor shall comply with the requirements specified in ER 385-1-92 entitled "Safety and Health Elements for HTRW Documents" as presented in Appendix B. These requirements do not supersede, but are in addition to, any federal, state, or local regulations. These requirements are in accordance with the Occupational Health and Safety Administration (OSHA) guidelines established in 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response." If a conflict occurs between these requirements and the current regulations, the more stringent shall apply. The completed Health and Safety Plan will be submitted to NYSDEC and New York State Department of Health (NYSDOH) for review.

3.2.2.9 Health and Safety Program Certification

The contractor shall prepare and submit a written certification that a Health and Safety Program (HSP) has been developed, implemented and maintained. An example of a site-specific Health and Safety Plan for the proposed removal actions in the designated SWMUs is provided in Appendix F.

3.2.2.10 Chemical Data Acquisition Plan (CDAP)

The Contractor shall prepare and submit a Chemical Data Acquisition Plan (CDAP). This plan shall address soil sampling, wastewater sampling and air sampling. The plan shall be submitted for Army approval.

3.2.2.10.1 At a minimum, the Contractor shall comply with all applicable US EPA and NYSDEC quality assurance (QA) requirements, and with the United States Army Corps of Engineers document: "Chemical Data Quality for Hazardous Waste Remedial Activities," ER 1110-1-263 as presented in Appendix C. Additionally, the Contractor shall document compliance with all QC requirements identified in these specifications.

3.2.2.10.2 The CDAP shall include, at a minimum, the following sections and discussions.

- Title page with approval signatures
- Site background information
- Data quality objectives

- Sample parameters, locations, types, preservation, holding times, containers, collection procedures, and decontamination techniques
- Field quality control samples including duplicates, trip blanks (VOA analyses only), matrix spike samples, and equipment rinsates
- Analytical methods (only EPA or NYSDEC approved methods shall be used)
- Laboratory information
- Chain-of-custody procedures
- Data validation protocols
- Proof of approval by NYSDOH or USEPA

The above outline is presented in Appendix D of ER 1110-1-263. The dates for submission and requirements are described in the Contract Data Requirements List shown in Appendix D and the Data Items Description shown in Appendix E.

3.2.2.10.3 The Contractor shall identify the key project personnel that are responsible monitoring and assessing project QC requirements. At a minimum, the Contractor shall designate a site quality control manager who will be responsible for, and have authority for all QC matters at the site. The site quality control manager shall be responsible for ensuring that all Contractor and subcontractor personnel at the work site have been properly trained in the site-specific QC procedures. The site quality control manager shall have no duties other than QC.

3.2.2.10.4 The Contractor shall maintain accurate records of all QC activities performed during the removal actions. These records shall be legible and prepared in an easily understood form, and shall be made available to the Army and the regulators upon request.

3.2.2.10.5 The Contractor shall not conceal any work containing uncorrected defects. If deficiencies indicate that the Contractor's quality control system is inadequate or does not produce the desired results, corrective action in both the work and the quality control system shall be taken by the Contractor.

3.3 INSTITUTIONAL REQUIREMENTS

3.3.1 The Contractor must and shall comply with all federal, state, and local safety codes and regulations at all times. The Contractor is responsible for training his supervisors and employees of the safety requirements and practices to be followed during the course of the work.

3.3.2 The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during the performance of the work. This requirement shall apply continuously and not be limited to normal working hours.

3.3.3 If at any time the NYSDOH Community Air Monitoring Guidelines are exceeded, the Contractor shall notify NYSDEC, NYSDOH, and the Army. The Contractor shall comply with all SEDA health and safety and emergency response requirements.

3.3.4 The Contractor shall train all employees and subcontractors aware of SEDA policy and procedures. The Contractor shall coordinate activities with SEDA personnel.

3.3.5 Odor, dust and noise control shall be limited in accordance with State and local regulations and ordinances. It shall be the Contractor's responsibility to meet these requirements.

3.3.6 The Contractor shall assure that all facilities that receive hazardous wastes from this site meet the requirements of 40 CFR 260 through 268. The Contractor shall assure that all facilities that receive nonhazardous solid waste from this site meet the requirements of 6 NYCRR 360.

3.3.7 The Contractor shall provide supporting documentation to complete hazardous waste manifests and to obtain services of permitted treatment, storage and disposal facilities if, during the performance of this work, off-site disposal of any hazardous waste is performed. With regard to disposal of wastes from this site, the Army will be the Waste Generator as defined in 40 CFR 262.

3.4 SITE CONTROL AND SECURITY REQUIREMENTS

3.4.1 SITE CONTROL

The Contractor shall establish a system to control access to the work areas. At a minimum, these areas will include an exclusion zone (defined as the area where contamination exists), a stockpile area, and a staging area. The Contractor will establish a decontamination area in compliance with these specifications.

3.4.2 SEDA REQUIREMENTS

The Contractor shall be responsible for complying with all SEDA requirements, including, but not limited to, access control, site security, and work permit requirements. The Contractor shall be responsible for determining the applicable SEDA requirements. At a minimum, the Contractor shall meet the SEDA requirements of this subsection. The following requirements must be followed by the Contractor at Seneca Army Depot Activity to facilitate entry and exit of Contractor employees and to maintain security.

3.4.2.1 A list of all Contractor employees, subcontractors and suppliers indicating firm name and address shall be furnished through POC/COR to the Counterintelligence Division, Building 710. A confirmation of employment SDSSE-SC Form 268 shall be executed by the Contractor concerning each employee, to include all subcontractors and their personnel. No forms will be transferred from another file if the Contractor has other on-going contracts at SEDA. The Contractor shall provide a list of personnel who are authorized to sign Form 268 for the firm. A sample of each signature is required. Counterintelligence Division must be notified, in writing, of any changes to this list. All completed forms shall be provided through COR/POC to the Counterintelligence Division 72 hours prior to commencement of work. Failure to complete Form 268 correctly will result in employee's denial of access to Seneca. The Counterintelligence Division must be notified, in writing through POC/COR to Counterintelligence, at least 72 hours prior to requesting any action. The chain of command for all contractor actions will be through POC/COR to Counterintelligence Division. There will be no exceptions.

3.4.2.2 Camera permits require written notice from the POC/COR prior to access. Open camera permits will not be issued. The following information is required:

- Camera make, model and serial number.
- Contract name and name of individual responsible for the camera.
- Dates camera will be used.
- Where it will be used.
- What will be photographed and why.

3.4.2.3 If a rental, leased or privately-owned vehicle is required in place of a company vehicle, the following information is required:

- Name of individual driving.
- Year, make, model, color and license plate of the vehicle.
- Typed letter on company letterhead indicating that the company assumes responsibility for rental, leased or privately owned vehicles.

3.4.2.4 All access media will be destroyed upon expiration data of contract. If an extension is required, a list of employee names and new expiration data must be furnished to the Counterintelligence Division. Contract extensions must be made prior to the contract expiration data or new Form 268s will be required for each individual that requires an extension.

3.4.2.5 Traffic laws of the State of New York apply with emphasis on the following regulations. All are subject to change with road conditions or as otherwise posted.

- Speed Limit: Controlled Area as posted
- Ammo Area - 5 mph
- Limited/Exclusion Area - 25 mph

3.4.2.6 Contractor vehicles (trucks, rigs, etc.) shall be parked in areas designated by the director of Law Enforcement and Security. Usually parking will be permitted within close proximity to the work site. No parking is allowed within 30 feet of a depot fence, as these are clear zones.

3.4.2.7 Available entrance/exit gates are Post 1, Main Gate (NY Highway 96, Romulus. New York; open for personnel entrance and exit 24 hours daily, 7 days a week) and Post 3 (entrance to North Depot Troop Area, located at end of access road from Route 96-A is open 7 days a week for personnel and vehicle entrance and exit).

3.4.2.8 The following restriction apply to all Contractor personnel:

- Cameras, binoculars, weapons and intoxicating beverages will not be introduced to the installation, except by written permission of the Director/Deputy Director of Law Enforcement and Security.

- Matches or other spark producing devices will not be introduced into the Limited/Exclusion or Ammo Area except when the processor of such items is covered by a properly validated match or flame producing device permit.

- All vehicles and personal parcels, lunch pails, etc. are subject to routine security inspections at any time while on depot property.

- All building materials, equipment and machinery must be cleared by the Director of Engineering and Housing who will issue a property pass for outgoing equipment and materials.

3.4.2.9 Contractor employees are cleared for entrance to the location of contract work only. Sight-seeing tours or wandering from the work site is NOT AUTHORIZED. The following items must be adhered to in order to obtain access to the facility:

- Written notification will be provided to the Counterintelligence Division (Ext. 30202) at least 72 hours prior to overtime work or prior to working on non-operating days.

- Security Police (Ext. 30448/30366) will be notified at least two hours in advance of any installation or movement of slow moving heavy equipment that may interfere with normal traffic flow, parking or security.

3.4.2.10 All Contractor/subcontractor employees on-site shall be aware of potential violations of law or regulations, including:

- Minor. Offenses committed by a Contractor personnel which are minor in nature will be reported by the Director of Law Enforcement and Security to the Contracting Officer who in turn will report such incidents to the Contractor for appropriate disciplinary action.

- Major. Serious offenses committed while on the installation will be reported to the FBI. Violators may be subject to trial in Federal Court.

3.4.2.11 The following rules shall be observed with regard to explosives-laden vehicles. Vehicles such as vans, cargo trucks, etc., carrying explosives will display placards or signs stating "EXPLOSIVES". Explosive ladened vehicles will not be passed. When an explosive laden vehicle is approaching, pull over to the side and stop. When catching up with an explosive laden vehicle, slow down and allow that vehicle to remain at least 100 feet ahead. When approaching an intersection where an explosive laden vehicle is crossing - STOP - do not enter the intersection until such time as the explosive carrier has passed through and cleared the intersection. When passing a vehicle that is parked and displaying "Explosive" signs, slow down to 10 miles per hour and take every precaution to allow more than ample clearance.

3.4.2.12 All Contractor employees are required to return all identification badges and passed on the last day of employment on the depot. The Contractor is responsible for the completion of all turn-ins by his employees and informing the Counterintelligence Division and the depot organization administering the contract, for termination of any employee's access to the depot.

3.5 MOBILIZATION

3.5.1 OFF SITE OR ON SITE BORROW PIT

Prior to starting the removal actions, the Contractor shall locate an off-site or on-site borrow pit that will be used to provide clean backfill. The Contractor shall be responsible for evaluating and certifying alternative borrow pit sites to ensure that the borrow material used for site backfill operations is clean. The borrow soil must be sampled and analyzed, and the results of the analyses must be provided to the Army prior to its use at the site. There must be enough borrow material available to meet the project requirements. The Contractor shall estimate the amount of borrow available prior to the initiation of the work. The Contractor shall submit a report that presents the data collected from the potential borrow pit(s) evaluated. This report shall include a site plan of the alternative sites along with an estimate of the quantity of borrow material available. The report shall present chemical and physical laboratory analysis results.

3.5.2 UTILITIES

The Contractor shall be responsible for the mobilization of necessary temporary site facilities for the performance of this removal action. The Contractor shall provide and maintain all temporary site utilities needed. Temporary site utilities may include telephone, electricity, natural gas (if required), potable water and sanitation facilities. Non-potable water, telephone and electric services are available in the area for tie-in by the Contractor. The Contractor shall furnish portable sanitary facilities, communications equipment, and potable water. Payment for telephone, electricity and water will be through SEDA.

3.5.3 SITE CLEARANCE

The Contractor shall locate, identify, mark, and protect site structures and utilities from damage.

The Contractor shall protect survey benchmarks from damage or displacement. The Contractor shall remove surface debris and clear areas required for site access and excavation.

3.5.4 SITE SECURITY

The Contractor shall be responsible for limiting and controlling personnel and wildlife entry into the exclusion zone, excavation, and any other potentially hazardous locations. The Contractor shall construct a security fence around the work areas.

3.5.5 DECONTAMINATION FACILITY

This section describes the basic requirements for decontamination activities that must be completed during, and the facilities that must be developed for, each removal action site.

3.5.5.1 The Contractor shall supply all labor, materials, and equipment needed to design, construct, and equip decontamination facilities in accordance with these specifications.

3.5.5.2 The Contractor shall decontaminate all excavation and transport equipment prior to its:

- use at a new site,
- removal from SEDA,
- use for handling of clean borrow materials intended for backfilling.

3.5.5.3 The Contractor shall design and operate decontamination facilities in a manner that ensures that all of the debris resulting from, and the materials used during the decontamination process are captured and recovered prior to their release to the surrounding environment.

3.5.5.4 Fluids and solids generated during decontamination activities will be segregated, and recovered. Fluids and solids may be separated by allowing the mixed wastes to flow into a lined sump where they are allowed to settle. The top layer of liquids will be decanted from sump and placed into appropriate containers for transport to storage, treatment, and disposal facilities. Recovered solids will be added to the excavated soils stockpiled for disposal, or placed in other suitable transport containers for subsequent transport and disposal at off-site facilities.

3.5.5.5 All personnel protective equipment used during site operations will be segregated from other removal action debris and collected as a separate stream for off-site disposal at approved facilities.

3.6 SITE OPERATIONS

3.6.1 STAGING AREAS

The Contractor shall construct, operate and maintain separate staging areas for the temporary storage and stockpiling of clean and contaminated soil. Additional requirements for the staging areas are provided below

3.6.1.1 The locations of the staging areas established for clean and contaminated soil shall be clearly marked and identified on the site plan. Each staging area shall have sufficient capacity for up to 6 days volume of soil.

3.6.1.2 The Contractor shall underline all staging areas with 2 to 3 inches of sand covered by a 40-mil HDPE (or equivalent) liner.

3.6.1.3 The Contractor shall use berms or equivalent means to prevent surface water run-on and run-off from the designated staging areas.

3.6.1.4 The Contractor shall cover all soil stockpiles with a tarp that is weighted appropriately to prevent erosion of the pile by wind, rain, snow, or stormwater. All soil stockpiles shall be covered to the fullest extent possible. Storage piles shall be covered at all times when they are not being actively worked.

3.6.1.5 The Contractor shall minimize vehicular traffic on staging area liners to prevent damage to the liner. The Contractor shall use only rubber-tired loaders in the staging area to minimize damage to the liner.

3.6.1.6 The Contractor shall inspect storage pile liners and covering tarps at least once per work day. If the integrity of the liner or the covering tarp is breached, the breach shall be immediately repaired or the contents of the stockpile shall be moved to another location that is constructed per the specifications defined above.

3.6.1.7 If a stockpile is relocated due to a failure of the liner or covering tarp, the new location will be marked on the site plan and reported to the Army.

3.6.2 PREPARATION FOR EXCAVATION

The Contractor shall survey and mark each site to delineate the proposed extent of the excavation. The Contractor shall identify the required excavation lines, levels, contours, and datum used to delineate the extent of the proposed excavation. The Contractor shall identify and protect existing structures, utilities and existing benchmarks from damage during the site operations.

3.6.2.1 Surveying

One benchmark is available in the area of SEAD-38 (Monument SEAD-4A) as shown on **Figure 1**. There are also three monitoring wells with known coordinates located in SEAD-60 near the area of the planned excavation for that site described herein. The location of the monitoring wells are shown on **Figure 5** for SEAD-60. Known coordinates for all of these locations are provided in **Table** 7.

There are no permanent benchmarks at the other SWMUs. Tasks that require surveying are layout of the soil excavations, sampling locations, and preparation of the project record drawings. All surveying shall be done under the supervision of a New York licensed and registered surveyor.

3.6.3 EXCAVATION

The Contractor shall be responsible for excavation of areas contaminated with petroelum hydrocarbons as are described in **Sections 3.5.3.1.1** through **3.5.3.1.5** below, and as are shown on **Figures 1** through **5**. Additional specifications pertinent to the excavation of contaminated soil are provided below.

3.6.3.1 The extent of the proposed excavations may be modified as are required to comply with other parts of this subsection, which are provided subsequently.

3.6.3.1.1 SEAD-38

Two portions of the blowdown area will be excavated (shown in shaded areas of **Figure 1** as Excavation A and B). Excavation A begins at the origination of the drainage ditch to the north

Table 7
Survey Coordinates for Site Features

Area	Location Identification	Northing (ft NAD 83)	Easting (ft NAD 83)
SEAD-38	SEAD-4A	987,478.03	744860.95
SEAD-60	MW60-1	986,468.75	751,766.75
SEAD-60	MW60-2	986,579.63	751,519.38
SEAD-60	MW60-3	986,469.31	751,467.13

of Building 2709 where the blowdown liquids are suspected to have been released and extends to 100 feet downstream. The ditch will be excavated three feet across to a depth of 1 foot. Excavation B is a 10-foot by 10-foot area at the approximate location where soil sample SS38-3 was collected. This area will be excavated to a depth of 1 foot. The amount of soil excavated from these locations is estimated to be approximately 15 cubic yards. No soil staging areas will be necessary because the impacted soil that is removed will immediately by loaded onto the trucks for transportation.

3.6.3.1.2 SEAD-39

A 20-foot by 50-foot area will be excavated to a depth of 6 inches (shown in shaded area of **Figure 2**). This soil (mostly grass and topsoil) will be set aside and another 6 inches of soil will be excavated from the hole and placed in a truck waiting on Center Street adjacent to the excavation area. The amount of soil requiring removal will be approximately 18 cubic yards. After the soil has been loaded into the trucks, the trucks will be covered will be covered by a tarpaulin and will transport the soil to the Ash Landfill. The first 6 inches of soil that is excavated and set aside is clean and will be staged on a tarpaulin adjacent to the hole for later backfilling. No additional soil staging areas will be necessary because the impacted soil that is removed will immediately by loaded onto the trucks for transportation.

3.6.3.1.3 SEAD-40

Two portions of the ditch alongside the railroad tracks will be excavated (shown in shaded areas of **Figure 3**). From the origination of the drainage ditch, an area 2 feet across the ditch and 10 feet down the length of the ditch will be excavated to a depth of 6 feet. From 10 feet from the origin of the ditch to 120 feet from the origin of the ditch, an area 2 feet across the ditch will be excavated to a depth of 1 foot. This soil will be excavated and immediately loaded into trucks waiting on the asphalt driveway area adjacent to the excavation area. The amount of soil requiring removal will be approximately 13 cubic yards. After the soil has been loaded onto the trucks, the trucks will be covered by a tarpaulin and will transport the soil to the Ash Landfill for treatment.

3.6.3.1.4 SEAD-41

An area 40 feet along the length of a drainage ditch and 3 feet across the ditch will be excavated to a depth of 1 foot (shown in shaded area of **Figure 4**). The approximate location of soil sample

SS41-1 is the suspected discharge point for the blowdown liquids, so the excavation will extend 20 feet in each direction of flow from SS41-1. This soil will be excavated and immediately loaded into a truck waiting on the asphalt driveway area adjacent to the excavation area. The amount of soil requiring removal will be approximately 5 cubic yards. After the soil has been loaded onto the truck, the trucks will be covered by a tarpaulin and will transport the soil to the Ash Landfill for treatment.

3.6.3.1.5 SEAD-60

No excavations will be performed at SEAD-60 under this removal action because this removal action was conducted by the Army previously. However, the existing excavation requires backfill. The estimated volume of backfill required is 200 cubic yards. The extent of the excavations in SEAD-60 are shown on **Figure 5**.

3.6.3.2 The Contractor shall excavate and manage all petroleum-contaminated soil from each of the removal action sites. The minimal extent of the required excavations are defined above in **Section 3.5.3.1** and in **Figures 1** through **5**. The excavation limits shown in **Figures 1** through **5** should be considered as initial. The Contractor shall collect soil samples along the perimeter and bottoms of the areas excavated, and analyze the samples to confirm that the proposed limits of excavation meet the specified performance standards. These samples shall be analyzed for volatile and semivolatile organic compounds via US EPA SW-846 Methods 8021 and 8270, respectively, or other approved methods. The resulting data will be compared to tabulated criteria levels provided in NYSDEC's STARS Memo #1. Compliance with the requirements of the excavation via this means will be based on the determination that all resulting analytical data is less than or equal to the tabulated concentrations identified in **Table 6**.

3.6.3.3 The Contractor shall collect samples of the excavated soil and submit them for analysis to develop source characterization data needed by the disposal facility.

3.6.3.4 Backfill of the excavation shall not begin until the confirmational samples laboratory results are reviewed and the final limits of excavation are defined. If the laboratory results indicate that additional soils must be excavated, the Contractor shall notify the Contracting Officer and await further instructions.

3.6.3.5 Excavations shall be made and maintained in accordance with the Grading and

Excavation Plan submitted by the Contractor and approved by the Army. The Contractor shall grade the upper perimeter edge of the excavation to prevent surface water inflow into the open excavation.

3.6.3.6 The Contractor shall use appropriate dust suppression and vapor control measures to minimize emissions from the excavation. The Contractor shall conduct air monitoring in accordance with the NYSDOH "Community Air Monitoring Plan" as presented in Appendix A. Should the air monitoring action levels be exceeded, work will be stopped until appropriate air emission control measures can be instituted.

3.6.3.7 The Contractor shall notify the Army of any unexpected subsurface conditions and discontinue work in the affected area until notified to resume work. Work is to continue in unaffected portions of the site.

3.6.3.8 Excavation shall not be conducted during periods of inclement weather (i.e., rain or snow events).

3.6.3.9 The Contractor shall stockpile all excavated soils in accordance with these specifications pending off-site transport and disposal.

3.6.3.10 The Contractor shall record the volume of material excavated and report this volume to the Army as part of the weekly reports required in these specifications.

3.6.3.11 The Contractor shall carefully set the excavation rate in areas with high concentration of volatile organics in order to control the volatile organic emissions. The Contractor shall include excavation procedures for the high concentration areas in the workplan.

3.6.3.12 The Contractor shall prepare a drawing that documents the extent of the excavations.

3.6.4 Backfilling

The Contractor will provide all labor, material and equipment needed to backfill the completed excavations. Additional details pertinent to the completion of the backfill operations are provided below.

3.6.4.1 The Contractor shall backfill excavation with certified, clean backfill. The backfill shall come either from an off-site facility or from a location on-site. The Contractor shall provide documentation that certifies that the material used as backfill is clean and free of undesirable substances including debris, rubble, wood, chemicals, etc. The documentation shall include laboratory testing results of soil samples collected from the borrow pit and a description of the location of the borrow pit.

3.6.4.2 Testing results of the soil samples from each borrow pit must be submitted and approval prior to the use of any material as backfill. At least one sample shall be collected from each borrow pit and analyzed for the following parameters:

- TAL Metals
- Explosives
- TCL Organic compounds (volatile and semi-volatiles)
- PCB/Pesticides

Analytical results shall be compared to the NYSDEC TAGMs to determine whether the backfill is clean, and suitable for use as backfill.

3.6.4.3 The Contractor shall visually inspect each load of backfill to assure that the material is similar to the material that was sampled in the borrow pit and tested. Also, the Contractor shall collect grab samples from three truck of fill each day and check the head space of the samples for volatile organic compounds. The material from the truck may not be backfill until the results of the headspace analysis is complete.

3.6.4.4 Satisfactory off-site borrow materials for use as backfill shall be selected from materials designated as GW – Gravel, well graded; GM – Gravels, mixed, non plastic, fines; GC – Gravels, clayey-plastic, fines; SW – Sands, well graded; SM – Sands, mixed-plastic, fines; or SC – Sands, clayey-plastic, fines in ASTM D 2487 "*Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)*". The selected backfill shall be free of roots and other organic matter, trash, debris, frozen materials, and stones larger than 3 inches in any dimension. Any material classified as SM shall not have more than 25 percent by weight passing the No. 200 sieve.

3.6.4.5 The Contractor shall not backfill an excavation if standing water is present in the excavation. The water either shall be allowed to naturally infiltrate through the base of the excavation or shall be pump from the excavation and treated prior to disposal.

3.6.4.6 All material backfilled into the excavation shall be compacted enough to support the construction traffic. The final grading plan shall allow for proper drainage after any estimated subsidence of the backfilled material has taken place.

3.7 DISPOSAL

3.7.1 DISPOSAL OF CONTAMINATED SOIL

The Contractor shall provide all labor, material, and equipment necessary to dispose of the contaminated soil. All disposal operations will be completed in accordance with prevailing environmental statues, laws, and regulations. This section describes the disposal requirements for all soils residue, and decontamination residuals generated as part of this removal action.

3.7.1.1 SEDA and the Army shall be identified as the Generator of all project-derived wastes (excavated soil, wastewater, PPE and miscellaneous debris – e.g., tarps and plastic sheeting). The Contractor shall be identified as the Generator of any waste resulting due to the release of a hazardous material from his equipment or resulting from improper use of chemical materials at the site.

3.7.1.2 The Contractor shall comply with all applicable federal, state, and local regulations. At a minimum, the Contractor shall identify and comply with all hazardous and solid waste, and transportation requirements.

3.7.1.3 The Contractor shall be responsible for determining whether the waste residuals generated from the excavation processes are hazardous wastes. Wastes include any excavated soil, waste oils or lubricants, hydraulic fluids, coolants, plastic sheeting, used personnel protection equipment and other miscellaneous debris.

3.7.1.4 The Contractor shall specify analytical determinations that shall be performed to assess the nature of the contamination contained in all excavated soils and other wastes generated during the identified removal actions.

3.7.1.5 The Contractor shall collect, secure analytical services and obtain results from a state certified laboratory identifying the contents of all generated waste streams resulting from the removal action. The Contractor shall provide the generated data to the Army and to the proposed disposal facility for review.

3.7.1.6 The Contractor shall obtain approval from the Army of all off-site disposal facilities that are selected to receive wastes from SEDA.

3.7.1.7 All waste shall be disposed off-site at a permitted waste treatment storage and disposal facility.

3.7.1.8 The Contractor shall transport all generated waste materials from the removal actions from the site of the excavation and on-site stockpiles to the selected disposal site. All waste transportation will be completed following procedures that are necessary to document the transfer of the waste from SEDA, over public roads, to the approved disposal site.

3.7.1.9 At a minimum, the contractor will document the quantity and type of waste materials moved from SEDA each day to an approved disposal site. At a minimum, collected records shall include a listing of all quantities and types of wastes transported. If necessary, bills of lading and hazardous waste manifests will be prepared and entered into the project files to document the transportation to and disposal of materials at off-site licensed and approved landfills.

3.7.2 TREATMENT OF WATER

3.7.2.1 The Contractor shall store all wastewater in portable tanks appropriate for managing wastewater. The Contractor shall ensure that the tanks used have been constructed in accordance with all applicable codes and standards. The Contractor shall visually inspect all tanks for leaks and shall replace all leaking tanks.

3.7.2.2 The Contractor shall treat all wastewater on site using either an air stripper column or an activated charcoal system and shall discharge the treated water in accordance with the approved discharge permit.

3.7.2.3 Following treatment of wastewater, the Contractor shall discharge all treated waters from this removal action including groundwater to a nearby drainage ditch. The Contractor shall include in the site plans all specific testing requirements for this discharge permit, and shall be responsible for meeting these testing requirements.

3.8 DRAINAGE CONTROL

3.8.1 RUNON CONTROL

The Contractor shall implement and maintain, for the duration of the removal action, run on control measures to prevent non-excavation related and non-contaminated surface water from entering the work areas of the site. These measures shall consist of berms and ditches, as are necessary, that redirect the flow of surface water around the excavation site to the historic surface water discharge points.

3.8.2 RUNOFF CONTROL

The Contractor shall implement and maintain, for the duration of the removal action, measures to prevent surface water from leaving the area of the excavation sites or stockpiles. These measures shall include berms or ditches that capture surface water in the work area for subsequent testing and disposal. The Contractor shall construct berms around all staging areas to prevent runoff from the stockpiled materials. Any collected runoff from the staging areas shall be collected and disposed of in accordance with the requirements of these specifications.

3.8.3 EXCAVATION DRAINAGE

The Contractor shall provide pumps, hoses, and any other equipment necessary to remove accumulated water from the open excavation. The Contractor shall be required to remove water from the excavation when necessary to continue excavation activities, or if a safety threat exists. The water from the excavation shall be collected and treated in accordance with the requirements of these specifications.

3.9 EROSION/DUST CONTROL

3.9.1 EROSION CONTROL

The Contractor shall provide the materials and labor required to control erosion of soils originating from the site. These measures may include limiting the exposure area, haybales and silt fences or berms.

3.9.2 DUST CONTROL

The Contractor shall take necessary measures, in addition to those required by federal, state, and local regulations, to eliminate or minimize the migration of dust off site due to site activities. At a minimum, the Contractor shall follow the requirements of the NYSDEC TAGM HWR-89-4031, "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites," October, 27, 1989 (or most recent version) and the monitoring requirements in these specifications.

3.10 AIR MONITORING AND ACTION LEVELS

3.10.1 GENERAL

The Contractor shall monitor the emissions from the excavations and soil staging areas to assure compliance with all federal, state, and local regulations. Monitoring shall be conducted in accordance with the NYSDEC TAGM, "Fugitive Dust Suppression and Particulate Monitoring at Inactive Hazardous Waste Sites," October 27, 1989 (or most recent version), and with the New York State Department of Health "Community Air Monitoring Plan."

3.10.2 CALIBRATION

The Contractor shall calibrate all air monitoring equipment weekly in accordance with the manufacturer's instructions, and shall maintain records of all calibrations. These records shall be made available to the Army's representative or to the regulators upon request.

3.11 CONFIRMATORY SAMPLING AND ANALYSIS

3.11.1 GENERAL

Confirmatory sampling shall be performed by the Oversight Contractor and the Contractor to verify the successful removal of soils containing petroleum hydrocarbon contaminants. The Oversight Contractor shall be responsible for confirmatory sampling and analysis in the excavations. This section describes the requirements for confirmatory sampling and analysis.

3.11.2 SAMPLING LOCATIONS

3.11.2.1 Soil

The Oversight Contractor shall collect confirmatory soil samples from the perimeter of excavations and the bottom of the excavations to confirm that the performance standards have been met. These samples shall be analyzed for the volatile and semivolatile organic compounds..

3.11.2.2 Wastewater

The Contractor shall collect samples of the wastewater resulting from all site operations, including excavation dewatering, precipitation onto contaminated soil stockpiles, and spent washwater to ensure proper treatment and disposal.

3.11.3 SAMPLING AND ANALYSIS

3.11.3.1 Sample Locations, Frequency, and Types

3.11.3.1.1 Soil

The excavation limits shown in **Figures 1** through **5** shall be considered as preliminary and subject to change. Confirmatory soil samples shall be collected from the perimeters and bottoms of the excavations. One sample will be collected for every 500 square feet of excavation bottom or at least one per excavation and one sample from every 200 feet of excavation perimeter or at least one per wall. These samples shall be analyzed for volatile organics and semi-volatile organics. If these samples indicate that additional contaminated soils still remains at the site then additional soil will be excavated until subsequent testing confirms that all impacted soil has been excavated.

3.11.3.1.2 Wastewater

Samples of wastewater shall be collected as necessary to ensure proper treatment and discharge of the wastewater.

3.11.3.2 Sampling Equipment Decontamination

The Contractor shall use disposable sampling equipment wherever possible to minimize decontamination requirements. When reusable equipment is used, the Contractor shall decontaminate all equipment prior to use in sampling. The decontamination procedure shall consist of successive washes in the following order:

- Potable water rinse
- Wash with laboratory grade detergent (Alconox or equivalent)
- Distilled water rinse
- Methanol rinse
- Hexane rinse
- Distilled water rinse

If samples are to be analyzed for metals, a nitric acid rinse and an additional distilled water rinse will be added between steps 3 and 4. All decontamination wastes shall be disposed of off-site as hazardous waste.

3.11.3.3 Sample Volumes, Containers, and Preservation

The Contractor shall ensure that all sample containers, preservation, packaging, and holding times are in accordance with EPA Region 2 and NYSDEC protocols. All samples collected shall be properly logged, labeled, packaged, and stored in an iced cooler immediately after collection and until arrival at the laboratory. All samples will be accompanied by a completed chain-of-custody form which can be used to document sample custody.

3.11.3.4 Laboratory Analyses

All soil samples shall be analyzed for volatile and semi-volatile organic compounds using NYSDEC Analytical Services Protocols (ASP). Results from the soil samples will be compared to NYSDEC reference values that must be satisfied to be considered acceptably remediated or not sufficiently contaminated. Key criteria include 1) protection of the groundwater; 2) protection of human health; 3) protection of fish and wildlife and the environment in which they live; and 4) protection against objectionable nuisance. Soil samples shall be analyzed using EPA SW-846 Method 1311 (for leachability), 8021 for volatiles, and 8270 for semivolatiles. The Contractor shall ensure that the laboratory is capable of providing reporting limits below the soil cleanup levels so that reported non-detect values may be compared to the cleanup levels. Specific details of the required analyses are provided in the Spill Technology and Remediation Series (STARS) Memo #1 which is provided in Appendix G. The Contractor shall ensure that the selected laboratory has been approved by NYSDEC and the Corps of Engineers, Missouri River Division.

3.12 DEMOBILIZATION AND SITE RESTORATION

3.12.1 DEMOBILIZATION

Following completion and acceptance of the work by the Contracting Officer, the Contractor shall provide all Contractor and subcontractor labor and materials required to decontaminate, dismantle, package, and transport from the site all Contractor or subcontractor equipment, materials, and personnel. Demobilization will not be complete until site restoration is complete.

3.12.2 REMOVAL

At the completion of the removal actions, the Contractor shall remove all temporary facilities, utility services, and debris, unless otherwise directed by the Army's representative. The Contractor shall restore the area in accordance with these specifications.

3.12.3 SITE RESTORATION

3.12.3.1 General

The Contractor shall restore the sites to their original condition except as described in these specifications or as directed by the Army.

3.12.3.2 Regrading

The Contractor shall grade the excavation sites to approximate the original site conditions. As necessary, the Contractor shall bring in documented clean fill to make up for any volume losses. The Contractor shall also grade the sites to minimize erosion during the revegetation period.

3.12.3.3 Revegetation

The Contractor shall revegetate the sites using grass seed upon completion of the backfill operations and demobilization. The Contractor shall revegetate the backfilled excavations and all work areas in which site work has killed off the vegetation.

3.12.3.4 Materials

3.12.3.4.1 Fill

Satisfactory materials for use as fill shall be materials classified in ASTM D 2487 as GW, GM, GC, SW, SM, SC and shall be free from roots and other organic matter, trash, debris, frozen materials, and stores larger than 3 inches in any dimension. Any material classified as SM shall have not more than 25 percent by weight passing the No. 200 sieve.

3.12.3.4.2 Topsoil

Topsoil shall be fertile, natural fraible, silty soil, with characteristics of typical soil in the vicinity that produces heavy crops, grass and other vegetation, obtained from naturally well-drained areas. The topsoil shall be reasonably free from subsoil, weeds and other vegetation and from clay lumps or stones. Soil shall have a pH between 5.5 to 7.6. The Contractor shall have representative topsoil samples test by a soil-test chemist and a copy of the test and recommendations for additives shall be furnished to the site representative prior to commencing work. Quantity given for the following materials used for conditioning and seeding will be adjusted as required by the soil chemist recommendations.

3.12.3.4.3 Limestone

Limestone shall consist of ground calcareous or dolomitic limestone, 95% to pass a No. 20 sieve and at least 50% to pass a No. 100 sieve. Limestone shall conform to the standards of the American Association of Analytical Chemists, and be marked in accordance with the appropriate Federal and state laws relating to commercial fertilizers.

3.12.3.4.4 Fertilizer

Fertilizer shall be applied in granular dry form and shall be a slow-release type product specifically designed for starting grass seed. The chemical analysis shall be (approximately) 15-10-10 applied at the rate designated by the soil-test chemist. The fertilizer shall conform to the requirements of the appropriate Federal and sate laws relating to commercial fertilizers, and be delivered dry in original, unopened containers bearing the manufacturer's guaranteed analysis.

3.12.3.4.5 Grass Seed

Grass seed shall meet the requirements of the appropriate state and Federal agricultural and vegetable seed laws. Grass seed shall contain Kentucky Blue, Red Top, Fescue and Creeping Bent. Red Top shall not exceed 20% of the mixture. Alternate types of permanent seed mixtures of equal quality may be used, if in the opinion of the Contractor's soil-chemist they are more suitable to the local climate and conditions provided that 80% of permanent grasses and not clover is used in any traffic areas. Weeds and inert material shall not exceed 2%.

3.12.3.4.6 Mulch

Mulch shall consist of hay mulch or straw mulch.

3.12.3.5 Application

3.12.3.5.1 Topsoil

The areas to be topsoiled shall be rough graded to the appropriate required sub-grades and shall be maintained in a true and even condition. Finish grading shall include any necessary repairs to previously rough graded areas. Immediately prior to dumping and spreading the topsoil, the sub-grade, wherever compacted by traffic or other causes, shall be loosened by disking or scarifying to a depth of at least two inches to permit bonding of the topsoil to the sub-grade. Topsoil shall be spread evenly to a compacted thickness of 6 inches over all required areas and shall be rolled and raked until it is clean and free from irregularities, and is at the finished grades. Topsoil shall not be placed on frozen, excessively wet or dry sub-grade.

3.12.3.5.2 Fertilizer and Limestone

After the topsoil has been spread to the required thickness, ground limestone shall be distributed uniformly over the topsoil at a rate of 5 pounds per 100 square feet. After disking in of the ground limestone, fertilizer shall be spread at a rate of 2 pounds per 100 square feet or as recommended by the soil chemist. Subsequent to liming and fertilization, the topsoil areas shall be scarified by disking in two directions at right angles to each other, or by other approved methods, in such a manner that the topsoil will be thoroughly incorporated into the top two inches of the subgrade. Prior to seeding, the surface of the topsoil shall be raked free of all stones and other objectionable material.

3.12.3.5.3 Grass Seed

No seeding shall be done during windy weather or when the ground is frozen, wet or otherwise non-tillable. As soon as the seed is sown, it shall be thoroughly covered with a thin layer of topsoil by raking, harrowing or dragging. The areas shall be uniformly seeded using not less than 4 pounds per 100 square yards of area. The seed shall be raked in lightly and rolled with a light roller.

3.12.3.6 Maintenance

Seeded areas shall be protected and maintained by watering, mowing and replanting as necessary for at least 30 days and as much longer as is necessary to establish a uniform stand of the specified grasses and until acceptance. The Contractor shall be responsible for the watering of all seeded areas that shall be kept moist. The Army's representative's decision will prevail in the event a dispute develops with the Contractor as to whether or not the seeded and grassed areas are moist. Seeded areas on which growth has started shall be watered to a minimum depth of two inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment. Prior to acceptance of the project, the Contractor will be responsible for mowing the grass on all flat or rolling slopes from level, to and including 4 to 1 slopes to a height of 2" when the grass has attained a height of 3". The grass on all slopes steeper than 4 to 1 shall be cut to a height of 2" at such time as a stable turf has been established in the judgement of the Army's representative. Seeded areas shall be cut at least 3 times; none of which shall be closer than ten (10) days apart. The Contractor shall cut and maintain the lawn and field areas until they are judged by the Army's representative to be at least 95% satisfactory.

3.13 DOCUMENTATION/RECORDKEEPING

3.13.1 DAILY LOGS

The Contractor shall maintain daily logs that include the quantities of the soil excavated and treated the previous day and copies of all analytical data received the previous day. The daily logs will also include any air monitoring results obtained the previous day and the volume of water treated the previous day.

3.13.2 WEEKLY REPORTS

The Contractor shall submit weekly reports each Monday morning to the Contracting Officer or his representative. The weekly reports shall summarize the daily logs from the previous week, and address administrative issues. Topics which should be included in the weekly report are:

- A summary of the work completed.
- A discussion of the work planned for the upcoming week period.
- A review of problems that arose during the previous week and the resolution to each item.
- Documentation of health and safety meetings
- A review of health and safety issues
- Site visitor logs

The requirements for the final report are presented in Appendix D and Appendix E.

3.13.3 FINAL REPORT

The Contractor shall submit a final report to the Contracting Officer or his representatives within 30 days of demobilization. The report shall summarize all the daily logs and weekly reports, and provide tabular summaries of all data collected during the removal action. The final report shall include copies of all analytical data, visitor logs, air monitoring data, shipping forms, manifests, and description of all problems and problem resolutions. The final report shall include a project record drawing which shows the extent of the excavations and clearly indicates the locations of all samples collected to verify the extent of the excavation. The requirements for the final report ispresented in Appendix D and Appendix E.

3.14 PERFORMANCE SCHEDULE

3.14.1 The Contractor shall complete each of the project tasks within the time frame presented in the Contract Data Requirements List, shown in Appendix D.

3.15 DELIVERABLE DATA

3.15.1 The Contractor shall prepare and submit a CDAP in accordance with ER 1110-1-263 and DD Forms 1423 and 1664-1.

3.15.2 The Contractor shall prepare and submit a written certification of the HSP in accordance with DD Forms 1423 and 1664-1.

3.15.3 The Contractor shall prepare and submit an SSHP in accordance with DD Forms 1423 and 1664-1.

3.15.4 The Contractor shall prepare and submit a Work Plan in accordance with DD Forms 1423 and 1664-1.

3.15.5 The Contractor shall prepare and submit weekly progress reports in accordance with DD Forms 1423 and 1664-1.

3.15.6 The Contractor shall prepare and submit a Final Report at the conclusion of the treatment period in accordance with DD Forms 1423 and 1664-1.

3.15.7 The Contractor shall submit all deliverable data to the Contracting Officer or his representatives. The Contracting Officer or his representatives will review the submissions to determine whether they meet the minimum contract requirements and will accept or reject them accordingly. The Contractor shall correct the deficiencies of the rejected deliverables and resubmit them within 30 days of rejection. The Contracting Officer's acceptance of any submittal does not constitute or imply approval or endorsement, and in no way relieves the Contractor of his responsibility to meet all the requirements of this document.

3.16 ADDRESSES

3.16.1 Deliverables shall be distributed to the following addresses in the quantities shown.

	Quantities Required
Commander U.S. Army Corps of Engineers Huntsville Division ATTN: CEHNC-OE-DC (Major David Sheets) Huntsville, AL 35816	3
Commander U.S. Army Center for Health Promotion and Preventative Medicine Agency ATTN: HSHB-ME-S (Mr. Keith Hoddinott) Aberdeen Proving Ground, MD 21010-5422	3
Seneca Army Depot Activity ATTN: Engineering and Environmental Office (Mr. Steve Absolom) Romulus, NY 14541	2
U.S. Army Corps of Engineers New York District ATTN: CENAN-PP-M (Mr. Randall Battaglia) Building 125 5786 State Rt. 96 Romulus, NY 14541	3
Commander U.S. Army Environmental Center ATTN: SFOM-AEC-ERO (Mr. Clayton Kim) 5179 Hoadley Road Aberdeen Proving Ground, MD 21010-5401	2

3.17 REFERENCES

U.S. Army Corps of Engineers, Huntsville Division, Manual No. HNDM 1110-1-1, Design Manual for Architect-Engineer, August 1986.

Engineering-Science, Inc., "Solid Waste Management Unit Classification Report", September, 1994.

Engineering-Science, Inc., "Draft Expanded Site Inspection Seven High Priority SWMUs" June 1994.

United States Army Environmental Hygiene Agency (USAEHA), 1987, Evaluation of Solid Waste Management Units, Seneca Army Depot, Interim Final Report, Groundwater Contamination Survey, No. 38-26-0868-88.

United States Army Toxic and Hazardous Materials Agency (USATHAMA), 1989, Remedial Investigations Feasibility Studies, Seneca Army Depot Ash Landfill.

United States Army Toxic and Hazardous Materials Agency (USATHAMA), 1980, Installation Assessment of Seneca Army Depot, Report No. 157, AMXTH-IR-A-157, January 1980.

APPENDIX A

NEW YORK STATE DEPARTMENT OF HEALTH COMMUNITY AIR MONITORING PLAN

AND

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM FUGITIVE DUST SUPPRESSION AND PARTICULATE MONITORING AT INACTIVE HAZARDOUS WASTE SITES

New York State Department of Environmental Conservation

TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM #4031

FUGITIVE DUST SUPPRESSION AND PARTICULATE MONITORING PROGRAM AT INACTIVE HAZARDOUS WASTE SITES

TO: Regional Hazardous Waste Remediation Engrs., Bur. Directors & Section Chiefs

FROM: Michael J. O'Toole, Jr., Director, Division of Hazardous Waste Remediation

SUBJECT: DIVISION TECHNICAL AND ADMINISTRATIVE GUIDANCE MEMORANDUM -- FUGITIVE DUST SUPRESSION AND PARTICULATE MONITORING PROGRAM AT INACTIVE HAZARDOUS WASTE SITES

DATE: Oct 27, 1989

Michael J. O'Toole, Jr. (signed)

1. Introduction

Fugitive dust suppression, particulate monitoring, and subsequent action levels for such must be used and applied consistently during remedial activities at hazardous waste sites. This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

2. Background

Fugitive dust is particulate matter--a generic term for a broad class of chemically and physically diverse substances that exist as discrete particles, liquid droplets or solids, over a wide range of sizes--which becomes airborne and contributes to air quality as a nuisance and threat to human health and the environment.

On July 1, 1987, the United States Environmental Protection Agency (USEPA) revised the ambient air quality standard for particulates so as to reflect direct impact on human health by setting the standard for particulate matter less than ten microns in diameter (PM_{10}); this involves fugitive dust whether contaminated or not. Based upon an examination of air quality composition, respiratory tract deposition, and health effects, PM_{10} is considered conservative for the primary standard--that requisite to protect public health with an adequate margin of safety. The primary standards are 150 ug/m^3 over a 24-hour averaging time and 50 ug/m^3 over an annual averaging time. Both of these standards are to be averaged arithmetically.

There exists real-time monitoring equipment available to measure PM_{10} and capable of integrating over a period of six seconds to ten hours. Combined with an adequate fugitive dust suppression program, such equipment will aid in preventing the off-site migration of contaminated soil. It will also protect both on-site personnel from exposure to high levels of dust and the public around the site from any exposure to any dust. While specifically intended for the protection of on-site personnel as well as the public, this program is not meant to replace long-term monitoring which may be required given the contaminants inherent to the site and its air quality.

3. Guidance

A program for suppressing fugitive dust and monitoring particulate matter at hazardous waste sites can be developed without placing an undue burden on remedial activities while still being protective of health and environment. Since the responsibility for implementing this program ultimately will fall on the party performing the work, these procedures must be incorporated into appropriate work plans. The following fugitive dust suppression and particulate monitoring program will be employed at hazardous waste sites during construction and other activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Such activities shall also include the excavation, grading, or placement of clean fill, and control measures therefore should be considered.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM_{10}) with the following minimum performance standards:

   Object to be measured: Dust, Mists, Aerosols
   Size range: <0.1 to 10 microns
   Sensitivity: 0.001 mg/m^3
   Range: 0.001 to 10 mg/m^3
   Overall Accuracy: ±10% as compared to gravimetric analysis of stearic acid or reference dust

   Operating Conditions:
      Temperature: 0 to 40°C
      Humidity: 10 to 99% Relative Humidity

   Power: Battery operated with a minimum capacity of eight hours continuous operation

   Automatic alarms are suggested.

   Particulate levels will be monitored immediately downwind<u>at</u> the working site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall require necessary averaging hardware to accomplish this task; the P-5 Digital Dust Indicator as manufactured by MDA Scientific, Inc. or similar is appropriate.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the entity operating the equipment to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m^3 over the integrated period not to exceed 15 minutes. While conservative, this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m^3, the upwind background level must be measured immediately using the same portable monitor. If the working site particulate measurement is greater than 100 ug/m^3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see Paragraph 7). Should the action level of 150 ug/m^3 be exceeded, the Division of Air Resources must be notified in writing within five working days; the notification shall include a description of the control measures implemented to prevent further exceedences.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM_{10} at or above the action level. Since this situation has the potential to migrate contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

    1. Applying water on haul roads.
    2. Wetting equipment and excavation faces.
    3. Spraying water on buckets during excavation and dumping.
    4. Hauling materials in properly tarped or watertight containers.
    5. Restricting vehicle speeds to 10 mph.
    6. Covering excavated areas and material after excavation activity ceases.
    7. Reducing the excavation size and/or number of excavations.

    Experience has shown that utilizing the above-mentioned dust suppression techniques, within reason as not to create excess water which would result in unacceptable wet conditions, the chance of exceeding the 150 ug/m^3 action level at hazardous waste site remediations is remote. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. If the dust suppression techniques being utilized at the site do not lower particulates to an acceptable level (that is, below 150 ug/m^3 and no visible dust), work must be suspended until appropriate corrective measures are approved to remedy the situation. Also, the evaluation of weather conditions will be necessary for proper fugitive dust control--when extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended.

There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require appropriate toxics monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX B

ER 385-1-92 SAFETY AND HEALTH ELEMENTS FOR HTRW DOCUMENTS

APPENDIX B

Safety and Health Elements For HTRW Documents

1. Site Description and Contamination Characterization.

a. Describe the site location, topography, approximate size of the site, the onsite jobs/tasks to be performed, and the duration of planned site activities.

b. Compile a complete list of the contaminants found or known to be present in site areas to be impacted by work performed. Compilation of this listing shall be based on results of previous studies; or, if not available, select the likely contaminants based on site history and prior site uses/activities. Include chemical names, concentration ranges, media in which found, locations on-site, and estimated quantities/volumes to be impacted by site work.

2. Hazard/Risk Analysis.

a. Identify the chemical, physical (including radiological), biological, and safety hazards of concern for each site task and/or operation to be performed. Selection of chemicals as indicators of hazards shall be based upon media concentrations (i.e., air, water, soil), toxicity, volatility or risk potential for air entrainment at hazardous levels, and frequency of detection.

b. Describe chemical and physical properties of selected contaminants, sources and pathways of employee exposures, anticipated on- and off-site exposure level potentials, and regulatory (including Federal, State, and Local governments) or recommended protective exposure standards.

c. Specify and justify "action levels" based upon airborne exposure hazards and direct skin contact potentials for upgrades/downgrades in levels of personnel protection; for implementation of engineering and/or work practice controls; for emergency evacuation of on-site personnel; and for the prevention and/or minimization of public exposures to hazards created by site activities. Exposure monitoring/air sampling shall be performed in accordance with paragraph 8 below, resulting data compared with established "action levels," and appropriate corrective actions initiated as necessary.

3. Accident Prevention.

a. Any additional Accident Prevention Plan topics required by EM 385-1-1, but not specifically covered elsewhere in these elements, shall be addressed.

b. Daily safety and health inspections shall be conducted to determine if operations are being performed in accordance with the SSHP, USACE and OSHA regulations, and contract requirements.

c. In the event of an accident/incident, the CO (or approving authority for in-house USACE activities) shall be notified according to EM 385-1-1, Section 2. Within two (2) working days of any reportable accident, the contractor (or responsible USACE supervisor for in-house USACE activities) shall complete and submit an Accident Report on ENG Form 3394 in accordance with AR 385-40 and USACE Supplements to that regulation.

4. Staff Organization, Qualifications, and Responsibilities.

a. Discuss the organizational structure, including lines of authority (chain of command), and overall responsibilities of the contractor and all subcontractors for site activities, including supervisor/employee relationships.

b. Summarize the operational and health and safety responsibilities, and qualifications of each key person identified.

(1) Specifically, a Certified Industrial Hygienist (CIH) with experience in the hazardous waste site operations shall be responsible for the development, implementation, and oversight of the contractor's Safety and Health Program (SHP) and Site Safety and Health Plan (SSHP). The SSHP shall be signed and dated by the CIH prior to submittal. (For in-house USACE activities, this responsibility shall be undertaken by qualified USACE industrial hygiene personnel at the geographic Major Subordinate Command/ District Command performing the work.)

(2) A fully trained and experienced Site Safety and Health Officer (SSHO), responsible to the contractor and the CIH (or the USACE approving authority), may be delegated to implement and continually enforce the safety and health program and site-specific plan elements on-site.

(3) At least one person currently certified in Standard First Aid/CPR by the American Red Cross or equivalent agency, according to EM 385-1-1, Section 4, shall be present on-site at all times during site operations.

per Bob Stout 10/2 --

5. Training.

a. All personnel performing on-site work activities wherein they may be exposed to safety or health hazards resulting from hazardous waste operations shall have completed applicable training in compliance with 29 CFR 1910.120(e).

b. Prior to conducting on-site HTRW activities, all USACE and contractor personnel shall successfully complete a 40 hour HTRW health and safety training course to be followed by an 8-hour annual refresher and/or an 8-hour supervisors course as mandated in OSHA (29 CFR 1910.120) and this regulation.

c. In addition, site-specific training covering site hazards, procedures, and all contents of the approved SSHP shall be conducted by the SSHO for on-site employees and visitors prior to commencement of work or entering the site.

d. The type (including initial, supervisory, refresher, and site-specific), duration, and dates of all employee training performed shall be listed by employee name and certified in the SSHP.

6. Personal Protective Equipment (PPE).

a. A written Personal Protective Equipment (PPE) program in accordance with 29 CFR 1910.120(g)(5) and the respiratory protection requirements of 29 CFR 1910.134 is required.

b. Provide a detailed description of the minimum PPE (including respirators) and specific materials from which the PPE components are constructed for each site-specific task/operation to be performed, based upon the hazard/risk analysis performed above. Component levels of protection (A,B,C,D and modifications) must be relevant to site-specific conditions, including potential heat stress and associated PPE safety hazards.

c. Provide site-specific procedures to determine PPE program effectiveness and for on-site fit-testing of respirators, proper cleaning, maintenance, inspection, and storage of all PPE.

7. Medical Surveillance.

a. All personnel performing on-site work activities wherein they may be exposed to safety or health hazards resulting from hazardous waste operations shall be participants in an ongoing medical surveillance program, meeting the requirements of 29 CFR 1910.120(f) and ANSI Z-88.2.

b. All medical surveillance protocols and examination results shall be reviewed by a licensed physician who is certified in Occupational Medicine or who, by necessary training and experience, is considered Board-eligible by the American Board of Preventive Medicine Incorporated.

c. In consultation with such an occupational physician, and based upon probable site conditions, potential occupational exposures and required protective equipment, specify minimum content and frequencies of necessary medical tests/examinations/consultations.

d. Certification of participation in the medical surveillance program, the date of last examination, and name of reviewing occupational physician shall also be included for each affected employee in the SSHP.

e. The written medical opinion from the attending physician required by 29 CFR 1910.120(f)(7) shall be made available upon request to the CO or approving authority for any site employee.

8. Exposure Monitoring/Air Sampling Program.

a. Where it has been determined that there may be potential employee exposures to and/or off-site migration of hazardous concentrations of airborne substances, appropriate direct-reading (real-time) air monitoring and time-integrated (time-weighted average (TWA)) air sampling shall be conducted in accordance with applicable regulations (OSHA, EPA, State). Air monitoring and air sampling must accurately represent concentrations of airborne contaminants encountered on, and leaving, the site.

b. Sampling and analytical methods following NIOSH criteria (for on-site personnel) and EPA criteria (for site perimeter or off-site locations) shall be appropriately utilized.

c. Personnel samples shall be analyzed only by laboratories successfully participating, in and meeting the requirements of the American Industrial Hygiene Association's (AIHA) Proficiency Analytical Testing (PAT) or Laboratory Accreditation programs.

d. Meteorological monitoring shall be performed on-site and used as an adjunct in determining perimeter and any off-site monitoring locations. Where perimeter monitoring/sampling is not deemed necessary, a suitable justification for its exclusion should be provided.

e. Noise monitoring and radiation monitoring (alpha, beta, gamma) shall be conducted as needed, depending on the site hazard assessment.

f. All monitoring/sampling results shall be compared to "action levels" established pursuant to paragraph 2. above to determine acceptability and need for corrective action.

9. Heat/Cold Stress Monitoring.

a. Heat and/or cold stress monitoring protocols shall be specified and implemented, as appropriate.

b. Work/rest schedules shall be developed by measurement of ambient temperature, humidity, wind speed (wind chill), solar radiation intensity, duration and intensity of work, and level of protective equipment.

c. Minimum required physiological monitoring protocols which will affect work schedules shall be developed.

d. In cases where impervious clothing is worn (i.e., full-body protective clothing), the NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" protocol for prevention of heat stress shall be followed, and heat stress monitoring shall commence at temperatures of 70 degrees Fahrenheit and above. Where impervious clothing is not worn, the most current published ACGIH heat stress standard (TLV) shall be used. For cold stress monitoring to help prevent frostbite and hypothermia, the most current published ACGIH cold stress standard shall be referenced and followed, as a minimum.

10. Standard Operating Safety Procedures, Engineering Controls and Work Practices. Address, as appropriate:

a. Site rules/prohibitions (buddy system, eat/drink/ smoking restrictions, etc.).

b. Material handling procedures (soils, liquids, radioactive materials).

c. Drum/container handling procedures and precautions (opening, sampling, overpacking).

d. Confined space entry procedures.

e. Hot-work, sources of ignition, fire protection/prevention, and electrical safety (ground-fault protection, overhead power line avoidance, etc.).

f. Excavation safety.

g. Guarding of machinery and equipment.

h. Fall protection.

i. Hazard Communication.

j. Illumination.

k. Sanitation.

l. Engineering controls.

11. Site Control Measures.

a. Include a site map.

b. Delineate work zones and their access points. Work zone delineation (Exclusion Zone, Contamination Reduction Zone, Support Zone) shall be based upon the contamination characterization data and the hazard/risk analysis to be performed under paragraphs 1 and 2 above.

c. Describe on-site and off-site communications.

d. Describe site security (physical and procedural).

e. Describe general site access.

12. Personal Hygiene and Decontamination.

a. Specify necessary facilities and their locations.

b. Provide detailed standard operating procedures, for frequencies, supplies and materials to accomplish decontamination of site personel.

13. Equipment Decontamination.

a. Specify necessary facilities, equipment, and their locations.

b. Provide detailed procedures, frequencies, supplies and materials, and methods to determine adequacy for the decontamination of equipment used on-site.

14. Emergency Equipment and First Aid Requirements. The following items, as a minimum and as appropriate, shall be immediately available for on-site use:

a. First aid equipment and supplies approved by the consulting physician.

b. Emergency eyewashes/showers (per ANSI Z-358.1).

c. Emergency-use respirators, i.e., escape: 5 - 15 minute emergency escape mask with air bottle; rescue: positive pressure self-contained breathing apparatus (SCBA).

d. Spill control materials and equipment.

e. Fire extinguishers (specify type, size, locations).

15. Emergency Response and Contingency Procedures (On-Site and Off-Site).

a. Local fire/police/rescue authorities having jurisdiction and nearby medical facilities that would be utilized for emergency treatment of injured personnel shall be contacted in order to notify them of upcoming site activities and potential emergency situations, to ascertain their response capabilities, and to obtain a response commitment.

b. An Emergency Response Plan, which complies with 29 CFR 1910.120(l), and which, as a minimum, addresses the following elements, shall be developed and implemented:

(1) Pre-emergency planning and procedures for reporting incidents to appropriate government agencies for potential chemical exposures, personal injuries, fires/explosions, environmental spills and releases, discovery of radioactive materials.

(2) Personnel roles, lines of authority, communications.

(3) Posted instructions and list of emergency contacts: physician/nearby medical facility, fire and police departments, ambulance service, state/local/federal environmental agencies, CIH, Contracting Officer, (approving authority for in-house activities.

(4) Emergency recognition and prevention.

(5) Site topography, layout, and prevailing weather conditions.

(6) Criteria and procedures for site evacuation (emergency alerting procedures/employee alarm system, emergency PPE and equipment, safe distances, places of refuge, evacuation routes, site security and control).

(7) Specific procedures for decontamination and medical treatment of injured personnel.

(8) Route maps to nearest pre-notified medical facility.

(9) Criteria for initiating community alert program, contacts and responsibilities.

(10) Critique of emergency responses and follow-up.

16. Logs, Reports, and Recordkeeping.

a. The following logs, reports, and records shall be developed, retained, and submitted to the CO (or approving authority for in-house activities):

(1) Training logs (site-specific and visitor).

(2) Daily safety inspection logs (may be part of the Daily QC Reports).

(3) Equipment maintenance logs.

(4) Employee/visitor register.

(5) Environmental and personal exposure monitoring/sampling results.

b. All personnel exposure and medical monitoring records are to be maintained in accordance with applicable OSHA standards, 29 CFR 1910 and 1926.

APPENDIX C

ER-1110-1-263 ENGINEERING AND DESIGN CHEMICAL DATA QUALITY MANAGEMENT FOR HAZARDOUS WASTE REMEDIAL ACTION

DEPARTMENT OF THE ARMY
U. S. Army Corps of Engineers
Washington, DC 20314-1000

ER 1110-1-263

CEMP-RT

Regulation
No. 1110-1-263

1 October 1990

Engineering and Design
CHEMICAL DATA QUALITY MANAGEMENT FOR HAZARDOUS WASTE REMEDIAL ACTIVITIES

1. Purpose. This regulation prescribes Chemical Data Quality Management (CDQM) responsibilities and procedures for all chemical contamination investigative and remedial activities to assure that the analytical data obtained is of sufficient quality to meet intended usages within the project.

2. Applicability. This regulation applies to HQUSACE/OCE elements, major subordinate commands, districts, laboratories, and separate field operating activities.

3. References.

a. PL 98-212, Department of Defense (DOD) Appropriation Act, Fiscal Year 1984, Environmental Restoration, enacted 8 December 1983, and following legislation.

b. PL 96-510, Comprehensive Environmental Response, Compensation and Liability Act of 1980.

c. PL 99-499, Superfund Amendments and Reauthorization Act of 1986.

d. Interagency Agreement between the USACE and the U.S. Environmental Protection Agency (EPA) in executing PL 96-510, 10 February 1982, and following extensions or modifications.

e. EPA OSWER Directive 9355.3-01, Guidance for Conducting Remedial Investigations (RI) and Feasibility Studies (FS) Under CERCLA (Interim Final), October 1988.

f. EPA OSWER Directive 9355.0-4A, Superfund Remedial Design and Remedial Action Guidance, June 1986.

g. EPA OSWER Directive 9345.1-02, Expanded Site Inspection Transitional Guidance for FY 1988.

This regulation supersedes ER 1110-1-263 dated 30 December 1985

h. EPA 540/G-87/003, Data Quality Objectives for Remedial Response Activities, March 1987.

i. ER 1180-1-6.

j. ER 1110-1-261.

k. ER 415-1-11.

l. EP 1110-2-6.

4. Discussion.

a. The intent of this ER is to conduct CDQM activities in full compliance with all applicable federal and state regulatory requirements. Standard methods and procedures promulgated by the EPA and the American Society of Testing Materials (ASTM) will be followed when available and applicable. ASTM is developing a document entitled "Standard Practice for Generation of Environmental Data Related to Waste Management Activities". When finalized, the ASTM document is expected to be adopted by the EPA and the Industry as standard practice. Accordingly, this ER is intended to be in compliance with the ASTM standard.

b. The U.S. Army Toxic and Hazardous Material Agency (CETHA), now an FOA of USACE, has developed and is practicing a separate approach to CDQM activities. Insofar as the CETHA CDQM program meets the federal, state and ASTM requirements set forth above, the CETHA CDQM program may be utilized for activities CETHA independently executes.

5. General.

a. Hazardous waste programs under which USACE currently executes remedial activities include:

(1) EPA Superfund

(2) Defense Environmental Restoration Program (DERP)

(a) Installation Restoration Program (IRP) (Army, Air Force and Navy)

(b) Formerly Used Defense Sites (FUDS)

b. Chemical analysis of environmental samples is usually required during the following activities under the programs listed in the previous section.

(1) Preliminary Assessment (PA) and Site Inspection (SI)

(2) Remedial Investigation/Feasibility Study (RI/FS)

(3) Remedial Design (RD) and Pre-Design Activities

(4) Remedial Action (RA)

(5) Post Remedial Action Monitoring

c. Acquisition of chemical analytical data is an integral part of chemical contamination investigative and remedial activities. There are a multitude of purposes for which chemical analytical data are acquired; however, they generally can be divided into eight categories.

(1) Site investigation

(2) Health and safety; hazard assessment

(3) Determination of potential responsible parties

(4) Engineering decisions

(5) Construction contractor payment

(6) Post remedial action monitoring

(7) Legal support of government actions

(8) Determination of proper disposal

d. The purpose of CDQM is to insure that chemical analytical data, acquired during investigative, remedial and monitoring activities, are of sufficient quality to meet intended usages. Data quality depends not only on how carefully an analytical method is carried out, but also on the sample point selection, sampling procedures, sample integrity and analytical methods selected. Data quality objectives (DQO) will be defined in the scope of services or design specifications for contract services and in the Chemical Data Acquisition Plan (CDAP) for in-house work for which a scope of services is not generated.

e. CDQM during chemical contamination investigative, remedial ard monitoring activities includes roles for both the government (USACE) and its contractors. Planning and reporting CDQM documents/tasks required of USACE or its contractors are listed in Tables 1, 2, and 3 shown at Appendix A. An estimate of the time required to prepare and review each submittal is also included. Table 1 contains investigation activities, Table 2 design activities, and Table 3 construction activities. In most cases, investigation activities will be conducted by Architect-Engineer (AE) firms; however, the listed documents/tasks are pertinent to all activities in which both planning and execution are carried out under a single contract or by utilizing in-house government personnel. In contrast, the documents/tasks listed under design and construction activities are pertinent to all activities in which planning and execution are carried under separate contracts. Specific guidance for carrying out the tasks in Appendix A are found in Appendices B through F, and a glossary is provided in Appendix G.

6. Responsibilities.

a. The Environmental Restoration Division, Directorate of Military Programs, Headquarters (CEMP-R), is responsible for program management, technical oversight, and USACE policy and guidance development and dissemination.

b. The Investigation District or FOA is responsible for executing investigation activities for chemical contamination cleanup projects and informing the local district of their activity.

c. The Design District or FOA is responsible for executing design activities for chemical contamination projects and coordination with the local district throughout design.

d. The Construction District or FOA is responsible for executing construction chemical contamination remedial action projects within its geographical area. It is also responsible for cooperating with activities undertaken by other Investigation and Design Districts or FOA within its geographical area.

e. Divisions are responsible for monitoring and oversight of activities of their districts to assure that program policies and procedures are implemented.

f. CEMRD has primary responsibility for implementation of CDQM requirements for all aspects of HTW activities conducted in support of the Superfund, DERP, and non-mission HTW assignments. To execute this overall responsibility CEMRD is responsible for identifying shortfalls and drafting technical guidance; training; conducting selected technical reviews of documents and chemical data; coordinating review with CDQM personnel in other districts and divisions; providing technical assistance; receiving and analyzing quality assurance samples; evaluating contract laboratories; and validating USACE division laboratories to participate in the above activities. These responsibilities are discharged through the assigned tasks of the Chemical Review Branch (CEMRD-ED-GC) and the Missouri River Division Laboratory HTW Chemistry Unit (CEMRD-ED-GL), which is designated the lead USACE QA laboratory for HTW projects.

g. CEMRD has review and approval authority for all work brokered by CEMRD to other FOA until that authority is transferred to the parent division with the approval of HQUSACE.

h. The QA Laboratory is responsible for executing CDQM activities delegated to it through the procedures specified in the Appendix E, USACE Chemical Quality Assurance.

i. Additional definition of organizational responsibilities for CDQM activities is described in Tables 4, 5, and 6 shown at Appendix A.

ALBERT J. GENETTI, JR.
Colonel, Corps of Engineers
Chief of Staff

7 Appendices
App. A - Tables
App. B - Guide to USACE Chemical Quality Assurance Procedures and Notifications
App. C - Commercial Laboratory Validation Procedures

Appendices (cont'd)
App. D - Guide to the Preparation of
the Chemical Data Acquisition Plan
App. E - USACE Chemical Quality Assurance
App. F - Sample Handling Protocol for Low, Medium and
High Concentration Samples of Hazardous Waste
App. G - Glossary

APPENDIX A

TABLES

TABLE 1

DOCUMENTS/TASKS FOR INVESTIGATIVE ACTIVITIES*

Activities	Estimated Window
Designation of a USACE Quality Assurance (QA) Laboratory	1 Week
Scope of Services	Preparation - 3 weeks Review - 3 weeks
Validation of AE's Laboratory	Begin as soon as lab is identified - allow 6-12 weeks
Chemical Data Acquisition Plan (CDAP)	Expect 1 month after scope is provided to AE - allow 3-4 weeks for review
Daily Quality Control Reports (DQCR)	Prepared daily, submitted USACE project manager daily by regular mail and to QA Lab by the USACE project manager
Submission of AE's Chemical Data to the QA Laboratory	As soon as possible
Quality Control Summary Report (QCSR)/Site Inspection Report	Expect 2-3 months after completion of field work - 3-4 weeks for review
Chemical Quality Assurance Report (CQAR)	Expect within 30 days of submission of data to the QA laboratory.

* These include SI, RI/FS, and Pre-Design investigative activities.

TABLE 4

ADDITIONAL ORGANIZATONAL RESPONSIBILITIES FOR INVESTIGATION CDQM DOCUMENTS/TASKS

Activity	Investigation* District	Investigation* Division	QA Laboratory	MRD	CEMP-R
Designation of a USACE QA Laboratory	I	I		E, A	O
Scope of Services (SOS)	E	R, A	R, M	O	
Disposition of SOS Comments	E	R, A	R	M	O
Contract Laboratory Validation	I, A	I	R	E, M, A	M, O
Chemical Data Acquisition Plan (CDAP)	E	R, A	R	R, M	O**
Disposition of CDAP Comments	E	R, A	R	M	O
Notice to Proceed (field work)	E	M	M	M	O
Daily Quality Control Reports (DQCR)	E	R	R	M	O
Inspection and Analyses of QA Samples,			E	R, M	O
Quality Control Summary Report (QCSR)/Site Inspection Report	E	R, A	R	M	O
Disposition of Site Inspection Report Comments	E	R, A	R	M	O
Chemical Quality Assurance Report (CQAR)	R	R	E	R, M	O

KEY: I = initiate, E = execution, R = review, A = approve, M = monitor, and O = oversight

* = These responsibilities are for district in-house work. For AE/Contractor work, the contracting officer in the district has approval authority.

** = Documents will be provided to HQUSACE (CEMP-R) for monitoring and oversight. On an exception basis, CEMP-R will audit specific projects and will require that all project documents be submitted.

The local district/division should be kept informed of the progress of any work in their geographic area, and should be furnished copies of documents if they so desire.

TABLE 5
ADDITIONAL ORGANIZATIONAL RESPONSIBILITIES FOR DESIGN CDQM DOCUMENTS/TASKS

	Design*		Construction		QA		
Activity	District	Division	District	Division	Laboratory	MRD	CEMP-R
Designation of a USACE QA Laboratory for Design	I	I	R	R	R	M	O
Scope of Services (SOS)	E	R, A	R	R	R	R	O
Disposition of SOS Comments	E	R, A	R	R	R	R	O
AE Laboratory Validation	I, A	I			R	E, M	M, O
Chemical Data Acquisition Plan (CDAP)	E	R, A	R	R	R	R	O
Daily Quality Control Reports	E	R	R	R	R	M	O
Quality Control Summary Report/ Investigation Report	E	R, A	R	R	R	M	O**
Chemical Quality Assurance Report	R	R	R	R	E	M	O**
Design Analyses Reports and Design Plans and Specifications	E	R, A	R	R	R	R	O**
Disposition of Design Comments	E	R, A	R	R	R	R	O
Advertise and Award Construction Contract	E			O			

KEY: I = initiate, E = execution, R = review, M = monitor, and O = oversight

* = These responsibilities are for district in-house work. For AE/Contractor work, the contracting officer in the district has approval authority. For design brokered by CEMRD, review and approval authority is retained by CEMRD until transferred to the Division.

** = Documents will be provided to HQUSACE (CEMP-R) for monitoring and oversight. On an exception basis, CEMP-R will audit specific projects and will require that all project be submitted.

The local district/division should be kept informed of the progress of any work in their geographical area, and should be furnished copies of documents if they so desire.

TABLE 6

ADDITIONAL ORGANIZATIONAL RESPONSIBILITIES FOR CONSTRUCTION CDQM DOCUMENTS/TASKS

	Design		Construction		QA		
Activity	District	Division	District	Division	Laboratory	MRD	CEMP-R
Designation of a USACE QA Laboratory			I	I		E	O
Contract Laboratory Validation			I	I	R	E	O
Chemical Data Acquisition Plan (CDAP)	R		E, A	R	R	R	O
Disposition of CDAP Comments	R		E	R	R	M	O
Daily Quality Control Reports			E	R	R	M	O
Inspection and Analysis of QA Samples					E	M	O
Quality Control Summary Report (QCSR)/Contractor Final Report			E, A	R	R	M	O**
Disposition of Final Report Comments			E, A	R	R	M	O
Chemical Quality Assurance Report (CQAR)			R	R	E	R, M	O**

KEY: I = initiate, E = execution, R = review, A = approve, M = monitor and O = oversight
** = Documents will be provided to HQUSACE (CEMP-R) for monitoring and oversight. On an exception basis, CEMP-R will audit specific projects and will require that all project documents be submitted.

The local district/division should be kept informed of the progress of any work in their geographical area, and should be furnished copies of documents if they so desire.

APPENDIX B

GUIDE TO USACE CHEMICAL QUALITY ASSURANCE PROCEDURES AND NOTIFICATIONS

1. Purpose. Chemical quality assurance in chemical contamination investigation, design, and remedial action activities requires the interface and coordination of several USACE units. This appendix outlines the procedures involved and provides suggested formats to aid in the coordination process. The responsibility for initiation and coordination lies with the USACE project manager for investigation and design and with the contracting officer (CO) or his representative (COR) for construction.

2. Applicability. This appendix applies to all HTW investigative, design, and remedial activities executed by USACE either in-house or utilizing the services of a contractor.

3. Procedures for Chemical Quality Management.

a. Site Investigation and Pre-Design Activities.

(1) Investigation district solicits AE services.

(2) Investigation district writes Scope of Services with data quality objectives and submits it for review to division, program management personnel and CEMRD.

(3) Project Manager obtains the services of a USACE division laboratory for quality assurance using protocols established by CEMRD (memorandum or attached Request for Government Quality Assurance Services).

(4) District negotiates and awards AE contract.

(5) AE identifies subcontract laboratory and supplies Laboratory Quality Management Manual (LQMM) or required information. See Appendix C.

(6) Project Manager verifies validation status of the laboratory with CEMRD or requests validation be initiated (memorandum or attached Request for Evaluation of Commercial Laboratory).

(7) LQMM is submitted to CEMRD, performance audit samples are sent if necessary, laboratory is inspected by CEMRD, and a recommendation for approval/disapproval is sent to the USACE project manager. Personnel from the QA laboratory or investigation district will be notified of a scheduled inspection and may assist with this process. If approval is not given, AE will select another laboratory.

(8) AE submits CDAP for investigation district's approval.

(9) CEMRD-ED-GC and QA laboratory review CDAP and make approval/disapproval recommendation to investigation district.

(10) Field work begins if CDAP is approved.

(11) AE Daily Quality Control Report is filled out daily and submitted to the investigation district. Copies are sent to the QA laboratory whenever sampling or analytical activities are included.

(12) Field work completed.

(13) AE's analytical results are submitted to the QA lab as they become available, and to the executing FOA.

(14) AE's Site Inspection or Investigation Report together with the Quality Control Summary Report is submitted to the investigation district. These are reviewed by the same offices that reviewed the CDAP.

(15) QA laboratory prepares the Chemical Quality Assurance Report and submits it to the investigation district.

b. Design Activities.

(1) Design district solicits AE services.

(2) Design district writes Scope of Services and submits it to design division, CEMRD, and program management personnel for review/approval.

(3) Design district negotiates and awards AE design contract.

(4) If investigative activities are included in the design contract, steps 5-15 of Section 3.a. should be followed.

(5) AE submits Design Analysis Reports which contain a section that specifically addresses chemical quality management concerns. AE also submits plans and specifications which include chemical quality management at the preliminary, intermediate, final and 100% phases. The chemical section of the plans and specifications should give the Construction Contractor instructions for writing the CDAP in addition to including all necessary site specific chemical detail. Relevant requirements in this ER and appendices should be addressed. These submittals are sent to the design division, CEMRD, and program management personnel for technical review, and comments are sent back to the design district.

(6) Design district assures that the comments are addressed and incorporated into the appropriate documents or provides an explanation if comments are not used. Revised documents and annotated comments are sent to the offices generating comments at the next submittal stage.

(7) 100% plans and specifications are approved by the design district and the district advertises and awards the construction contract.

c. Construction.

(1) The contractor submits a CDAP (which may be a section in his overall Quality Control Plan). The contract laboratory (if needed) along with the Contractor's proposed quality control officers are identified for the Construction District's approval.

(2) CEMRD at request of the CO designates the Construction Division Lab or CEMRD-ED-GL to be the government QA laboratory for construction (forms provided) and validate the contractor's laboratory.

(3) The designated QA laboratory together with CEMRD assists the Construction District in reviewing the CDAP. The contractor's proposed laboratory is validated by CEMRD according to protocols discussed in Appendices C and E.

(4) Construction district approves/disapproves the contractor's laboratory and/or CDAP.

(5) Construction cleanup begins after CDAP and contractor's laboratory are approved.

(6) Contractor's Daily Quality Control Report is submitted to the Contracting Officer's Representative (COR) daily. The COR submits copies to the QA laboratory when sampling or analyses are involved. Analytical results are submitted to the QA laboratory as soon as they are available.

(7) Construction work is completed.

(8) The contractor submits the Quality Control Summary Report to the construction district. This should include a complete data package.

(9) The QA laboratory prepares the Chemical Quality Assurance Report and submits it to the construction district.

4. The following pages contain suggested formats which may be used to initiate interaction among various Corps elements regarding chemical data quality management. These would initiate a request for government quality assurance services, laboratory validation or document review. If these services are initiated by memoranda, the information called for on these pages should be supplied. Examples of formats which might be used for Daily Quality Control Reports and Chemical Quality Assurance Reports are also included.

(SAMPLE FORMAT)

TO: CEMRD-ED-GC FROM: __________ DATE __/__/__

SUBJECT: **Request for Evaluation of Commercial Laboratory**

Project Name: _______________ _____________**Contract No.:** ________________

Superfund ______ FUDS ______ IRP ______ **Other** ______ **Phase** ____________

Location: ____**State:** _____

A-E/Contractor: ____**State:** _____

USACE Project Manager: ____
Phone: _____________Address: __________________________________

Approximate Sampling Dates: ____________________________________
Laboratory Name: ____
Address: ____
Phone: ____
POC: ____

Laboratory Quality Management Manual Request ON __/__/__

Required analytical methods and approximate number of samples to be taken for above project.

METHOD	# OF WATER SAMPLES	# OF SOIL/SEDIMENT SAMPLES

State or other laboratory certification which will be required for this project: ____________________________________

If the laboratory is planning to subcontract any samples to another laboratory or location, all of these are to be evaluated separately. This request should be sent for verification of laboratory status regardless of expiration date on the list of validated laboratories.

(SAMPLE FORMAT)

TO:____________________ FROM:____________________ DATE: __/__/__

SUBJECT: **Request for Government Quality Assurance Services** (To be sent to the requested USACE Laboratory with a copy to CEMRD-ED-GC)

Project Name:______________________ Contract No.:__________________

Superfund ____ FUDS ____ IRP ____ Other _____ Phase ____________
Location:____ State:__________

A-E/Contractor:____________________________________ State:__________
USACE Project
Manager:____
Phone:________________ Address:_____________________________________

Laboratory Name:____
Address:____
Phone:____
POC:____

Approximate Sampling Dates:____

The following QA Laboratory support is requested for the subject project: USACE Division Laboratory:______________________________

____ Review and comment on Draft __________________________________
____
____
____

____ Analysis and Reports of Quality Assurance Samples

METHOD	NO. OF WATER SAMPLES*	NO. OF SOIL/SEDIMENT SAMPLES‡

* Includes Blanks

‡ Includes Background Soil Sample

CF: CEMRD-ED-GC

DATE ____________________

DAY	S	M	T	W	TH	F	S

A-E DAILY QUALITY CONTROL REPORT

WEATHER	Bright Sun	Clear	Overcast	Rain	Snow
TEMP	To 32	32-50	50-70	70-85	85 up
WIND	Still	Moder	High	Report No.	
HUMIDITY	Dry	Moder	Humid		

COE PROJECT MANAGER ____________________

PROJECT ____________________

JOB NO. ____________________

CONTRACT NO. ____________________

SUB-CONTRACTORS ON SITE:

EQUIPMENT ON SITE.

WORK PERFORMED (INCLUDING SAMPLING):

SHEET _____ OF _____

(Continuation Sheet)

PROJECT: ______________________ REPORT NO. ____________

JOB NO. ______________________ DATE ____________

QUALITY CONTROL ACTIVITIES (INCLUDING FIELD CALIBRATIONS)
HEALTH AND SAFETY LEVELS AND ACTIVITIES.
PROBLEMS ENCOUNTERED/CORRECTION ACTION TAKEN:
SPECIAL NOTES.
TOMORROW'S EXPECTATIONS:

BY ______________________ TITLE ____________

(SAMPLE FORMAT)

______ LAB NO.

DEPARTMENT OF THE ARMY
________________ DIVISION, CORPS OF ENGINEERS
DIVISION LABORATORY

____________, ________, ______
(city) (state) (zip)

Subject: Chemical Quality Assurance Report ________________

Project: ________________
Intended Use: ________________
Source of Material: ________________

Submitted by: ________________
Date Sampled: ________________, Date Received: ________________
Method of Test or Specification: See attached Tables 1 - ______

References: ________________

-- REMARKS --

1. CONTRACTOR DATA EVALUATION: (General comments)

   a. ACCURACY:

   b. PRECISION:

   c. LABORATORY CONTMINATION:

2. QA/QC DATA COMPARISON:

3. OTHER PROBLEMS:

4. CORRECTIVE ACTION:

Submitted by:

Director, ________________ Laboratory

APPENDIX C

COMMERCIAL LABORATORY VALIDATION PROCEDURES

1. Purpose. This appendix specifies the procedure used to evaluate a commercial laboratory for hazardous and toxic chemical analysis either for AE/Contractor work or for in-house projects conducted by USACE in hazardous waste activities. The latter includes chemical analyses contracted by the quality assurance laboratory.

2. Applicability. These procedures apply to all chemical analyses conducted to support investigative and remedial actions undertaken by USACE.

3. Initiation Procedures. A project manager from a Corps District or Division contacts CEMRD-ED-GC requesting validation of a contract laboratory. A form is provided in Appendix A or a memorandum may be written. The name of the project, the contract number, analytical methods to be used, numbers of samples of each matrix, estimated dates of sampling, and any special certification requirements should be included.

4. Implementation Procedures. Ordinarily each step in this sequence is completed before the subsequent step is initiated.

a. Step 1. The laboratory must submit its qualifications. This submittal may be in the form of an off-the-shelf Quality Management Manual (LQMM) or in some other format. Blank information tables can be requested from CEMRD. The submittal includes the following information:

- General Lab Information:
  - (1) Lab name, address, POC, phone #; lab age, number of employees; square footage, etc.
  - (2) Type of analytical work routinely performed;
  - (3) Organizational chart and floor plan;
  - (4) Special capabilities.

- List of previous evaluation/validation programs and most recent results.

- List of EPA and USACE contracts held in the last two years.

- Copy of lab certificates for other environmental programs or states.

- Chart of employee training and experience or chronological resumes.

- Copy of QA manual and/or in-house SOP's for analyses to be conducted for the contract including all internal quality control practices.

- List of instruments to be used for the contract and date of purchase.

The laboratory is requested to furnish above information promptly for review. If it appears that the capabilities of the laboratory are adequate to meet project requirements, CEMRD will initiate Step 2.

b. Step 2. The Corps of Engineers will provide the laboratory with performance audit (PA) samples through CEMRD-ED-GC. Arrangements will be made with the laboratory for the analysis of these samples. The results will be submitted as directed within 20 working days after receipt of the PA samples. Failure to analyze these samples correctly and within the required time frame may result in termination of the validation process. Ordinarily the laboratory is not reimbursed for costs involved in the analysis of the PA samples. The details of payment must be clarified in advance. If any of the results are unacceptable, a second set of PA samples may be allowed.

(1) The performance audit samples are method and matrix specific. The results are considered passing if a particular method has no results outside three standard deviations as determined by USACE, and no more than two parameters outside two standard deviations. Often a laboratory will be contacted if problems such as dilution or calculation errors can be identified.

c. Step 3. On-site inspection. A representative of CEMRD will inspect the contract laboratory only after Steps 1 and 2 have been successfully completed. All in-house SOPs will be reviewed. Any problems encountered with the performance audit samples will be discussed with laboratory management at the time of the inspection. The inspecting team will prepare a detailed report using the format specified by CEMRD and submit this to CEMRD-ED-GC. An exit interview will be held with lab personnel in which any problems encountered are discussed. The project manager or contracting officer and/or the assigned QA laboratory will be invited to send a representative to the inspection.

5. Conclusion. CEMRD will evaluate lab performance on the preceding steps and make a validation decision. A letter and a copy of the inspection report will be sent to the USACE personnel who initiated the validation process and to the laboratory. Ordinarily the letter will specify the methods and matrices, the project(s) and the time period (usually 18 months) for which the validation is granted. If specific recommendations are made by the inspectors, the lab is required to respond to CEMRD within a given time frame. Centralized records of validations and lab performances are kept at CEMRD-ED-GC. If a laboratory obtains a second contract within the eighteen month period, previous performances will be checked. If different analytes/matrices are involved in the second contract, only those performance audit samples will be sent. If work done for the Corps by the lab has been satisfactory, no further action will be necessary. **A validated laboratory may not subcontract USACE samples to a second laboratory without the knowledge and approval of the contracting officer and unless the second laboratory is validated for the parameters concerned.**

6. Renewal of Validation. Towards the close of the eighteen month period CEMRD-ED-GC will notify USACE users of laboratories of the pending expiration of validation. When the next contract is awarded, the validation will be renewed. After considering use of the lab and previous performance, CEMRD-ED-GC will determine which of the steps in Part II will apply to the revalidation process.

APPENDIX D

GUIDE TO THE PREPARATION OF THE CHEMICAL DATA ACQUISITION PLAN

1. Definition and Responsibility. Chemical Data Acquisition Plan (CDAP)--a document prepared by an Architect-Engineer firm, a Contractor or USACE for all field activities, laboratory activities, and contract deliverables related to the acquisition and reporting of chemical data for HTW investigation or remedial activities. For the convenience of the sampling team, field activities may be bound separately; however for purposes of cost this should not be considered a separate document. The CDAP must be approved by the CO prior to initiation of field work. In the event corrections and comments on the draft are provided by the CO, the changes shall be incorporated by the authors in a revised plan before final approval is given. It should be noted that the purpose and content of the CDAP are essentially the same as the Quality Assurance Project Plan (QAPjP) required for Superfund investigations by the EPA. On Superfund projects QAPjP guidance may be followed as an alternative to this appendix, but ordinarily the Contract Laboratory Program (CLP) should not be used in its entirety (CLP analytical methods may be specified as well as a CLP type data validation).

2. Applicability. This guide applies to all HTW investigative, pre-design, and remedial activities undertaken by USACE. A CDAP will be prepared for each activity and submitted to the appropriate USACE personnel for review, comments, and recommendations. The identification of these reviewers for each type of project is found in Tables 4, 5, and 6 in Appendix A. Once approved, the CDAP is considered part of the contract and is enforceable as such.

3. USACE Chemical Quality Data Management. USACE requires that quality control (QC) and quality assurance (QA) samples be collected and analyzed by the contract laboratory and the USACE QA laboratory, respectively. These QC and QA samples include splits or replicates of field samples, rinsate blanks, trip blanks and background soil and groundwater samples. QC samples, which represent approximately 10% of the field samples, help the prime contractor to identify and diagnose problems related to sampling and analysis. QA samples, which represent approximately 10% of the field samples, are sent to a USACE QA laboratory by overnight delivery for government monitoring of sampling and contract laboratory performance. For additional guidance on chemical quality assurance, see Appendix E. When

the following procedures, performed by the USACE QA laboratory, demonstrate that contract requirements for chemical quality control were not met, contractor resampling and reanalysis may be required by the contracting officer.

a. Inspection of QA samples to insure that sampling procedures correspond to Chemical Data Acquisition Plan (CDAP) with regard to sample containers, preservation, labeling, and chain of custody.

b. Analyses of QA samples.

c. Evaluation of contractor deliverables specified in Chemical Data Acquisition Plan (CDAP).

d. Comparison of analytical results obtained by contract laboratory and USACE QA laboratory from split or replicate samples. The procedures for obtaining QA laboratory services are in Appendix E to ER 1110-1-263.

4. Contract Laboratory Validation. Any laboratory performing chemical analyses shall be validated by USACE Missouri River Division (MRD). Laboratories are validated for each environmental matrix and each specific analytical method to be employed. If the prime contractor selects a laboratory which has a current (within one year) validation for all analytes and matrices specific to its project, additional evaluation will not be necessary. A request for the evaluation of commercial laboratory should be sent to CEMRD to verify the status of the contract laboratory(ies). If the prime contractor selects a laboratory which does not have a current validation, the laboratory shall be validated prior to approval of the CDAP. Commercial laboratory validation procedures are in Appendix C to ER 1110-1-263. **Samples may not be subcontracted to another laboratory without knowledge and approval of the contracting officer and unless the second laboratory is validated for the parameters concerned.**

5. The CDAP shall address the following topics, not necessarily in the presented order within subsections.

SECTION 1.0 TABLE OF CONTENTS
SECTION 2.0 PROJECT DESCRIPTION
SECTION 3.0 CHEMICAL DATA QUALITY OBJECTIVES - GENERAL DISCUSSION
SECTION 4.0 AE CONTRACTOR PROJECT ORGANIZATION AND FUNCTIONAL AREA RESPONSIBILITIES.
SECTION 5.0 FIELD ACTIVITIES

5.1 List of Field Equipment, Containers, and Supplies
5.2 Sampling Locations
5.3 General Information and Definitions
5.4 Sampling and Preservation Procedures
5.4.1 Matrix 1
5.4.1.1 Locations
5.4.1.1.1 Sampling Procedure
5.4.1.1.2 Analytical Parameters
5.4.1.1.3 Sample Containers, Preservation Procedure and Holding Time
5.4.2 Matrix 2
5.4.2.1 Locations(s)
5.4.2.1.1 Sampling Procedure
5.4.2.1.2 Analytical Parameters
5.4.2.1.3 Sample Containers, Preservation Procedure and Holding Time
5.4.3 Matrix 3, etc.
5.5 Field Documentation

SECTION 6.0 SAMPLE CHAIN OF CUSTODY, PACKING AND TRANSPORTATION
SECTION 7.0 LABORATORY ANALYTICAL PROCEDURES
7.1 Analytical Method 1
7.1.1 Matrix 1
7.1.1.1 Sample Preparation
7.1.2 Matrix 2
7.1.2.1 Sample Preparation
7.1.3 Matrix 3, etc.
7.1.4 Analytical Method (if not standard)
7.1.5 Method Specific Data Quality Objectives
7.1.6 Preventive Maintenance
7.1.7 Instrument Calibration and Frequency
7.1.8 Internal Quality Control Checks
7.1.9 Corrective Action
7.1.10 Data Reduction, Validation, and Documentation
7.2 Analytical Method 2
7.2.1 Matrix 1
7.2.1.1 Sample Preparation
7.2.2 Matrix 2, etc.
7.2.3 Matrix 3, etc.
7.2.4 Analytical Method
7.2.5 Method Specific Data Quality Objectives
7.2.6 Preventive Maintenance
7.2.7 Instrument Calibration and Frequency

7.2.8 Internal Quality Control Checks
7.2.9 Corrective Action
7.2.10 Data Reduction, Validation, and Documentation
7.3 Analytical Method 3, etc.

SECTION 8.0 CDQM DELIVERABLES
SECTION 9.0 REFERENCES

6. Project Description (SECTION 2.0 in Table of Contents). This section of the CDAP shall include a description of the work site and any unusual conditions. Anticipated project start and completion dates shall be estimated. This section shall also provide a summary of past and future work at the site including past chemical data of significance as well as a presentation of the multi-media sampling to be carried out in the present work effort.

7. Chemical Data Quality Objectives (SECTION 3.0 in Table of Contents). This section of the CDAP shall include a description of the general scope of work and relevant background information as it relates to the acquisition of chemical analytical data. State the objectives of the project: what questions must be answered and what decisions must be made; one specific objective may be completion of the USACE Hazardous Ranking System. Describe the level and extent of chemical data required to answer questions and support decisions during the project: the approach for sample collection, sample analysis, and QA/QC which will result in the required chemical data. The extent of analytical effort and data validation procedures to be required must be specified. Guidance for this requirement can be found in "Data Quality Objectives for Remedial Response Activities", EPA 540/G-87/003.

8. Contractor Project Organization and Functional Area Responsibilities (SECTION 4.0 in Table of Contents). The project organization for the prime contractor and any subcontractors shall be clearly defined with a discussion of quality control responsibilities. The prime contractor's Quality Assurance (QA) Officer shall report to a responsible senior officer of the company (i.e., QA management shall be separate from project management). A list of all individuals shall be provided and will include QC officers for the various components (those responsible for initiating and carrying out corrective actions and those involved in the data reporting sequence) and all analytical laboratory personnel (supervisors, chemists, and technicians). Resumes of all non-laboratory AE/Contractor personnel listing education and experience are

required, including personnel collecting samples. List the names of field personnel that will wear monitoring equipment. The name of the contract laboratory with a brief description of location, facilities and capabilities should be included.

9. Field Activities. Briefly summarize types of field activities required by the project.

10. List of Equipment, Containers, and Supplies to be taken to the Field (SECTION 5.1 in the Table of Contents). This section of the CDAP shall include all sample screening equipment to be used (brand, model, serial number) and a description of its calibration as well as sampling equipment, decontamination supplies and sample containers (specific numbers and types).

11. Sampling Locations (SECTION 5.2 in Table of Contents). This section of the CDAP shall provide the location of each sampling point on a site map. These locations shall be identified by the AE/Contractor after a visual inspection if they are not already specified in their Scope of Services or in the Specifications. In addition, at least one soil sample and one groundwater sample shall be collected in areas presenting the least potential for contamination and shall be used as background samples if this data has not been obtained in a previous phase. This section shall describe the rationale that governed the selection of sampling locations.

12. General Information and Definitions (SECTION 5.3 in Table of Contents). Some commonly used definitions are given below.

a. Contractor Laboratory. The laboratory performing analysis of the field samples. This may be an AE laboratory, a Remedial Action contractor laboratory or a laboratory subcontracted by either.

b. QA and QC Samples. Samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QA and QC samples include splits or replicates of field samples, rinsate blanks, trip blanks, and background (up gradient) samples.

c. QC Samples. Quality Control samples are collected by the sampling team for use by the contractor's laboratory. The identity of these samples is held blind to the analysts and laboratory personnel until data are in deliverable form. The purpose of the sample is to provide site specific field originated checks that the data generated by the contractor's analytical lab are of suitable quality. QC samples represent approximately 10% of the field samples.

d. QA Samples. Samples sent to a USACE QA laboratory by overnight delivery and analyzed to evaluate AE and contractor laboratory performance. QA samples represent approximately 10% of the field samples. The contractor shall coordinate with the designated QA laboratory not less than 48 hours before sampling to assure that the QA laboratory is alerted to receive the QA samples
and process them within the time limits specified by applicable EPA regulations and guidelines.

e. Split Samples. Samples that are collected as a single sample, homogenized, divided into two or more equal parts, and placed into separate containers. The sample shall be split in the field prior to delivery to a laboratory. Ordinarily split samples are analyzed by two different laboratories.

f. Replicate (duplicate, triplicate, etc.) Samples. Multiple grab samples, collected separately, that equally represent a medium at a given time and location. This is the required type of collocated sample for volatile organic analyses and most groundwater and surface water samples.

g. Rinsate Blank. Samples consisting of reagent water collected from a final rinse of sampling equipment after the decontamination procedure has been performed. The purpose of rinsate blanks is to determine whether the sampling equipment is causing cross contamination of samples.

h. Trip Blank. Containers of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The purpose of trip blanks is to determine whether samples are being contaminated during transit or sample collection. Trip blanks pertain only to volatile organic analyses; therefore, the containers must contain no headspace. Only one trip blank is needed for one day's sampling and shall satisfy trip blank requirements for all matrices for that day if the volatile samples are shipped in the same cooler.

13. Sampling and Preservation Procedures (SECTION 5.4 in Table of Contents). The CDAP shall include a table, which lists sampling locations, matrix (waste, soil, water, etc.), number of field samples, number of split or replicate samples, and number of rinsate or trip blank samples. Specific sampling, preservation, etc. details shall be included. All details

shall meet the requirements of one of the following: (a) EPA SW-846 method; (b) another EPA method; (c) ASTM method; (d) NIOSH method (for air sampling); or (e) another accepted published method. Container and preservation requirements shall meet the USACE Sample Handling Protocol (Appendix F to ER 1110-1-263). Each table entry shall include the reference, if any, from which the specifications were taken. Any modifications to the standard methods must be approved by the CO with the concurrence of the QA laboratory prior to their use. All methods should be referenced to the most recent edition of their source. If a standard method is not available, the AE/Contractor or subcontractors shall propose a nonstandard method with validation data for approval by the CO.

14. Details of Sampling and Preservation Procedures. The composition and volume of sample containers shall be specified along with a description of their preparation and cleaning. Sampling equipment directly contacting the sample shall be stainless steel or Teflon. The CDAP shall describe the cleaning of equipment and precautions for prevention of sample cross contamination during collection. Any field screening methods employed to select samples for analysis shall be discussed in detail. Compositing and homogenizing procedures shall be included. Sample containers, volumes, preservatives and holding times for the common analyses in low concentration are presented in Table D-1. A more detailed table is presented in the Sample Handling Protocol (Appendix F).

a. Soil Sampling Procedure. Using stainless steel or Teflon sampling equipment enough solid is removed from a specified depth to fill the required containers. The volatile organic samples should be removed first with as little mixing as possible. The remaining soil shall be placed in a clean stainless steel bowl and mixed thoroughly with stainless steel implements (spoons, spades, etc.), then divided among the sample containers to be filled and properly preserved. QC and/or QA sample containers shall be filled from the same mixture as one of the samples.

b. Groundwater Sampling Procedure. Valid, representative samples must be obtained. Before a sample is collected from a well, the water level shall be measured and recorded. Then the well shall be pumped or bailed with clean equipment to remove a quantity of water equal to at least three times the submerged volume of the casing and filter pack. If the well does not recharge fast enough to permit removing three casing volumes, the well shall be pumped or bailed dry, and sampled as soon as sufficient recharge has occurred. The field parameters of pH, conductivity and temperature must be stable before sampling. Containers to be analyzed for volatiles should be filled first allowing no headspace and with as little disturbance of the water as possible. If preservative is added to the bottles prior to shipment to the field, care must be taken not to overfill the containers and pH must be measured on samples where a value is specified.

c. Other Matrices. Sampling methods and equipment used shall meet the requirements of EPA or NIOSH methods.

15. Field Documentation (SECTION 5.5 in Table of Contents). The system for identifying and tracking the samples shall be described, and shall include the recording of field data in permanently bound notebooks along with the method of relating the field data to the proper samples. All field documentation shall be done in indelible ink. Daily Quality Control Reports shall be prepared daily, dated, signed by the site manager, and sent to the CO. These reports shall include (with respect to chemistry) weather information at the time of sampling, samples taken with reference given to appropriate sections of the CDAP, field instrument measurements and calibrations. Any deviations from the CDAP shall be stated. All field documentation will become part of the project files.

16. Sample Chain of Custody and Transportation (SECTION 6.0 in Table of Contents). All sample labeling, packing, transportation and chain of custody procedures shall follow the USACE Sample Handling Protocol (Appendix F to ER 1110-1-263).

17. Laboratory Analytical Procedures (SECTION 7.0 in Table of Contents). Specific laboratory procedural details shall be included. Each method shall be specified exactly and in detail by one of the following: (a) reference to an EPA SW-846 method; (b) reference to another EPA method; (c) reference to an ASTM method; (d) reference to a NIOSH method (for air analysis); (e) reference to another accepted published method; (f) reference to an accepted published method with a description of any deviations from the published procedure; or (g) complete description of the procedure, e.g., copies of laboratory instructions. EPA SW-846 methods shall be used where possible. Generally, nonstandard methods are not allowed. In special cases that require the consideration of nonstandard methods, the contract laboratory shall be prepared to provide validation data. The use of proposed nonstandard methods requires prior approval of the CO. A list of sample preparation and analytical methods most frequently used is presented in Table D-2. A table shall be included which lists for each matrix

sample preparation method number, analytical method number, analytes and laboratory quantitation limits.

18. Preventive Maintenance. The instrument, including manufacturer, model, accessories, etc., shall be specified and preventive maintenance shall be described. Preventive maintenance shall be performed by qualified personnel. Records of repairs, adjustments and calibrations shall be maintained and available for inspection by the CO on request.

19. Instrument Calibration and Frequency. Description of the procedure used for calibration and frequency of checks is required for each instrument or method. These shall be consistent with the requirements of the contract and the analytical method.

20. Analytical Methods. Include the required concentration range and data on the sensitivity (detection limits), precision, and accuracy when this information is not included in the method. Indicate how preexisting data on sensitivity, precision, and accuracy were determined, and procedures to be used to validate the method. State source and purity of analytical reference materials and laboratory chemicals necessary to perform the analyses. Nominal detection limits for common analytes are given in Tables D-3 and D-5. DQO's for specific projects will affect the value of required detection limits and goals for precision, accuracy and completeness.

21. Method Specific Data Quality Objectives. Provide objectives for precision, accuracy, detection limits, and completeness. DQO's for accuracy and precision established for each measurement parameter will be based on prior knowledge of the specific measurement system used and method validation studies employing replicate analyses, spikes, standards, calibrations, recoveries, control charts and project specific requirements. Completeness refers to the amount of valid data obtainable (by the specific method in the laboratory used with the instrument to be employed) from a measurement system compared to the expected amount of data, and is usually expressed as a percentage.

22. Quality Control Checks. Quality control checks are necessary to evaluate performance reliability for each measurement parameter. Describe procedures to assess the precision, accuracy and completeness of the measurement. The numbers and types of internal laboratory QC checks and samples proposed (e.g., blanks, duplicates, splits, spikes, surrogates, and reference standards, as applicable) shall be defined

clearly. At a minimum these must be run at the rates prescribed in the individual methods. The laboratory's established practice for including control samples among the samples analyzed and any additional controls required by the present project shall be described. Describe the feedback systems used to identify problems by means of the results obtained from control samples. Limits of data acceptability shall be included. Results from laboratory internal quality control checks shall be reported with the analytical data. Standard forms should be used, preferably CLP or SW-846 recommended format.

23. Corrective Action. Plans for corrective actions to be taken when results appear unusual, questionable, or limits of acceptability are exceeded shall be included. When limits of acceptability are exceeded, information justifying the poor recovery or precision shall be documented. Describe how reestablishment of control is demonstrated.

24. Data Reduction, Validation, and Documentation. Equations, including units, required to calculate the concentration or value of the measured parameter, shall be included. Describe the data management systems which collect raw data, store data, and document quality control data. If statistical procedures are used for data review before reporting, include descriptions. Data validation procedures and organization shall be specified. Data validation shall be conducted as determined by the Data Quality Objectives.

25. CDQM Deliverables (SECTION 8.0 in Table of Contents). The contractor shall address the frequency and content of chemical data quality control reports that shall be submitted during the project.

a. Daily Quality Control Report (DQCR) during field activities.

b. Daily Quality Control Report from the contract laboratory if this is required in the specifications or Scope of Work.

c. Departure From Approved Plans. Include problems identified, corrective actions, and verbal/written instructions from USACE personnel for sampling or re-analysis. These reports of significant problems should be sent to the CO within 48 hours of the occurrence.

d. Data Report to the QA Laboratory. The contractor's data must be submitted to the designated quality assurance laboratory (for data validation and comparison purposes) as soon as it is available. This submittal should include all sample, blank and internal quality control results such as spike and surrogate recoveries and agreement between replicate analyses. Interim data reports may be requested if the project warrants. A complete data set should also be submitted to the executing FOA for evaluation. If the submission of raw data such as chromatograms is required, it should be specified in the approved CDAP.

e. Quality Control Summary Report (QCSR)/Final Investigation Report. Ordinarily these reports are completed within thirty days of the availability of results. The QCSR addresses quality control practices employed and summarizes the DQCR. For investigative activities the QCSR may be included in the Final Investigation Report.

f. Final Investigation Report. (For investigation projects).

TABLE D-1

SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIMES

				Maximum Holding Times[4]	
Matrix	Parameter[1]	Container[2]	Preservation[3]	Extraction)	Analysis
Water	Volatiles	2 x 40 mL G, Septa vial	Ice to 4°C 4 drops con HCl or $NaHSO_4$ to pH < 2	-	14 d
Water	B/N/A	2 x 1 L amber G	Ice to 4°C	7 d	40 d
Water	PCBs, Pesticides	2 x 1 L amber G	Ice to 4°C	7 d	40 d
Water mo[5]	Metals[5]	1 x 1 L P	HNO_3 to pH<2	-	6
Water	TRPH	2 x 1 L amber G	Ice to 4°C HCl to pH<2	-	28 d
Water	Common anions[6]	1 x 1 L G	Ice to 4°C	-	28 d[6]
Water	Explosives	2 x 1 L amber G	Ice to 4°C	7 d	40 d
Water	- Cyanide	1 x 1 L P	Ice to 4°C NaOH to pH > 12	-	14 d
Soils/ Sed.	Volatiles	2 x 40 mL or 2 x 125 mL G, Septa vial	Ice to 4°C	-	14 d
Soils/ Sed.	B/N/A, PCBs Pesticides	1 x 8 oz G	Ice to 4°C	14 d	40 d
Soils/ Sed.	Metals, Cyanid TRPH	1 x 8 oz G	Ice to 4°C	-	6mo[5] (TRPH: 28d)
Soils/ Sed.	Explosives	1 x 4 oz G	Ice to 4°C	14 d	40 d

TABLE D-1 (cont'd)

1. B/N/A = Base/Neutral/Acid extractable organics; TRPH = Total Recoverable Petroleum Hydrocarbons.

2. All containers must have Teflon-lined seals (Teflon-lined septa for VOA vials). G = Glass; P = High density polyethylene.

3. Sample preservation will be done in the field immediately upon sample collection. If preservative is added to the bottles prior to shipment, care must be taken not to overfill them and pH should be checked. If samples are filtered in the field, differential pressure methods and 45 micron filters will be used. (Preservative is added after filtration.) VOA samples must never be filtered.

4. When only one holding time is given, it implies total holding time from sampling until analysis.

5. Total Recoverable Metals for water samples. Holding time for Hg is 28 days; for Cr(VI) is 24 hours.

6. Cl^-, Br^-, F^-, NO_3^-, NO_2^-, PO_4^{3-}, SO_4^{2-}; 1 L for each method; orthophosphate requires filtration. Holding time for analysis is 48 hours for NO_2^-, NO_3^-, and PO_4^{3-} if not preserved with H_2SO_4 to pH < 2.

TABLE D-2
EPA METHODS FOR SAMPLE ANALYSIS

Part 1. General Information. All sample analyses of water or soils will be performed using standard EPA methods as listed below. All procedures specified must be followed exactly with no deviations unless modifications are specifically authorized by the government's QA laboratory. All method QC requirements will be followed explicitly. The running of QC duplicates and spike samples shall be in accordance with the laboratory QA/QC Plan as set forth in the LQMP, or at a minimum rate of 1 in 20 but at least 1 per batch. The detection limits stated in each method must be met by the AE laboratory. All samples must be extracted and analyzed within the specific holding times specified by each method. All analyses must be performed by the validated laboratory (in-house) and may not be subcontracted out to another laboratory. EPA-CLP methods may be substituted for analytical parameters included in the CLP Statements of Work.

Part 2. Methods for the Determination of Metals (RCRA and Priority Pollutants) by Atomic Absorption and Inductively Coupled Plasma

		Extraction and Analysis Method		
Metal	Technique[1]	Soil/Sed.	Groundwater[2]	Surface Water[2]
Antimony (Sb)	DA	CLP[4]/7040	3005/7040	204.1
	GF	CLP[4]/7041	3020/7041	204.2
	ICP	CLP[4]/6010	3005/6010	200.7
Arsenic (As)	GF	3050/7060	Inc[3]/7060	206.2
	H	Inc[3]/7061	Inc[3]/7061	206.3
Barium (Ba)	DA	3050/7080	3005/7080	208.1
	GF	3050/7081	3020/7081	208.2
	ICP	3050/6010	3005/6010	200.7
Beryllium (Be)	DA	3050/7090	3005/7090	210.1
	GF	3050/7091	3020/7091	210.2
	ICP	3050/6010	3005/6010	200.7
Cadmium (Cd)	DA	3050/7130	3005/7130	213.1
	GF	3050/7131	3020/7131	213.2
	ICP	3050/6010	3005/6010	200.7
Calcium (Ca)	DA	3050/7140	3005/7140	215.1
	GF	-	-	-
	ICP	3050/6010	3005/6010	200.7

Table D-2 (Cont'd)

Metal	Technique[1]	Extraction and Analysis Method		
		Soil/Sed.	Groundwater[2]	Surface Water[2]
Chromium (Cr)	DA	3050/7190	3005/7190	218.1
	GF	3050/7191	3020/7191	218.2
	ICP	3050/6010	3005/6010	200.7
Copper (Cu)	DA	3050/7210	3005/7210	220.1
	GF	3050/7211	3020/7211	220.2
	ICP	3050/6010	3005/6010	200.7
Iron (Fe)	DA	3050/7380	3005/7380	236.1
	GF	3050/7381	3020/7381	236.2
	ICP	3050/6010	3005/6010	200.7
Lead (Pb)	DA	3050/7420	3005/7420	239.1
	GF	3050/7421	3020/7421	239.2
	ICP	3050/6010	3005/6010	200.7
Manganese (Mn)	DA	3050/7460	3005/7460	243.1
	GF	3050/7461	3020/7461	243.2
	ICP	3050/6010	3005/6010	200.7
Mercury (Hg)	CV	Inc[3]/7471	Inc[3]/7470	245.1
Nickel (Ni)	DA	3050/7520	3005/7520	249.1
	GF	-	-	249.2
	ICP	3050/6010	3005/6010	200.7
Selenium (Se)	GF	3050/7740	Inc[3]/7740	270.2
	H	Inc[3]/7741	Inc[3]/7741	270.3
Silver (Ag)	DA	3050/7760	Inc[3]/7760	272.1
	GF	3050/7761	Inc[3]/7761	272.2
	ICP	3050/6010	3005/6010	200.7
Sodium (Na)	DA	3050/7770	3005/7770	273.1
	GF	-	-	273.2
	ICP	3050/6010	3005/6010	200.7
Thallium (Tl)	DA	3050/7840	3005/7840	279.1
	GF	3050/7841	3020/7841	279.2
	ICP	3050/6010	3005/6010	200.7
Zinc (Zn)	DA	3050/7950	3005/7950	289.1
	GF	3050/7951	3020/7951	289.2
	ICP	3050/6010	3005/6010	200.7

Table D-2 (Cont'd)

Part 2. Methods for the Determination of Metals (RCRA and Priority Pollutants) by Atomic Absorption and Inductively Coupled Plasma (continued)

NOTES:

1. Abbreviations: DA = Direct Aspiration; GF = Graphite Furnace; H = Hydride; CV = Cold Vapor; ICP = Inductively Coupled Plasma.

2. (a) Any water samples may be analyzed by the groundwater techniques. Groundwater samples must be analyzed by these techniques. Surface water and other water samples (drinking, silo, leachate, etc.) may be analyzed by the 200-series or the SW-846 series methods.

(b) Other extraction procedures may be appropriate instead of those listed. Methods 3010 (for flame and ICP) and 3020 (for graphite furnace) are used as extraction procedures for Total Metals and are used in TCLP methodology. Method 3040 is used to extract metals from oily wastes (greases, waxes, etc.).

(c) All 200 series methods are from EPA 600/4-79-020 (1983) "Methods for Chemical Analysis of Water and Wastes"; all other methods are from SW-846 (1986), "Test Methods for Evaluation of Solid Waste".

3. Method-specific extraction procedure is incorporated into method.

4. Follow CLP sample preparation procedures. Existing guidance in SW-846 is inadequate in this regard.

Table D-2 (Cont'd)

Part 3. Methods for the Determination of Non-Metallic Analytes

		Analytical Methods		
Organic Analytes	Technique[1]	Soil/Sed	Groundwater[2]	Surface Water[2]
Halogenated Volatile Organics	GC	5030/8010	5030/8010[3]	601[3]
Non-Halogenated Volatile Organics	GC	5030/8015	5030/8015[3]	602[3]
Aromatic Volatile Organics	GC	5030/8020	5030/8020[3]	602[3]
Organochlorine Pesticides and PCBs	GC	3540/8080 3550/8080	3510/8080 3520/8080	608
Organophosphorus Pesticides	GC	3540/8140 3550/8140	3510/8140 3520/8140	
Chlorinated Herbicides	GC	Inc[4]/8150	Inc[4]/8150	509B[10]
Volatile Organics	GC/MS	Inc[4]/8240	Inc[4]/8240	624
Base/Neutral Semi-volatile Organics	GC/MS[5]	3540/8250 3550/8250 3540/8270 3550/8270	3510/8250 3520/8250 3510/8270 3520/8270	625
Acid Semivolatile Organics	GC/MS	3540/8250 3550/8250 3540/8270 3550/8270	3510/8250 3520/8250 3510/8270 3520/8270	625
Dioxins, etc.	GC/MS	Inc[4]/8280	Inc[4]/8280	613
Polynuclear Aromatic Hydrocarbons	HPLC	3540/8310 3550/8310	3510/8310 3520/8310	

Table D-2 (Cont'd)

Inorganic Analytes	Technique[1]	Analytical Methods Soil/ Sediment	 Ground-water[2]	 Surface Water[2]
Total and Amenable Cyanide		9010 or 9012		335
Sulfide		9030	9030	376
Sulfate		9035, 9036, or 9038		375
Nitrate		9200	9200	353
Chloride		9250, 9251, or 9252		325
Common Anions[6]	IC			300.0 429[10]
Total Organic Carbon			9060	415
Oil and Grease	IR	9071/413.2	413.2	413.2
TRPH[7]	IR	9071/418.1[7]	418.1	418.1
Ignitability		1010 or 1020		
Corrosivity		9045	9040/1110	9040/1110
Reactivity	(Section 7.3.3 and 7.3.4 of SW-846)			
EP Toxicity		1310[8]	1310[8]	
TCLP		1311[8,9]	1311[8,9]	
pH		9045	9040	
Gross alpha and beta		9310	9310	
Explosives		____[11]	____[11]	____[11]

Table D-2 (Cont'd)

Part 3 continued:
NOTES:
1. Abbreviations: GC = Gas Chromatograph; GC/MS = Gas Chromatograph/Mass Spectroscopy; IC = Ion Chromatograph; IR = Infrared Spectroscopy; HPLC = High Pressure Liquid Chromatograph.

2. (a) All water samples may be analyzed by these techniques. Groundwater samples must be analyzed by these techniques. Surface water and other water samples (drinking, silo, leachate, etc.) may be analyzed by the 200-series or the SW-846 series methods. Soil or sediment preparation unless otherwise specified involves extration of a predetermined weight of the dried samples with a fixed anount (500 mL) of water.

(b) All 300-600 series methods are from EPA 600/4-79-020 (1983) "Methods for Chemical Analysis of Water and Wastes"; all other methods are from SW-846 (1986), "Test Methods for Evaluation of Solid Waste".

3. Direct injection may be used for high concentrations of contaminates in water. It is preferable to use Method 8240. If Method 8010, 8015, 8020, 601, or 602 is used, it is necessary to confirm results with a second GC column or a validation by GC/MS.

4. Method-specific extraction procedure is incorporated into method.

5. Either method may be used. Extract cleanup by Methods 3600 is usually also required.

6. Common anions are fluoride (F^-), chloride (Cl^-), bromide (Br^-), nitrite (NO_2^-), nitrate (NO_3^-), Orthophosphate (PO_4^{3-}), and sulfate (SO_4^{2-}).

7. Total Recoverable Petroleum Hydrocarbons. Follow extraction procedures 9071 through Step 7.11 and then dilute with Freon-113 to 100 mL.

8. Extraction procedure only. Analysis must follow.

9. Federal Register March 29, 1990. TCLP leachates are analyzed by one or more of the following methods. Scope must specify which analyses are to be performed on TCLP leachate extracts.

Table D-2 (Cont'd)

Metals: Methods 6010, 7060, 7470, and 7740
Pesticides: Method 8080
Herbicides: Method 8150
Volatile organics: Method 8240 (Zero headspace TCLP extraction required)
Semi-volatile organics: Method 8270

10. Standard Methods for the Examination of Water and Wastewater, 16th Edition, 1985.

11. USACE method developed by Cold Regions Research and Engineering Laboratory to be obtained from CEMRD.

Table D-3. Inorganic Analysis Nominal Values for Instrument Detection Limits[a].

Analyte:	User's Guide to CLP ug/L	SW-846 ICP ug/L	SW-846 AA-DA ug/L	SW-846 AA-GF ug/L
Aluminum, Al	200	45	100	-
Antimony, Sb	60	32	200	3
Arsenic, As	10	53	2[b]	1
Barium, Ba	200	2	100	-
Beryllium, Be	5	0.3	5	0.2
Cadmium, Cd	5	4	5	0.1
Calcium, Ca	5000	10	10	-
Chromium, Cr	10	7	50	1
Cobalt, Co	50	7	50	1
Copper, Cu	25	6	20	-
Iron, Fe	100	7	30	-
Lead, Pb	5	42	100	1
Magnesium, Mg	5000	30	1	-
Manganese, Mn	15	2	10	-
Mercury, Hg	0.2	-	0.2[c]	-
Nickel, Ni	40	15	40	-
Potassium, K	5000	-	10	-
Selenium, Se	5	75	2[b]	2
Silver, Ag	10	7	10	-
Sodium, Na	5000	29	2	-
Thallium, Tl	10	10	100	1
Vanadium, V	50	8	200	4
Zinc, Zn	20	2	5	-
Cyanide, CN^-	10	-	-	-

__Important Note:__ These estimated instrument detection limits are to be used as a guide. The actual detection limits are matrix dependent and sample dependent. For ICP, each instrument must have an established analyte interference table as per Method 6010. See Method 6000 or 7000 for further guidance.

a. AA-DA = Atomic Absorption - Direct Aspiration
AA-GF = Atomic Absorption - Graphite Furnace

b. Gas hydride technique

c. Cold vapor technique

Table D-4. Volatile Organic Analysis Nominal Values for Practical Quantitation Limits

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
Chloromethane	10	10
Bromomethane	10	10
Vinyl Chloride	10	10
Chloroethane	10	10
Methylene Chloride	5	5
Acetone	100	100
Carbon Disulfide	5	5
1, 1-Dichloroethene	5	5
1, 1-Dichloroethane	5	5
1, 2-Dichloroethene	5	5
Chloroform	5	5
1, 2-Dichloroethane	5	5
2-Butanone	100	100
1,1,1-Trichloroethane	5	5
Carbon Tetrachloride	5	5
Vinyl Acetate	50	50
Bromodichloromethane	5	5
1,2-Dichloropropane	5	5
cis-1,3-Dichloropropene	5	5
Trichloroethene	5	5
Dibromochloromethane	5	5
1,1,2-Trichloroethane	5	5
Benzene	5	5
trans-1,3-dichloropropene	5	5
Bromoform	5	5
2-Chloroethyl Vinyl Ether	10	10
4-Methyl-2-pentanone	50	50
2-Hexanone	50	50
Tetrachloroethene	5	5
Toluene	5	5
1,1,2,2-Tetrachloroethane	5	5
Chlorobenzene	5	5
Ethyl Benzene	5	5
Styrene	5	5
Xylenes (Total)	5	5

Table D-5. Semivolatile Organic Analysis Nominal Values for Practical Quantitation Limits

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
Phenol	10	660
Bis (2-chloroethyl) ether	10	660
2-Chlorophenol	10	660
1,3-Dichlorobenzene	10	660
1,4-Dichlorobenzene	10	660
Benzyl alcohol	20	1300
1,2-Dichlorobenzene	10	660
2-Methylphenol	10	660
Bis (2-chloroisopropyl)ether	10	660
4-Methylphenol	10	660
N-Nitroso-di-n-dipropylamine	10	660
Hexachloroethane	10	660
Nitrobenzene	10	660
Isophorone	10	660
2-Nitrophenol	10	660
2,4-Dimethylphenol	10	660
Benzoic Acid	50	3300
Bis(2-chloroethoxy)methane	10	660
2,4-Dichlorophenol	10	660
1,2,4-Trichlorobenzene	10	660
Naphthalene	10	660
4-Chloroaniline	20	1300
Hexachlorobutadiene	10	660
4-Chloro-3-methylphenol	20	1300
2-Methylnaphthalene	10	660
Hexachlorocyclopentadiene	10	660
2,4,6-Trichlorophenol	10	660
2,4,5-Trichlorophenol	50	3300
2-Chloronaphthalene	10	660
2-Nitroaniline	50	3300
Dimethylphthalate	10	660
Acenaphthylene	10	660
2,6-Dinitrotoluene	10	660
3-Nitroaniline	50	3300
Acenaphthene	10	660
2,4-Dinitrophenol	50	3300
4-Nitrophenol	50	3300
Dibenzofuran	10	660
2,4-Dinitrotoluene	10	660
Diethylphthalate	10	660
4-Chlorophenyl phenyl ether	10	660
Fluorene	10	660
4-Nitroaniline	50	3300
4,6-Dinitro-2-methylphenol	50	3300

Table D-5. (Cont'd)

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
N-Nitrosodiphenylamine	10	660
4-Bromophenyl phenyl ether	10	660
Hexachlorobenzene	10	600
Pentachlorophenol	50	3600
Phenanthrene	10	660
Anthracene	10	660
Di-n-butylphthalate	10	660
Fluoranthene	10	660
Pyrene	10	660
Butylbenzylphthalate	10	660
3,3'-Dichlorobenzidine	20	1300
Benzo(a)anthracene	10	660
Chrysene	10	660
Bis(2-ethylhexyl)phthalate	10	660
Di-n-octylphthalate	10	660
Benzo(b)fluoranthene	10	660
Benzo(k)fluoranthene	10	660
Benzo(a)pyrene	10	660
Indeno(1,2,3-cd)pyrene	10	660
Dibenzo(a,h)anthracene	10	660
Benzo(g,h,i)perylene	10	660

Table D-6. Pesticide/PCB Analysis Nominal Values for Practical Quantitation Limits

Analyte:	Ground Water ug/L	Low Soil Sediment ug/kg
Aldrin	0.04	2.7
alpha-BHC	0.03	2.0
beta-BHC	0.06	4.0
delta-BHC	0.09	6.0
gamma-BHC (Lindane)	0.04	2.7
Chlordane (technical)	0.14	9.4
4,4'-DDD	0.11	7.5
4,4'-DDE	0.04	2.7
4,4'-DDT	0.12	8.0
Dieldrin	0.02	1.3
Endosulfan I	0.14	9.4
Endosulfan II	0.04	2.7
Endosulfan sulfate	0.66	44.2
Endrin	0.06	4.0
Endrin aldehyde	0.23	15.4
Heptachlor	0.03	2.0
Heptachlor epoxide	0.83	55.6
Methoxychlor	1.76	117.9
Toxaphene	2.4	160.8
Aroclor-1016	0.5	80.0
Aroclor-1221	0.5	80.0
Aroclor-1232	0.5	80.0
Aroclor-1242	0.65	43.6
Aroclor-1248	0.5	80.0
Aroclor-1254	1.0	160.0
Aroclor-1260	1.0	160.0

APPENDIX E

USACE CHEMICAL QUALITY ASSURANCE

1. Purpose. This appendix defines the components of USACE HTW chemical quality assurance and delineates the responsibilities of those USACE elements which provide these services.

2. Applicability. The policies in this appendix apply to all HTW projects executed by USACE districts, divisions and other FOA and their contractors. Every project must be assigned a QA Laboratory. QA functions may not be contracted out directly by the FOA to commercial enterprises. Sample analysis may be performed by a commercial lab under direct contract to the USACE QA Laboratory.

3. Elements and Responsibilities of USACE Chemical Quality Assurance. CEMRD is appointed by HQUSACE to exercise the lead in Corps-wide chemical data quality management and maintain consistency in this effort for all HTW activities. The elements of chemical data quality management involved in quality assurance are document review, analysis of field quality assurance samples, generation of the Chemical Quality Assurance Report (CQAR), validation of commercial laboratories, and assignment of quality assurance responsibilities. The first three are responsibilities transferred to the assigned quality assurance laboratory for a given project. The latter two activities remain the responsibility of CEMRD.

4. Procedures. The following procedures are followed for each investigation and remedial activity involving chemical analysis.

a. The project manager/COR notifies CEMRD and the preferred QA Laboratory (CEMRD-ED-GL or the geographic USACE Division Laboratory) of the need for chemical quality assurance services. A suggested format is provided for this purpose. If a memorandum is preferred the same information should be included.

b. The proposed QA laboratory requests project specific assignment providing CEMRD with information on procedures which will be employed to discharge their responsibilities. The suggested format provided in this appendix or a memorandum which addresses the same information should be sent.

c. CEMRD confirms the assignment in writing to the project manager/COR and the Division Laboratory and monitors the chemical data quality management through oversight review of ER 1110-1-263

documents and review of the Chemical Quality Assurance Report. To facilitate this the quality assurance laboratory should send copies of their comments and of the CQAR to CEMRD as soon as these are available.

d. The quality assurance laboratory will either analyze the QA samples in-house or send them to a USACE validated commercial laboratory for analysis. Analysis in-house requires method and matrix-specific validation by CEMRD. Ongoing retention of validation requires periodic analysis of performance audit samples and laboratory site audits. Internal quality control specified in the methods--blanks, replicate analyses, spikes, surrogates, etc. must be included and reported in the analyses of the QA samples and results must be reported.

e. USACE quality assurance laboratories are required to maintain a Laboratory Quality Management Manual which is updated regularly. The manual should contain chronological resumes of all HTW chemistry personnel, a list of instruments and accessories with dates of purchase, and SOP's for the following activities:

(1) sample check-in, logging, and cooler packing procedure,

(2) in-house chain of custody,

(3) glassware cleaning,

(4) analytical procedures used in-house,

(5) data analysis and reporting,

(6) quality control procedures employed for each analytical method.

A copy of updated pages or the revised LQMM should be sent to CEMRD when these are generated.

f. The validation of commercial laboratories for nationwide USACE work is centralized at CEMRD. If a Division Quality Assurance Laboratory assists in this effort by sending an inspector to a commercial laboratory, CEMRD will be notified immediately by phone of general inspection results. A written report will be prepared by the inspector and sent to CEMRD within two weeks of the inspection date, and should not specify approval but rather make recommendations based on the inspection. The formats of the inspection checklist to be used and of the report will be provided to the inspector by CEMRD.

CEMRD will take into account all aspects of laboratory performance during evaluation and determine extent and length of validation, and make an approval recommendation to the requesting FOA.

5. Guidance on Field Quality Assurance Sample Rates. Quality Assurance Samples are duplicates and/or splits and field blanks which are sent to one of the USACE Division Laboratories to be analyzed and later compared in the CQAR with the contractor's results. Some attempt should be made to select contaminated samples for QA, as based on physical evidence such as appearance, odor, or field screening tests. Prior to determining the QA rates on a site, the following should be ascertained:

a. Number of Matrices - groundwater, surface water, soil, sediment, and waste are those most commonly encountered.

b. Whether dedicated sampling equipment will be used for each sampling event or decontamination in the field will be an issue.

c. Whether the QA splits or duplicates will be taken on the same sample as the contractor's QC or whether these will be staggered.

d. Whether the rinsates will be associated with samples which will be split for QA purposes (in most cases this would be advisable).

(1) In general samples which are taken for volatiles analyses are discrete collocated samples. Most groundwater and surface water samples also fall under this category. Soil and sediment samples which are taken for analytical methods other than volatiles should be thoroughly mixed in the field and then split for QC and/or QA purposes, with a portion going to the contractor as a regular sample.

(2) Trip blanks are relevant only when water samples are taken for volatile organics analysis. Ordinarily one trip blank is shipped in each cooler containing aqueous volatile samples. To reduce the number of trip blanks needed, it is recommended that all VOA samples be shipped in the same cooler. The trip blank is not to be opened at any time between its preparation and its analysis.

(3) The rinsates should be associated by sample number with the sample for which the equipment was decontaminated.

Rinsates taken for government quality assurance samples should be taken just prior to the QA sample. If the sample is analyzed first, and is clean, the rinsate and trip blanks need not be analyzed. If dedicated sampling equipment is used for each sampling event, rinsate blanks are not required.

(4) The Scope of Services or the CDAP for the site should contain a Data Quality Objectives section which discusses in some detail the rationale for the rates of QA which are selected for the site. The following are proposed minimum rates for the USACE QA samples.

a. DERP Site Inspection Confirmation Studies (usually a sample set of 1 to 20 samples per matrix).

(1) Soil or sediment -- 1 duplicate/split to be analyzed for all site specific analytes. Under some circumstances such as suspected heavy contamination, a rinsate may be advisable. See Section 5.d.(3) above.

(2) Groundwater -- 1 duplicate, 1 rinsate analyzed for all groundwater parameters, 1 trip blank analyzed only for volatiles.

(3) Surface water -- 1 duplicate, 1 rinsate analyzed for all surface water parameters. If volatiles are included among the parameters, ship VOA vials with groundwater VOA's to avoid the necessity of an additional trip blank.

(4) A background soil sample with no attendant blanks to be analyzed for metals, total recoverable petroleum hydrocarbons, volatiles, BNAs and PCBs/Pesticides if these are site-specific analytes for soils.

b. RI/FS or Pre-Design CDQM.

(1) Include 5-10% duplicates/splits or at least one per matrix for both QC and QA. If there is a possibility of litigation, the higher rate should probably be selected.

(2) A background soil sample should be included and analyzed for metals, volatiles, BNA's, PCB's/Pesticides, and total recoverable petroleum hydrocarbons if these are site-specific soil analytes. Additional background samples may be specified depending upon the degree of confidence needed in establishing background levels.

(3) Rinsates at the rate of one per day for water samples.

(4) Include 1 trip blank per shipping cooler containing water samples to be analyzed for volatiles.

c. Construction and other activities. Special projects such as pilot plant treatability studies, kinetic studies, leachate tests, etc. undertaken in Design/Construction stages require separate consideration. The rates of quality assurance should be decided on a case-by-case basis by the project manager or COR in concurrence with CEMRD. Ordinarily they will be somewhat less than 10%.

6. The Chemical Quality Assurance Report. The CQAR is written by the USACE Quality Assurance Laboratory and sent to the project manager within 30 days of receipt of the contractor's data and completion of the quality assurance data. This report should address the following concerns:

a. Overall performance of the laboratory--commercial or USACE--that analyzed the site primary samples,

b. Detailed evaluation of the contractor's data--laboratory blanks, replicate analyses, agreement between duplicates/splits, acceptability of spike and surrogate recoveries,

c. Comparison of the quality assurance analytical results with those of the project laboratory,

d. Any other problems or issues encountered such as packing and shipment errors, chain of custody failures, etc.

Tables should be prepared which compare the results for duplicates, splits and blanks sent to both laboratories. The quality assurance data with internal quality control results should be appended.

7. In-House Work. When a USACE Division Laboratory is functioning as the primary laboratory on a project, special arrangements for quality assurance should be made. If the samples are contracted out by the division laboratory, and only the QA samples are analyzed in-house, the final report written by the division laboratory would have to be modified to accommodate this arrangement. If the division laboratory is analyzing all of the project samples or a method subset of the samples in-house, ordinarily a second USACE Division Laboratory should be selected as the quality assurance laboratory for the project.

8. When the following procedures, performed by the designated USACE QA laboratory, demonstrate that contract requirements are not being met, resampling and/or reanalysis may be required by the COR at the expense of the contractor.

a. Inspection of QA samples to insure that sampling procedures correspond to the CDAP with regard to containers, preservation, labeling, packing, chain of custody, etc.

b. Analyses of QA samples,

c. Evaluation of contractor analytical deliverables specified in the CDAP,

d. Comparison of analytical results obtained by contract laboratory and USACE QA laboratory from split or duplicate samples.

(SAMPLE FORMAT)

TO: CEMRD-ED-GC FROM:____________ DATE: / /

SUBJECT: **Request for USACE Project Specific Chemical Quality Assurance Assignment** (To be filled out by the Quality Assurance Laboratory)

Project Name:____________ Contract No.:____________

Superfund ___ FUDS ___ IRP ___ Other ___ Phase ____________

Location:____________ State:________

A-E/Contractor:____________ State:________

USACE Project Manager:____________

Phone:____________ Address:____________

Approximate Sampling Dates:____________

Document to be reviewed: ____________

____

____

____

Reviewer: ____________

QUALITY ASSURANCE SAMPLES:

MATRIX	METHOD	NO. OF SAMPLES	ANALYTICAL LABORATORY*	ESTIMATED COST‡

* Name of USACE validated laboratory to be used or designated "in-house" analyses.

‡ Include cost of review, sample checks, etc.

(SAMPLE FORMAT)

TO:____________________ FROM:____________________ DATE:__/__/__

SUBJECT: **Request for Government Quality Assurance Services** (To be sent to the requested USACE Laboratory with a copy to CEMRD-ED-GC)

Project Name:____________________ Contract No.:______________

Superfund ___ FUDS ___ IRP ___ Other ___ Phase ______________
Location:______________________________ State:__________

A-E/Contractor:______________________________ State:__________
USACE Project Manager:______________________________
Phone:__________ Address:______________________________

Laboratory Name:______________________________
Address:______________________________
Phone:______________________________
POC:______________________________

Approximate Sampling Dates:______________________________

The following QA Laboratory support is requested for the subject project: USACE Division Laboratory:______________

____ Review and comment on Draft ______________________
____
____
____

____ Analysis and Reports of Quality Assurance Samples

METHOD	NO. OF WATER SAMPLES*	NO. OF SOIL/SEDIMENT SAMPLES‡

* Includes Blanks

‡ Includes Background Soil Sample

CF: CEMRD-ED-GC

APPENDIX F

SAMPLE HANDLING PROTOCOL FOR LOW, MEDIUM AND HIGH CONCENTRATION SAMPLES OF HAZARDOUS WASTE

1. Purpose. This protocol provides guidance on sample volumes, containers, packing, and shipping for low, medium, and high concentration environmental samples taken for chemical analysis.

2. Applicability. The guidance in this appendix applies to all samples taken by USACE for HTW chemical analysis. The requirements are consistent with those of the Environmental Protection Agency and all standard chemical methods generally used are included.

3. Low Concentration Samples. Low level samples are considered to be those collected off-site, around the perimeter of a waste site, or in areas where hazards are thought to be significantly reduced by normal environmental processes.

a. Waters.

(1) Organics.

(a) Bottle and Preservative Requirements.

- o Four 1-liter amber glass bottles (Teflon-lined caps), iced to $4^{\circ}C$ (may not be held at site over 24 hours). Remember: Leave some headspace!
- o Two 40 mL glass VOA vials (with Teflon septa), iced to $4^{\circ}C$ (may not be held at site over 24 hours). Fill completely! All air bubbles must be excluded. Add HCl (4 drops of concentrated HCl) or $NaHSO_4$ to pH < 2.
- o The samples above are needed when Method 8240 is used to analyze for volatile (or purgeable) organics, when Methods 8250 or 8270 are used to analyze for Base/Neutral/Acid (B/N/A) extractable organics, and when Method 8080 is used to analyze for pesticides and PCB's. Two of the 1-L bottles are needed for 8250 or 8270 and two for 8080.

- Oil and Grease, Total Organic Carbon (TOC) or TRPH. For each analyte, two 1-liter glass bottle (Teflon-lined cap), 5 mL 1:1 HCl (to pH < 2), and 4°C. Leave headspace.

(b) Paperwork/Labels.

- (ENG Form 5021-R) Chain of Custody Record. See attached example. It is important to note that only one site may be listed per form even if the sites have the same project number. Top original goes with the samples; a copy should be saved for the sampler's files.

- Receipt for Samples. See attached example. This form complies with the requirements that the owner, operator, or agent-in-charge is legally entitled to: (1) a receipt describing the samples obtained from the site and; (2) a portion of each sample equal in weight or volume to the portion retained, if requested. The original form is retained for the Project Coordinator and a copy is given to the owner, operator, or agent-in-charge.

- Sample Labels/Tags. See attached example. You must label the sample with a date, time of collection, site name, and brief description on a label that will not float/soak off - no masking tape, please. Use only indelible ink on all labels. Numbered sample labels should be used on all samples. Some projects may also require the use of sample tags in addition to labels.

(c) Packaging and Shipping.

- Waterproof metal (or equivalent strength plastic) ice chests or coolers only.

- After filling out the pertinent information on the sample label and tag, put the sample in the bottle or vial and screw on the lid. For bottles other than VOA vials, secure the lid with strapping tape. (Tape on VOA vials may cause contamination.) Then, secure the string from the numbered approved tag around the lid.

- Mark volume level on bottle with grease pencil.

- Place about 3 inches of inert cushioning material such as vermiculite in the bottom of the cooler.
- Enclose the bottles in clear plastic bags through which sample tags and labels are visible, and seal the bag. Place bottles upright in the cooler in such a way that they do not touch and will not touch during shipment.
- Put in additional inert packing material to partially cover sample bottles (more than halfway). Place bags of ice around, among, and on top of the sample bottles. If chemical ice is used, it should be placed in a plastic bag.
- Fill cooler with cushioning material.
- Put paperwork (chain of custody record) in a waterproof plastic bag and tape it with masking tape to the inside lid of the cooler.
- Tape the drain shut.
- Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.
- Attach completed shipping label to top of the cooler.
- Put "This Side Up" labels on all four sides and "Fragile" labels on at least two sides.
- Affix numbered and signed custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

Remember that each cooler cannot exceed the weight limit set by the shipper.

(2) Inorganics.

(a) Bottle and Preservative Requirements.

- Metals. One 1-liter high density polyethylene bottle (Teflon-lined cap), adjust to pH < 2 with 1:1 HNO_3 (usually 3 mL).

- *Cyanides*. One 1-liter high density polyethylene bottle (Telfon-lined cap), adjust to pH > 12 with NaOH (usually 2 mL of 10N NaOH or 4 pellets), and 4°C.

- *Sulfide*. One 1-liter high density polyethylene bottle (Teflon-lined cap), 4 mL 2.0 N zinc acetate and adjust pH > 9 with NaOH, and 4°C.

- *Fluoride*. One 1-liter high density polyethylene bottle (Teflon-lined cap), no preservative, and 4°C.

- *pH*. No preservative. Must be measured twice immediately in field. Do not ship.

- *Ammonia, Total Kjeldahl Nitrogen, Nitrate/Nitrite*. For each analyte, one 1-liter high density polyethylene bottle (Telfon-lined cap), adjust to pH < 2 with H_2SO_4 (usually 4 mL 1:1 H_2SO_4), and 4°C.

(b) *Paperwork/Labels*.

- *Inorganic Paperwork* is the same as described for organics (see Section 3.a.(1).(b). above) and includes the Chain of Custody Record, Receipt for Samples, and Labels/Sample Tags. See previous examples and explanations.

(c) *Packaging and Shipment*.

- Follow packaging and shipping requirements listed for organics (see Section 3.a.(1).(c). above). "Fragile" labels are optional for coolers not containing glass bottles. In cases where ice is not required (metals), fill cooler with only packing material. Once again, remember that the cooler must not exceed the shipper's weight limit.

b. *Soils/Sediments (Organics and Inorganics)*.

(1) *Bottle and Preservative Requirements*.

- Two 8-ounce glass wide mouth jars at least 3/4 full (Teflon-lined caps), iced to 4°C - one jar for organics (non-VOA) and one jar for inorganics. For analysis of volatiles in soil, two 40 mL VOA vials or two 125 mL jars with Teflon septa are used. These shoudl be completely filled and iced to 4°C.

(2) Paperwork/Labels.

- o Follow paperwork requirements listed for water samples in Section 3.a.(1).(b). above. See attached examples of forms.

(3) Packaging and Shipping.

- o Follow packaging and shipping requirements in Section 3.a.(1).(c). above. Be sure that the shipping cooler does not exceed the shipper's weight limits.

4. Medium Concentration Samples. Medium level samples are most often those collected on-site, in areas of moderate dilution by normal environmental processes.

a. Water/Liquids (Organics and Inorganics).

Note: Samples are not known to contain highly toxic compounds.

(1) Bottle and Preservative Requirements.

- o Four 32-ounce wide mouth glass jars (Teflon-lined caps), no preservatives, and iced to 4°C for B/N/A extractable organics and PCB/Pesticides (two jars for each method). Remember: Leave some headspace.
- o Two 40 mL glass VOA vials (Teflon septa), Iced to 4°C. Fill completely. No headspace.
- o Two 16-ounce wide mouth glass jars nearly full (Teflon-lined caps) one for metals and one for cyanides. (Preserved as for low level. See Section 3.a.(2).(a).)

(2) Paperwork/Labels.

- o See previous examples. Follow paperwork requirements in Section 3.a.(1).(b). for low concentration samples.

(3) Packaging and Shipping

- o Secure sample jar lids with strapping tape or evidence tape. At the same time secure string from USEPA numbered tag around lid.

- Mark volume level of bottle with grease pencil.
- Position jar in Ziploc bag so that tags may be read.
- Place about 1/2 inch of cushioning material in the bottom of metal can.
- Place jar in can and fill remaining volume of can with cushioning material.
- Close the can using three clips to secure lid.
- Write sample number on can lid. Indicate "This Side Up" by drawing an arrow and place "Flammable Liquid N.O.S." label on can. Personnel who ship samples must be sure to comply with DOT shipping regulations and not knowingly over-classify a sample prior to shipment. If the person shipping a sample knows that the sample is not a "Flammable Liquid" (i.e., a water phase sample or a soil sample), he should not classify it as "Flammable Liquid."
- Place about 1 inch of packing material in bottom of cooler.
- Place cans in cooler and fill remaining volume of of cooler with packing material. Add ice bags if required.
- Put paperwork in plastic bags and tape with masking tape to inside lid of cooler.
- Tape drain shut.
- After acceptance by shipper, tape cooler completely around with strapping tape at two locations. Secure lid by taping. Do not cover any labels.
- Place lab address on top of cooler.

Note: Write "Flammable Liquid N.O.S." on side of cooler if this is not marked on the margin of your DOT label.

- For all medium and high concentration shipments, complete shipper's hazardous material certification form.

- Put "This Side Up" labels on all four sides sides, "Flammable Liquid N.O.S." and "Danger-Peligro" on all sides.

Note: "Danger-Peligro" labels should be used only when net quantity of samples in cooler exceeds 1 quart (32 ounces) for liquids or 25 pounds for solids. In other words, for our purposes "Danger-Peligro" labels will never be used for Flammable Solids N.O.S.

- Affix number custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

b. Soils/Sediments/Solids (Organics and Inorganics).

(1) Bottles and Preservatives Requirements.

- For analysis of volatiles, two 40 mL VOA vials or two 125 mL jars with Teflon septa are used. These should be completely filled and iced to 4°C.
- Two 8-ounce wide mouth glass jars, 3/4 full (Teflon-lined caps), no preservatives, one jar for organics (non-VOA) and one jar for inorganics (metals and cyanide) or
- Four 4-ounce wide mouth glass jars each 3/4 full (Teflon-lined caps), no preservative; two jars for organics (non-VOA) and two jars for inorganics.

(2) Paperwork/Labels.

- See previous examples. Follow paperwork requirements listed in Section 3.a.(1).(b). for low concentration samples.

(3) Packaging and Shipping.

- Follow packaging and shipping requirements listed in Section 3.a.(1).(c). for medium concentration water/liquids above substituting "Flammable Liquid N.O.S." with "Flammable Solid N.O.S."

5. High Concentration Samples (Hazardous: Determined Not to be D.O.T.-Defined Poison A). High concentration samples include those from drums, surface impoundments, direct discharges, and chemical spills, where there is little or no evidence of environmental dilution. High concentration (or high

hazard) samples are suspected to contain greater than 15% concentration of any individual chemical substituent.

a. Liquids (Organics and Inorganics).

(1) Bottle and Preservative Requirements.

- One 8-ounce wide mouth glass jar filled 1/2 to 3/4 full (Teflon-lined cap). No preservative.

(2) Paperwork/Labels.

(a) See previous examples. Follow paperwork requirements listed in Section 3.a.(1).(b). above.

(b) Shipper may require special forms to be completed before shipment of high hazard concentration samples.

(3) Packaging and Shipping.

- Follow packaging and shipping requirements listed in Section 3.a.(1).(c). above for medium concentration water/liquids.

b. Soils/Sediments/Solids (Organics and Inorganics).

(1) Bottle and Preservative Requirements.

- One 8-ounce wide-mouth glass jar filled 1/2 to 3/4 full (Teflon-lined cap). No preservative.

(2) Paperwork/Labels.

- See attached examples. Follow paperwork requirements in Section 3.a.(1).(b). above.

(3) Packaging and Shipping.

- Follow packaging and shipping requirements listed in Section 3.a.(1).(c). for medium concentration water/liquids, substituting "Flammable Liquid N.O.S." with "Flammable Solid N.O.S."

TABLE F-1

SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Low Concentration Samples

				Maximum Holding Times:	
Matrix	Parameter[1]	Container[2]	Preservation[3]	Extraction)[4]	Analysis
Water	Volatiles	2 x 40 mL[8] G, Septa vial	Ice to 4°C 4 drops con HCl or $NaHSO_4$ to pH<2	-	14 d
Water	B/N/A	2 x 1 L[5,8] amber G	Ice to 4°C	7 d	40 d
Water	PCBs, Pesticides	2 x 1 L[5,8] amber G	Ice to 4°C	7 d	40 d
Water	Metals[6]	1 x 1 L P	HNO_3 to pH<2	-	6 mo[6]
Water	TRPH	2 x 1 L G	Ice to 4°C HCl to pH<2	-	28 d
Water	Common anions[7]	1 x 1 L[7] G	Ice to 4°C	-	28 d[7]
Water	Explosives	2 x 1 L G (amber)	Ice to 4°C	7 d	40 d
Water	Cyanide	1 x 1 L P	NaOH to pH>12 Ice to 4°C	-	14 d
Soils/ Sed.	Volatiles	2 x 40 ml G or 2 x 125 mL G, Septa vial	Ice to 4°C	-	14 d
Soils/ Sed.	B/N/A, PCBs, Pesticides	1 x 8 oz G	Ice to 4°C	14 d	40 d
Soils/ Sed.	Metals, Cyanide, TRPH	1 x 8 oz G	Ice to 4°C (Cyanide & TRPH)	-	6 mo[6] (TRPH: 28d)
Soils/ Sed.	Explosives	1 x 4 oz G	Ice to 4°C	14 d	40 d

TABLE F-2

SAMPLE CONTAINERS AND PRESERVATIVES[9]

Medium Concentration Samples

Matrix	Parameter[1]	Container[2]	Preservation[3]
Water/Liquid	Volatiles	2 x 40 mL G, Septa vial	Ice to 4°C[8]
Water/Liquid	B/N/A[5]	2 x 32 oz wide mouth jars, G	Ice to 4°C[8]
Water/Liquid	PCBs[5], Pesticides	2 x 32 oz wide mouth jars, G	Ice to 4°C[8]
Water/Liquid	Metals	1 x 16 oz wide mouth jar, G	HNO_3 to pH<2
Water/Liquid	Cyanide	1 x 16 oz wide mouth jar, G	Ice to 4°C
Water/Liquid	Explosives	2 x 1 L G (Amber)	Ice to 4°C
Soils/ Sediments	Volatiles	2 x 40 ml G or 2 x 125 mL G	Ice to 4°C
Soils/ Sediments	B/N/A, PCBs, Pesticides	1 x 8 oz wide mouth jar, G	---
Soils/ Sediments	Metals, Cyanide, TRPH	1 x 8 oz wide mouth jar, G	Ice to 4°C (Cyanide & TRPH)
Soils/ Sediments	Explosives	1 x 4 oz wide mouth jar, G	Ice to 4°C

High Concentration Samples

Matrix	Parameter[1]	Container[2]	Preservation
Liquid	All organic and inorganic analyses	1 x 8 oz wide mouth jar, G	---
Solid	All organic and inorganic analyses	1 x 8 oz wide mouth jar, G	---

1. B/N/A = Base/Neutral/Acid extractables; TRPH = Total Recoverable Petroleum Hydrocarbons

2. All containers must have Teflon-lined seals (Teflon-lined septa for VOA vials). G = Glass; P = High density polyethylene.

3. Sample preservation will be done in the field immediately upon sample collection. If water samples are filtered in the field, differential pressure methods using 45 micron filters will be used, and preservative added after filtration. VOA samples should never be filtered.

4. When only one holding time is given, it implies total holding time from sampling until analysis.

5. Three bottles are required on at least 5-10% (but at least one) sample so that laboratory can perform all method QC checks for SW-846 method.

6. Total Recoverable Metals for water samples. Holding time for Hg is 28 days in glass; for Cr(VI) is 24 hours.

7. Cl^-, Br^-, F^-, NO_3^-, NO_2^-, PO_4^{3-}, SO_4^{2-}; 1 L for each method; orthophosphate requires filtration. Holding time for extraction is 48 hours for NO_2^-, NO_3^-, and PO_4^{3-} if not preserved with H_2SO_4 to pH < 2.

8. Samples with residual chlorine present will be dechlorinated with sodium thiosulfate as specified in SW-846 (Third edition).

9. Holding times for medium concentration samples are the same as those specified for low concentration samples.

U.S. Army Corps of Engineers

Chain of Custody Record
(ER 1110-1-263)

Proj. No.	Project Name
Sampler : (Signature)	

Date	Time	Pres.	Grab	Comp	Site Code/Sample Number	Number of Containers								Remarks:

FOR ILLUSTRATION PURPOSES ONLY
(Local reproduction authorized - blank masters available from local FMO)

Sampler Relinquished by:	Date/Time	Received by: (Sig.)	Date/Time	Hazards Associated with Samples
Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Date/Time	
Relinquished by: (Sig)	Date/Time	Received for Laboratory by: (Sig.)	Date/Time	Remarks at time of receipt:
Custody Seal No.		Lab case No.:		

ENG Form 5021-R, Oct 90

Proponent: CEMP-RT

SAMPLE

U.S. Army Corps of Engineers **Chain of Custody Record**
(ER 1110-1-263)

Proj. No. 017	Project Name ANY ARMY AMMUNITION PLANT
Sampler : (Signature) Marcia C Davis	

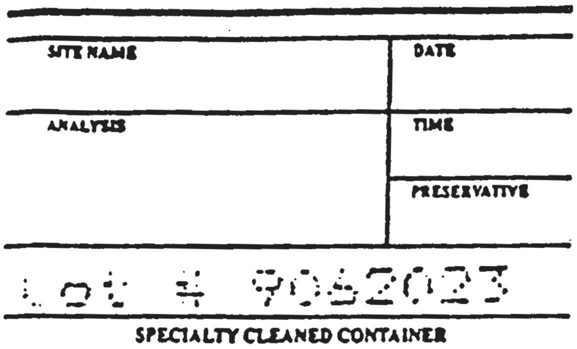
Date 90	Time	Pres.	Grab	Comp	Site Code/Sample Number	Number of Containers	Volatile Organics	B/N/A	Total Metals	TRPH	Explosives			Remarks:
9/4	0930	4°C	X		AAAP-SB01-0001	2	X							Strong hydrocarbon odor
9/4	0935	4°C	X		AAAP-SB01-0001	1		X	X		X			" " "
9/4	0937	4°C	X		AAAP-SB01-0001	1				X				" " "
9/4	1035	pH<2 HCL 4°C	X		AAAP-MW02-0001	2	X							No visual turbidity
9/4	1036	4°C	X		AAAP-MW02-0001	2		X						" " "
9/4	1040	pH<2 HNO3 4°C	X		AAAP-MW02-0001	1			X					" " "
9/4	1050	pH<2 HCL 4°C	X		AAAP-MW02-0001	2				X				" " "
9/4	1055	4°C	X		AAAP-MW02-0001	1					X			" " "

Sample Relinquished by: Marcia C Davis	Date/Time 9/4 1400	Received by: (Sig.)	Date/Time	Hazards Associated with Samples NONE
Relinquished by: (Sig.)	Date/Time	Received by: (Sig.)	Date/Time	
Relinquished by: (Sig)	Date/Time	Received for Laboratory by: (Sig.)	Date/Time	Remarks at time of receipt:
Custody Seal No. 1535		Lab case No.:		

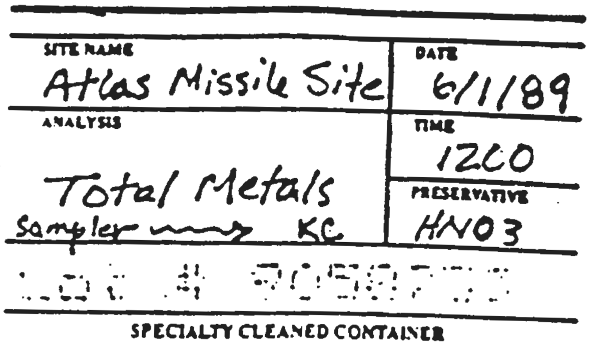
ENG Form 5021-R, Oct 90

Proponent: CEMP-RT

SAMPLE LABELS

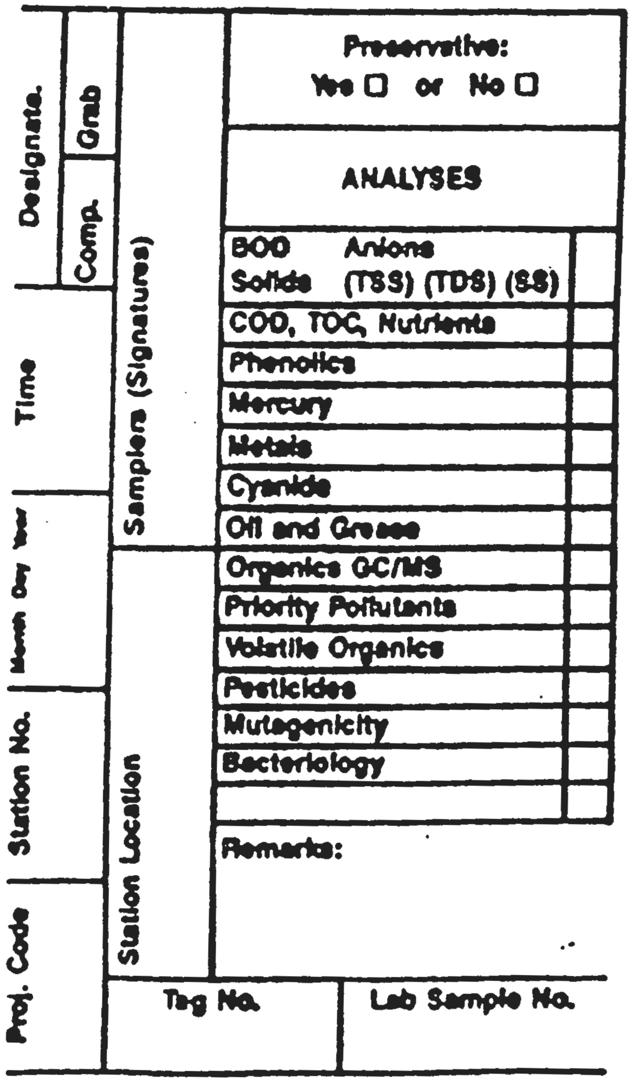


SITE NAME
DATE
ANALYSIS
TIME
PRESERVATIVE
Lot # 9062023
SPECIALTY CLEANED CONTAINER



SITE NAME Atlas Missile Site
DATE 6/1/89
ANALYSIS Total Metals
Sampler KC
TIME 1200
PRESERVATIVE HNO3
Lot # 90587[illegible]
SPECIALTY CLEANED CONTAINER

SAMPLE TAGS



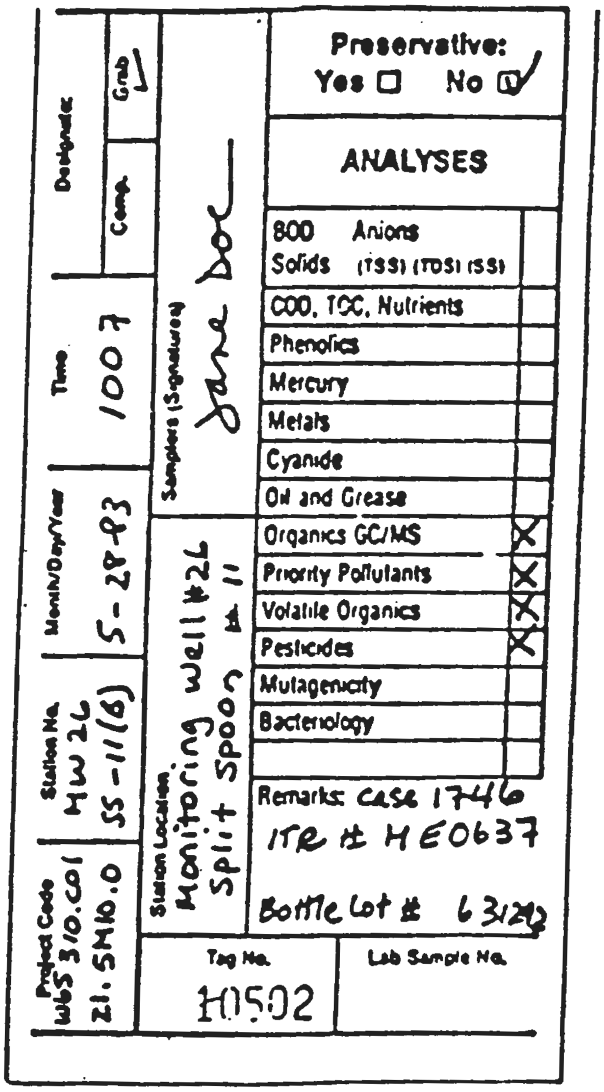
Proj. Code
Station No.
Month Day Year
Time
Designate. Comp. Grab
Station Location
Samplers (Signatures)
Preservative: Yes ☐ or No ☐

ANALYSES

BOD Anions Solids (TSS) (TDS) (SS)	☐
COD, TOC, Nutrients	☐
Phenolics	☐
Mercury	☐
Metals	☐
Cyanide	☐
Oil and Grease	☐
Organics GC/MS	☐
Priority Pollutants	☐
Volatile Organics	☐
Pesticides	☐
Mutagenicity	☐
Bacteriology	☐
	☐

Remarks:

Tag No.
Lab Sample No.



Project Code WBS 310.C01 Z1.SM10.0
Station No. MW 26 SS-11(6)
Month/Day/Year 5-28-93
Time 1007
Designate Comp. Grab ✓
Station Location Monitoring Well #26 Split Spoon # 11
Samplers (Signatures) Jane Doe
Preservative: Yes ☐ No ☑

ANALYSES

BOD Anions Solids (TSS) (TDS) (SS)	☐
COD, TOC, Nutrients	☐
Phenolics	☐
Mercury	☐
Metals	☐
Cyanide	☐
Oil and Grease	☐
Organics GC/MS	☒
Priority Pollutants	☒
Volatile Organics	☒
Pesticides	☒
Mutagenicity	☐
Bacteriology	☐
	☐

Remarks: Case 1746
ITR # HE0637
Bottle Lot # 631292

Tag No. H0502
Lab Sample No.

APPENDIX G

GLOSSARY

1. **Chemical Contamination Activities** - All activities related to the cleanup of chemical contamination at a site including investigation and remedial activities. This definition includes activities defined by EPA as "removal activities" and "remedial activities".

2. **Chemical Data Acquisition Plan (CDAP)** - A submittal document which describes the site specific implementation of CDQM requirements. For investigation and design contracts, CDQM guidance and requirements for CDAP preparation and implementation are found in the Scope of Services. For construction contracts, these requirements are found in the contract technical specifications in language which is clearly biddable and enforceable. The CDAP shall include detailed plans for sampling, analysis, and chemical QC activities. A guide for preparation of the CDAP is found in Appendix D. A CDAP is required for both in-house and contracted work. The EPA equivalent is called a Quality Assurance Project Plan (QAP_jP) and may be substituted for the CDAP.

3. **Chemical Data Quality Management (CDQM)** - The combination of activities establishing a government quality assurance (QA) program and specifying quality control (QC) operations for the AE, construction contractor, or USACE District. CDQM includes the maintenance of field and laboratory practices/checks which insure that Data Quality Objectives (DQO) are met.

4. **Chemical Data Management Specifications** - Construction Contract technical specifications prepared during design which describe all construction contractor sampling, sample handling and custody, documentation, analytical procedures, and data reporting. The specifications outline contractor QC responsibilities and the requirements of the Chemical Data Acquisition Plan for construction. Appropriate chemical concerns should be addressed at each design submittal phase.

5. **Chemical Quality Assurance (QA)** - The government activities required to assure desired and verifiable levels of quality in chemical data for a specific project. Chemical Quality Assurance activities are defined in Appendix E.

6. **Chemical Quality Assurance Report (CQAR)** - Prepared by the designated QA laboratory; approved by the investigation/design/construction division; and normally ready for distribution within 30 days of receipt of the AE/contractor analytical data. The report will include an overall evaluation of the contractor's/AE's data and quality assurance data, a comparison of the contractor's and government results, problems in accomplishing the CDAP, and lessons learned. The CQAR shall be prepared in accordance with the guidance found in Appendix E.

7. **Chemical Quality Control (QC)** - Specific activities for insuring that data of the required quality will be obtained for a specific project by the AE, construction contractor, or government (for in-house chemical analyses). Normally this consists of the analysis of field blanks, duplicate samples and the inclusion of laboratory internal quality control procedures as required by the methods or otherwise specified.

8. **Construction District** - The district assigned the responsibility to administer the construction contract.

9. **Construction Division** - The geographic USACE division in which the Construction District is located.

10. **Contract Laboratory** - The laboratory retained by a USACE AE/contractor or QA laboratory to perform chemical analyses of field samples. These laboratories are evaluated in accordance with the procedures in Appendix C, and must be validated by CEMRD prior to performing chemical analyses for HTW projects.

11. **Daily Quality Control Report (DQCR)** - A daily report prepared by an AE in accordance with the Scope of Services or by a construction contractor per contract specifications and submitted to the Contracting Officer (CO) during chemical contamination investigation and remedial activities. Copies are sent by the COR to the QA laboratory whenever sampling and analytical activities are involved. The DQCR shall contain at a minimum the following with respect to chemistry:

(a) Work performed. Sections in the CDAP that specify the sampling procedure and the analytical procedure shall be referenced. Weather information at the time of sampling shall be included. Information concerning all field samples, sample shipping, and field instrument measurements and calibration shall be included.

(b) Departures from the approved sampling plan. Include problems identified, corrective actions, and verbal/written instructions from USACE personnel. These shall be reported to the contracting officer (CO) in writing within two working days.

12. **Data Quality Objectives (DQO)** - DQOs are qualitative and quantitative statements specifying the level and extent of chemical data required to support decisions during remedial activities. They are determined based on the end uses of the data to be collected. DQOs are established prior to data collection and are not considered a separate deliverable. Rather, the DQO development process is integrated with the project planning process and the results are incorporated into Scopes of Work and Work Plans for the site. The levels and responsibility for data validations should be determined with the DQOs.

13. **Design Analysis Reports** - Documents prepared during design to support the Plans and Specifications. Technical Design Analysis Reports should have a section or chapter dedicated to design chemical evaluations and to the level of sampling, analysis, and CDQM required to support and document construction.

14. **Design District** - The USACE district assigned the responsibility for coordinating, reviewing, and completing design documents, including plans and specifications for HTW site design activities either in-house or through contracted services. Other Design District responsibilities include procuring AE services and construction contracts when work is not done in-house.

15. **Design Division** - The USACE Division overseeing the Design District.

16. **HQUSACE (CEMP-R)** - Headquarters office responsible for CDQM requirements and other supporting issues related to the proper implementation and execution of all phases of HTW program activities under USACE management.

17. **Internal Quality Control** - Measures which a laboratory implements to ensure data reliability. These include the analysis of blanks of various types, replicate sample or extract analysis, lab duplicates, blind standards, matrix spikes, matrix spike duplicates, surrogate compound analysis, calibrations, generation of control charts, etc. Minimal requirements are

usually specified in the analytical methods. Internal quality control needs and requirements should be determined as a part of the Data Quality Objectives. All internal quality control results should be reported with the sample results.

18. **Investigation District** - The USACE district assigned the responsibility for coordinating, reviewing, and completing an HTW site investigation activity either in-house or through contracted services.

19. **Investigation Division** - The USACE Division overseeing the Investigation District.

20. **Laboratory Validation** - An ongoing assessment of laboratory capabilities, including evaluation of personnel, equipment, QA/QC procedures, results from performance evaluation samples and an on-site laboratory inspection.

21. **Matrix** is the environmental medium which is sampled; e.g. groundwater, surface water, soil, sediment, waste, etc.

22. **Quality Assurance** - Measures taken by USACE to oversee the work of contractors.

23. **QA Laboratory** - The validated USACE Division Laboratory performing or coordinating CDQM activities for a project. These activities ordinarily include: document review, inspection and analysis of quality assurance samples, technical assistance to project managers and preparation of the Chemical Quality Assurance Reports. A given Division Laboratory may not have capability for in house performance of all these activities. The QA laboratory is assigned on a project specific basis by CEMRD. QA functions may not be contracted out directly by the FOA to commercial enterprises. QA sample analysis may be performed under contract to the USACE QA laboratory.

24. **Quality Assurance and Quality Control Samples**. Samples analyzed for the purpose of assessing the quality of the sampling effort and of the analytical data. QA and QC samples include splits or replicates of field samples, rinsate blanks, trip blanks, and background (up gradient) samples. The purpose of the sample is to provide site specific field originated checks that the data generated by the contractor's analytical lab are of suitable quality.

25. Quality Control - Measures taken by contractors and to verify the reliability of their own work and to oversee subcontractors.

26. **Quality Control Summary Report (QCSR) - A report submitted by the AE/construction contractor at the conclusion of a chemical contamination remedial activity. For an investigation activity, the QCSR may be included in the Investigation Report.** The QCSR should include the following.

(a) **An outline of QC practices employed by the** AE/construction contractor, including any problems and corrective actions taken;

(b) A consolidation and summary of the DQCR, as prescribed in the contract.

27. **Replicate (duplicate, triplicate, etc.) Samples. Multiple grab samples, collected separately, that equally represent a medium at a given time and location. This is the required type of collocated sample for volatile organic analyses and most** groundwater and surface water samples.

28. **Rinsate blanks** (equipment blanks) are field blanks generated by passing analyte-free reagent water through sampling equipment after it has been decontaminated between uses. Rinsates are analyzed by the same methods as the samples for which they are blanks and are a check on sampling and decontamination procedures.

29. **Split** is a field sample taken, homogenized, divided in the field, contained and sent to one or more laboratories for analysis.

30. **Trip Blank**. 40 mL vials of organic-free reagent water that are kept with the field sample containers from the time they leave the laboratory until the time they are returned to the laboratory. The purpose of trip blanks is to determine whether samples are being contaminated during transit or sample collection. Trip blanks pertain only to volatile organic analyses; therefore, the containers must contain no headspace. Only one trip blank is needed for one day's sampling and shall satisfy trip blank requirements for all matrices for that day if the volatile samples are shipped in the same cooler.

31. **Scope of Services** - Prepared by a District or Field Operation Activity (FOA) and provided to a contractor for the purposes of work definition and fee negotiation. The Scope of Services for an investigation activity shall have attached guidance to the AE including Guide for Preparing a Chemical Data Acquisition Plan (CDAP) (Appendix D), and the Sample Handling Protocol (Appendix F). The Scope of Services for design shall provide the AE with guidance including any appropriate Guide Specifications for Chemical Data Quality Management and the Sample Handling Protocol (Appendix F).

32. **Site Inspection Report or Investigation Report** - Prepared by the AE firm or the investigating district (in-house work) and includes a summary of work done, departures from the CDAP, analytical results, results from all testing, field observations, and regulatory or action level factors which impact on decisions to be made as a result of the investigation.

APPENDIX D

CONTRACT DATA REQUIREMENTS LIST

DD FORM 1423

CONTRACT DATA REQUIREMENTS LIST

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 440 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

A. CONTRACT LINE ITEM NO.:
B. EXH/ATCH NO.:
C. CATEGORY: TDP ____ TM ____ OTHER ____
D. SYSTEM/ITEM:
E. CONTRACT/PR NO.:
F. CONTRACTOR:

---

1. DATA ITEM NO.: A001
2. TITLE OF DATA ITEM: Sampling and Analysis Plan (SAP)
3. SUBTITLE:
4. AUTHORITY (Data Acquisition Document No.):
5. CONTRACT REFERENCE:
6. REQUIRING OFFICE:
7. DD 250 REQ:
8. APP CODE:
9. DIST STATEMENT REQUIRED:
10. FREQUENCY:
11. AS OF DATE:
12. DATE OF FIRST SUBMISSION: 10 days after award
13. DATE OF SUBSEQUENT SUBMISSION: 30 days after award
14. DISTRIBUTION:

a. ADDRESSEE	b. COPIES Draft	Final Reg	Final Repro
15. TOTAL →			

16. REMARKS: SAP prepared in accordance with EM-200-1-3

17. PRICE GROUP
18. ESTIMATED TOTAL PRICE

---

1. DATA ITEM NO.: A002
2. TITLE OF DATA ITEM: Certification of Health & Safety Program (HSP)
3. SUBTITLE:
4. AUTHORITY (Data Acquisition Document No.):
5. CONTRACT REFERENCE:
6. REQUIRING OFFICE:
7. DD 250 REQ:
8. APP CODE:
9. DIST STATEMENT REQUIRED:
10. FREQUENCY:
11. AS OF DATE:
12. DATE OF FIRST SUBMISSION: 10 days after award
13. DATE OF SUBSEQUENT SUBMISSION:
14. DISTRIBUTION:

a. ADDRESSEE	b. COPIES Draft	Final Reg	Final Repro
15. TOTAL →			

16. REMARKS: A written certification of the development and implementation of the HSP in accordance with 29 CFR 1910.120 shall be submitted.

17. PRICE GROUP
18. ESTIMATED TOTAL PRICE

---

1. DATA ITEM NO.: A003
2. TITLE OF DATA ITEM: Site Health & Safety Plan (SSHP)
3. SUBTITLE:
4. AUTHORITY (Data Acquisition Document No.):
5. CONTRACT REFERENCE: SOW - Section C, 3:2.2
6. REQUIRING OFFICE:
7. DD 250 REQ:
8. APP CODE:
9. DIST STATEMENT REQUIRED:
10. FREQUENCY:
11. AS OF DATE:
12. DATE OF FIRST SUBMISSION: 10days after award
13. DATE OF SUBSEQUENT SUBMISSION: 30 days after award
14. DISTRIBUTION:

a. ADDRESSEE	b. COPIES Draft	Final Reg	Final Repro
15. TOTAL →			

16. REMARKS: SSHP prepared in accordance with requirements of EM 385-1-1 and 29 CFR 1910.120. Plus a UXO Avoidance Work Plan.

17. PRICE GROU
18. ESTIMATED TOTAL PRIC

---

1. DATA ITEM NO.: A004
2. TITLE OF DATA ITEM: Work Plan
3. SUBTITLE:
4. AUTHORITY (Data Acquisition Document No.):
5. CONTRACT REFERENCE: SOW - Section C, 3.2.1
6. REQUIRING OFFICE:
7. DD 250 REQ:
8. APP CODE:
9. DIST STATEMENT REQUIRED:
10. FREQUENCY:
11. AS OF DATE:
12. DATE OF FIRST SUBMISSION: 20 days after award
13. DATE OF SUBSEQUENT SUBMISSION: 40 days after award
14. DISTRIBUTION:

a. ADDRESSEE	b. COPIES Draft	Final Reg	Final Repro
15. TOTAL →			

16. REMARKS: A detailed work plan documenting the proposed equipment, procedures and subcontractors to be used.

17. PRICE GRC
18. ESTIMATE TOTAL PR

G. PREPARED BY:
H. DATE:
I. APPROVED BY:
J. DATE:

DD Form 1423, APR 89 — Previous editions are obsolete — Page ____ of ____ Pages

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APPENDIX E

DATA ITEM DESCRIPTIONS

DD FORM 1664

DATA ITEM DESCRIPTION		**Form Approved OMB No. 0704-0188**	
2. Title Sampling and Analysis Plan (SAP)		**1. Identification Number** 1	
3. Description/Purpose The SAP shall provide detailed information on chemical QA/QC during execution of this contract.			
4. Approval Data	**5. Office of Primary Responsibility (OPR)**	**6a. DTIC Applicable**	**6b. GIDEP Applicable**
7. Application/Interrelationship			
8. Approval Limitation		**9a. Applicable Forms**	**9b. AMSC Number**
10. Preparation Instructions The Contractor shall comply with the EM-200-1-3 to prepare and submit the SAP.			
11. Distribution Statement			

DATA ITEM DESCRIPTION	Form Approved OMB No. 0704-0188
2. Title Written Certification of Health and Safety Program (HSP)	**1. Identification Number** 2

3. Description/Purpose

Certification of the development and implementation of HSP.

4. Approval Data	**5. Office of Primary Responsibility (OPR)**	**6a. DTIC Applicable**	**6b. GIDEP Applicable**

7. Application/Interrelationship

8. Approval Limitation	**9a. Applicable Forms**	**9b. AMSC Number**

10. Preparation Instructions

The Contractor shall prepare and submit a written certification that a Health and Safety Program (HSP) has been developed, implemented and maintained.

11. Distribution Statement

DATA ITEM DESCRIPTION	**Form Approved OMB No. 0704-0188**
2. Title Site specific Health and Safety Plan (SSHP)	**1. Identification Number** 3

3. Description/Purpose
The SSHP shall provide detailed information on safety at SEDA during the execution of the contract.

4. Approval Data	**5. Office of Primary Responsibility (OPR)**	**6a. DTIC Applicable**	**6b. GIDEP Applicable**

7. Application/Interrelationship

8. Approval Limitation	**9a. Applicable Forms**	**9b. AMSC Number**

10. Preparation Instructions

The Contractor shall prepare the SSHP in accordance with EM385-1-1, 29 CFR 1910 and 1926, Appendix B. The SSHP shall address the elements described in Appendix B. The services of a Certified Industrial Hygienist experienced in hazardous waste site operation shall be utilized to oversee the development and implementation of the SSHP. In addition the Contractor (or his subcontractor) shall prepare a UXO Avoidance work plan.

11. Distribution Statement

DATA ITEM DESCRIPTION		**Form Approved OMB No. 0704-0188**	
2. Title Work Plan		**1. Identification Number** 4	
3. Description/Purpose Documentation on the proposed equipment, procedures and subcontractors to be used during the project.			
4. Approval Data	**5. Office of Primary Responsibility (OPR)**	**6a. DTIC Applicable**	**6b. GIDEP Applicable**
7. Application/Interrelationship			
8. Approval Limitation		**9a. Applicable Forms**	**9b. AMSC Number**
10. Preparation Instructions The Contractor shall provide a detailed workplan for the owner's review prior to mobilization. The work plan shall provide the information specified in Section 3.1.			
11. Distribution Statement			

DATA ITEM DESCRIPTION	**Form Approved OMB No. 0704-0188**
2. Title Weekly Progress Reports	**1. Identification Number** 5

3. Description/Purpose

Weekly progress reports will be used to monitor the actual progress of the contractor. These reports will be the basis for progress payments.

4. Approval Data	**5. Office of Primary Responsibility (OPR)**	**6a. DTIC Applicable**	**6b. GIDEP Applicable**

7. Application/Interrelationship

8. Approval Limitation	**9a. Applicable Forms**	**9b. AMSC Number**

10. Preparation Instructions

The Contractor shall issue a weekly progress report which shall include the following information:

1. Weight of treated soil processed for the week and cumulative.
2. Weight of treated soil passing the treatment standard for the week and cumulative.
3. Weight of the debris shipped off site for disposal for the week and cumulative.
4. Volume of wastewater collected, treated and discharged for the week and cumulative.
5. Site plan updated monthly with treated areas highlighted.
6. Weight tickets.
7. Laboratory Reports.
8. Air monitoring results.
9. Manifests for material shipped offsite.

11. Distribution Statement

DATA ITEM DESCRIPTION

Form Approved OMB No. 0704-0188

2. Title

Final Reports

1. Identification Number

6

3. Description/Purpose

The final report shall document that the contractor has successfully completed the SEDA open burning grounds remedial action.

4. Approval Data

5. Office of Primary Responsibility (OPR)

6a. DTIC Applicable

6b. GIDEP Applicable

7. Application/Interrelationship

8. Approval Limitation

9a. Applicable Forms

9b. AMSC Number

10. Preparation Instructions

The final report shall contain the following information:

1. Description of work completed with weight of soil processed, weight of debris disposed shipped off site, volume of water treated and discharged.
2. As built site plan with limits of excavation, sample locations and limits of the soil cover.
3. Laboratory reports and summary tables.
4. Air monitoring results.
5. Daily logs with weight tickets.
6. Manifests for material disposed offsite.
7. Surveyor report defining the limits of the treated area.
8. Monitoring well installation documentation.

11. Distribution Statement

APPENDIX F

SITE SPECIFIC HEALTH AND SAFETY PLAN

TPH CONTAMINATED SITES

TABLE OF CONTENTS

LIST OF TABLES

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LIST OF ATTACHMENTS

Attachment 1	Material Safety Data Sheets and Safety Cards
Attachment 2	Standard Operating Procedures For Emergencies Due To • Cold And Stress Monitoring • Heat And Stress Monitoring
Attachment 3	On-Site Documentation Forms
Attachment 4	Personal Protective Equipment Program

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this Health and Safety Plan (HASP) is to establish personnel protection standards and mandatory safety practices and procedures for field investigation efforts. This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise during the Removal Actions at SEADs – 38, 39, 40, 41, and 60 at Seneca Army Depot, Romulus, New York.

This plan may be modified by Addenda to accommodate changes in specific work plans and task specific and location specific hazards encountered during various solid waste management unit (SWMU) investigation activities. Addenda to this plan will incorporate data obtained during subsequent sampling.

The provisions of the plan are mandatory for all of the architect-engineer's (AE's) personnel engaged in on-site hazardous waste operations. Subcontractors working for the AE must conform to this Health and Safety Plan unless they prepare and administer a documented plan with equivalent requirements. All AE and AE contract personnel who engage in project activities must be familiar with this plan and comply with its requirements; these personnel must sign-off on the Plan Acceptance Form (see **Attachment 3**), which will be submitted to the AE Project Manager for retention in the project file. All personnel performing work under this plan must be trained and have a current medical examination in accordance with Title 29 Code of Federal Regulations (CFR) §1910.120. This HASP follows the requirements of ER385-1-92, Safety and Health Elements for HTRW Documents.

1.2 PERSONNEL

All AE site personnel and AE subcontractors performing duties or working in areas where there is the potential for exposure to hazardous material will meet the training requirements specified by the Occupational Safety and Health Administration (OSHA) 29 CFR §1910.120 before working on-site. Site personnel and their duties are outlined below:

1. The AE's Site Manager is responsible for all AE and AE subcontractor personnel on-site and designates duties to the on-site personnel. The name of the Site Manager or, if the Site Manager is absent, the name of the acting Site Manager, shall be posted in the command post.

2. The Site Safety Officer is responsible for carrying out and enforcing provisions of this HASP with regard to site work. The Site Safety Officer will also ensure that all personnel entering the site understand and adhere to the provisions of this plan and that personnel meet the training and medical monitoring requirements of 29 CFR §1910.120. Any changes in the provisions of this HASP shall be made in writing by the Site Safety Officer and shall be approved by the Project Safety Officer or Corporate Health and Safety Officer. Any personal protective equipment upgrades or downgrades shall be documented in writing by the Site Safety Officer. The Site Safety Officer shall have the authority to stop an operation or site work if, in the opinion of the Site Safety Officer, the site conditions or the manner in which the work is being conducted presents a hazard to site personnel, surrounding populations, or the environment. The name of the Site Safety Officer or, if the Site Safety Officer is absent, the name of the Acting Site Safety Officer, shall be posted in the Command Post.

3. The Site Safety Monitors are responsible for all air monitoring. Air monitoring requirements for the Seneca Site are set forth in Section 6.0 of the HASP.

4. Field personnel will be involved in sampling, inspections, field monitoring, and decontamination, as specified in this HASP, the Work Plan, and the Field Sampling and Analysis Plan. These activities will be carried out in accordance with the QA/QC protocols in the Chemical Data Acquisition Plan (CDAP). Site personnel will only perform tasks for which they have received appropriate training.

Site visitors who are not affiliated with the AE, the AE's subcontractors, USEPA, NYSDEC, or Seneca Army Depot will not be allowed into active work areas without making arrangements with Seneca and the AE in advance of the planned visit. Site visitors must present evidence of appropriate training and participation in a medical surveillance program in accordance with 29 CFR §1910.120, and evidence of ability to use a respirator in accordance with 29 CFR §1910.134.

Seneca Army Depot, USEPA and NYSDEC personnel will be permitted into active work areas after presenting a letter addressed to the AE's Site Safety Officer certifying they have passed a physical examination and are certified to wear the appropriate respiratory protective equipment.

All visitors will follow the advice and instructions of the AE's Site Manager and Site Safety Officer. Failure to follow these instructions may endanger the health and safety of visitors and other on-site personnel.

2.0 SITE CHARACTERIZATION

2.1 SITE HISTORY AND DESCRIPTION

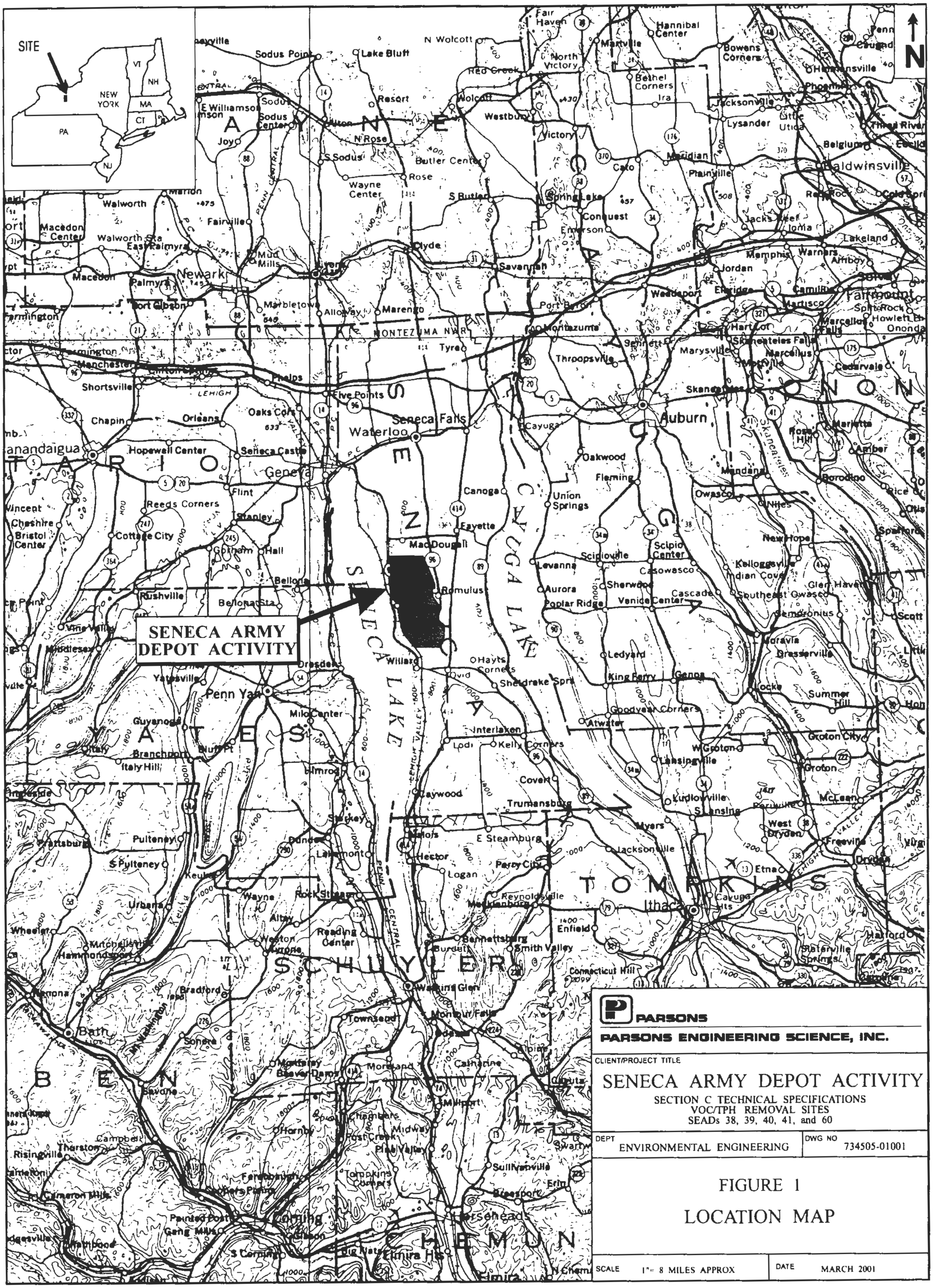
The Seneca Army Depot Activity (SEDA) is a 10,587 acre facility in Seneca County, Romulus, New York that has been owned by the United States Government and operated by the Department of the Army since 1941 (**Figures 1 and 2**). Beginning with its inception in 1941, SEDA's primary mission was the receipt, storage, maintenance, and supply of military items. This function included disposal of military ammunition and explosives by burning and detonation. In 1995, the SEDA was designated for closure under the Department of Defense's Base Realignment and Closure (BRAC) process. SEDA's military mission was terminated on September 30, 1999, and the installation was closed on September 30, 2000.

The Army is continuing to perform remedial investigation and remedial actions at SEDA to address hazardous materials and constituents that have been identified at the site which result from historic operations and activities. This Health and Safety Plan has been developed for removal actions at five sites where total petroleum hydrocarbon and volatile organic type chemicals have been found in soil and sediment. The Removal Actions will be performed at SEADs –38, 39, 40, 41, and 60. A description of each site follows below.

2.1.1 SEAD-38

Building 2079 is an abandoned boiler plant located in the southwestern portion of SEDA. SEAD-38 is the blowdown leaching area that is located to the north-northwest of Building 2079 (**Figure 3**). Currently, the leach pit is not visible. A drainage pipe that originates in Building 2079 is suspected to have carried boiler blowdown liquids from the boiler plant to a roadside drainage ditch that is located approximately 100 feet to the northwest of Building 2079 and drains to the west. A second, smaller drainage ditch originates approximately 50 feet to the west of Building 2079 and drains to the northwest where it intercepts the larger roadside drainage ditch discussed previously. The area between the Building 2079 and the two drainage ditches is a relatively flat and level, grassy field.

Between the time when the boilers were installed and 1979 – 1980, when all blowdown points were connected to the sanitary sewer system, the boilers discharged a total of 400 to 800 gallons per day. The discharge flow drained partly into nearby drainage ditches and partly into the ground. It is presumed that the boiler blowdown contained water, tannins, caustic soda (sodium hydroxide), and sodium phosphate.



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PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

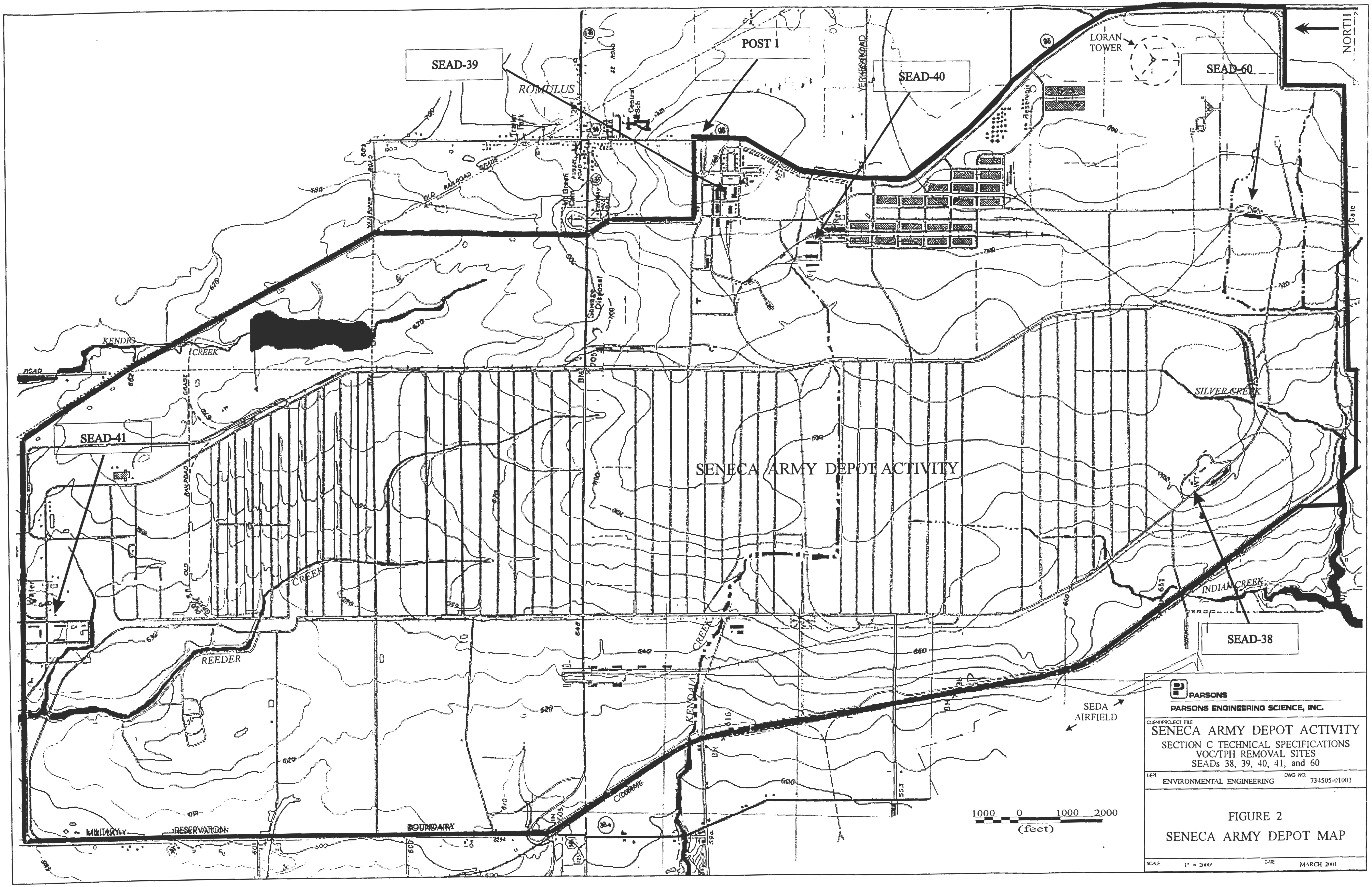
SENECA ARMY DEPOT ACTIVITY
SECTION C TECHNICAL SPECIFICATIONS
VOC/TPH REMOVAL SITES
SEADs 38, 39, 40, 41, and 60

DEPT	DWG NO
ENVIRONMENTAL ENGINEERING	734505-01001

FIGURE 1
LOCATION MAP

SCALE	DATE
1"= 8 MILES APPROX	MARCH 2001

P:\pit\projects\seneca\s383940\draft_final\spce_voc\LOCMAP.CDR(CVM)



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VOC/TPH REMOVAL SITES
SEADs 38, 39, 40, 41, and 60

DEPT. ENVIRONMENTAL ENGINEERING
DWG NO. 734505-01001

FIGURE 2

SENECA ARMY DEPOT MAP

SCALE 1" = 2000'
DATE MARCH 2001

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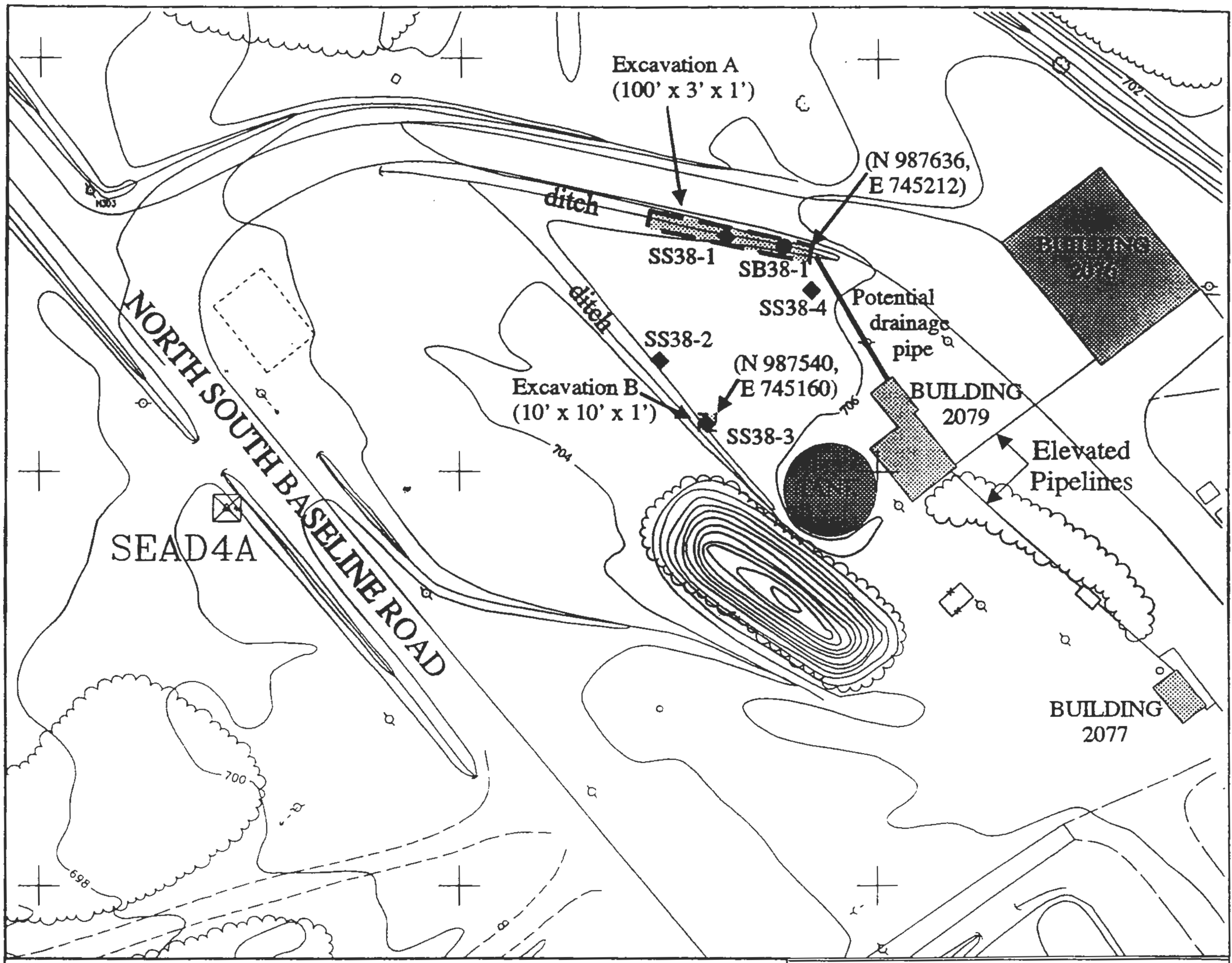

LEGEND

- ● SOIL BORING LOCATION
- ◆ SURFACE SOIL SAMPLE
- (N 987636, E 745212) NEW YORK STATE PLANE N/E COORDINATES
- ☒ SURVEY MONUMENT
- ☋ TELEPHONE POLE

N

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REMOVAL ACTION AT SEADs-38,39,40,41, and 60
HEALTH AND SAFETY PLAN

FIGURE 3

SEAD-38 SITE MAP

SCALE	1" = 100'	DATE	MARCH 2001

H:\ENG\SENECA\DECISION\VOLATILE\COMMENT\SEAD38A.CDR

Previous investigations have detected petroleum hydrocarbons in the surface and subsurface soils at SEAD-38.

2.1.2 SEAD-39

Building 121 is an active boiler plant located in the administrative area (i.e., halfway along the eastern border) of the Seneca Army Depot Activity (SEDA). SEAD-39 is the historic blowdown leaching area that was located exterior to, and immediately north of, Building 121 (**Figure 4**). Use of the leaching area was terminated in approximately 1979 or 1980 when all boiler blowdown points were connected to the sanitary sewer. There is no depression or visible indication of where the historic leaching area was previously located. Center Street, which runs in an east-west direction, is located 50 feet to the north of Building 121 and the suspected location of the former leach pit. The land surface to the north of Building 121 is grass covered and is slightly mounded between the building and the street.

Between the time when the boilers were first installed and when all blowdown points were connected to the sanitary sewer system, the boilers discharged between 400 and 800 gallons of blowdown liquids per day. Blowdown was released three times a day, and the discharged liquid was allowed to flow into the drainage system in the street and partly into the ground. The boiler blowdown is suspected to have contained water, tannins, caustic soda (sodium hydroxide), and sodium phosphate.

Previous investigations have detected petroleum hydrocarbons in the soils at SEAD-39.

2.1.3 SEAD-40

Building 319 is an active boiler plant located on First Street at the Seneca Army Depot Activity (SEDA). The historic blowdown leach pit that constitutes SEAD-40 was located in a drainage ditch that was next to the railroad tracks that are located north of Building 319 (**Figure 5**). Currently, evidence of the historic leach pit is not visible. A drainage pipe originating in Building 319 is suspected to have carried blowdown liquids to the drainage ditch, where they were released. The drainage ditch originates at the mouth of the drainage pipe approximately thirty feet northeast of Building 319. The drainage ditch continues for approximately 400 feet to the north where it eventually levels into a grassy field. The ground surface to the north of Building 319 and to the south of the drainage ditch is covered with asphalt.

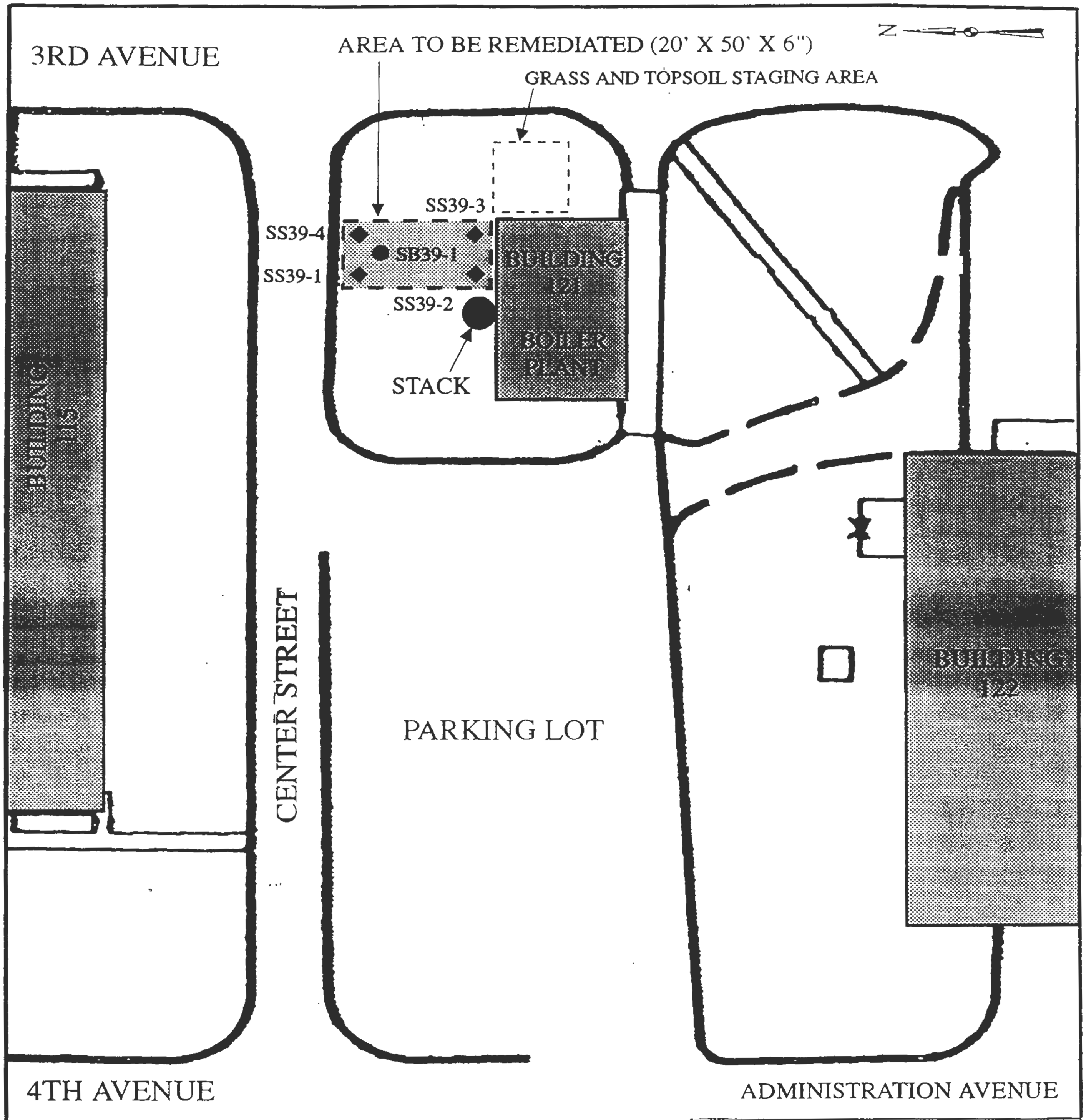

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FIGURE 4

SEAD-39 SITE MAP

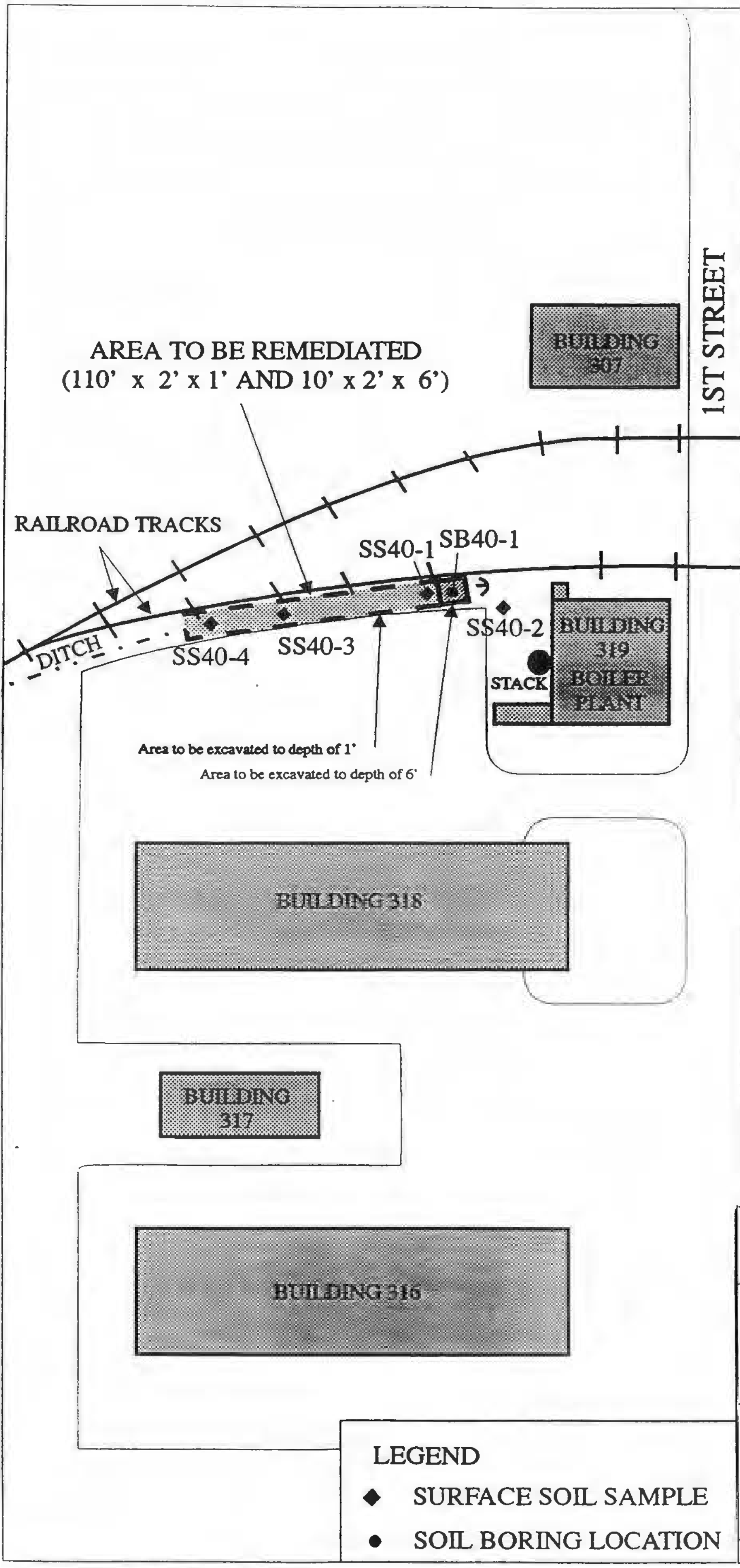
SCALE 1 = 100 DATE MARCH 2001

LEGEND

◆ SURFACE SOIL SAMPLE

● SOIL BORING LOCATION

H:\ENG\SENECA\DECISION\VOLAT\SEAD39.CDR



NOTE: The origin of the ditch where the soil is to be excavated is approximately 40 feet from the northeast corner of Building 319.

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REMOVAL ACTION AT SEADs-38,39,40,41, and 60
HEALTH AND SAFETY PLAN

FIGURE 5

SEAD-40 SITE MAP

SCALE	1" = 100'	DATE	MARCH 2001

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Between the time when the boilers were first installed and 1979 – 1980, when all blowdown points were connected to the sanitary sewer system, the boilers discharged blowdown three times every 24 hours. It is estimated that the average blowdown flow totaled 400 to 800 gallons per day. The blowdown flow drained partly into the drainage ditch and partly into the ground. It is presumed that the boiler blowdown contained water condensate and a small amount of tannins, caustic soda (sodium hydroxide), and sodium phosphate that were used to reduce corrosion and scale in the boiler.

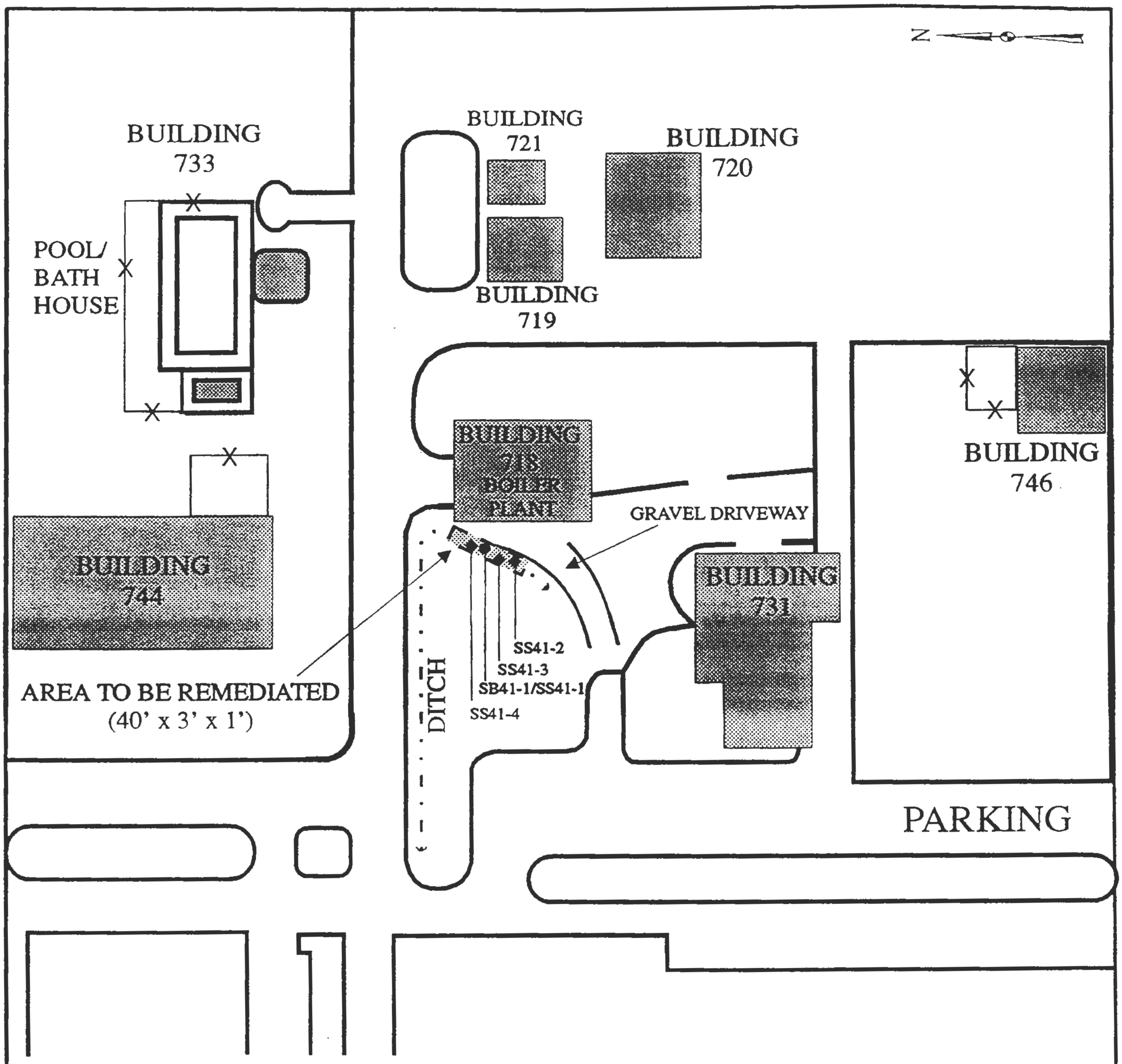
Previous investigations have detected petroleum hydrocarbons in the surface and subsurface soils at SEAD-40.

2.1.4 SEAD-41

Building 718 is an abandoned boiler plant located in the northern end of SEDA. SEAD-41 is the blowdown leaching area that is suspected to have existed in the drainage ditch that is located approximately 40 west of Building 718 (**Figure 6**). All surface discharge originating along the west side of Building 718 would flow into this ditch. Thirty feet to the north of Building 718 is a street that runs east-west. The drainage ditch is relatively steep-sided near the building and primarily drains to the north where it joins a roadside drainage ditch. Some runoff in the ditch would flow to the southwest where the drainage ditch is cut off by a crushed gravel road leading southwest, away from Building 718.

Between the time when the boilers were installed and 1979 – 1980, when all blowdown points were connected to the sanitary sewer system, the boilers discharged a total of 400 to 800 gallons per day. The discharge flow drained partly into nearby drainage ditches and partly into the ground. It is unknown whether the blowdown liquid was discharged directly into the ditch to the west of Building 718, or whether it was discharged next to the building and flowed overground into the ditch. It is presumed that the boiler blowdown contained water condensate and a small amount of tannins, caustic soda (sodium hydroxide), and sodium phosphate that were used to reduce corrosion and scale in the boiler.

Previous investigations have detected petroleum hydrocarbons in the surface and subsurface soils at SEAD-41.



LEGEND

◆ SURFACE SOIL SAMPLE

● SOIL BORING LOCATION

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REMOVAL ACTION AT SEADs-38,39,40,41, and 60
HEALTH AND SAFETY PLAN

FIGURE 6

SEAD-41 SITE MAP

SCALE 1" = 100 DATE MARCH 2001

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2.1.5 SEAD-60

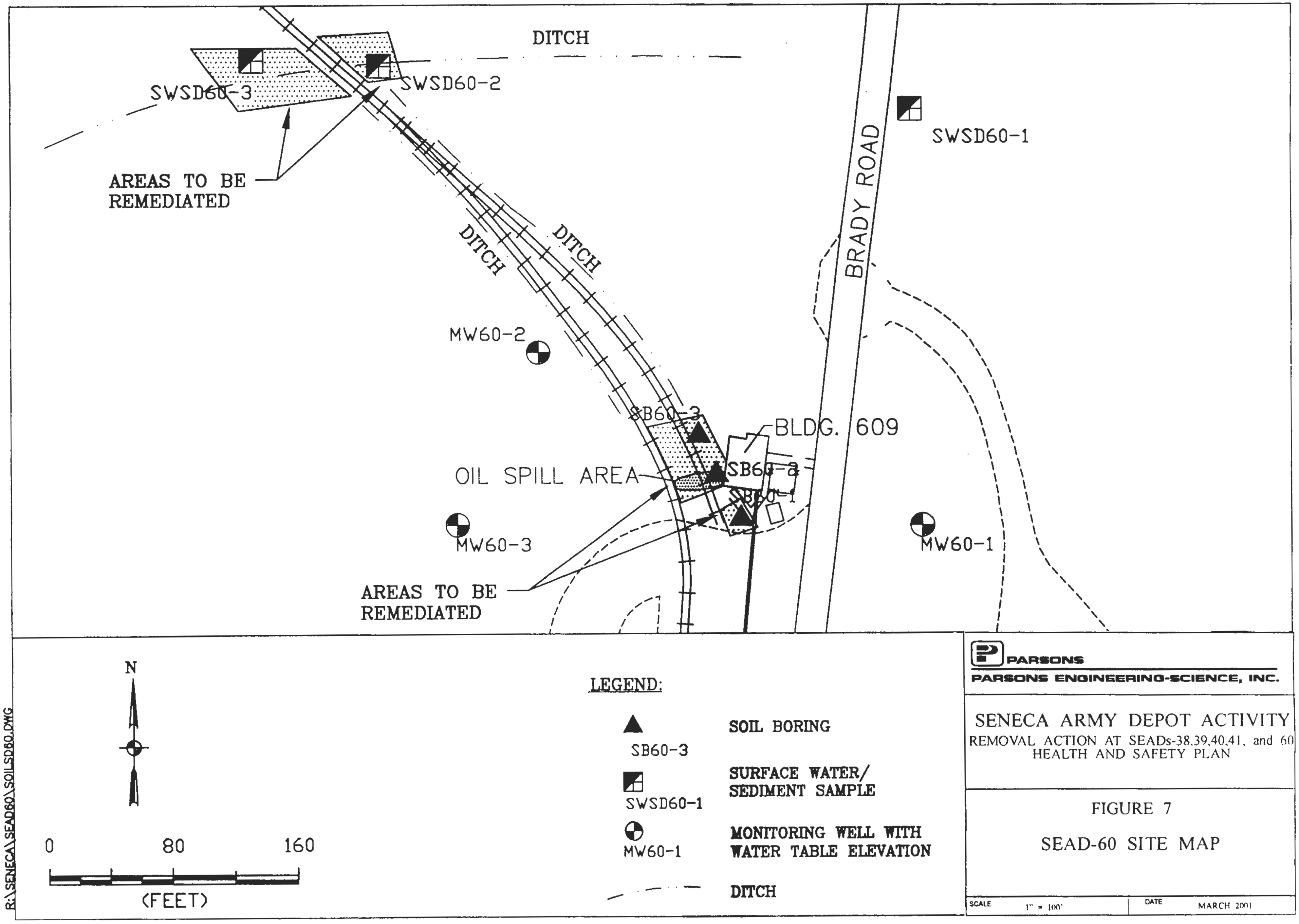
SEAD-60 is located in the southeastern portion of SEDA and represents an area of oil stained soil adjacent to the southwest corner of Building 609. SEAD-52 is adjacent to the southern boundary of the SWMU area, and SEAD-62 is located to the east. The site is located within the ammunition storage area and access to the site is restricted. The site plan is shown in **Figure** 7.

The surrounding areas are characterized as developed and undeveloped land. The developed areas consist of Building 609, which is located immediately west of Brady Road, and two SEDA railroad spurs. A single railroad track enters the developed area from the northwest and splits into two spur lines approximately 300 feet northwest of Building 609. The two spurs transect the site to the west of Building 609. The eastern spur line passes within a few feet of Building 609 and ends just south of Building 609. The western spur ends at the northern side of Building 612 which is south of Building 609.

The undeveloped areas are located north, west and east of SEAD-60, and consist of grassy fields with sparse brush. A grassy mounded area is also located north-northwest of the site. Building 612, which is part of SEAD-52, is located approximately 120 feet south of the site of SEAD-60. Building 609 is the boiler house for Building 612. Elevated pipes, which include steam pipes, run parallel to Brady Road and connect Buildings 609 and 612. A tall emissions stack protrudes from the southeastern corner of Building 609. A paved driveway is located immediately south of Building 609 and provides vehicular access to the western portion of the site from Brady Road. There are also paved access routes on the eastern and northern sides of the building.

The spill area, evidenced by visibly stained soils, measures approximately 6 feet by 30 feet in size and extends west of the easternmost railroad spur. No vegetation is present in the visibly stained soil area.

The topography in the immediate vicinity of the Building 609 is variable but the most notable feature is a low-lying area that is defined by the western wall of Building 609 and the easement of the easternmost railroad spur. The local topography within an approximately 50-foot radius slopes toward this area while the regional topography slopes to the west. In the northern portion of the site, the topography slopes toward an east-west trending intermittent stream that flows to the west. Drainage swales, which parallel each side of the railroad spurs, flow north intersecting the intermittent stream approximately 300 feet northwest of Building 609.



LEGEND:

▲ SB60-3	**SOIL BORING**
◩ SWSD60-1	**SURFACE WATER/ SEDIMENT SAMPLE**
⊕ MW60-1	**MONITORING WELL WITH WATER TABLE ELEVATION**
— · —	**DITCH**

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REMOVAL ACTION AT SEADs-38,39,40,41, and 60
HEALTH AND SAFETY PLAN

FIGURE 7

SEAD-60 SITE MAP

SCALE 1" = 100'
DATE MARCH 2001

Surface water flow resulting from precipitation events at SEAD-60 is controlled by the local topography. Surface water flows primarily westward following the regional topographic slope in this area. There are no sustained surface water bodies present at SEAD-60, although intermittent drainage ditches are present to the north, northwest and west of the site. The two drainage ditches, which flow to the northwest along the railroad spurs, originate near the oil spill area.

Three monitoring wells were installed at SEAD-60 as part of the ESI program. Groundwater elevations were measured in the three monitoring wells and the results are presented in the referenced ESI Report. Based on these data, the groundwater flow direction is primarily west across SEAD-60.

Most of the historical information for SEAD-60 is related to a release of oil on the site. Building 609 has historically been a boiler house for Building 612, which is located south of Building 609. It is believed that overflow from an aboveground storage tank located in Building 609 was discharged from a pipe in the wall of Building 609 resulting in a spill adjacent to the southwest corner of the building. According to SEDA personnel, the aboveground storage tank contains No. 2 fuel oil. No information is available on the date of the spill or the volume of oil released.

Investigations have been performed on the surface and subsurface soils, groundwater, surface water and sediment at SEAD-60. Total petroleum hydrocarbons (TPHs), polynuclear aromatic hydrocarbons (PAHs e.g., benzo[a]anthracene, chrysene, benzo[b]fluroanthene, benzo[a]pyrene, and dibenz[a,h]anthracene), metals, and to a small extent, polychlorinated biphenyl (PCB) compounds were detected in the surface soils. Dibenz[a,h]anthracene was also detected in the subsurface soils. TPH and PAHs were detected at elevated levels in the sediment. TPH and four metals (aluminum, iron, manganese, and sodium) were detected in the groundwater. Surface water was not found to be significantly impacted by any of the constituents which were analyzed for during the investigation.

2.2 PLANNED SITE ACTIVITIES

The activities associated with this Removal Action include the excavation, management, and disposal of petroleum-contaminated soil that has been identified at SEADs 38, 39, 40, 41 and 60.

The petroleum-hydrocarbon contaminated soils must be excavated to the cleanup requirements established in New York State Department of Environmental Conservation (NYSDEC) Spill Technology and Remediation Series (STARS) Memo #1 Petroleum-Contaminated Soil Guidance Policy, dated August 1992.

Petroleum-contaminated soil from SEAD-60 was previously excavated and treated in a low temperature thermal desorption (LTTD) treatability study that was conducted at SEDA's former APE-1236 deactivation furnace. Analytical results of the treated soil indicates that the concentration of petroleum-hydrocarbon contamination remaining in the soil has been reduced.

The field activities will include the following:

- the establishment and maintenance of necessary site security in the area of the planned excavation;
- the implementation of dust suppression procedures to minimize air borne releases during the excavation operations;
- the excavation and removal of the contaminated soil from the site;
- the collection and analysis of any required air samples to document that the action has been completed in accordance with prevailing air pollution requirements;
- the collection and analysis of samples needed for waste disposal purposes;
- the collection and analysis of samples to confirm that the excavation and removal action has adequately been conducted;
- the handling and on-site management of excavated soil prior to transport off-site;
- the transportation of the excavated soil to the selected off-site disposal site;
- the off-site disposal of the petroleum-contaminated soil;
- backfilling, compacting, regrading and revegetation of soils at SEADs 38, 39, 40, 41 and 60.

2.3 HAZARD EVALUATION

The chemical and physical hazards that may be encountered at the areas of concern are described below.

2.3.1 Exposure Potential

The primary sources of exposure at the subject sites will be the surface and subsurface soils. These soils may be contaminated with TPH, PAHs, or low levels of PCBs. The exposure potential for each of the planned site activities is described below.

Establishment of Site Security – There is a low potential of exposure during the establishment of site security. These activities will not involve any direct contact with contaminated media and the site excavation activities will not yet have taken place.

Dust Suppression - The primary route of exposure during dust suppression will be through inhalation of dust generated by the excavation activities. There is a low to moderate potential for inhalation of contaminated dust.

Excavation of Contaminated Soils – The primary route of exposure during the soil excavation will be through contact with TPH/PAH contaminated soil. There is a high potential for direct contact with contaminated soils. There is also a potential for exposure through the inhalation of dust generated by the excavation. The excavations are planned to extend 1-2 feet in depth, therefore, contact with groundwater is unlikely.

Air Sampling – The primary route of exposure during air sampling will be through inhalation of dust generated by the excavation activities, as discussed above. There is a low to moderate potential for inhalation of contaminated dust.

Soil Sampling – The primary route of exposure during the confirmatory soil sampling and sampling for waste disposal will be through direct contact with TPH/PAH contaminated soil. There is a high potential for direct contact with contaminated soils.

Transportation and Disposal of Excavated Soil - The primary route of exposure during the transportation and disposal will be through contact with TPH/PAH contaminated soil. There is a high potential for direct contact with contaminated soils. There is also a potential for exposure through the inhalation of dust generated by the loading and unloading of material from the trucks.

Backfilling – There is a low potential for exposure during backfilling activities because uncontaminated fill material will be used.

2.3.2 Chemical Hazards

TPH, PAHs, and to a small extent, PCBs are the primary compounds that have been detected during previous investigations at the SEADs-38, 39, 40, 41, and 60. The following is a summary of the toxic effects of these compounds. Exposure limits and physical properties are given in **Table 1** and in the Material Safety Data Sheets contained in **Attachment 1**.

Benzene - Benzene will cause local irritation to the skin, eyes and respiratory tract and may cause redness, dryness and scaling of the skin due to defatting. Acute systemic effects include headache, dizziness, convulsions, coma and death may occur due to effects on the heart. Chronic exposures

TABLE 1
PERMISSIBLE EXPOSURE LIMITS FOR SELECTED COMPOUNDS AT SEDA

		Permissible Exposure Limits(1) (mg/m3)	Short-Term Exposure Limits (mg/m3)(2)	Ceiling Limits (mg/m3)(3)	Other Exposure Limits (mg/m3)(4)	Carcinogenic Rating(5)
Volatiles		(PPM)	(PPM)			
	Benzene	1.0	5	--	0.1	A
	Ethylbenzene	100	125(7)	800(6)	100	D
	Toluene	200	150	300	100	D
	Xylene	100	150	--	--	D
	Petroleum Products					
Semi-volatiles						
	PAHs					
	Coal Tar Pitch Volatiles	0.2	--	80(6)	0.1	
	(includes the following compounds)					
	Acenaphthene					--
	Acenaphthylene					D
	Anthracene					D
	Benzo(a)anthracene					B2
	Benzo(a)pyrene					B2
	Benzo(g.h.i)perylene					D
	Benzo(b)fluoranthene					B2
	Benzo(k)fluoranthene					B2
	Chrysene					B2
	Dibenzo(a.h)anthracene					B2
	Fluoranthene					D
	Fluorene					D
	Indeno(1.2.3-cd)pyrene					B2
	Phenanthrene					D
	Pyrene					--
	PCB's	0.5 (skin)	--	--	0.001	B2

Notes:

(1) OSHA 8-hour time-weighted average Permissible Exposure Limits (PEL). For metals, PEL shown is lowest of compounds likely to be encountered on-site.

(2) OSHA Short-Term Exposure Limit. 15 minute time-weighted average concentration

(3) OSHA Ceiling Limit. Concentration not to be exceeded during any part of the work day.

(4) NIOSH REL TWA

(5) EPA weight of evidence ratings for each compounds.

A	Confirmed human carcinogen
B1	Probable confirmed human carcinogen. Limited human evidence.
B2	Probable confirmed human carcinogen. Sufficient animal evidence.
C	Possible Human Carcinogen, Limited Animal Evidence
D	Not classifiable
--	No data or carcinogenic rating not determined.

(6) NIOSH REL Ceiling

(7) NIOSH Short-Term Exposure Limit. 15 minute time-weighted average concentration

effect the blood-forming tissues primarily, resulting initially in increases in blood cell counts followed by aplastic anemia with an overactive or under active bone marrow. Epidemiological studies have linked benzene with leukemia and it is classified as a suspected human carcinogen.

Ethylbenzene – Ethylbenzene may cause eye and throat irritation, decreased movement, and dizziness. Studies in animals have shown liver and kidney damage, nervous system changes, and blood changes. It is not classifiable as a human carcinogen.

Fuel Oils - Fuel oils are mixtures of straight-chain, branched, double-bonded, cyclic, and aromatic hydrocarbons containing 10 to 16 carbons. Fuel oils come in six grades, numbered 1 to 6, with the lower numbered fuel oils being composed of lighter mixtures of hydrocarbons. The toxicity of these fuel oils varies widely, though all produce skin irritation with prolonged contact. Inhalation exposure is generally not a problem due to the low volatility of these mixtures, though cases of inhalation intoxication from Fuel oil No. 1 (jet fuel) have been reported to cause dizziness, headache, nausea, palpitations, and pressure in the chest. Lighter fuel oils are rapidly absorbed from the stomach and cause gastrointestinal irritation, vomiting, diarrhea, and may cause drowsiness and central nervous depression. Ingestion may lead to aspiration into the lungs, which may cause pulmonary edema, hemorrhage, irritation, and cardiac and kidney effects. Pulmonary exposure may also occur through exposure to mists. Chronic exposure may lead to kidney damage. Fuel oils are not classified as carcinogens and teratogenic data are negative.

Gasoline - Gasoline is a mixture of five-carbon to eleven-carbon straight-chain, branched, double-bonded, cyclic, and aromatic hydrocarbons. Acute inhalation exposure effects are primarily on the central nervous system, including staggered gait, slurred speech and confusion. High levels may cause coma or death from respiratory failure. Contact exposure results in irritation, defatting, and some individuals may develop an allergic reaction to gasoline. Chronic exposures may result is kidney damage and in lead toxicity with leaded gasolines. Gasoline is not classified as a carcinogen. Teratogenic and mutagenic data are negative.

Polychlorinated Biphenyls (PCBs) - Polychlorinated biphenyls primarily effect the skin and the liver. Skin areas exposed to PCBs develop chloracne, which consists of small pimples and dark pigmentation. Later, comedones and pustules develop. Some PCBs are suspected carcinogens, producing liver tumors. Acute and chronic exposures can result in edema, jaundice, vomiting, anorexia, nausea, abdominal pains, and fatigue.

Polycyclic Aromatic Hydrocarbons - Polycyclic aromatic hydrocarbons, i.e., PAHs, are a large group of chemicals formed during the incomplete combustion of organic materials. There are over one hundred PAHs, and they are found throughout the environment in air, water, and soil. Seven of the 15 PAHs listed below are classified as probable human carcinogens.

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(g,h,i)perylene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Phenanthrene
Pyrene

Because the physical and chemical properties of PAHs vary substantially depending on the specific compounds in question, the fate and transport characteristics vary. Ingestion of, inhalation of, or dermal contact with PAHs by laboratory animals has been shown to produce tumors. Reports show that humans exposed by inhalation or dermal contact for long periods of time to mixtures of PAHs and other compounds can also develop cancer. However, the relationship of exposure to any individual PAH with the onset of cancer in humans is not clear.

Toluene - Toluene will cause local irritation to the skin, eyes, and respiratory tract, and may cause defatting, drying and scaling of the skin. Acute systemic effects include headache, dizziness, nausea, loss of appetite, lassitude and eventual coma if exposure is prolonged. Toluene does not display the effects on the blood forming tissues seen with benzene and is not classified as a carcinogen in humans or animals. Chronic exposures can result in effects on the liver, kidneys and central nervous system.

Xylenes - Acute effects of xylene exposure include skin and mucous membrane irritation, central nervous system effects, and respiratory irritation leading to pulmonary congestion, edema, and hemorrhage. Inhalation exposure can also lead to liver and cardiac damage. Chronic exposure can result in effects on the liver, kidneys and central nervous system and may have an effect on the blood forming tissues. No carcinogenic effects have been documented; possible teratogenic effects have been observed.

2.3.3 Physical Hazards

The principle physical hazards associated with the Removal Action at SEADs- 38, 39, 40, 41, and 60 involve working around heavy equipment, site terrain, and site debris.

Terrain hazards include marshy areas, drainage ditches, areas of rough terrain, and areas of protruding debris. In areas where access is difficult or hazardous, access paths shall be cleared and maintained, and movement through these areas shall be along the access paths.

Activities on-site will include:

1. Site visits
2. Soil excavation
3. Dust suppression
4. Air sampling
5. Confirmatory soil sampling
6. Transportation/disposal of excavated material
7. Backfilling

Hazards associated with these activities are varied and include vehicle/pedestrian collisions; fire; contact or crushing injuries resulting from materials handling and equipment operations; abrasions, contusions, lacerations, etc. resulting from use of power tools; and elevated noise levels. The potential for such hazards necessitates that all on-site personnel wear appropriate protective clothing, including coveralls, gloves, eye and face protection, safety boots, ear plugs and hard hats.

2.3.4 Motor Vehicles and Motorized Equipment

All motor vehicles will be maintained in a safe operating condition and in accordance with local and state safety requirements. All vehicles and moving equipment will be operated on-site and en route to and from sites in accordance with state and local motor vehicle regulations for speed, lights and warnings, passenger carrying, and operation. If any equipment is left unattended at night adjacent to a highway in use, it will be provided with suitable barricading, lighting, reflectors, or other suitable visual warnings to identify its location.

Any mobile equipment, including drilling rigs, earth-moving machinery, or other similar types of equipment, will be operated in strict compliance with the manufacturer's instructions, specifications, and limitations, as well as any applicable regulations. The operator is responsible for inspecting the equipment daily to assure that it is functioning properly and safely. This inspection will include all parts subject to faster than normal wear and all lubrication points.

Hand and audible (horn) signals to equipment operators will be the commonly accepted industry standard signals for the type of equipment being used. All signals will be reviewed by the operator and signaller before work begins. Only one person will signal the equipment operator at any give time.

When equipment with moving booms, arms, or masts is operated near overhead hazards, the operator, with assistance from the designated signaling person, will assure that the moving parts of the equipment maintain safe vertical and horizontal clearances to the hazards. Moving booms, arms, or masts will be lowered and secured prior to being moved from one location to another, even on the same site. Equipment will be kept at least 10 feet (ft) away from energized electrical lines rated up to 50 kilo volts (kV) and 16 ft away from lines rated over 50 and up to 750 kV.

Drill rigs and other equipment not specifically designed to move with the boom, mast or arm in an elevated position will be returned to traveling position and condition before being moved. Movement through the depot facility will be along established roads. All site equipment will be inspected before each use to ensure that it is in proper working order. Any equipment found to be unsafe shall be repaired or taken out of service.

2.3.5 Heat Stress

Site work at the SWMUs may be conducted during the summer and early fall months and heat stress is a serious concern. Heat stress monitoring for employees wearing protective clothing will be conducted whenever the temperature is above 60 degrees Fahrenheit (^{O}F). For employees not wearing protective clothing, heat stress monitoring will be conducted when the temperature is above 80^{O}F. Pulse rate and oral temperature measured at the end of each work period will be used to monitor heat stress in on-site employees. Heat stress monitoring procedures are described in **Attachment 2** of this HASP, Standard Operating Procedures for Emergencies Due to Heat and Heat Stress Monitoring.

2.3.6 Cold Stress

Site work at the SWMUs may be conducted during cold weather. Cold stress monitoring for employees working outdoors will be conducted. Two factors influence the development of a cold injury: ambient temperature and wind velocity. Cold stress monitoring will be conducted when temperatures are below 4 degrees Celsius (^{O}C or 40^{O}F). Cold stress monitoring procedures are described in **Attachment 2** of this HASP, Standard Operating Procedures for Emergencies Due to Cold and Cold Stress Monitoring.

2.3.7 Biological Hazards

Biological hazards can result from encounters with mammals, insects, snakes, spiders, ticks, plants, parasites, and pathogens. Mammals can bite or scratch when cornered or surprised. The bite or scratch can result in local infection or infection with systemic pathogens or parasites. Insect and spider bites can result in severe allergic reactions in sensitive individuals. Exposure to poison ivy, poison oak or poison sumac results in skin rash. Ticks are a vector for a number of serious diseases. Dead animals, organic wastes, and contaminated soil and water can harbor parasites and pathogens.

2.3.7.1 Poison Ivy

Poison ivy is common throughout SEDA. Site workers should how to recognize the poison ivy plant and avoid walking through areas of heavy growth. If walking through areas of poison ivy is unavoidable, workers should keep extremities covered and avoid contact of bare skin with poison ivy leaves and stems. When digging in areas of poison ivy growth, contact with the roots should be avoided; these can also produce a reaction.

Skin areas exposed to the poison ivy should be washed as soon as possible. Oils from the poison ivy plant can adhere to clothes. Clothes exposed to poison ivy should be washed before wearing again.

2.3.7.2 Ticks and Lyme Disease

Ticks may be common during the spring and summer at SEDA. Two types of ticks may be encountered.

The dog tick is the larger, more common tick. After biting, the dog tick will remain attached to the victim until engorged with blood. Usually, dog ticks can be found by careful inspection of the body at the end of the workday. If the tick is already imbedded in the skin, remove it with tweezers or fingers by grasping the tick as close to the skin as possible and pulling downward. Check to make sure all tick parts have been removed from the skin. Wash the area of the bite with soap and water. Seek medical attention if any tick parts remain in the skin. Dog ticks may transmit Rocky Mountain spotted fever and other diseases.

The deer tick is much smaller, ranging from poppy seed to grape seed size, and does not remain attached to the skin for very long after biting. You may be bitten by a deer tick and never see the tick. Deer ticks can transmit Lyme disease, which can have serious, long-term health effects if left untreated. If you discover a small tick imbedded in the skin, remove it as above. Check the area of the bite periodically. If you develop a rash or develop flu-like symptoms, seek medical attention. Lyme disease is characterized by a bull's-eye type rash: light in the center with an outer red area. Flu-like symptoms may also occur. These signs may occur at different times and the rash may not appear.

If workers discover any bites on the skin, they should wash the affected area and seek medical attention if a rash or flu-like symptoms appear.

Workers should the following steps to limit the likelihood of getting tick bites:

- Tuck pants legs into socks;
- Wear long sleeves, hat and closed shoes;
- Use tick repellant, such as DEET, on clothes;
- Check body for ticks daily; and
- Shower immediately after work and wash work clothes daily.

2.3.7.3 Snakes

Poisonous snakes are not common to the area of SEDA, though central New York is within the range of rattlesnakes and copperhead snakes. To minimize the chance of snake bites, workers should:

- Not put hands and feet where they have not looked;
- Avoid stepping into clumps of weeds and brush;
- Step heavily. Snakes can feel footfalls through the ground and will avoid you if they can; and
- Wear heavy leather boots and loose fitting pants.

Caution should be used if any snake is encountered.

3.0 HEALTH AND SAFETY TRAINING

All site workers involved in hazardous work must meet the training requirements set forth in 29 CFR §1910.120(e). All employees engaged in hazardous waste site work must receive an initial 40 hours of training in hazardous waste site operations and safety procedures. Written certification of this training will be provided as an attachment to the HASP. This training must be followed by 3 days of supervised on-site experience. Employees performing hazardous waste work prior to March 1987, who received initial training that was standard at that time, are assumed to satisfy 29 CFR §1910.120 as a result of training and experience. In addition, at least two workers per shift shall be certified in First Aid and CPR.

Supervisors and site managers must receive an additional 8 hours of specialized training on the safe management of site operations. All employees must receive an additional 8 hours of refresher training, annually. Additional training must also be provided to those employees who have been designated to respond to site emergencies. Additional training will be provided to those employees who may be exposed to unique or special hazards at the site.

On-site safety training will consist of a detailed safety meeting and training session prior to the beginning of any fieldwork. This meeting will cover all site activities and will also review the site emergency response plan. All site workers and managers are required to attend this meeting. Other topics to be discussed will include donning and doffing of personal protective equipment as well as a brief toxicological review of site-specific known and suspected contaminants.

Daily safety meetings will also be conducted prior to each day's activities. These meetings will cover the safety measures to be employed during that day's activities and the emergency response and evacuation procedures for each work site and work crew.

On-site training will be documented using the form contained in **Attachment 3**, On-Site Documentation Forms.

3.1 INITIAL SITE TRAINING

Initial site training shall consist of a review of this site specific HASP and shall cover the following topics:

- Site Personnel and Duties;
- Site Description;

- Site Characterization;
- Chemical and Physical Hazard Evaluation;
- Toxicological Information;
- Heat Stress and Cold Stress;
- Site Layout, Site Control Measures, and Work Zones;
- Personal Protective Equipment;
- Safe Work Practices and Engineering Controls;
- Emergency Response Plan;
- On-site Emergency Plan;
- Off-site Emergency Plan;
- Evacuation Procedures;
- Emergency and Personal protective equipment;
- Emergency Telephone Numbers;
- Directions to Hospital;
- Medical Surveillance Requirements; and
- Health and Safety Training.

3.2 SAFETY BRIEFINGS

Safety briefings shall be conducted at least weekly and at the beginning of new operations, changes in site conditions, and changes in operating procedures due to weather, new equipment, or additional site information.

The topics covered in the safety briefings will include, as appropriate:

- Evacuation routes and emergency procedures;
- Use of additional protective equipment;
- Terrain hazards;
- Weather hazards;
- New chemical or toxicological information;
- Periodic review of portions of the site specific HASP; and
- Review of site incidents, follow-up, and corrective measures.

4.0 MEDICAL SURVEILLANCE

All personnel conducting work in the exclusion and contamination reduction zones will be participating in a medical surveillance program that meets the criteria set forth in OSHA 29 CFR §1910.120. This rule requires that employees engaged in hazardous waste site work receive a medical examination at least annually and that they become certified by the examining physician to wear a respirator without restrictions. All subcontractors involved in hazardous work must certify to the AE that all site workers meet the above criteria. Written certification of completion of medical exams for designated project employees will be provided as a separate attachment of this HASP.

Employees of Seneca Army Depot (SEDA) who will be performing activities in active work areas at the SWMUs will be required to participate in SEDA's medical surveillance program for respirator use.

4.1 PHYSICAL EXAMINATIONS

Employees receive physical exams annually and at the time of termination from the AE's or reassignment from the hazardous work assignments.

Personnel who are significantly exposed to hazardous materials may require special exams. The need for these tests will be determined by the attending physician after consulting with supervisors and health and safety personnel. Provisions will be made to repeat tests when necessary.

Physical exams will be conducted by or under the direct supervision of a licensed physician or a medical consultant who is Board Certified or Board Eligible in Occupation or Aerospace Medicine by the American Board of Preventive Medicine, Inc. with at least three years of experience in occupational medicine.

The examining physician will furnish the AE's Health and Safety Officer with an oral report and indicate any adverse effects. A written report will follow. The physician is instructed, however, to reveal any specific findings or diagnoses unrelated to occupational exposure to the employee or the employee's designee only.

Medical records for the AE's personnel are kept on file by the AE for at least 30 years plus the length of employment. Medical monitoring for the AE's employees is the responsibility of the AE, and the AE will bear the entire cost.

5.0 SITE LAYOUT AND CONTROL MEASURES

5.1 WORK ZONES

The support zone and command post for the fieldwork at the SWMU areas will consist of an office trailer and storage areas situated at one central location for all SWMUs. The location of the support zone will be determined prior to the commencement of the fieldwork. Exclusion zones will be established at each of the removal action sites.

If surface contamination is created or suspected as a result of the operations, an exclusion zone will be defined around the suspected surface contamination until the problem has been mitigated. Mobile operations, such as sediment sampling, will not have defined exclusion zones.

5.2 UTILITIES CLEARANCE

Facility maps will be obtained and consulted prior to commencing any intrusive work. Excavation sites will be positioned accordingly, marked with wooden stakes, and then cleared with SEDA. Excavation is to be done at the marked, cleared locations only.

5.3 SITE CONTROL

SEDA is responsible for overall site security. All AE personnel and subcontractors and all equipment used in the field investigation or removal action shall be logged each day at the command post prior to proceeding to other areas of the site. All persons other than work crews wishing to enter the active work areas shall first sign in at the command post.

5.4 SITE COMMUNICATIONS

Routine site communications will be maintained between all work crews and the support zone using two-way radios or cellular phones. On-site emergency communications will be maintained by the use of air horns. Details of the emergency communications are contained in the Emergency Response Plan in Section 10 of this HASP.

6.0 MONITORING

6.1 GENERAL

Standard Operating Procedures (SOPs) for the calibration and operation of all monitoring instruments and copies of the operating manuals for these instruments will be kept in the command post. Instruments will be field calibrated daily, each day the instrument is used. Calibration log sheets (**Attachment 3**) will be kept for each instrument and will become part of the permanent file.

Instruments will be kept on charge whenever not in use. All monitoring and instrument calibration will be done by personnel who have been trained in the use of the equipment.

6.2 ON-SITE MONITORING

6.2.1 Monitoring Overview

All site work which breaks the ground surface will be monitored, at a minimum, using an organic vapor meter with a photoionization detector [e.g., Thermoenvironmental Organic Vapor Meter (OVM-580B/580S) equipped with a 10.6e V lamp] and a particulate meter (e.g., MIE Miniram PDM-3). Field monitoring log sheets will be kept (**Attachment 3**).

Instrument settings on all direct reading air monitoring instruments will be set on the most sensitive scale unless a reading is detected. The action levels for changes in personal protective equipment and personnel actions are given in **Table 2**, Action Levels for Changes in Respiratory Protection. The action levels specified for the organic vapors may be increased or decreased if air sample analysis, using species appropriate draeger tubes (e.g., benzene, toluene, ethylbenzene, etc), results indicate a greater or lesser degree of hazard for the given organic vapors readings. Any changes in the action levels will be documented in writing by the Site Safety Officer and approved by the Project Safety Officer or the Corporate Health and Safety Officer.

6.2.2 Volatile Organics Monitoring

Monitoring of volatile organic compounds (VOCs) will be conducted with an organic vapor meter (e.g., OVM 580B or 580S) during excavation activities. Two OVMs will be used, one at the work site and one downwind of the work site.

TABLE 2

ACTION LEVELS FOR CHANGES IN RESPIRATORY PROTECTION AND SITE EVACUATION

	LEVEL OF PROTECTION/ACTION TAKEN*				
INSTRUMENT	LEVEL D	LEVEL C	LEVEL B	PROCEED WITH CAUTION	EVACUATE SITE
OVM (ppm as isobutylene)	BKGD	<5**	5-500		>500
OXYGEN (%)	19.5-23	19.5-23	19.5-23		>23
LOWER EXPLOSIVE LIMIT (%)	<10	<10	<10	10<LEL<25	>25
AEROSOL MONITOR (mg/m3)	<1.0	1.0-10	10-50		<50

Notes:

* All monitoring performed in the breathing zone for a period of at least 30 seconds.

** If OVM reading equals or exceeds 5 ppm take a benzene Draeger tube. If no benzene is present, action level for Level D protection may be increased to between 5 and 50 ppm.

6.2.3 Dust/Particulates Monitoring

Monitoring of airborne particulates will be conducted with the MIE Miniram (PDM-3) during excavation activities and in areas where surface contamination and fugitive dust is expected to be high. Measurements will be data logged and a time-weighted average (TWA) for the work period will be calculated. Two Minirams will be used, one at the worksite, and one downwind of the work area.

6.2.4 O_2/LEL/H_2S Monitoring

The use of a 3-range monitor (O_2/LEL/H_2S) will allow the site worker to evaluate the oxygen level, explosivity, as well as detect the presence of hydrogen sulfide (H_2S) gas in any SWMU where these levels are of concern (such as in a confined space).

6.3 ACTION LEVELS AND RESPIRATORY PROTECTION

Action levels for all instruments are given in **Table 2**, Action Levels for Changes in Respiratory Protection. When an action level is equaled or exceeded, immediately shut down the operation and evacuate the work area. Allow the levels to stabilize and/or employ engineering controls and reenter the work area to make a measurement. Restart work if levels are below the action levels. If the action level remains exceeded, reassess the situation. Upgrade personal protective equipment (PPE) prior to reentry of the area.

Periodic measurements will be made for total VOCs at the work face (e.g., top of well, drill cuttings, excavation spoils). If the total VOC levels at the work face are higher than the action level but ambient levels are below action levels, proceed carefully and monitor more frequently. The level of personal protection will be upgraded if concentrations of volatile organic vapors in the breathing zone are between 5 and 50 ppm for a period of greater than 30 seconds.

6.4 WIND DIRECTION INDICATOR

A wind direction indicator (e.g., a survey flagging tied to a stake) will be erected at every active work site. This will enable the site safety monitor and on-site personnel to determine upwind locations necessary for proper health and safety procedure implementation and, if necessary, evacuation procedures.

6.5 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring, for volatile compounds and particulate levels at the perimeter of the work area is necessary if either of the following conditions are met:

a. At SWMUs where residences or occupied buildings are greater than ¼ mile away, and concentrations of organic vapors at the work zone exceeds 500 parts per million (ppm), providing that monitoring for worker Health and Safety is conducted at least every two hours.

b. At SWMUs where residences or occupied buildings are less than ¼ mile away.

The plan includes the following:

- Volatile organic compounds must be monitored at the downwind perimeter of the work area daily at 2-hour intervals. If total organic vapor levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

- Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations. If the downwind particulate level is 150 ug/m3 or greater than the upwind particulate level, then dust suppression techniques must be employed. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

6.5.1 Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume but more frequent intervals of monitoring, as directed by the Safety Officer, must be conducted. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- The organic vapor level 200 ft. downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background, and

- More frequent intervals of monitoring, as directed by the Safety Officer, are conducted.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

6.5.2 Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (220-Foot Zone).

If efforts to abate the emission source are unsuccessful and if any of the following levels persist at 5 ppm above background for more than 30 minutes in the 20-Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect.

However, the Major Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

6.5.3 Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

1. All Emergency Response Contacts as listed in the Health and Safety Plan of the Work Plan will be contacted;

2. The local police authorities will immediately be contacted by the Safety Officer and advised of the situation; and

3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

7.0 PERSONAL PROTECTIVE EQUIPMENT

The selection and use of personal protective equipment at the subject site will be in accordance with the AE's Personal Protective Equipment Program, contained in **Attachment 4**. The unknown nature of hazardous waste site work and the possibility of changing conditions during the conduct of the work may require changes in the personal protective equipment. When changes in personal protective equipment become necessary, these changes shall be made in accordance with the action levels and criteria set forth in this plan and according to the established procedures contained in The AE's Personal Protective Equipment Program.

Routine site work at the SEDA site will be performed in Level D protection, augmented with overboots, inner surgical gloves, and chemical-resistant outer gloves. Level C respiratory protection with organic vapor/acid gas cartridges will be carried by all work crews to be donned when air monitoring indicates the need for respiratory protection. Required equipment for Levels B, C, and D are detailed in **Table 3**, Description of Personal Protective Equipment and Levels of Protection.

The organic vapor monitor will be the primary instrument for determining contaminant concentrations which may trigger a change in respiratory protection. Level C protection will be worn in situations where inhalation of fugitive dust containing metals or explosives is determined to be present in high levels. Action levels for changes in personnel protection equipment are shown in **Table 2 (Section 6)**.

In the event that personal protective equipment (PPE) is ripped or torn, work shall stop and PPE shall be removed and replaced as soon as possible. The minimum levels of protection to be worn and the equipment which shall be available for general site tasks are shown in **Table 4**.

TABLE 3

DESCRIPTION OF PERSONAL PROTECTIVE EQUIPMENT AND LEVELS OF PROTECTION

LEVEL D	HARD HAT EYE PROTECTION - SAFETY GOGGLES, GLASSES, OR FACE SHIELD SAFETY SHOES - STEEL TOE, LEATHER (or) SAFETY BOOTS - STEEL TOE, NEOPRENE OVERBOOTS, INNER SURGICAL GLOVES, AND CHEMICAL-RESISTANT OUTER GLOVES PROTECTIVE OVERALLS, EAR PLUGS
LEVEL C	LEVEL D PROTECTIVE EQUIPMENT PLUS: RESPIRATORY PROTECTION - FULL FACEPIECE AIR PURIFYING RESPIRATOR (APR), CARTRIDGE OR CANISTER SKIN PROTECTION - POLY-COATED TYVEK OR SARANEX COVERALL* INNER LATEX GLOVES* OUTER NITRILE GLOVES* NEOPRENE BOOT COVERS*
LEVEL B	LEVEL C PROTECTIVE EQUIPMENT EXCEPT FOR: RESPIRATORY PROTECTION - FULL FACEPIECE SELF-CONTAINED BREATHING APPARATUS (SCBA) INSTEAD OF APR

* OTHER MATERIALS MAY BE SPECIFIED TO PROVIDE BETTER PROTECTION WHEN WORKING WITH CERTAIN TYPES OF CHEMICALS.

TABLE 4

MINIMUM LEVELS OF PROTECTION AND AVAILABLE UPGRADE PROTECTION FOR SITE TASKS

Activity	PPE Worn	PPE With Crew	Emergency PPE at Command Post
Excavation	D	C	B
Soil and Sediment Sampling	D	C	B
Air Sampling	D	C	B
Decontamination	D	-	B

8.0 SAFE WORK PRACTICES AND ENGINEERING CONTROLS

Safe work practices and engineering controls shall be implemented to comply with OSHA 29 CFR §1910.120 to limit employee exposure to hazardous substances or conditions. The use of personal protective equipment has limitations and presents hazards of its own, such as physical stress and interference with peripheral vision, calling for the consideration and implementation of work practices and engineering controls prior to beginning site tasks and before the use of personal protective equipment is instituted.

The safe work practices and engineering controls discussed below apply to general site procedures.

8.1 SAFE WORK PRACTICES

The following work practices are intended for use when site activities involve potential exposure to hazardous substances or conditions.

1. The buddy system will be utilized at all times within the exclusion zone.
2. Entry into and exit from zones within the site must be made via the established access control points.
3. Prescribed personal protective equipment must be worn as directed by the Site Health and Safety Office and Project Manager.
4. Assumptions will not be made concerning the nature of materials found on the site. Should any unusual situations occur (not covered by the Site Standard Operating Procedures), operations will cease and the Site Health and Safety Officer and the Project Manager will be contacted for further guidance.
5. Communication hand signals must be understood and reviewed daily.
6. Consultation with the Project Manager shall be made to avoid any uncertainties.
7. Ground fault circuit interrupters shall be used on all field electrical equipment. Improperly grounded/guarded tools shall be tagged out-of- service and the Project Manager shall be notified immediately.
8. If a piece of equipment fails or is found to be in need of repair, it will be immediately tagged out-of-service and the Project Manager shall be notified. This equipment will not be returned to service until repairs have been completed and the equipment tested by a competent individual.
9. Unsafe conditions shall be reported immediately.
10. Unusual odors, emissions, or signs of chemical reaction shall be reported immediately.
11. Workers will minimize contact with hazardous materials by:

   a. Avoiding areas of obvious contamination
   b. Using poly sheeting to help contain contaminants

12. Avoiding contact with toxic materials
13. Only essential personnel will be permitted in the work zones.
14. Whenever possible, personnel will be located upwind during material handling.
15. At the first sign of odors detected inside the facepiece of a respirator, or if the employee begins experiencing any signs or symptoms of exposure to site toxic material (this information will be discussed during the daily meeting and can be found on the appropriate Chemical Hazard Evaluation Sheets, Attachment B-1), the employee will leave the area immediately and report the incident to the Health and Safety Officer and Project Manager.
16. Smoking will be allowed only in designated areas of the support zone.

8.2 PERSONAL HYGIENE PRACTICES

The following personal hygiene practices will apply to fieldwork conducted at the SEDA SWMU areas:

1. No smoking or chewing of tobacco or gum shall be allowed within the exclusion or decontamination zones.
2. No eating or drinking shall be allowed in the exclusion or decontamination zones.
3. On-site personnel shall remove protective clothing and wash face and hands prior to leaving the decontamination zones.
4. Disposable outerwear will be placed in drums located in the personnel decontamination area. Drums will be staged on-site at a central location for later disposal.

8.3 FIRE CONTROL

Fire extinguishers, suitable for Class A, B, and C fires (rated at least 1A, 10BC), will be available at work sites for use on small fires. All samples must be treated as flammable or explosive. The site safety officer will have available the telephone number of the nearest fire station and local law enforcement agencies in case of a major fire emergency.

8.4 SPILL CONTROL

In the event of a spill, the site safety officer will be notified immediately. The important factors are that no personnel are overexposed to vapors, gases, or mists and that the liquid does not ignite. Waste spillage must not be allowed to contaminate any local water source. Small dikes will be erected to contain spills, if necessary, until proper disposal can be completed. Subsequent to cleanup activities, the site safety officer will survey the area to ensure that no toxic or explosive vapors remain.

8.5 EXPLOSIVE FIRES

Under no circumstances will an attempt be made to fight an explosive fire. If a fire involving explosive materials should occur on the site, all personnel will immediately evacuate the site. Fire department personnel responding to the incident must be informed of the fact that the fire involves explosive materials.

8.6 CONFINED SPACE ENTRY

No confined space entry is planned for the investigations of the SWMUs. Excavations are not anticipated to exceed 2 feet in depth. If confined space entry becomes necessary during the implementation of the work, a confined space entry procedure will be appended to the site safety plan and will be instituted prior to allowing any confined space entry.

8.7 SITE INSPECTIONS

Site inspections will be conducted daily by the site safety officer to ensure that site work is accomplished in accordance with the approved safety plan, contract requirements, and federal regulations. Daily inspections will be documented.

8.8 ACCIDENT REPORTING AND RECORD KEEPING

Accidents and near miss incidents will be recorded on the accident report form contained in **Attachment 3** – On-Site Documentation Forms. Accident reports are to be completed by involved parties if possible. Accidents and near misses will be investigated by the site safety officer and the site manager. The investigation team shall make recommendations for preventing a recurrence of the accident or incident and submit the accident report to the project health and safety officer and the office health and safety representative. The accident report shall be retained on file at the site, in the project files, and in office health and safety files. All accidents or incidents which are recordable will be entered on the OSHA 200 log maintained in the AE's home office. In addition, Corps of Engineers contractors will submit an accident report on form ENG3394.

The office health and safety officer and the project health and safety officer shall review the accident report and approve or make additional recommendations for prevention of the future occurrence of the incident. The project health and safety officer shall ensure that remedial recommendations are carried out by the field staff.

9.0 DECONTAMINATION

Decontamination is the physical removal of contaminants from clothing and equipment or the chemical change of such contaminants to innocuous substances. Decontamination procedures will take place in the contamination reduction zone. Disposal is an available option in lieu of decontamination when decontamination is impractical.

The following decontamination procedures are intended to meet the requirements of 29 CFR §1910.120(k). No personnel or equipment shall enter the contaminated zone of the site until workers have acknowledged the decontamination procedures and operating procedures intended to minimize contamination. These procedures shall be monitored by the Site Health and Safety Officer to determine their effectiveness. Ineffective procedures will be corrected.

9.1 DECONTAMINATION FACILITIES

The main decontamination facilities at the SEDA SWMU areas will be located adjacent to the support zone. These decontamination facilities will be used for vehicle and heavy equipment decontamination and for personnel decontamination. Personnel decontamination must take place prior to leaving the decontamination area and prior to entering any personnel hygiene facilities or before eating, drinking, or smoking.

9.2 PERSONNEL DECONTAMINATION

Personnel decontamination will consist primarily of a segregated equipment drop, removal and disposal of any non-reusable protective equipment, and washing of hands and face. No heavy contamination of clothing is expected and disposable protective clothing will be disposed of as non-hazardous waste. However, if contamination is detected (i.e., elevated PID readings, visual evidence, or known contact with potentially contaminated liquids) personal protective equipment and cartridges from respirators will be bagged separately from daily garbage. Facilities for personnel and sampling equipment decontamination will be set up between the equipment decontamination pad and the site trailer. Personnel will not enter the office trailer without first going through decontamination, and hands and face must be thoroughly washed before eating, drinking, etc.

Level C Decontamination – The activities to be carried out at each station are described on **Table 5**, Measures for Level C Decontamination.

TABLE 5

MEASURES FOR LEVEL C DECONTAMINATION

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices, and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2:	Outer Garment, Boots and Gloves Wash and Rinse	Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boots and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Canister or Mask	If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	Outer Garment Removal	Remove outer garment. Place on plastic for further cleaning or in barrel for disposal.
Station 6:	Face Piece Removal	Facepiece is removed. Avoid touching face with fingers. Facepiece deposited on plastic sheets.
Station 7:	Inner Boot and Glove Removal	Boots and inner gloves removed and deposited in separate containers lined with plastic.
Station 8:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Level B Decontamination – The activities to be carried out at each station are described on **Table 6**, Measures for Level B Decontamination.

9.3 EQUIPMENT DECONTAMINATION

Equipment and vehicle decontamination will consist of steam cleaning. Solvent and Alconox and water washes will be performed when required for sampling or for heavy contamination. Gross contamination, such as caked mud and dirt on excavator buckets or grading blades will be removed at the work site and placed back in the excavation or or drummed with other spoils if containment indicators (e.g., PID readings) warrant drumming of the soils.

Refer to the Field Sampling and Analysis Plan for the details of the management of investigation generated wastes.

9.4 PREVENTION OF CONTAMINATION

In an effort to minimize contact with waste and decrease the potential for contamination, the points outlined below will be adhered to during all phases of field investigation and sampling.

1. Personnel will make every effort not to walk through puddles, mud, any discolored surface, and/or any area of obvious contamination.
2. Personnel will not kneel or sit on the ground in the exclusion zone and/or in the Contamination Reduction Zone (CRZ).
3. Personnel will not place equipment on drums, containers, vehicles, or on the unprotected ground.
4. Where appropriate, personnel will wear disposable outer garments and use disposable equipment.

TABLE 6

MEASURES FOR LEVEL B DECONTAMINATION

Station 1:	Equipment Drop	Deposit equipment used on-site (tools, sampling devices, and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, cool down station may be set up within this area.
Station 2:	Outer Garment, Boots	Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station 3:	Outer Boots and Glove Removal	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister air tank is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station 5:	SCBA Removal	SCBA backpack and facepiece is removed. Avoid touching face with finger. SCBA deposited on plastic sheets.
Station 6:	Outer Garment Removal	Remove outer garment. Place on plastic for further cleaning or in barrel for disposal.
Station 7:	Inner Boot and Glove Removal	Boots and inner gloves removed and deposited in separate containers lined with plastic.
Station 8:	Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

10.0 EMERGENCY RESPONSE PLAN

This Emergency Response Plan applies to site work at the Removal Action at SEADs-38, 39, 40, 41, and 60. Copies of this plan are to be kept at the site command post and support areas. The list of emergency telephone numbers and directions to the nearest exit gate and nearest hospital will be prominently posted in the command post. Copies of the directions to the nearest hospital will be kept in all site vehicles.

This emergency response plan shall be coordinated with SEDA emergency response procedures prior to the beginning of site work.

10.1 ON-SITE EMERGENCIES

On site emergencies can range from minor cuts and scrapes to explosions, fires, and the release of toxic gases. Apparently minor incidents at hazardous waste sites can have serious consequences or may indicate the presence of a previously unknown health and safety hazard. Explosions, fires, and the release of toxic gases will not only involve site workers, but may affect the neighboring populations and the environment.

All incidents will be reported as soon as possible to the Site Manager and the Site Safety Officer who will determine the appropriate steps to be taken.

When the incident is minor, the work may continue. When an incident is considered serious, work will be discontinued until the emergency situation has been brought under control, the incident has been evaluated, and any conditions which may have contributed to the emergency have been mitigated.

All site incidents, including near misses, will be investigated and documented, using the Incident Report Form and Incident Follow-Up Report Form in **Attachment 3**, On-Site Documentation Forms.

10.2 OFF-SITE EMERGENCIES

In the unlikely event of a vapor release off-site, the contamination source will be secured, if possible.

Emergency response contacts will be notified in the following order:

1. Sheriff's Department
2. Site Safety Officer
3. SEDA Environmental Office
4. Project Manager

The phone numbers of these contacts are provided in Section 10.9 and will be posted in the site trailer.

The Sheriff's Department will be used in all emergencies that may involve exposure to people away from the work sites.

10.3 SITE PERSONNEL AND LINES OF AUTHORITY

A clear chain-of-command in emergency situations ensures clear and consistent communication between site personnel and, therefore, results in more effective response to the emergency situation. The duties of site personnel in emergency situations are outlined below:

The **Site Manager** will direct all emergency response operations, designate duties to other site personnel, and serve as liaison with government officials and emergency response teams.

The **Site Safety Officer** will make initial contact with off-site emergency response teams (first aid, fire, police, etc.), make recommendations on work stoppage, and provide for on-site first aid and rescue.

The **Command Post Supervisor** will be designated when no one is performing this function during normal site work. This person will maintain contact with off-site response teams and notify additional agencies or offices that need to be contacted.

Decontamination personnel will stand by to perform emergency decontamination. Decontamination personnel will also assist the safety officer in rescue operations when necessary.

Field personnel will assist in rescue operations or take over for decontamination personnel when they are required for other duties.

10.4 EMERGENCY SITE COMMUNICATIONS

Emergency communications will be maintained by use of air horns kept in the support areas and with each work crew. The emergency communications codes are given in **Table 7**, On-Site Emergency Communications.

10.5 EVACUATION PROCEDURES

Evacuation routes from work sites shall be designated during the Health and Safety kickoff meeting. Equipment shall be placed so as not to impede emergency escape and evacuation routes. A meeting spot will be established where all employees are to meet after an evacuation to allow for the identification and accounting.

10.6 EMERGENCY DECONTAMINATION AND FIRST AID

Decontamination procedures used in emergency situations will vary greatly with the severity and particulars of the situation. The AE Site Safety Officer is first aid/CPR certified and will provide advice on the medical and decontamination procedures to be used in each emergency situation. General guidelines for first aid and decontamination procedures are given below.

10.6.1 Inhalation Exposure

Remove the victim from the exposure area to an area with fresh air. Attempt rescue only if proper protective gear (Level B or C) is available for the rescue team. Remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical unit arrives. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated.

TABLE 7

ON-SITE EMERGENCY COMMUNICATIONS

AIR HORN SIGNAL	ACTION
THREE SHORT BLASTS	SHUT DOWN EQUIPMENT, STAND BY RADIO
ONE LONG BLAST	RETURN TO NEAREST SUPPORT ZONE
CONTINUOUS LONG BLASTS	EVACUATE SITE BY BEST, FASTEST ROUTE

HAND SIGNALS	MEANING
HAND GRIPPING THROAT	OUT OF AIR, CAN'T BREATHE
GRIP PARTNER'S WRIST	LEAVE AREA IMMEDIATELY; NO DEBATE
HANDS ON TOP OF HEAD	NEED ASSISTANCE
THUMBS UP	OK; I'M ALL RIGHT; I UNDERSTAND
THUMBS DOWN	NO; NEGATIVE

10.6.2 Contact Exposure

Remove victim from area and flush affected area with water only. Be careful not to spread the contamination to other parts of the body. Remove protective clothing and flush area with water only. Consult references to determine if soap and water wash is indicated. Do not remove a respirator until removal of contaminant from body is reasonably assured and the victim is well into a clean zone.

10.6.3 Physical Injury

If a physical injury occurs or worker collapses in a clean zone, first aid will be administered as indicated.

If a physical injury occurs in a contaminated zone, care must be taken to prevent contact of any contaminant with open wounds. The wound can provide easy access to the body for toxic chemicals that are not normally a skin absorption problem. Protective clothing will be removed carefully to avoid additional injury and avoid any exposure of the wound to contaminants on the clothing.

If a worker collapses or loses consciousness in a contaminated zone, remove protective clothing and respiratory protective gear as soon as possible to determine if the administration of CPR is necessary. If so, complete decontamination while CPR is being administered. Continue CPR until emergency medical units arrive. If CPR is not required, complete decontamination and transport to hospital; administer other first-aid as indicated. The field site will have at least two persons certified in CPR and first-aid per shift.

10.7 EMERGENCY MEDICAL TREATMENT AND FIRST AID

A first aid kit large enough to accommodate anticipated emergencies will be kept in the support zone. In addition, each work crew will carry a smaller first aid kit for minor injuries. If any injury should require advanced medical assistance, the victim will be transported to the hospital.

Each work site will have a vehicle for transportation to the hospital. Keys will be left in or near the ignition.

10.8 EMERGENCY AND PERSONAL PROTECTIVE EQUIPMENT

The support zone will have the following emergency equipment:

Self-Contained Breathing Apparatus (SCBA);
First Aid Kit;
Fire Extinguisher (A, B, C Type);
Bolt Cutters;
15-Minute Emergency Eyewash Station; and
Air Horn.

Each work crew will have at the work site the following emergency equipment:

First Aid Kit;
Fire Extinguisher (A, B, C Type);
Hand-Held Eyewash; and
Air Horn.

10.9 EMERGENCY TELEPHONE NUMBERS

Emergency telephone numbers for medical and chemical emergencies are given in **Table 8**, Emergency Telephone Numbers. These numbers will be displayed prominently near each site phone.

10.10 DIRECTIONS TO HOSPITAL

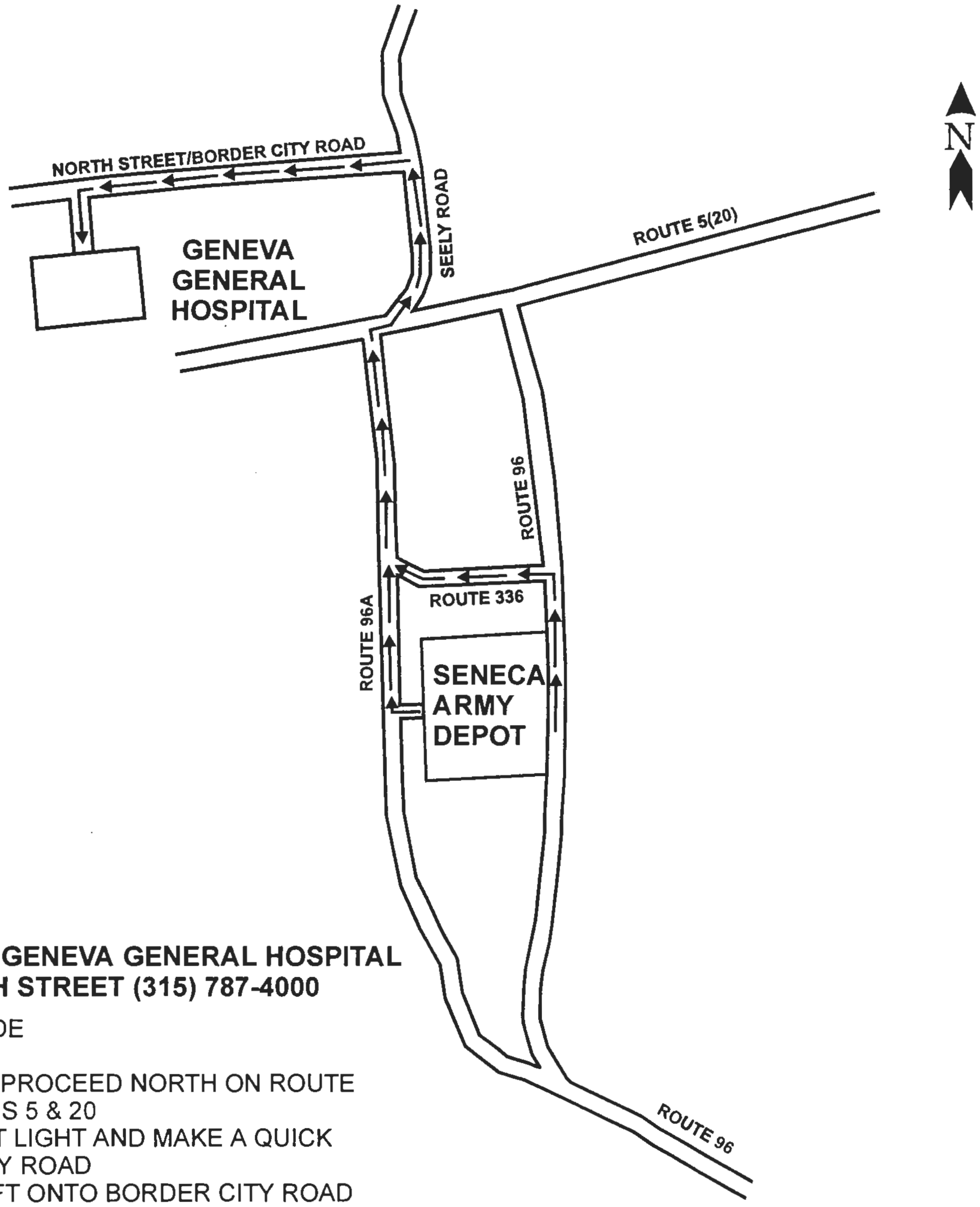
Directions to the nearest hospital are shown and described in **Figure 8**, Route to Geneva General Hospital. The map will be displayed in the command post and kept in every site vehicle. The nearest exits gates from SEDA are shown in **Figure 2 (Section 2)**. In most cases the exit gate will be locked and will require bolt cutters to cut the chain. **Work crews should include bolt cutters with their emergency equipment.**

TABLE 8

EMERGENCY TELEPHONE NUMBERS

Agency	Telephone Number
Police, Fire, & Ambulance Seneca County Sheriff Dispatch	1-315-539-9241
Geneva General Hospital 186-198 North Street Geneva, NY	1-315-798-4222
SEAD Security	1-607-869-1448
Poison Control Center (NJ)	1-800-962-1253
National Response Center/Chemtrec	1-800-424-9300
USEPA Emergency Response	1-215-596-1260
USEPA Hazardous Waste Hotline	1-800-621-3191

Responsible Person	Telephone Number	
	Work	Home
Mike Duchesneau (Parsons ES Project Manager)	781-401-2492	508-393-1824
Steve Absolom (SEDA Contact)	607-869-1450	
Brian Powell (Project H&S Officer)	315-451-9560	
Ed Grunwald (Parsons Corporate H&S Officer)	678-969-2394	770-594-9760
Medical Services Network (Dr. Mitchell)	1-800-874-4676, ext. 111	



DIRECTIONS TO GENEVA GENERAL HOSPITAL
196 NORTH STREET (315) 787-4000

FROM WEST SIDE

- -EXIT SITE AND PROCEED NORTH ON ROUTE 96A TO ROUTES 5 & 20
- -TURN RIGHT AT LIGHT AND MAKE A QUICK LEFT ON SEELY ROAD
- -TAKE NEXT LEFT ONTO BORDER CITY ROAD WHICH TURNS INTO NORTH STREET IN GENEVA
- -HOSPITAL IS ON LEFT

FROM EAST SIDE (POST 1)

- -EXIT SITE AND PROCEED NORTH ON ROUTE 96 TO ROUTE 336
- -TURN LEFT ONTO ROUTE 336 AND PROCEED ONTO ROUTE 96A
- -PROCEED NORTH ON ROUTE 96A TO ROUTES 5 & 20
- -TURN RIGHT AT LIGHT AND MAKE A QUICK LEFT ON SEELY ROAD
- -TAKE NEXT LEFT ONTO BORDER CITY ROAD WHICH TURNS INTO NORTH STREET IN GENEVA
- -HOSPITAL IS ON LEFT

NOTE:Not to scale

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY

DEPT
ENVIRONMENTAL ENGINEERING
DWG NO

FIGURE 8

MAP AND DIRECTIONS TO GENEVA HOSPITAL

SCALE NA
DATE MARCH 2001

ATTACHMENT 1

MATERIAL SAFETY DATA SHEETS AND SAFETY CARDS

- No. 2 Fuel Oils
- Lubricating Oil
- Regular Unleaded Gasoline
- Benzene
- Ethylbenzene
- Toluene
- Xylenes
- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(ghi)perylene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Chrysene
- Dibenz(ah)anthracene
- Fluoranthene
- Fluorene
- Phenanthrene
- Pyrene
- PCBs

CITGO PETROLEUM -- NO 2 FUEL OILS, DIESEL FUELS-ALL GRADES, 1763
MATERIAL SAFETY DATA SHEET
NSN: 915000N060728
Manufacturer's CAGE: 12518
Part No. Indicator: A
Part Number/Trade Name: NO 2 FUEL OILS, DIESEL FUELS-ALL GRADES, 1763

General Information

Company's Name: CITGO PETROLEUM CORP
Company's P. O. Box: 3758
Company's City: TULSA
Company's State: OK
Company's Country: US
Company's Zip Code: 74102
Company's Emerg Ph #: 800-424-9300(CHEMTREC)
Company's Info Ph #: 918-495-5933
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 11NOV94
Safety Data Review Date: 14JUN95
MSDS Serial Number: BXWZC

Ingredients/Identity Information

Physical/Chemical Characteristics

Appearance And Odor: HIGH SULFUR FUEL OIL/DIESEL FUEL:RED LIQ, PETROL ODOR. LOW SULFUR FUEL (SUP DAT)
Boiling Point: >342F,>172C
Melting Point: N/A
Vapor Density (Air=1): >1
Specific Gravity: 0.87 (H*2O=1)
Evaporation Rate And Ref: <1 (BUTYL ACETATE=1)
Solubility In Water: NEGLIGIBLE

Fire and Explosion Hazard Data

Flash Point: >126F,>52C
Flash Point Method: CC
Extinguishing Media: CO*2, DRY CHEMICAL, FOAM, WATER FOG.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: MATERIAL IS HIGHLY VOLATILE AND EMITS VAPORS WHICH MAY BE IGNITED BY OTHER IGNITION SOURCES.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, FLAME.
Materials To Avoid: CAUSTICS, OXIDIZING AGENTS AND STRONG ACIDS.
Hazardous Decomp Products: CO*2, (CO UNDER INCOMPLETE COMBUSTION).
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: SEE INGREDIENTS
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: LOW HAZ UNDER AMBIENT CNDTNS. VAPS, MISTS & FUMES HAZ. NORMALLY OF LOW TOX EXCEPT ON INGEST, IF MISTING OCCURS/DERM ABSORP. ACUTE:INHAL:MISTS/FUMES ABOVE TLV MAY CAUSE TRANSIENT EUPHORIA, RESP & GI IRRIT, HDCH, DIZZ, CNS & GENERALIZED DEPRESS, COMA, PARTICULARLY IN OXYG-DEFICIENT ATM. PULM IRRIT. SKIN:(EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NOT RELEVANT

Signs/Symptoms Of Overexp: HLTH HAZS:MILD TEMP IRRIT. EYES:MILD TO MOD IRRIT. INGEST:TOX DOSE:1 OZ TO 1 PINT FOR HUMAN ADULT. SYMPS INCLUDE BURNING OF MOUTH & UPPER GI TRACT, VOMIT & DIARR. LESS THAN 1 OZ W/ RETENTION MAY PRDCE GEN DEPRESS, SEDATION, RESP & CARDIAC INSUFFICIENCY & COMA. INJECTION:IRRIT, ERYTHEMA, EDEMA. CHRONIC:PRLNGD, (ING 10)

Med Cond Aggravated By Exp: PRE-EXISTING DERMATOSIS.

Emergency/First Aid Proc: INHAL:REMOVE FROM EXPOS, SEEK IMMED MED AID. SKIN:WASH W/SOAP & WATER. DO NOT WEAR HEAVILY CONTAM CLTHG BEFORE CLEANING. EYES:FLUSH W/LG VOLS OF TEPID WATER FOR @ LST 15 MIN. INGEST:DO NOT INDUCE VOMIT. SEEK MED AID. INJECTION:SEEK IMMED MED AID. NOTE TO MD:THIS IS LOW VISCOSITY MATL, W/SAYBOLT VISCOSITY @ 100F OF 32.6-40 SUS. IF INGEST & VOMIT OCCURS, THERE EXISTS HIGH PULM ASPIR HAZ, (SUP DAT)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: REMOVE SOURCES OF IGNIT, VENT AREA. SM SPILLS:TAKE UP W/NONCOMBUST ABOSRB SUCH AS FULLERS EARTH/SAND. PLACE INTO CNTNRS FOR LATER DISP. LG SPILLS:CNTN SPILL IN EARTHEN DIKES FOR LATER RECOVERY. CTL IGNIT SOURCES AROUND SPILL AREA. FIRE-FIGHT (ING 4)

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: DISP MUST BE I/A/W FED, STATE & LOC REGS(FPN). IT IS RESPONSIBILITY OF USER TO DETERM IF MATL IS HAZ WASTE AT TIME OF DISP. CHECK BEFORE DISPOSING TO BE SURE YOU ARE IN COMPLIANCE W/ALL APPLIC LAWS & REGS. RCRA EMER HOTLINE #:800-424-9346.

Precautions-Handling/Storing: KEEP CNTNR TIGHTLY CLSD & AWAY FROM HEAT & FLAME. DO NOT STORE W/STRONG OXIDIZERS. CAUTN:COMBUST LIQ. DO NOT INHALE VAPS, FUMES/MISTS. PVNT DERM CONT.

Other Precautions: CAUTN:EMPTY CNTNRS MAY CNTN PROD RESIDUE WHICH COULD INCLUDE FLAM/EXPLO VAPS. CONSULT FED, STATE & LOC AUTHS BEFORE REUSING, RECNDTNING, RECLAIMING, RECYCLING/DISP OF EMPTY CNTNRS &/OR WASTE RESIDUES OF PROD. PROT MEASURES DURING (ING 7)

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED ORGANIC RESPIRATOR ABOVE THE TLV'S.

Ventilation: USE IN WELL VENT AREA. IN CONFINED SPACES, MECH VENT MAY BE REQ TO KEEP LEVELS OF CERTAIN COMPONENTS BELOW (ING 9)

Protective Gloves: OIL IMPERVIOUS GLOVES.

Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS &(SUPDAT)

Other Protective Equipment: ANSI APPRVD EMER EYE WASH & DELUGE SHOWER (FP N). WEAR BODY-COVERING WORK CLTHS TO AVOID PRLNGD/RPTD EXPOS.

Work Hygienic Practices: WASH EXPOSED SKIN THOROUGLY WITH SOAP AND WATER. LAUNDER SOILED WORK CLOTHES BEFORE REUSE.

Suppl. Safety & Health Data: APPEAR & ODOR:OIL/DIESEL FUEL:WATER WHITE TO LEMON LIQ, PETROL ODOR. FIRST AID PROC:POSS INDUCING LIPOID PNEUM. FOR QTYS >FEW DROPS, USE CAREFUL GASTRIC LAVAGE W/TIGHT FITTING, CUFFED ENDOTRACHEAL TUBE. EYE PROT:FULL LENGTH FACE SHIELD (FP N).

Transportation Data

Disposal Data

Label Data

Label Required: YES

Technical Review Date: 14JUN95

Label Status: G

Common Name: NO 2 FUEL OILS, DIESEL FUELS-ALL GRADES, 1763

Chronic Hazard: YES

Signal Word: WARNING!

Acute Health Hazard-Moderate: X

Contact Hazard-Moderate: X

Fire Hazard-Moderate: X

Reactivity Hazard-None: X

Special Hazard Precautions: FLAMMABLE. ACUTE:INHAL:MISTS/FUMES ABOVE TLV MAY CAUSE TRANSIENT EUPHORIA, RESP & GI IRRIT, HDCH, DIZZ, CNS &

GENERALIZED DEPRESS, COMA, PARTICULARLY IN OXYG-DEFICIENT ATM. SKIN:MILD TEMPORARY IRRIT. EYE:MILD TO MOD IRRIT. INGEST:TOX DOSE:1 OZ TO 1 PINT FOR HUMAN ADULT. SYMPS INCLUDE BURNING OF MOUTH & UPPER GI TRACT, VOMITING AND DIARRHEA. LESS THAN 1 OZ WITH RETENTION MAY PRODUCE GENERAL DEPRESSION, SEDATION, RESP & CARDIAC INSUFFICIENCY & COMA. INJECTION:IRRIT, ERYTHEMA, EDEMA. CHRONIC:PRLNGD, RPTD DERM CONT MAY CAUSE DRYING, CRACKING, DERMATOSES. DIESEL EXHST MAY BE CONSIDERED POTNTL CANCER HAZ. TARGET ORGANS:LUNGS, CNS (DEPRESSANT).
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: CITGO PETROLEUM CORP
Label P.O. Box: 3758
Label City: TULSA
Label State: OK
Label Zip Code: 74102
Label Country: US
Label Emergency Number: 800-424-9300(CHEMTREC)

CITGO PETROLEUM -- LAWN BOY 2-CYCLE OIL - LUBRICATING OIL
MATERIAL SAFETY DATA SHEET
NSN: 915000F025150
Manufacturer's CAGE: 7X110
Part No. Indicator: A
Part Number/Trade Name: LAWN BOY 2-CYCLE OIL

General Information

Item Name: LUBRICATING OIL
Company's Name: CITGO PETROLEUM
Company's Street: 6100 S YALE
Company's P. O. Box: 992
Company's City: TULSA
Company's State: OK
Company's Country: US
Company's Zip Code: 74102
Company's Emerg Ph #: (318) 491-6215
Company's Info Ph #: (918) 495-5933
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SE
Date MSDS Prepared: 24AUG90
Safety Data Review Date: 08OCT92
Preparer's Company: CITGO PETROLEUM
Preparer's St Or P. O. Box: 6100 S YALE
Preparer's City: TULSA
Preparer's State: OK
Preparer's Zip Code: 74102
MSDS Serial Number: BNZGL

Ingredients/Identity Information

Proprietary: NO
Ingredient: MINERAL OIL, PETROLEUM DISTILLATES, SOLVENT-REFINED HEAVY PARAFFINIC, LUBRICATING OIL BASE STOCK
Ingredient Sequence Number: 01
Percent: 70-85%
NIOSH (RTECS) Number: PY8040500
CAS Number: 64741-88-4
OSHA PEL: 5 MG/CUM
ACGIH TLV: 5 MG/CUM

Proprietary: NO
Ingredient: SOLVENT-REFINED RESIDUUM *92-2*
Ingredient Sequence Number: 02
Percent: 70-85%
NIOSH (RTECS) Number: 1005387SR
CAS Number: 64742-01-4

Proprietary: NO
Ingredient: STODDARD SOLVENT (PETROLEUM DISTILLATE), MINERAL SPIRITS
Ingredient Sequence Number: 03
Percent: <15%
NIOSH (RTECS) Number: WJ8925000
CAS Number: 8052-41-3
OSHA PEL: 500 PPM
ACGIH TLV: 100 PPM; 9293
Other Recommended Limit: 350 MG/CUM

Proprietary: NO
Ingredient: ASHLESS DISPERSANT
Ingredient Sequence Number: 04
Percent: <10%
NIOSH (RTECS) Number: 1002315AS

Proprietary: NO
Ingredient: RUST INHIBITOR
Ingredient Sequence Number: 05
Percent: <1%

NIOSH (RTECS) Number: 1002707RI

Proprietary: NO
Ingredient: DYE
Ingredient Sequence Number: 06
Percent: <0.1%
NIOSH (RTECS) Number: 1000093DY

Physical/Chemical Characteristics

Appearance And Odor: BLUE LIQUID W/SLIGHT PETROLEUM DISTILLATE ODOR
Boiling Point: 320F
Vapor Pressure (MM Hg/70 F): <20
Vapor Density (Air=1): >1
Specific Gravity: 0.87
Evaporation Rate And Ref: (BU AC = 1): <1
Solubility In Water: NEGLIGIBLE
Percent Volatiles By Volume: <20%

Fire and Explosion Hazard Data

Flash Point: 190F
Flash Point Method: COC
Lower Explosive Limit: 1%
Upper Explosive Limit: 6%
Extinguishing Media: CO2, DRY CHEMICAL, FOAM & WATER FOG
Special Fire Fighting Proc: WATER MAY CAUSE FROTHING.
Unusual Fire And Expl Hazrds: COMBUSTIBLE LIQUID.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, FLAME, & ALL SOURCES OF IGNITION
Materials To Avoid: STRONG OXIDANTS
Hazardous Decomp Products: CO2, CO
Hazardous Poly Occur: NO

Health Hazard Data

LD50-LC50 Mixture: ORAL (RAT) LD50: >15 G/KG (SEE SUPP)
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: EYES: IRRITATION. SKIN: IRRITATION/DRYNESS/CRACKING/DERMATITIS/FOLLICULITIS/ABSORPTION. INHALATION: DROWSINESS/DIZZINESS/HEADACHE/NAUSEA/LUNG IRRITATION/CHEMICAL PNEUMONITIS/NEUROTOXIC/MYELOTOXIC EFFECTS. INGESTION: HARMFUL OR FATAL/GI DISCOMFORT/DIARRHEA/HEADACHE/IRRITATION/DIARRHEA.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NONE
Signs/Symptoms Of Overexp: EYES: IRRITATION. SKIN: IRRITATION/DRYNESS/CRACKING/DERMATITIS/FOLLICULITIS/ABSORPTION. INHALATION: DROWSINESS/DIZZINESS/HEADACHE/NAUSEA/LUNG IRRITATION/CHEMICAL PNEUMONITIS/NEUROTOXIC/MYELOTOXIC EFFECTS. INGESTION: HARMFUL OR FATAL/GI DISCOMFORT/DIARRHEA/HEADACHE/IRRITATION.
Emergency/First Aid Proc: EYES: FLUSH W/PLENTY OF WATER FOR AT LEAST 15 MINS. SKIN: WASH THOROUGHLY W/SOAP & WATER. INHALATION: REMOVE TO FRESH AIR. GIVE CPR OR OXYGEN IF NEEDED. INGESTION: DON'T INDUCE VOMITING. INJECTION: OBTAIN MEDICAL ATTENTION IN ALL CASES. PHYSICIAN NOTE: THERE STILL EXISTS RISK OF ASPIRATION INTO THE LUNGS AT A SAYBOLT VISCOSITY OF ABOUT 330 SUS (100F). REMOVAL BY CUFFED TUBE LAVAGE. SEE SUPP.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: ELIMINATE IGNITION SOURCES. VENTILATE AREA. CONTAIN LEAK. SMALL SPILL: ABSORB W/SUITABLE MATERIAL SUCH AS RAGS, STRAW OR SAND. LARGE SPILL: CONTAIN SPILL IN EARTHEN DIKES FOR LATER RECOVERY. REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES.
Waste Disposal Method: DISPOSE OF IN ACCORDANCE W/LOCAL, STATE, & FEDERAL

REGULATIONS. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE IF THE MATERIAL IS A HAZARDOUS WASTE AT THE TIME OF DISPOSAL. COMBUSTIBLE LIQUID.

Precautions-Handling/Storing: AVOID CONTACT W/OIL. STORE <150F. EMPTY CONTAINERS MAY CONTAIN PRODUCT RESIDUE WHICH RETAIN FLAMMABLE/EXPLOSIVE VAPORS.

Other Precautions: AVOID INHALING FUMES. KEEP OUT OF REACH OF CHILDREN. DON'T APPLY HIGH HEAT/FLAME TO CONTAINER. CONSULT FEDERAL/STATE/LOCAL REGS BEFORE REUSING/RECONDITIONING/RECLAIMING/RECYCLING/DISPOSING OF EMPTY CONTAINERS &/OR WASTE RESIDUES.

Control Measures

Respiratory Protection: USE RESPIRATOR APPROVED FOR ORGANIC VAPORS & MISTS.

Ventilation: MECHANICAL

Protective Gloves: OIL IMPERVIOUS

Eye Protection: SAFETY GOGGLES/CHEMICAL SPLASH GOGGLES

Other Protective Equipment: FULL PROTECTIVE CLOTHING

Work Hygienic Practices: REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE. WASH THOROUGHLY AFTER HANDLING.

Suppl. Safety & Health Data: FIRST AID CONT: ASPIRATED MATERIAL MAY CAUSE CHEMICAL PNEUMONITIS OR LIPOID PNEUMONIA. SUBCUTANEOUS OR INTRAMUSCULAR INJECTION REQUIRES PROMPT SURGICICAL DEBRIDEMENT. LD50 FOR REFINED PETROLEUM OIL. PRODUCT MAY CONTAIN EITHER INGREDIENT 64741-88-4 OR 64742-01-4 AT 70-85% LETHAL DOSE FOR 150LB HUMAN MAY BE 10-250 ML.

Transportation Data

Disposal Data

Label Data

Label Required: YES

Technical Review Date: 08OCT92

Label Date: 01SEP92

Label Status: F

Common Name: LAWN BOY 2-CYCLE OIL

Chronic Hazard: YES

Signal Word: DANGER!

Acute Health Hazard-Severe: X

Contact Hazard-Severe: X

Fire Hazard-Moderate: X

Reactivity Hazard-None: X

Special Hazard Precautions: EYES: IRRITATION. SKIN: IRRITATION/DRYNESS/ CRACKING/DERMATITIS/FOLLICULITIS/ABSORPTION. INHALATION: DROWSINESS/ DIZZINESS/HEADACHE/NAUSEA/LUNG IRRITATION/CHEMICAL PNEUMONITIS/NEUROTOXIC/ MYELOTOXIC EFFECTS. INGESTION: HARMFUL OR FATAL/GI DISCOMFORT/DIARRHEA/ HEADACHE/IRRITATION/DIARRHEA. TARGET ORGAN: LUNG.

Protect Eye: Y

Protect Skin: Y

Protect Respiratory: Y

Label Name: CITGO PETROLEUM

Label Street: 6100 S YALE

Label P.O. Box: 992

Label City: TULSA

Label State: OK

Label Zip Code: 74102

Label Country: US

Label Emergency Number: (318) 491-6215

Year Procured: UNK

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<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<!-- saved from url=(0037)http://siri.org/msds/h/q277/q427.html -->
<HTML><HEAD><TITLE>CHEVRON USA PRODUCTS -- REGULAR UNLEADED GASOLINE, C
PS201116</TITLE>
<META content="text/html; charset=windows-1252" http-equiv=Content-Type
>
<META content="MSHTML 5.00.2314.1000" name=GENERATOR></HEAD>
<BODY bgColor=#ffffff><PRE>CHEVRON USA PRODUCTS -- REGULAR UNLEADED GAS
OLINE, CPS201116
MATERIAL SAFETY DATA SHEET
NSN: 913000N050852
Manufacturer's CAGE: 8X116
Part No. Indicator: A
Part Number/Trade Name: REGULAR UNLEADED GASOLINE, CPS201116
=======================================================================
====
                          General Information
=======================================================================
====
Company's Name: CHEVRON USA PRODUCTS COMPANY
Company's Street: 575 MARKET ST
Company's City: SAN FRANCISCO
Company's State: CA
Company's Country: US
Company's Zip Code: 94105-2856
Company's Emerg Ph #: 800-424-9300(CHEMTREC)
Company's Info Ph #: 800-822-5823
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 12MAY93
Safety Data Review Date: 07MAY97
MSDS Serial Number: CDTGZ
=======================================================================
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                     Ingredients/Identity Information
=======================================================================
====
Proprietary: NO
Ingredient: GASOLINE (GENERIC) (CONTAINS INGS 2 - 9 &amp; MAY CONTAIN I
NGS 10,
11 OR 12)
Ingredient Sequence Number: 01
Percent: 100
NIOSH (RTECS) Number: LX3300000
CAS Number: 8006-61-9
OSHA PEL: 300 PPM
ACGIH TLV: 300 PPM;500 STEL
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Proprietary: NO
Ingredient: BENZENE (SARA 313) (CERCLA)
Ingredient Sequence Number: 02
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Percent: <4.9
NIOSH (RTECS) Number: CY1400000
CAS Number: 71-43-2
OSHA PEL: 25 PPM, C (MFR)
ACGIH TLV: 10 PPM

Proprietary: NO
Ingredient: BENZENE, ETHYL-; (ETHYLBENZENE) (SARA 313)
Ingredient Sequence Number: 03
Percent: <1.4
NIOSH (RTECS) Number: DA0700000
CAS Number: 100-41-4
OSHA PEL: 100 PPM
ACGIH TLV: 100 PPM;125 STEL

Proprietary: NO
Ingredient: P-XYLENE; (P-DIMETHYLBENZENE) (SARA 313) (CERCLA)
Ingredient Sequence Number: 04
Percent: <0.9
NIOSH (RTECS) Number: ZE2625000
CAS Number: 106-42-3
OSHA PEL: 100 PPM
ACGIH TLV: 100 PPM;150 STEL

Proprietary: NO
Ingredient: M-XYLENE; (M-DIMETHYLBENZENE) (SARA 313) (CERCLA)
Ingredient Sequence Number: 05
Percent: <4.6
NIOSH (RTECS) Number: ZE2275000
CAS Number: 108-38-3
OSHA PEL: 100 PPM
ACGIH TLV: 100 PPM;150 STEL

Proprietary: NO
Ingredient: O-XYLENE; (O-DIMETHYLBENZENE) (SARA 313) (CERCLA)
Ingredient Sequence Number: 06
Percent: <2.2
NIOSH (RTECS) Number: ZE2450000
CAS Number: 95-47-6
OSHA PEL: 100 PPM
ACGIH TLV: 100 PPM;150 STEL

Proprietary: NO
Ingredient: TOLUENE (SARA 313) (CERCLA)
Ingredient Sequence Number: 07
Percent: <6.5
NIOSH (RTECS) Number: XS5250000
CAS Number: 108-88-3
OSHA PEL: 200 PPM
ACGIH TLV: 50 PPM, S

Proprietary: NO

Ingredient: HEXANE; (N-HEXANE) (CERCLA)
Ingredient Sequence Number: 08
Percent: <3
NIOSH (RTECS) Number: MN9275000
CAS Number: 110-54-3
OSHA PEL: 500 PPM
ACGIH TLV: 50 PPM

Proprietary: NO
Ingredient: CYCLOHEXANE (SARA 313) (CERCLA)
Ingredient Sequence Number: 09
Percent: <2.4
NIOSH (RTECS) Number: GU6300000
CAS Number: 110-82-7
OSHA PEL: 300 PPM
ACGIH TLV: 300 PPM

Proprietary: NO
Ingredient: ETHER, TERT-BUTYL METHYL; (2-METHOXY-2-METHYL PROPANE) (SAR
A
313) (CERCLA)
Ingredient Sequence Number: 10
Percent: <15
NIOSH (RTECS) Number: KN5250000
CAS Number: 1634-04-4
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)
Other Recommended Limit: 50 PPM (MFR)

Proprietary: NO
Ingredient: ETHER, TERT-BUTYL ETHYL; (ETHYL TERT BUTYL ETHER (ETBE))
Ingredient Sequence Number: 11
Percent: <18
NIOSH (RTECS) Number: KN4730200
CAS Number: 637-92-3
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: ETHYL ALCOHOL; (ETHANOL). (ONLY ADDED IN LIMITED SPECIFIC
DISTRIBUTION AREAS.)
Ingredient Sequence Number: 12
Percent: <10
NIOSH (RTECS) Number: KQ6300000
CAS Number: 64-17-5
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM

Proprietary: NO
Ingredient: FIRST AID PROC:AID TREATMENT CONTACT NEHC (FP N).
Ingredient Sequence Number: 13
NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: EFTS OF OVEREXP:EYE & SPEED & THOROUGHNESS OF FIRST AID
TREATMENT; AMT ABSORBED FROM GUT; & AIRBORNE CONC & (ING 15)
Ingredient Sequence Number: 14
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 14:DURATION OF EXPOS. NOTE:TOLUENE APPEARS ON NAVY LIST OF
OCCUP CHEM REPRO HAZS. SEEK CONSULTATION FROM (ING 16)
Ingredient Sequence Number: 15
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 15:APPROP HLTH PROFESSIONALS CONCERNING LATEST HAZ LIST
INFO & SAFE HNDLG & EXPOS INFO(FP N). TOX:GAS:INHAL:(ING 17)
Ingredient Sequence Number: 16
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 16:INCR LIVER TUMORS-FEMALE MICE; KIDNEY DMG/CANCER-MALE
RATS. ING 2:INHAL:ANIMALS-DEVEL OF CHROMOSOMAL DMG;(ING 18)
Ingredient Sequence Number: 17
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 17:HUMANS-VARIOUS BLOOD DISEASES (APLASTIC ANEMIA TO
LEUKEMIA). ALL CAN BE FATAL. ANIMALS-FETAL TOX (DELAYED(ING 19)
Ingredient Sequence Number: 18
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 18:PHYSICAL DEVEL). CAN CROSS HUMAN PLACENTA. ING 8:SKIN/
INHAL:NERVE DMG; PROGRESSIVE WEAK & NUMBNESS IN (ING 20)
Ingredient Sequence Number: 19
NIOSH (RTECS) Number: 9999999ZZ

OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 19:ARMS & LEGS. ING 7:ANIMALS-DECR IMMUNOLOGICAL RESPONSES; IRREVERSIBLE HEARING LOSS. CHRONIC ABUSERS (GLUE(ING 21)
Ingredient Sequence Number: 20
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 20:SNIFFERS/HUFFERS)-LIVER, KIDNEY/BRAIN DMG; CHILDREN OF
PREGNANT ABUSERS-MENTAL &/OR GROWTH RETARDATION. (ING 22)
Ingredient Sequence Number: 21
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 21:XYLENE:RATS/MICE:INHAL:DEVEL TOX DURING PREGNANCY; DELAYED DEVEL & MINOR SKELETAL VARIATIONS; INGEST: (ING 23)
Ingredient Sequence Number: 22
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 22:LETHALITY (RESORPTIONS) & MALFORMS (PRIMARILY CLEFT
PALATE). MIXED XYLENES:RATS:PROBABLE HEARING LOSS. (ING 24)
Ingredient Sequence Number: 23
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 23:ING 10:ANIMAL:MATERNAL TOX (DECR OF SUCCESSFUL PREGNANCIES & REDUCTION IN BIRTH WT; CLEFT PALATE; LIVER TUMORS.
Ingredient Sequence Number: 24
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 24:FOR MORE SPECIFIC TOXICOLOGICAL INFORMATION CONTACT NEHC (FP N).
Ingredient Sequence Number: 25
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

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========================================================================
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                   Physical/Chemical Characteristics
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Appearance And Odor: ORANGE TO BRONZE LIQUID.
Boiling Point: &gt;77F,&gt;25C
Melting Point: N/A
Vapor Pressure (MM Hg/70 F): 5-15 @100F
Vapor Density (Air=1): 3-4
Specific Gravity: 0.7-0.8
Solubility In Water: INSOLUBLE
Percent Volatiles By Volume: &gt;99
========================================================================
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                    Fire and Explosion Hazard Data
========================================================================
====
Flash Point: &lt;-49F,&lt;-45C
Flash Point Method: PMCC
Lower Explosive Limit: 1.4%
Upper Explosive Limit: 7.6%
Extinguishing Media: FIRE FIGHTING FOAM:ALCOHOL RESISTANT TYPE (AR) AFF
F,
CO*2, DRY CHEMICAL.
Special Fire Fighting Proc: USE NIOSH APPROVED SCBA &amp; FULL PROTECTI
VE
EQUIPMENT (FP N). READ ENTIRE DOCUMENT. THIS PRODUCT PRESENTS AN EXTREM
E
FIRE HAZARD.
Unusual Fire And Expl Hazrds: LIQ VERY QUICKLY EVAPS, EVEN AT LOW TEMPS
 &amp;
FORMS VAP(FUMES) WHICH CAN CATCH FIRE &amp; BURN W/EXPLO VIOLENCE. INVI
SIBLE
VAP SPREADS EASILY &amp; CAN BE SET ON (SUPDAT)
========================================================================
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                           Reactivity Data
========================================================================
====
Stability: YES
Cond To Avoid (Stability): NO DATA AVAILABLE.
Materials To Avoid: MAY REACT W/STRONG OXIDIZING AGENTS, SUCH AS
CHLORATES, NITRATES, PEROXIDES, ETC.
Hazardous Decomp Products: NORMAL COMBUSTION FORMS CARBON DIOXIDE &amp;
 WATER
VAPOR; INCOMPLETE COMBUSTION CAN PRODUCE CARBON MONOXIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT
========================================================================
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                          Health Hazard Data
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=======================================================================
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LD50-LC50 Mixture: LD50:(ORAL,RAT) &gt;5 ML/KG.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: EYE:SLIGHTLY IRRIT, PRLNG VISION IMPAIRME
NT,
PAIN, TEARS, SWELL, REDNESS &amp; BLURRED VISION. SKIN:CRACKED/DRY FROM
 DEFAT.
PRACTICALLY NON-TOX IF ABSORBED. INGEST:SLIGHTLY TOX. CAN DIRECTLY ENTE
R
LUNGS BY SWALLOWING/VOMIT (ASPIR). ONCE IN LUNGS, SUBSTANCE IS VERY DFC
LT
TO REMOVE &amp; CAN CAUSE SEV INJURY TO (EFTS OF OVEREXP)
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: YES
Explanation Carcinogenicity: BENZENE:IARC MONOGRAPHS, SUPP, VOL 7, PG 1
20,
1987:GRP 1. NTP 7TH ANNUAL RPT ON CARCINS, 1994:ANTIC TO BE (SUPP DATA)
Signs/Symptoms Of Overexp: HLTH HAZ:LUNGS &amp; DEATH. INHAL:SLIGHTLY T
OX. CNS
EFTS (HDCH, DIZZ, LOSS OF APPETITE, WEAK &amp; LOSS OF COORD); LOSS OF
CONSCIOUSNESS, COMA &amp; DEATH; PULM EDEMA &amp; BRONCH. INTENTIONAL E
XPOS MAY
RSLT IN CONVLS, DELIRIUM &amp; HALLUCINATIONS. TARGET ORG:NERV SYS. DEG
REE OF
INJURY WILL DEPEND ON AMT OF MATL THAT GETS INTO (ING 14)
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INGEST:CALL MD IMMED (FP N). INHAL:REMOVE TO
FRESH AIR. SUPPORT BRTHG (GIVE O*2/ARTF RESP (FP N). EYES:IMMED FLUSH W
/
FLUSH W/COPIOUS AMTS OF WATER. CALL MD (FP N). NOTE TO MD:INGEST OF THI
S
PROD/SUBSEQUENT VOMIT CAN RSLT IN ASPIR OF LIGHT HYDROCARBON LIQ WHICH
CAN
CAUSE PNEUM. FOR MORE SPECIFIC INFO REGARDING FIRST (ING 13)
=======================================================================
====
                  Precautions for Safe Handling and Use
=======================================================================
====
Steps If Matl Released/Spill: ELIM ALL SOURCES OF IGNIT IN VICIN OF SPI
LL/
RELS VAP. CLEAN UP SPILLS IMMED, OBSERVING APPROP PRECS. WATER POLLUTAN
T;
PVNT RELS FROM CONTAM SOIL/WATER &amp; FROM ENTERING DRAINAGE/SEWER SYS
. CLEAN
UP SM SPILLS USING APPROP TECHNIQUES (SORB MATL/ (SUPDAT)
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL MUST BE I/A/W FEDERAL, STATE &amp; LOCA
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L
REGULATIONS (FP N). PLACE CONTAM MATLS IN DISPOSABLE CNTNRS & DISP OF IN
MANNER CONSISTENT W/APPLIC REGS. CONT LOC ENVIRON/HLTH AUTHS FOR APPROVED
DISP OF THIS MATL.
Precautions-Handling/Storing: KEEP OUT OF REACH OF CHILDREN. DO NOT GET IN
EYES. AVOID PRLNG/FREQUENTLY RPTD SKIN CONT. NEVER SIPHON GAS BY MOUTH.
READ & OBSERVE ALL PRECS ON LBL.
Other Precautions: USE ONLY AS MOTOR FUEL. DO NOT USE FOR CLEANING, PRESS
APPLIANCE FUEL/ANY OTHER SUCH USE. DO NOT USE/STORE NEAR FLAME, SPKS/HOT
SURFS. KEEP CNTNR CLSD. DO NOT TRANSFER LIQ TO UNLABELED CNTNR. DO NOT
WELD, HEAT/DRILL CNTNR. REPLACE (SUPDAT)

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Control Measures

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Respiratory Protection: NO SPECIAL RESP PROT IS NORMALLY REQD. HOWEVER, IF
OPERATING CNDTNS CREATE AIRBORNE CONCS WHICH EXCEED REC EXPOS STDS, USE OF
NIOSH APPRVD RESP IS REQD. REFER TO OSHA BENZENE STD TO DETERM WHAT TYPE OF
RESP IS REQD BASED ON EXPOS LEVELS.
Ventilation: USE THIS MATERIAL ONLY IN WELL VENTILATED AREAS.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: ANSI APPROVED EYE WASH FOUNTAIN & DELUGE
SHOWER (FP N). SKIN CONTACT CAN BE MINIMIZED BY WEARING PROTECTIVE
CLOTHING.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: EXPLO HAZ:FIRE BY MANY SOURCES (PILOT LIGHTS,
WELDING EQUIP & ELEC MOTORS & SWITCHES). EXPLAN OF CARCIN:CARCIN. OSHA
REGULATED:29 CFR 1910.1028. HUMAN:MYELOID LEUKEMIA, HODGKINS DISEASE,
LYMPHOMA. OTHER PREC:CAP/BUNG. EMPTIED CNTNR STILL CNTNS HAZ/EXPLO VAP/LIQ.
SPILL PROC:PUMPING. FOR MORE INFO, CONTACT NEHC (FP N).

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Transportation Data

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Disposal Data

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=======================================================================
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                              Label Data
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====
Label Required: YES
Technical Review Date: 07MAY97
Label Date: 24APR97
Label Status: G
Common Name: REGULAR UNLEADED GASOLINE, CPS201116
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: FLAMM. ACUTE:EYE:SLIGHTLY IRRIT, PRLNG VISI
ON
IMPAIRMENT, PAIN, TEARS, SWELL, REDNESS &amp; BLURRED VISION. SKIN:CRAC
KED/DRY
FROM DEFAT. INGEST:SLIGHTLY TOX. CAN DIRECTLY ENTER LUNGS BY SWALLOWING
/
VOMIT (ASPIR). SEV INJURY TO LUNGS, DEATH. INHAL:CNS; HDCH, DIZZ, LOSS
OF
APPETITE, WEAK &amp; LOSS OF COORD, LOSS OF CONSCIOUSNESS, COMA &amp; D
EATH. PULM
EDEMA &amp; BRONCH. CONVLS, DELIRIUM &amp; HALLUCINATIONS. CHRONIC:CANC
ER HAZ.
CONTAINS BENZENE, WHICH IS LISTED AS A HUMAN BLOOD CARCIN (FP N). TOLUE
NE
APPEARS ON THE NAVY OCCUP CHEM REPRO HAZS LIST (FP N). POSS LIVER TUMOR
S,
BLOOD DISEASE, NERVE DMG, PROGRESSIVE WEAK &amp; NUMB, HEARING LOSS. LI
VER,
KIDNEY/BRAIN DMG.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: CHEVRON USA PRODUCTS COMPANY
Label Street: 575 MARKET ST
Label City: SAN FRANCISCO
Label State: CA
Label Zip Code: 94105-2856
Label Country: US
Label Emergency Number: 800-424-9300(CHEMTREC)
</PRE></BODY></HTML>
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MATERIAL SAFETY DATA SHEET

BENZENE (AMOCO/TOTAL)

MSDS No. 11697000 ANSI/ENGLISH

1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: BENZENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER:

Amoco Oil Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735

EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)

OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Benzene	71-43-2	99.80
Toluene	108-88-3	0.20

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Danger! Extremely flammable. Causes eye and skin irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Causes mild skin irritation. Causes skin irritation on prolonged or repeated contact. Harmful when absorbed through the skin.

INHALATION: Cancer hazard. Can cause blood disorders. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. See "Toxicological Information" section (Section 11.0).

INGESTION: Harmful or fatal if liquid is aspirated into lungs. See "Toxicological Information" section (Section 11.0).

HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)

NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

4.0 FIRST AID MEASURES

EYE: Flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation persists.

SKIN: Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 12°F(-11°C)

UEL: 8.0%

LEL: 1.5%

AUTOIGNITION TEMPERATURE: 928°F (498°C)

FLAMMABILITY CLASSIFICATION: Extremely Flammable Liquid.

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable liquid. Vapor may explode if ignited in enclosed area.

FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.

HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Increase ventilation if possible. Wear respirator and spray with water to disperse vapors. Keep out of sewers and waterways.

7.0 HANDLING AND STORAGE

HANDLING: Use with adequate ventilation. Do not breathe vapors. Keep away from ignition sources (e.g., heat, sparks, or open flames). Ground and bond containers when transferring materials. Wash thoroughly after handling. After this container has been emptied, it may contain flammable vapors; observe all warnings and precautions listed for this product.

STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed. Outside storage is recommended.

8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear eye protection.

SKIN: Do not get on skin or clothing. Wear protective clothing and gloves.

INHALATION: Do not breathe mist or vapor. If heated and ventilation is inadequate, use supplied-air respirator approved by NIOSH/MSHA.

ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.

EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)

9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Colorless. Sweet odor.

pH: Not determined.

VAPOR PRESSURE: 74.6 mm Hg at 20 °C

VAPOR DENSITY: Not determined.

BOILING POINT: 176°F(80°C)

MELTING POINT: 42°F(6°C)

SOLUBILITY IN WATER: Slight, 0.1 to 1.0%.

SPECIFIC GRAVITY (WATER=1): 0.88

10.0 STABILITY AND REACTIVITY

STABILITY: Stable.

CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).

MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.

HAZARDOUS DECOMPOSITION: None identified.

HAZARDOUS POLYMERIZATION: Will not occur.

11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.

SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.

ORAL LD50: 3.8 g/kg (rat).

INHALATION LC50: 10000 ppm (rat)

OTHER TOXICITY DATA: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances. Residues and spilled material are hazardous waste due to ignitability.

14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Benzene
Hazard Class	3
Identification Number	UN1114
Packing Group	II
RQ	RQ

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	99.80	10 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	99.80

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Carcinogen. Irritant. CNS Effects. Target organ effects.

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (MITI): Not determined.

AUSTRALIA INVENTORY (AICS): Not determined.

KOREA INVENTORY (ECL): Not determined.

CANADA INVENTORY (DSL): Not determined.

PHILIPPINE INVENTORY (PICCS): Not determined.

16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department

Issued: November 14, 1995

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

ETHYLBENZENE
Ethylbenzol
Phenylethane
EB
$C_8H_{10}/C_6H_5\text{-}C_2H_5$
Molecular mass: 106.2

CAS # 100-41-4
RTECS # DA0700000
ICSC # 0268
UN # 1175
EC # 601-023-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT GENERATION OF MISTS!	
• **INHALATION**	Cough. Dizziness. Drowsiness. Headache.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**	Redness. Pain. Blurred vision.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	(further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Ventilation. Collect leaking liquid in covered containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer (extra personal protection: A filter respirator for organic vapour).	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-20 S: (2-)16-24/25-29 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0268

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities

International Chemical Safety Cards

ETHYLBENZENE

ICSC: 0268

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH AROMATIC ODOUR.

PHYSICAL DANGERS:
The vapour mixes well with air, explosive mixtures are easily formed.

CHEMICAL DANGERS:
Reacts with strong oxidants. Attacks plastic and rubber.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV (as TWA): 100 ppm; 434 mg/m^3; as STEL: 125 ppm; 543 mg/m^3 (ACGIH 1994-1995).
MAK: 100 ppm; 440 mg/m^3 (1994).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes, the skin and the respiratory tract. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. The substance may cause effects on the central nervous system. Exposure far above OEL could cause lowering of consciousness.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis.

PHYSICAL PROPERTIES

Boiling point: 136°C
Melting point: -95°C
Relative density (water = 1): 0.9
Solubility in water, g/100 ml at 20°C: 0.015
Vapour pressure, kPa at 20°C: 0.9
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 18°C c.c.
Auto-ignition temperature: 432°C
Explosive limits, vol% in air: 1.0-6.7
Octanol/water partition coefficient as log Pow: 3.2

ENVIRONMENTAL DATA

The substance is harmful to aquatic organisms.

NOTES

The odour warning when the exposure limit value is exceeded is insufficient.

Transport Emergency Card: TEC (R)-522
NFPA Code: H2; F3; R0

ADDITIONAL INFORMATION

ICSC: 0268 **ETHYLBENZENE**

IMPORTANT LEGAL NOTICE:

Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

TOLUENE

ICSC: 0078

TOLUENE
Methylbenzene
Toluol
$C_6H_5CH_3/C_7H_8$
Molecular mass: 92.1

CAS # 108-88-3
RTECS # XS5250000
ICSC # 0078
UN # 1294
EC # 601-021-00-3

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Highly flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Vapour/air mixtures are explosive.	Closed system, ventilation, explosion-proof electrical equipment and lighting. Prevent build-up of electrostatic charges (e.g., by grounding). Do NOT use compressed air for filling, discharging, or handling.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
• **INHALATION**	Dizziness. Drowsiness. Headache. Nausea. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**	Redness. Pain.	Safety goggles or face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain. Burning sensation (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT wash away into sewer (extra personal protection: self-contained breathing apparatus).	Fireproof. Separated from strong oxidants.	F symbol Xn symbol R: 11-20 S: (2-)16-25-29-33 UN Hazard Class: 3 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0078

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities

International Chemical Safety Cards

TOLUENE

ICSC: 0078

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
The vapour is heavier than air and may travel along the ground; distant ignition possible. As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 50 ppm: 188 mg/m^3 (as TWA) (skin) (ACGIH 1993-1994).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached rather quickly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes and the respiratory tract. Exposure could cause central nervous system depression. Exposure at high levels may result in cardiac dysrhythmia, unconsciousness and death.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
Repeated or prolonged contact with skin may cause dermatitis. The substance may have effects on the central nervous system , resulting in decreased learning ability and psychological disorders. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

PHYSICAL PROPERTIES

Boiling point: 111°C
Melting point: -95°C
Relative density (water = 1): 0.87
Solubility in water: none
Vapour pressure, kPa at 20°C: 2.9
Relative vapour density (air = 1): 3.2
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.06
Flash point: 4°C c.c.°C
Auto-ignition temperature: 480°C
Explosive limits, vol% in air: 1.1-7.1
Octanol/water partition coefficient as log Pow: 2.69

ENVIRONMENTAL DATA

NOTES

Depending on the degree of exposure, periodic medical examination is indicated.

Transport Emergency Card: TEC (R)-31
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0078 **TOLUENE**

IMPORTANT LEGAL NOTICE:

Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

o-XYLENE

ICSC: 0084

o-XYLENE
ortho-Xylene
1,2-Dimethylbenzene
o-Xylol
$C_6H_4(CH_3)_2/C_8H_{10}$
Molecular mass: 106.2

CAS # 95-47-6
RTECS # ZE2450000
ICSC # 0084
UN # 1307
EC # 601-022-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, AFFF, foam, carbon dioxide.
EXPLOSION	Above 32°C explosive vapour/air mixtures may be formed.	Above 32°C use a closed system, ventilation, and explosion-proof electrical equipment.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		STRICT HYGIENE! AVOID EXPOSURE OF (PREGNANT) WOMEN!	
• **INHALATION**	Dizziness. Drowsiness. Headache. Unconsciousness.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	Dry skin. Redness.	Protective gloves.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**	Redness. Pain.	Safety spectacles.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain. Burning sensation (further see Inhalation).	Do not eat, drink, or smoke during work.	Rinse mouth. Give a slurry of activated charcoal in water to drink. Do NOT induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment.	Fireproof. Separated from strong oxidants.	Xn symbol R: 10-20/21-38 S: (2-)25 Note: C UN Hazard Class: 3

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0084

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International Chemical Safety Cards

o-XYLENE

ICSC: 0084

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS LIQUID , WITH CHARACTERISTIC ODOUR.

PHYSICAL DANGERS:
As a result of flow, agitation, etc., electrostatic charges can be generated.

CHEMICAL DANGERS:
Reacts violently with strong oxidants causing fire and explosion hazard.

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV: 100 ppm; 434 mg/m^3 (as TWA) (ACGIH 1993-1994).
TLV (as (STEL): 150 ppm; 651 mg/m^3 (ACGIH 1993-1994).

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes. Exposure far above the OEL may result in central nervous system depression, unconsciousness and death.

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
The liquid defats the skin. The substance may have effects on the central nervous system , resulting in decreased learning ability. Animal tests show that this substance possibly causes toxic effects upon human reproduction.

PHYSICAL PROPERTIES

Boiling point: 144°C
Melting point: -25°C
Relative density (water = 1): 0.88
Solubility in water: none
Vapour pressure, kPa at 20°C: 0.7
Relative vapour density (air = 1): 3.7
Relative density of the vapour/air-mixture at 20°C (air = 1): 1.02
Flash point: 32°C c.c.°C
Auto-ignition temperature: 463°C
Explosive limits, vol% in air: 0.9-7.0
Octanol/water partition coefficient as log Pow: 3.12

ENVIRONMENTAL DATA

This substance may be hazardous to the environment; special attention should be given to fish and crustacea.

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. The recommendations on this Card also apply to technical xylene. Also consult ICSC # 0086 p-xylene and 0085 m-xylene.

Transport Emergency Card: TEC (R)-33
NFPA Code: H 2; F 3; R 0;

ADDITIONAL INFORMATION

ICSC: 0084 **o-XYLENE**

IMPORTANT LEGAL NOTICE:

Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

MATERIAL SAFETY DATA SHEET

PARA-XYLENE

MSDS No. 01263000 ANSI/ENGLISH

1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: PARA-XYLENE

MANUFACTURER/SUPPLIER:

Amoco Chemical Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735

EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)

OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
P-Xylene	106-42-3	100

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Warning! Flammable. Causes eye and skin irritation. Can be harmful if high concentrations are inhaled. Harmful or fatal if liquid is aspirated into lungs.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes eye irritation.

SKIN CONTACT: Causes skin irritation.

INHALATION: Can be harmful if high concentrations are inhaled. See "Toxicological Information" section (Section 11.0).

INGESTION: Harmful or fatal if liquid is aspirated into lungs. See "Toxicological Information" section (Section 11.0).

HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)

NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

4.0 FIRST AID MEASURES

EYE: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

SKIN: Wash exposed skin with soap and water. Remove contaminated clothing and thoroughly clean and dry before reuse. Get medical attention if irritation develops.

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

INGESTION: If swallowed, do NOT induce vomiting. Get immediate medical attention.

5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 81°F(27°C) ASTM D56

UEL: 7.0%

LEL: 1.1%

AUTOIGNITION TEMPERATURE: 924°F (496°C) (approximate)

FLAMMABILITY CLASSIFICATION: Flammable Liquid.

EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid. Vapor may explode if ignited in enclosed area.

FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.

PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.

HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Keep out of sewers and waterways.

7.0 HANDLING AND STORAGE

HANDLING: Keep away from ignition sources (e.g., heat, sparks, or open flames). Keep container closed. Use with adequate ventilation.

STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed.

8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear chemical goggles.

SKIN: Avoid skin contact. Wear protective clothing and gloves.

INHALATION: Do not breathe mist or vapor. Use with adequate ventilation. If ventilation is inadequate, use NIOSH/MSHA certified respirator that will protect against organic vapor and dust/mist.

ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.

EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
P-Xylene	106-42-3	OSHA PEL: 100 ppm (1989)(1971) OSHA STEL: 150 ppm (1989); Not established. (1971) ACGIH TLV-TWA: 100 ppm ACGIH TLV-STEL: 150 ppm

9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Clear. Sweet odor.

pH: Not determined.

VAPOR PRESSURE: 6.4 mm Hg at 20 °C

VAPOR DENSITY: 3.7

BOILING POINT: 282°F(139°C)

MELTING POINT: 56°F(13°C)

SOLUBILITY IN WATER: Negligible, below 0.1%.

SPECIFIC GRAVITY (WATER=1): 0.86

10.0 STABILITY AND REACTIVITY

STABILITY: Burning can be started easily.

CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).

MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.

HAZARDOUS DECOMPOSITION: Burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

HAZARDOUS POLYMERIZATION: Will not occur.

11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.

SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.

ORAL LD50: Testing not conducted. See Other Toxicity Data.

INHALATION LC50: Testing not conducted. See Other Toxicity Data.

OTHER TOXICITY DATA: In humans, overexposure to xylene can cause headache, fatigue, dizziness, listlessness, confusion, irritability, gastrointestinal disturbances (nausea and loss of appetite), flushing of the face, and a feeling of increased body heat. Exposure to xylene vapors above recommended exposure limits (100 ppm - TWA) can cause irritation of the eyes, nose and throat as well as tightening of the chest and staggering gait. Severe overexposure to xylene has been reported to cause irregular heartbeat or rapid incoordinate contractions of the heart, tremors, central nervous system depression, and unconsciousness. Lethality has resulted upon exposure to 10,000 ppm. The odor threshold for xylene is reported to be 1 ppm.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lung can occur while vomiting after ingestion of this product.

The oral LD50 for xylene is 4300 mg/kg (rat). The inhalation LC50 is 6350 ppm in rats exposed for 4 hours and 3907 ppm in mice exposed for 6 hours.

No significant treatment related effects were seen following inhalation exposure of rats and dogs exposed t0 810 ppm for 13 weeks, whereas liver damage and lung inflammation were reported in guinea pigs exposed to 300 ppm for a total of 64 exposures (4 hours der day, 6 days per week).

Xylenes were not teratogenic in rats exposed via inhalation to 100 and 400 ppm, however, adverse effects upon the unborn have been reported at exposure levels producing toxicity in the mother. Xylenes have produced negative results in various genetic toxicity tests, including the AMES assay, mouse lymphoma assay in vitro, rat bone marrow cytogenetic assay in vivo, and a dominant lethal assay.

No component of this product present at levels greater than 0.1% as a carcinogen by NTP, IARC or OSHA.

12.0 ECOLOGICAL INFORMATION

Ecotoxicity Test Data:

Para-xylene (p-xylene, or 4-xylene) is toxic to fish and other aquatic life. Published test results of the acute toxicity of of p-xylene for several aquatic species show that concentrations of 2 to 10 mg/L are acutely toxic to most species tested. Acute toxicity endpoints ranged from 2 to 35 mg/L, with a geometric mean of 7 mg/L. The para-isomer appears to be slightly more toxic than the meta- and ortho-isomers.

Biodegradation Potential:

Xylenes have been shown to be readily biodegradable in water using standard protocols with inocula including sewage, activated sludge, and seawater. Field data indicates biodegradation in several situations. However, reports suggest that p-xylene may persist in some groundwater situations. Rates of degradation are expected to vary with environmental conditions and the extent of adaptation of the microbial population.

Bioconcentration Potential:

P-xylene is not expected to bioconcentrate or bioaccumulate. A bioconcentration factor of 138 to 158 is predicted using the estimated octanol-water partition coefficient (log Kow) of 3.12 to 3.2. A bioconcentration factor of 20 was reported for eels. Metabolism and excretion of xylenes has been demonstrated in several organisms, generally via production of toluic acid. Significant bioconcentrations is unlikely if bioconcentration factors are less than 1000 and the chemical is metabolized.

Other Ecological Information:

P-xylene is expected to volatilize from water and soil with a relatively high Henry's law constant of 0.32, yielding an estimated half-life in water of less than 1 week. Sorption to soil is low to moderate, with the Koc of ortho-xylene being 48-68. Abiotic degradation in air occurs through reaction with photochemically produced hydroxyl radicals, resulting in typical losses of 67-86% per day. Xylenes are likely to move with groundwater from soils and to volatilize from both soil and surface waters.

The potential for long-term ecological effects to intermittent environmental releases is expected to be minimal. However, repeated discharges may cause long-term adverse effects in the aquatic environment.

13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Residues and spilled material are hazardous waste due to ignitability.

The container for this product can present explosion or fire hazards, even when emptied! To avoid risk of injury, do not cut, puncture, or weld on or near this container. Since the emptied containers retain product residue, follow label warnings even after container is emptied.

14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Xylenes
Hazard Class	3
Identification Number	UN1307
Packing Group	III
RQ	RQ (Para-Xylene)

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)

Shipping Name	Xylenes
Class	3.3
Packing Group	III
UN Number	UN1307

Air (ICAO/IATA)

Shipping Name	Xylenes
Class	3
Subsidiary Class	UN1307
Packing Group	III

European Road/Rail (ADR/RID)

Shipping Name	Xylenes
Class	3
Item	31°(C)

Canadian Transportation of Dangerous Goods

Shipping Name	Xylenes
Hazard Class	3.3
Subsidiary Class	9.2
UN Number	UN1307
Packing Group	III

15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
P-Xylene 106-42-3	100	100 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).

SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
P-Xylene 106-42-3	100

U.S. INVENTORY (TSCA): Listed on inventory.

OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Irritant.

EC INVENTORY (EINECS/ELINCS): In compliance.

JAPAN INVENTORY (MITI): Not determined.

AUSTRALIA INVENTORY (AICS): Not determined.

KOREA INVENTORY (ECL): Not determined.

CANADA INVENTORY (DSL): Not determined.

PHILIPPINE INVENTORY (PICCS): Not determined.

16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department

Issued: March 28, 1997

Supersedes: February 27, 1996

This Material Safety Data Sheet conforms to the requirements of ANSI Z400.1.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

Acenaphthene, 96%
ACROS95363

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Acenaphthene, 96%
Catalog Numbers:
AC102180000, AC102180010, AC102180050, AC102181000
Synonyms:
1,8-Ethylenenaphthalene; Acenaphthylene, 1,2-dihydro-; Naphthyleneethylene; Periethylenenaphthalene

Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium

Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410

For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
83-32-9	Acenaphthene	96	201-469-6

Hazard Symbols: XI
Risk Phrases: 36/38

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: pale yellow.
Caution! Causes respiratory tract irritation. May cause digestive tract irritation. The toxicological properties of this material have not been fully investigated. Causes eye and skin irritation.
Target Organs: None known.

Potential Health Effects

Eye:
Causes eye irritation.

Skin:
Causes skin irritation.

Ingestion:
May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May cause acute vomiting if swallow in large quantities.

Inhalation:
The toxicological properties of this substance have not been fully investigated. Causes upper respiratory tract irritation. Causes irritation of the mucous membrane.

Chronic:
No information found.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:
Get medical aid. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

Use extinguishing media most appropriate for the surrounding fire. In case of fire use water spray, dry chemical, carbon dioxide, or chemical foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation. Use with adequate ventilation.

Storage:

Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acenaphthene	none listed	none listed	none listed

OSHA Vacated PELs:

Acenaphthene:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Needles
Appearance: pale yellow
Odor: Not available.
pH: Not available.
Vapor Pressure: 10 mm Hg @ 131 C
Vapor Density: 5.32
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 279 deg C
Freezing/Melting Point: 93-95 C
Autoignition Temperature: Not applicable.
Flash Point: 125 deg C (257.00 deg F)
NFPA Rating: (est.) Health: 1; Flammability: 1; Reactivity: 0
Explosion Limits, Lower: Not available.
Upper: Not available.
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density: 1.0690
Molecular Formula: $C_{12}H_{10}$
Molecular Weight: 154.07

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, dust generation, excess heat.
Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 83-32-9: AB1000000
LD50/LC50:
Not available.
Carcinogenicity:
Acenaphthene -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology:
No information available.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
Mutation in Microorganisms: Microorganism - not otherwise specified = 3 mg.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Fish: Fathead Minnow: LC50 =1.6 mg/L; 96 Hr; Flow-through at 22.9°C (pH 7.5-7.6)Fish: Rainbow trout: LC50 =0.67 mg/L; 96 Hr; Flow-through at 12.0°C (pH 7.2-7.4)Fish: Bluegill/Sunfish: LC50 =1.7 mg/L; 96 Hr; Static bioassayWater flea Daphnia: EC50 =41.2 mg/L; 48 Hr; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 =0.58-0.93 mg/L; 15 min; Microtox test at 15°CAcenaphthene is not expected to undergo hydrolysis or bioconcentrate in envionmental waters. It is degraded by microbes and is readily metabolized by multicellular organisms. Bioaccumulation, (BCF value = 387) especially in vertebrate organisms, is considered to be short-term and is not

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

- US DOT
    - No information available
- Canadian TDG
    - No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

- US FEDERAL
    - TSCA
        - CAS# 83-32-9 is listed on the TSCA inventory.
        - Health & Safety Reporting List
            - None of the chemicals are on the Health & Safety Reporting List.
        - Chemical Test Rules
            - None of the chemicals in this product are under a Chemical Test Rule.
        - Section 12b
            - None of the chemicals are listed under TSCA Section 12b.
        - TSCA Significant New Use Rule
            - None of the chemicals in this material have a SNUR under TSCA.
    - SARA
        - Section 302 (RQ)
            - CAS# 83-32-9: final RQ = 100 pounds (45.4 kg)
        - Section 302 (TPQ)
            - None of the chemicals in this product have a TPQ.
        - SARA Codes
            - CAS # 83-32-9: acute.
        - Section 313
            - No chemicals are reportable under Section 313.
    - Clean Air Act:
        - This material does not contain any hazardous air pollutants.
        - This material does not contain any Class 1 Ozone depletors.
        - This material does not contain any Class 2 Ozone depletors.
    - Clean Water Act:
        - None of the chemicals in this product are listed as Hazardous Substances under the CWA.
        - CAS# 83-32-9 is listed as a Priority Pollutant under the Clean Water Act.
        - CAS# 83-32-9 is listed as a Toxic Pollutant under the Clean Water Act.
    - OSHA:
        - None of the chemicals in this product are considered highly hazardous by OSHA.
- STATE
    - Acenaphthene can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.
    - California No Significant Risk Level:
    - None of the chemicals in this product are listed.
- European/International Regulations
    - European Labeling in Accordance with EC Directives
        - Hazard Symbols: XI

Risk Phrases:
R 36/38 Irritating to eyes and skin.
Safety Phrases:
S 37/39 Wear suitable gloves and eye/face protection.

WGK (Water Danger/Protection)
CAS# 83-32-9: No information available.

United Kingdom Occupational Exposure Limits

Canada
CAS# 83-32-9 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D2B.
CAS# 83-32-9 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 83-32-9: OEL-RUSSIA:STEL 10 mg/m3

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 5/10/1999 Revision #1 Date: 8/02/2000

Acenaphthylene, 99+%
ACROS98224

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Acenaphthylene, 99+%
Catalog Numbers:
AC310770000, AC310771000
Synonyms:
Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
208-96-8	Acenaphthylene	99.0+	205-917-1

Hazard Symbols: XI
Risk Phrases: 36/37/38

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: yellow.
Warning! Causes respiratory tract irritation. May cause digestive tract irritation. Causes eye and skin irritation.
Target Organs: None.

Potential Health Effects

Eye:
Causes eye irritation. May cause chemical conjunctivitis.

Skin:
Causes skin irritation.

Ingestion:
May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

Inhalation:
Causes respiratory tract irritation. Can produce delayed pulmonary edema.

Chronic:
Effects may be delayed.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:
Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:
Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:
In case of fire use water spray, dry chemical, carbon dioxide, or chemical foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:
Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Use only in a well ventilated area. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation. Wash clothing before reuse.

Storage:
Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Acenaphthylene	none listed	none listed	none listed

OSHA Vacated PELs:
Acenaphthylene:
No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use. Follow the OSHA respirator regulations found in 29CFR 1910.134 or

European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Solid
Appearance: yellow
Odor: Not available.
pH: Not available.
Vapor Pressure: 9.12104 mm Hg @25C
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 275 deg C
Freezing/Melting Point: 88 - 91 deg C
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating:
Explosion Limits, Lower: Not available.
Upper: Not available.
Decomposition Temperature:
Solubility: 16.1 mg/l H_2O at 25°C
Specific Gravity/Density: .8988 at 16 °C/2°C
Molecular Formula: $C_{12}H_{8}$
Molecular Weight: 152.056

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, excess heat.
Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 208-96-8: AB1254000
LD50/LC50:
Not available.
Carcinogenicity:
Acenaphthylene -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology:
No information available.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
No information available.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Daphnia: Phytobacterium phosphoreum: EC50 =0.23-0.28 mg/L; 5,15,30 minutes; Microtox test; 15 degrees C

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif as a hazardous waste.

US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

No information available

Canadian TDG

No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 208-96-8 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

CAS# 208-96-8: final RQ = 5000 pounds (2270 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depletors.

This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 208-96-8 is listed as a Priority Pollutant under the Clean Water Act.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Acenaphthylene can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.

California No Significant Risk Level:

None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XI

Risk Phrases:

R 36/37/38 Irritating to eyes, respiratory system and skin.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 37/39 Wear suitable gloves and eye/face protection.

WGK (Water Danger/Protection)

CAS# 208-96-8: No information available.

United Kingdom Occupational Exposure Limits

Canada

None of the chemicals in this product are listed on the DSL/NDSL list.

This product has a WHMIS classification of D2B.

CAS# 208-96-8 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 208-96-8: Not available.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 6/25/1999 Revision #1 Date: 8/02/2000

International Chemical Safety Cards

ANTHRACENE

ICSC: 0825

ANTHRACENE
Anthracin
Paranaphthalene
Molecular mass: 178.2

CAS # 120-12-7
RTECS # CA9350000
ICSC # 0825

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Powder, water spray, foam, carbon dioxide.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	In case of fire: keep drums, etc., cool by spraying with water.
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE!	
• **INHALATION**	Cough. Laboured breathing. Sore throat.	Local exhaust or breathing protection.	Fresh air, rest. Artificial respiration if indicated. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED! Redness.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**	Redness. Pain.	Safety goggles, or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Abdominal pain.	Do not eat, drink, or smoke during work.	Rinse mouth. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place (extra personal protection: P2 filter respirator for harmful particles).	Separated from strong oxidants, strong acids. Tightly closed. Cool.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0825

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International Chemical Safety Cards

ANTHRACENE

ICSC: 0825

IMPORTANT

PHYSICAL STATE; APPEARANCE:
WHITE CRYSTALS OR FLAKES.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:
The substance decomposes on heating, on contact with sunlight, under influence of strong oxidants producing acrid, toxic fume . causing fire and explosion hazard.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible: a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance irritates the eyes, the skin, the respiratory tract and the gastrointestinal tract.

D A T A	**OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established. PDK not established.	**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization.
PHYSICAL PROPERTIES	Boiling point: 342°C Melting point: 218°C Relative density (water = 1): 1.25 Solubility in water: none Relative vapour density (air = 1): 6.15	Flash point: 121°C Auto-ignition temperature: 538°C Explosive limits, vol% in air: 0.6-? Octanol/water partition coefficient as log Pow: 4.5 (calculated)
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to soil and air. In the food chain important to humans, bioaccumulation takes place, specifically in aquatic organisms and plants.	

NOTES

Do NOT take working clothes home. Green oil, Tetraolive are trade names.

NFPA Code: H0; F1; R;

ADDITIONAL INFORMATION

ICSC: 0825 **ANTHRACENE**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

BENZ(a)ANTHRACENE
1,2-Benzoanthracene
Benzo(a)anthracene
2,3-Benzphenanthrene
Naphthanthracene
$C_{18}H_{12}$
Molecular mass: 228.3

CAS # 56-55-3
RTECS # CV9275000
ICSC # 0385
EC # 601-033-00-9

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.		Water spray, powder. In case of fire in the surroundings: all extinguishing agents allowed.
EXPLOSION	Finely dispersed particles form explosive mixtures in air.	Prevent deposition of dust; closed system, dust explosion-proof electrical equipment and lighting.	
EXPOSURE		AVOID ALL CONTACT!	
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**		Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**		Safety goggles, face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers; if appropriate, moisten first to prevent dusting. Carefully collect remainder, then remove to safe place (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Well closed.	T symbol R: 45 S: 53-45

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0385

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International Chemical Safety Cards

BENZ(a)ANTHRACENE

ICSC: 0385

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS TO YELLOW-BROWN FLUORESCENT FLAKES OR POWDER.

PHYSICAL DANGERS:
Dust explosion possible if in powder or granular form, mixed with air.

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:
This substance is probably carcinogenic to humans.

PHYSICAL PROPERTIES

Sublimation point: 435°C
Melting point: 162°C
Relative density (water = 1): 1.274
Solubility in water: none
Vapour pressure, Pa at 20°C: 292
Octanol/water partition coefficient as log Pow: 5.61

ENVIRONMENTAL DATA

In the food chain important to humans, bioaccumulation takes place, specifically in seafood.

NOTES

This substance is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. Tetraphene is a common name.

ADDITIONAL INFORMATION

ICSC: 0385 **BENZ(a)ANTHRACENE**

IMPORTANT LEGAL NOTICE:

Benzo(a)pyrene, 98%
ACROS37175

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Benzo(a)pyrene, 98%
Catalog Numbers:
AC105600000, AC105600010, AC105601000
Synonyms:
3,4-Benzopyrene; 3,4-Benzpyrene.
Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
50-32-8	Benzo[a]pyrene	98.0	200-028-5

Hazard Symbols: T
Risk Phrases: 45 46 60 61

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: slightly brown.
Caution! Cancer suspect agent. The toxicological properties of this material have not been fully investigated. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. Possible risk of harm to the unborn child.
Target Organs: None.

Potential Health Effects

Eye:
May cause eye irritation.

Skin:
May cause skin irritation.

Ingestion:
May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated.

Inhalation:
May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.

Chronic:
May cause cancer in humans.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:
Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:
Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam. Use agent most appropriate to extinguish fire. In case of fire use water spray, dry chemical, carbon dioxide, or appropriate foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage:

Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzo[a]pyrene	as benzene solubles: 0.2 mg/m3 (listed under ** no name **).	none listed	benzene soluble fraction: 0.2 mg/m3 TWA (includes anthracene, BaP, phenanthrene, acridine, chrysene, and pyrene) (listed under ** no name **).

OSHA Vacated PELs:

Benzo[a]pyrene:

benzene soluble fraction: 0.2 mg/m3 TWA (anthracene, BaP, phenathrene, acridine, (listed under ** no name **)

Personal Protective Equipment

Eyes:
Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use. Wear a NIOSH/MSHA or European Standard EN 149 approved full-facepiece airline respirator in the positive pressure mode with emergency escape provisions.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Solid
Appearance:	slightly brown
Odor:	faint aromatic odor
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	495 deg C @ 760.00mm Hg
Freezing/Melting Point:	175 - 177 deg C
Autoignition Temperature:	Not available.
Flash Point:	Not available.
NFPA Rating:	
Explosion Limits, Lower:	Not available.
Upper:	Not available.
Decomposition Temperature:	
Solubility:	1.60x10-3 mg/l @25°C
Specific Gravity/Density:	
Molecular Formula:	$C_{20}H_{12}$
Molecular Weight:	252.31

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Incompatible materials, dust generation.

Incompatibilities with Other Materials:
Strong oxidizing agents.

Hazardous Decomposition Products:
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, acrid smoke and fumes.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 50-32-8: DJ3675000

LD50/LC50:
Not available.

Carcinogenicity:
Benzo[a]pyrene -
ACGIH: A2 - suspected human carcinogen
California: carcinogen; initial date 7/1/87
NIOSH: occupational carcinogen (listed as ** undefined **)
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen

IARC: Group 2A carcinogen
Epidemiology:
No information available.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
No information available.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Other
No information available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 50-32-8: waste number U022.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
Shipping Name: TOXIC SOLID, ORGANIC, N.O.S.*
Hazard Class: 6.1
UN Number: 2811
Packing Group: I
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 50-32-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
CAS# 50-32-8: final RQ = 1 pound (0.454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 50-32-8: acute, chronic.
Section 313
This material contains Benzo[a]pyrene (CAS# 50-32-8, 98 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 50-32-8 is listed as a Priority Pollutant under the Clean Water

Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Benzo[a]pyrene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Benzo[a]pyrene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level:
CAS# 50-32-8: no significant risk level = 0.06 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T

Risk Phrases:

- R 45 May cause cancer.
- R 46 May cause heritable genetic damages.
- R 60 May impair fertility.
- R 61 May cause harm to the unborn child.

Safety Phrases:

- S 53 Avoid exposure - obtain special instructions before use.
- S 28A After contact with skin, wash immediately with plenty of water.
- S 37 Wear suitable gloves.
- S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 50-32-8: No information available.

United Kingdom Occupational Exposure Limits

Canada
CAS# 50-32-8 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D2A.
CAS# 50-32-8 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 50-32-8: OEL-AUSTRALIA;Carcinogen
OEL-BELGIUM;Carcinogen
OEL-FINLAND:TWA 0.01 mg/m3;Skin;Carcinogen
OEL-FRANCE;Carcinogen
OEL-GERMANY;Carcinogen
OEL-RUSSIA:STEL 0.00015 mg/m3;Carcinogen
OEL-SWEDEN:TWA 0.005 mg/m3;STEL 0.03 mg/m3;Skin
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/02/1997 Revision #4 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

International Chemical Safety Cards

BENZO(G,H,I)PERYLENE

ICSC: 0739

BENZO(G,H,I)PERYLENE
1,12-Benzoperylene
$C_{22}H_{12}$
Molecular mass: 276.3

CAS # 191-24-2
RTECS # DI6200500
ICSC # 0739

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE			
• INHALATION			
• SKIN	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• EYES			
• INGESTION		Do not eat, drink, or smoke during work.	

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0739

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International Chemical Safety Cards

BENZO(G,H,I)PERYLENE

ICSC: 0739

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** PALE YELLOW-GREEN CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with NO and NO2 to form nitro derivatives. **OCCUPATIONAL EXPOSURE LIMITS (OELs):**	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** No indication can be given about the rate in which a harmful concentration in the air is reached on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:**
PHYSICAL PROPERTIES	Melting point: 278.3°C	
ENVIRONMENTAL	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and	

DATA	fats.

NOTES

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken.

ADDITIONAL INFORMATION

ICSC: 0739 **BENZO(G,H,I)PERYLENE**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

BENZO(B)FLUORANTHENE
Benzo(e)acephenanthrylene
2,3-Benzofluoroanthene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 205-99-2
RTECS # CU1400000
ICSC # 0720

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Tightly closed.	Unbreakable packaging; put breakable packaging into closed unbreakable container.

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0720

International Chemical Safety Cards

BENZO(B)FLUORANTHENE

ICSC: 0720

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** COLOURLESS TO YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Melting point: 168°C Solubility in water: none	Vapour pressure, Pa at 20°C: <10 Octanol/water partition coefficient as log Pow: 6.04
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Depending on the degree of exposure, periodic medical examination is indicated. Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0720 **BENZO(B)FLUORANTHENE**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

BENZO(K)FLUOROANTHENE
11,12-Benzofluoroanthene
Dibenzo(b,j,k)fluorene
$C_{20}H_{12}$
Molecular mass: 252.3

CAS # 207-08-9
RTECS # DF6350000
ICSC # 0721

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		PREVENT DISPERSION OF DUST! STRICT HYGIENE! AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED!	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention. Wear protective gloves when administering first aid.
• **EYES**		Safety goggles or eye protection in combination with breathing protection if powder.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work.	Wear protective gloves when inducing vomiting. Induce vomiting (ONLY IN CONSCIOUS PERSONS!). Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into containers. Carefully collect remainder, then remove to safe place. Do NOT let this chemical enter the environment.	Provision to contain effluent from fire extinguishing. Separated from strong oxidants. Tightly closed.	

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0721

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International Chemical Safety Cards

BENZO(K)FLUORANTHENE

ICSC: 0721

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** YELLOW CRYSTALS. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** Upon heating, toxic fumes are formed. Reacts with strong oxidants. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV not established.	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol and through the skin. **INHALATION RISK:** Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly. **EFFECTS OF SHORT-TERM EXPOSURE:** **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 480°C Melting point: 215.7°C	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.84
ENVIRONMENTAL DATA	This substance may be hazardous to the environment; special attention should be given to the total environment. In the food chain important to humans, bioaccumulation takes place, specifically in oils and fats.	

NOTES

Data are insufficiently available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home.

ADDITIONAL INFORMATION

ICSC: 0721 **BENZO(K)FLUORANTHENE**

Chrysene, 98%
ACROS95251

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Chrysene, 98%
Catalog Numbers:
AC224140000, AC224140010, AC224140050, AC224145000
Synonyms:
1,2 Benzophenanthrene; Benzo(a)phenanthrene.
Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
218-01-9	Chrysene	98.0	205-923-4

Hazard Symbols: T
Risk Phrases: 45

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: very light beige.
Caution! Carcinogen. Mutagen. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. May cause cancer in humans.
Target Organs: Liver, skin.

Potential Health Effects
Eye:
May cause eye irritation.
Skin:
May cause skin irritation.
Ingestion:
May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation:
May cause respiratory tract irritation.
Chronic:
May cause cancer in humans. May cause cancer according to animal studies.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin:
Get medical aid. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion:
Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation:
Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If

breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

In case of fire use water spray, dry chemical, carbon dioxide, or chemical foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate Personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Wash hands before eating. Use only in a well ventilated area. Do not breathe dust, vapor, mist, or gas. Do not get on skin or in eyes. Do not ingest or inhale.

Storage:

Store in a cool, dry place. Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	as benzene solubles: 0.2 mg/m3 (listed under ** no name **).	none listed	benzene soluble fraction: 0.2 mg/m3 TWA (includes anthracene, BaP, phenanthrene, acridine, chrysene, and pyrene) (listed under ** no name **).

OSHA Vacated PELs:

Chrysene:

benzene soluble fraction: 0.2 mg/m3 TWA (anthracene, BaP, phenathrene, acridine, (listed under ** no name **)

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Solid
Appearance: very light beige
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 448 deg C @ 760.00mm Hg
Freezing/Melting Point: 254 - 255 deg C
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating:
Explosion Limits, Lower: Not available.
Upper: Not available.
Decomposition Temperature:
Solubility: insoluble
Specific Gravity/Density:
Molecular Formula: C18H12
Molecular Weight: 228.29

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
Incompatible materials, dust generation.

Incompatibilities with Other Materials:
Strong oxidizing agents.

Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 218-01-9: GC0700000

LD50/LC50:
Not available.

Carcinogenicity:
Chrysene -
ACGIH: A3 - Animal Carcinogen
California: carcinogen; initial date 1/1/90
NIOSH: occupational carcinogen (listed as ** undefined **)
OSHA: Select carcinogen (listed as ** undefined **).
IARC: Group 3 carcinogen

Epidemiology:
No information available.

Teratogenicity:
No information available.

Reproductive Effects:
No information available.

Neurotoxicity:
No information available.

Mutagenicity:
Chrysene was mutagenic to S. Typhimurium in the presence of an exogenous metabolic system.

Other Studies:

Genotoxicity : Salmonella typhimurium TA97,TA98,TA100 with metabolic activation positive (Sakai.M.et al Mutat.Res1985); Saccharomyces cerrevisae (Miotic recombination) D3 strain 330mg/kg negative.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Water flea LC50 = 1.9 mg/L; 2 Hr.; UnspecifiedFish toxicity : LC50 (96hr) Neauthes arenacedentata >1ppm.(Rossi,S.S. et al Marine Pollut. Bull. 1978) Invertebrate toxicity : lethal treshold concentration (24hr) Daphnia Magna 0,7æg/l.(* Newsted,J.L. et al Environ. Toxicol. Chem. 1987) Bioaccumulation : 24hr Daphnia Magna log bioconcentration factor 3.7845 (*)

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 218-01-9: waste number U050.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
- No information available

Canadian TDG
- No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
- TSCA
  - CAS# 218-01-9 is listed on the TSCA inventory.
  - Health & Safety Reporting List
    - None of the chemicals are on the Health & Safety Reporting List.
  - Chemical Test Rules
    - None of the chemicals in this product are under a Chemical Test Rule.
  - Section 12b
    - None of the chemicals are listed under TSCA Section 12b.
  - TSCA Significant New Use Rule
    - None of the chemicals in this material have a SNUR under TSCA.
- SARA
  - Section 302 (RQ)
    - CAS# 218-01-9: final RQ = 100 pounds (45.4 kg)
  - Section 302 (TPQ)
    - None of the chemicals in this product have a TPQ.
  - Section 313
    - This material contains Chrysene (CAS# 218-01-9, 98 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.
- Clean Air Act:
  - This material does not contain any hazardous air pollutants.
  - This material does not contain any Class 1 Ozone depletors.
  - This material does not contain any Class 2 Ozone depletors.
- Clean Water Act:
  - None of the chemicals in this product are listed as Hazardous Substances under the CWA.
  - CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act.
  - None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
- OSHA:
  - None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Chrysene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota,

Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Chrysene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: T
Risk Phrases:
R 45 May cause cancer.
Safety Phrases:
S 53 Avoid exposure - obtain special instructions before use.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)
CAS# 218-01-9: No information available.

United Kingdom Occupational Exposure Limits

Canada
CAS# 218-01-9 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D2A.
CAS# 218-01-9 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 218-01-9: OEL-AUSTRALIA;Carcinogen
OEL-BELGIUM;Carcinogen
OEL-GERMANY;Carcinogen
OEL-SWITZERLAND;Carcinogen
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 6/30/1999 Revision #2 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

International Chemical Safety Cards

DIBENZ(a,h)ANTHRACENE

ICSC: 0431

DIBENZO(a,h)ANTHRACENE
1,2:5,6-Dibenzanthracene
$C_{22}H_{14}$
Molecular mass: 278.4

CAS # 53-70-3
RTECS # HN2625000
ICSC # 0431
EC # 601-041-00-2

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Combustible.	NO open flames.	Water spray, powder.
EXPLOSION			
EXPOSURE		AVOID ALL CONTACT!	
• **INHALATION**		Local exhaust or breathing protection.	Fresh air, rest.
• **SKIN**	Redness. Swelling. Itching.	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap.
• **EYES**	Redness.	Face shield, or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**		Do not eat, drink, or smoke during work. Wash hands before eating.	Rinse mouth.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Sweep spilled substance into sealable containers: if appropriate, moisten first to prevent dusting. Carefully collect remainder. then remove to safe place (extra personal protection: P3 filter respirator for toxic particles).	Well closed.	T symbol R: 45 S: 53-45

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0431

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities

International Chemical Safety Cards

DIBENZ(a,h)ANTHRACENE

ICSC: 0431

I M P O R T A

PHYSICAL STATE; APPEARANCE:
COLOURLESS CRYSTALLINE POWDER.

PHYSICAL DANGERS:

CHEMICAL DANGERS:

OCCUPATIONAL EXPOSURE LIMITS (OELs):
TLV not established.

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation, through the skin and by ingestion.

INHALATION RISK:
Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly.

EFFECTS OF SHORT-TERM EXPOSURE:

EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:

N T D A T A		The substance may have effects on the skin , resulting in photosensitization. This substance is probably carcinogenic to humans.
PHYSICAL PROPERTIES	Boiling point: 524°C Melting point: 267°C Relative density (water = 1): 1.28	Solubility in water: none Octanol/water partition coefficient as log Pow: 6.5
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in seafood.	

NOTES

This is one of many polycyclic aromatic hydrocarbons - standards are usually established for them as mixtures, e.g., coal tar pitch volatiles. However, it may be encountered as a laboratory chemical in its pure form. Insufficient data are available on the effect of this substance on human health, therefore utmost care must be taken. Do NOT take working clothes home. DBA is a commonly used name. This substance is one of many polycyclic aromatic hydrocarbons (PAH).

ADDITIONAL INFORMATION

ICSC: 0431 **DIBENZ(a,h)ANTHRACENE**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

Fluoranthene, 98%
ACROS80991

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Fluoranthene, 98%
Catalog Numbers:
AC119170000, AC119170250, AC119171000, AC119175000
Synonyms:
1,2-(1,8-Naphthalenediyl)benzene; 1,2-(1,8-Naphthylene)benzene; 1,2-Benzacenaphthene; Benzene, 1,2-(1,8-naphthylene)-; Benzo(j,k)fluorene; Benzo(jk)fluoranthene; Benzo(jk)fluorene

Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium

Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410

For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
206-44-0	Fluoranthene	98	205-912-4

Hazard Symbols: XN
Risk Phrases: 21/22

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: yellow.
Caution! May be harmful if absorbed through the skin. Harmful. Mutagen. May be harmful if swallowed. Causes eye and skin irritation and possible burns. May cause heart and liver injury.
Target Organs: Heart, liver, lungs.

Potential Health Effects

Eye:
Causes eye irritation and possible burns.

Skin:
May be harmful if absorbed through the skin. Causes severe skin irritation and possible burns.

Ingestion:
May be harmful if swallowed. May cause rapid heartbeat and cardiac arrythmias.
May cause liver injury, pulmonary edema, and respiratory arrest. May cause gastrointestinal disturbances such as nausea.

Inhalation:
May cause effects similar to those described for ingestion. May produce cardiac failure and pulmonary edema.

Chronic:
Prolonged or repeated skin contact may cause defatting and dermatitis.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed. Extensive irrigation is required (at least 30 minutes).

Skin:
Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated

clothing and shoes. Remove contaminated clothing and shoes.

Ingestion:

Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well ventilated area. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Do not breathe dust.

Storage:

Keep containers tightly closed. Store in a cool, dry area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Fluoranthene	none listed	none listed	none listed

OSHA Vacated PELs:

Fluoranthene:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Needles
Appearance: yellow
Odor: None reported.
pH: Not available.
Vapor Pressure: 0.01 mm Hg @ 20 deg C
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 384 deg C @ 760.00mmHg
Freezing/Melting Point: 107.00 - 110.00 deg C
Autoignition Temperature: Not applicable.
Flash Point: Not applicable.
NFPA Rating: (est.) Health: 2; Flammability: 0; Reactivity: 0
Explosion Limits, Lower: Not available.
Upper: Not available.
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density: 1.252 g/cm3
Molecular Formula: $C_{16}H_{10}$
Molecular Weight: 202.25

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, strong oxidants.
Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide, acrid smoke and fumes.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 206-44-0: LL4025000
LD50/LC50:
CAS# 206-44-0: Oral, rat: LD50 = 2 gm/kg; Skin, rabbit: LD50 = 3180 mg/kg.
Carcinogenicity:
Fluoranthene -
IARC: Group 3 carcinogen
Epidemiology:
IARC Group 3: Limited or insufficient evidence for carcinogenicity in both animals and humans. Experimental tumorigenic data has been reported.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
Mutation in microorganisms: Salmonella typhimurium = 5ug/plate.
Mutation in mammalian somatic cells: Human Lymphocyte = 2 umol/L.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Fish: Bluegill/Sunfish: 3980 um/L; 96 H; (not specified)

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 206-44-0: waste number U120.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 206-44-0 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
CAS# 206-44-0: final RQ = 100 pounds (45.4 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 206-44-0: acute.
Section 313
No chemicals are reportable under Section 313.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 206-44-0 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 206-44-0 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
Fluoranthene can be found on the following state right to know lists:
California, New Jersey, Pennsylvania, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.
European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN
Risk Phrases:
R 21/22 Harmful in contact with skin and if swallowed.
Safety Phrases:
S 22 Do not breathe dust.
S 24/25 Avoid contact with skin and eyes.
WGK (Water Danger/Protection)

CAS# 206-44-0: No information available.

United Kingdom Occupational Exposure Limits

Canada

None of the chemicals in this product are listed on the DSL/NDSL list.

This product has a WHMIS classification of D2B.

CAS# 206-44-0 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 206-44-0: Not available.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 9/02/1997 Revision #3 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

Fluorene, 98%
ACROS92820

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Fluorene, 98%
Catalog Numbers:
AC156130000, AC156130250, AC156131000, AC156135000
Synonyms:
9H-Fluorene; O-Biphenylenemethane; O-Biphenylmethane; Di-Phenylenemethane; 2,2'-Methylenebiphenyl.

Company Identification (Europe): Acros Organics N.V.
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium

Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410

For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
86-73-7	Fluorene	98	201-695-5

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: white.
Caution! Mutagen. The toxicological properties of this material have not been fully investigated. This is expected to be a low hazard for usual industrial handling. May cause eye and skin irritation. May cause respiratory and digestive tract irritation.
Target Organs: None known.

Potential Health Effects

Eye:
May cause eye irritation.

Skin:
May cause skin irritation.

Ingestion:
May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.

Inhalation:
May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.

Chronic:
May cause cancer according to animal studies.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin:
Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.

Ingestion:
Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:
Remove from exposure to fresh air immediately. If not breathing,

give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam. Use agent most appropriate to extinguish fire.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container. Reduce airborne dust and prevent scattering by moistening with water. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Wash hands before eating. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation.

Storage:

Store in a cool, dry place. Keep container closed when not in use.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Fluorene	none listed	none listed	none listed

OSHA Vacated PELs:

Fluorene:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Solid
Appearance:	white
Odor:	None reported.
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	295 deg C
Freezing/Melting Point:	116 deg C
Autoignition Temperature:	Not applicable.
Flash Point:	Not applicable.
NFPA Rating:	(est.) Health: 1; Flammability: 0; Reactivity: 0
Explosion Limits, Lower:	Not available.
Upper:	Not available.
Decomposition Temperature:	Not available.
Solubility:	Insoluble in water.
Specific Gravity/Density:	Not available.
Molecular Formula:	C13H10
Molecular Weight:	166.07

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, dust generation, excess heat.
Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 86-73-7: LL5670000
LD50/LC50:
Not available.
Carcinogenicity:
Fluorene -
IARC: Group 3 carcinogen
Epidemiology:
Inadequate evidence for carcinogenicity in humans according to IARC.
Teratogenicity:
No information available.
Reproductive Effects:
No information available.
Neurotoxicity:
No information available.
Mutagenicity:
Mutagenic effects have occurred in experimental animals.
Other Studies:
See actual entry in RTECS for complete information.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Material Safety Data Sheet TLm=1.0 ppm; 96 hr. @ 22°C; Static bioassayFish toxicity :LC50 (48hr) fathead minnow > 100mg/l (Finger, S.E. et al ASTM Spec. Tech. Publ. 865 1985); LC50 (24hr) bluegill sunfish, goldfish +/-5mg/l (Wood, E.M. The toxicity of 3400

chemicals to fish 1987); LC50 (unspecified exposure) himedaka killifish 3,3mg/l (Niiromi, J. et al Mie-ken Kankyo Kagaku Senta Kenkyu Hokuku 1989) Invertebrate toxicity : EC50 (48hr) Daphnia magna 0,43 mg/l (Finger, S.E. et al ASTM spec. Tech. Publ. 865 1985); LC50 (96hr) Neanthes arenacoedentata 1mg/l (Rossi, S. S. et al Mar. Pollut. Bull. 1978)

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classif
as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Part
Additionally, waste generators must consult state and local hazardous waste regu
ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
  No information available
Canadian TDG
  Shipping Name: KETONES, LIQUID, NOS
  Hazard Class: 3
  UN Number: UN1224
  Other Information: FLASHPOINT +52

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
  TSCA
    CAS# 86-73-7 is listed on the TSCA inventory.
    Health & Safety Reporting List
      None of the chemicals are on the Health & Safety Reporting List.
    Chemical Test Rules
      None of the chemicals in this product are under a Chemical Test Rule.
    Section 12b
      None of the chemicals are listed under TSCA Section 12b.
    TSCA Significant New Use Rule
      None of the chemicals in this material have a SNUR under TSCA.
  SARA
    Section 302 (RQ)
      CAS# 86-73-7: final RQ = 5000 pounds (2270 kg)
    Section 302 (TPQ)
      None of the chemicals in this product have a TPQ.
    Section 313
      No chemicals are reportable under Section 313.
  Clean Air Act:
    This material does not contain any hazardous air pollutants.
    This material does not contain any Class 1 Ozone depletors.
    This material does not contain any Class 2 Ozone depletors.
  Clean Water Act:
    None of the chemicals in this product are listed as Hazardous Substances under the CWA.
    CAS# 86-73-7 is listed as a Priority Pollutant under the Clean Water Act.
    None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
  OSHA:
    None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
  Fluorene can be found on the following state right to know lists: New Jersey, Pennsylvania, Massachusetts.
  California No Significant Risk Level:
  None of the chemicals in this product are listed.
European/International Regulations
  European Labeling in Accordance with EC Directives
    Hazard Symbols: Not available.
    Risk Phrases:
    Safety Phrases:

WGK (Water Danger/Protection)
CAS# 86-73-7: No information available.
United Kingdom Occupational Exposure Limits

Canada
CAS# 86-73-7 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D2B.
CAS# 86-73-7 is not listed on Canada's Ingredient Disclosure List.
Exposure Limits
CAS# 86-73-7: Not available.

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 2/25/1999 Revision #1 Date: 8/02/2000

ALDRICH CHEMICAL -- PHENANTHRENE 98%, P1140-9
MATERIAL SAFETY DATA SHEET
NSN: 681000N014546
Manufacturer's CAGE: 60928
Part No. Indicator: B
Part Number/Trade Name: PHENANTHRENE 98%, P1140-9

General Information

Company's Name: ALDRICH CHEMICAL CO INC
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: MI
Company's Country: US
Company's Zip Code: 52301
Company's Emerg Ph #: 414-273-3850
Company's Info Ph #: 414-273-3850
Record No. For Safety Entry: 002
Tot Safety Entries This Stk#: 002
Status: SMJ
Date MSDS Prepared: 28MAY97
Safety Data Review Date: 24FEB98
MSDS Serial Number: CGNRV
Hazard Characteristic Code: NK

Ingredients/Identity Information

Proprietary: NO
Ingredient: PHENANTHRENE (CERCLA)
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: SF7175000
CAS Number: 85-01-8
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: WHITE TO OFF-WHITE CRYSTALS.
Boiling Point: 637F,336C
Melting Point: >210F,>99C
Specific Gravity: 1.063
Evaporation Rate And Ref: NOT KNOWN
Solubility In Water: NOT KNOWN

Fire and Explosion Hazard Data

Extinguishing Media: WATER SPRAY. CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Special Fire Fighting Proc: USE NIOSH APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: EMITS TOXIC FUMES UNDER FIRE CONDTIONS.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: STRONG OXIDIZING AGENTS.
Hazardous Decomp Products: TOXIC FUMES OF: CARBON MONOXIDE, CARBON DIOXIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE: HARMFUL IF SWALLOWED. MAY BE HARMFUL IF INHALED. MAY BE HARMFUL IF ABSORBED THRU SKIN. CAUSES EYE & SKIN IRRIT.

MATL IS IRRITATING TO MUC MEMBRANES & UPPER RESP TRACT. CAUSES PHOTOSENSITIVITY. EXPOS TO LIGHT CAN RSLT IN ALLERGIC REACTIONS RESULTING IN DERMATOLOGIC LESIONS, WHICH CAN VARY FROM (EFTS OF OVEREXP)

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: NOT RELEVANT.

Signs/Symptoms Of Overexp: HLTH HAZ: SUNBURNLIKE RESPONSES TO EDEMATOUS, VESTICULATED LESIONS/BULLAE. CHRONIC: LAB EXPERIMENTS HAVE SHOWN MUTAGENIC SKIN & APPENDAGES(TUMORS). TUMORIGENIC: (NEOPLASTIC BY RTECS CRITERIA) (TUMORS AT SITE OF APPLIC). ONLY SELECTED (SUPDAT)

Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.

Emergency/First Aid Proc: EYES: IMMEDIATELY FLUSH WITH COPIOUS AMTS OF WATER FOR AT LST 15 MINUTES. SKIN: IMMEDIATELY WASH WITH SOAP & COPIOUS AMTS OF WATER. INHAL: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTF RESP. IF BREATHING IS DIFFICULT, GIVE OXYGEN. INGEST: WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL PHYS. DISCARD CONTAMINATED CLOTHING AND SHOES.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR NIOSH APPRVD SCBA, RUBBER BOOTS AND HEAVY RUBBER GLOVES. SWEEP UP, PLACE IN BAG AND HOLD FOR WASTE DISPOSAL. AVOID RAISING DUST. VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: DISSOLVE OR MIX MATL W/COMBUST SOLVENT & BURN IN CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

Precautions-Handling/Storing: HARMFUL. HARMFUL IF SWALLOWED. IRRITATING TO EYES, RESP SYS & SKIN. POSS RISK OF IRREVERSIBLE EFTS. POSSIBLE MUTAGEN. PHOTOSENSITIZER.

Other Precautions: WEAR SUITABLE PROT CLTHG. DO NOT BREATHE DUST. AVOID INHALATION. DO NOT GET IN EYES, ON SKIN, ON CLTHG. AVOID PRLNGD/RPTD EXPOSURE. HARMFUL SOLID. IRRITANT. KEEP TIGHTLY CLOSED. STORE IN COOL DRY PLACE.

Control Measures

Respiratory Protection: NIOSH APPROVED RESPIRATOR.

Ventilation: MECHANICAL EXHAUST REQUIRED.

Protective Gloves: RUBBER GLOVES.

Eye Protection: ANSI APPRVD CHEM WORKERS GOGGLES (FP N).

Other Protective Equipment: ANSI APPRVD EYE WASH & DELUGE SHOWER (FP N).

Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.

Suppl. Safety & Health Data: EFTS OF OVEREXP: REGISTRY OF TOX EFTS OF CHEM SUBSTANCES (RTECS) DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFO.

Transportation Data

Disposal Data

Label Data

Label Required: YES

Technical Review Date: 24FEB98

Label Date: 18FEB98

Label Status: G

Common Name: PHENANTHRENE 98%, P1140-9

Chronic Hazard: YES

Signal Word: WARNING!

Acute Health Hazard-Moderate: X

Contact Hazard-Moderate: X

Fire Hazard-None: X

Reactivity Hazard-None: X

Special Hazard Precautions: ACUTE: HARMFUL IF SWALLOWED. MAY BE HARMFUL IF INHALED. MAY BE HARMFUL IF ABSORBED THRU SKIN. CAUSES EYE & SKIN IRRIT. MATL IS IRRITATING TO MUC MEMBRANES & UPPER RESP TRACT. CAUSES

PHOTOSENSITIVITY. EXPOS TO LIGHT CAN RSLT IN ALLERGIC REACTIONS RESULTING IN DERMATOLOGIC LESIONS, WHICH CAN VARY FROM SUNBURNLIKE RESPONSES TO EDEMATOUS, VESICULATED LESIONS OR BULLAE. CHRONIC: LABORATORY EXPERIMENTS HAVE SHOWN MUTAGENIC EFFECTS. CAN CAUSE SKIN PHOTOSENSITIZATION AND ALLERGIC REACTIONS.

Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALDRICH CHEMICAL CO INC
Label P.O. Box: 355
Label City: MILWAUKEE
Label State: MI
Label Zip Code: 52301
Label Country: US
Label Emergency Number: 414-273-3850

ALDRICH CHEMICAL -- PYRENE, 99%, 18551-5
MATERIAL SAFETY DATA SHEET
NSN: 685000N014585
Manufacturer's CAGE: 60928
Part No. Indicator: A
Part Number/Trade Name: PYRENE, 99%, 18551-5

General Information

Company's Name: ALDRICH CHEMICAL CO
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: WI
Company's Country: US
Company's Zip Code: 53201
Company's Info Ph #: 414-273-3850
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 24JAN90
Safety Data Review Date: 25MAR91
MSDS Serial Number: BKPQW
Hazard Characteristic Code: N1

Ingredients/Identity Information

Proprietary: NO
Ingredient: PYRENE (SARA III)
Ingredient Sequence Number: 01
Percent: 99
NIOSH (RTECS) Number: UR2450000
CAS Number: 129-00-0
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED

Physical/Chemical Characteristics

Appearance And Odor: YELLOW CRYSTALS AND POWDER
Boiling Point: 739F,393C
Melting Point: 300F,149C
Vapor Pressure (MM Hg/70 F): VERY LOW
Vapor Density (Air=1): N/A
Specific Gravity: 1.271 (FP N)
Evaporation Rate And Ref: NOT APPLICABLE
Solubility In Water: INSOLUBLE (FP N)
pH: N/A

Fire and Explosion Hazard Data

Extinguishing Media: WATER SPRAY. CO*2, DRY CHEMICAL POWDER, ALCOHOL OR POLYMER FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT TO PREVENT CONTACT WITH SKIN AND EYES.
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: STRONG OXIDIZING AGENTS.
Hazardous Decomp Products: TOXIC FUMES OF: CO, CO*2
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: SEE SUPP DATA
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO

Health Haz Acute And Chronic: ACUTE: HARMFUL IF SWALLOWED. MAY BE HARMFUL IF INHALED. MAY CAUSE EYE OR SKIN IRRITATION. INHALATION STUDIES IN ANIMALS HAVE CAUSED HEPATIC, PULMONARY & INTRAGASTRIC PATHOLOGIC CHANGES. NEUTROPHIL, LEUKOCYTE & ERYTHROCYTE LEVELS DECREASED. CUTANEOUS APPLICATION CAUSED HYPEREMIA, WEIGHT LOSS AND (SEE EFTS OF OVEREXP)

Carcinogenicity - NTP: NO

Carcinogenicity - IARC: NO

Carcinogenicity - OSHA: NO

Explanation Carcinogenicity: N/A

Signs/Symptoms Of Overexp: HLTH HAZ: HEMATOPOIETIC CHANGES AND DERMATITIS. PYRENE IS READILY ABSORBED THROUGH THE SKIN (FP N). CHRONIC: LEUKOCYTOSIS. DERMATITIS (FP N). TARGET ORGANS: LIVER, KIDNEY, LUNG, SKIN AND BLOOD SYSTEM (FP N).

Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.

Emergency/First Aid Proc: EYES: IMMEDIATELY FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. SKIN: IMMEDIATELY WASH WITH SOAP AND COPIOUS AMOUNTS OF WATER. INHAL: REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. CALL MD. WASH CONTAMINATED CLOTHING BEFORE REUSE.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR NIOSH/MSHA APPROVED SCBA, RUBBER BOOTS AND HEAVY RUBBER GLOVES. SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL. AVOID RAISING DUST. VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.

Waste Disposal Method: DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE I/A/W FEDERAL, STATE AND LOCAL LAWS.

Precautions-Handling/Storing: KEEP TIGHTLY CLOSED. STORE IN A COOL, DRY PLACE.

Other Precautions: AVOID INHALATION. DO NOT GET IN EYES, ON SKIN OR CLOTHING. AVOID PROLONGED OR REPEATED EXPOSURE. HARMFUL VAPOR.

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED RESPIRATOR.

Ventilation: MECHANICAL EXHAUST REQUIRED.

Protective Gloves: RUBBER GLOVES

Eye Protection: CHEMICAL WORKERS GOGGLES (FP N)

Other Protective Equipment: RUBBER BOOTS, SAFETY SHOWER AND EYE BATH

Work Hygienic Practices: WASH HANDS THOROUGHLY AFTER USE AND BEFORE EATING, DRINKING, SMOKING OR USING SANITARY FACILITIES (FP N).

Suppl. Safety & Health Data: LD50-LC50 MIX: LD50: (ORL/RAT)=2700 MG/KG, (ORL/MUS)=800 MG/KG, (IPR/MUS)=514 MG/KG.

Transportation Data

Trans Data Review Date: 91269

DOT PSN Code: ZZZ

DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

IMO PSN Code: ZZZ

IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION

IATA PSN Code: ZZZ

IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

AFI PSN Code: ZZZ

AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION

Additional Trans Data: NOT REGULATED FOR TRANSPORTATION

Disposal Data

Label Data

Label Required: YES

Technical Review Date: 25MAR91

Label Status: G

Common Name: PYRENE, 99%

Chronic Hazard: YES

Signal Word: WARNING!

Acute Health Hazard-Moderate: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE: MAY BE HARMFUL IF INGESTED OR INHALED. MAY CAUSE EYE & SKIN IRRITATION. AVOID BREATHING DUST. KEEP CONTAINER CLOSED. USE WITH ADEQUATE VENTILATION. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. WASH THOROUGHLY AFTER HANDLING. FIRE HAZARD NOT DETERMINED. CHRONIC: POSSIBLE CANCER HAZARD BASED ON ANIMAL DATA. TARGET ORGANS: LIVER, KIDNEY, SKIN, LUNGS AND BLOOD SYSTEM.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALDRICH CHEMICAL CO
Label P.O. Box: 355
Label City: MILWAUKEE
Label State: WI
Label Zip Code: 53201
Label Country: US

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

POLYCHLORINATED BIPHENYL (AROCLOR 1254)
Chlorobiphenyl (54% chlorine)
Chlorodiphenyl (54% chlorine)
PCB
Molecular mass: 327 (average)

CAS # 11097-69-1
RTECS # TQ1360000
ICSC # 0939
UN # 2315
EC # 602-039-00-4

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Irritating and toxic gases may be generated in a fire.		Powder, carbon dioxide.
EXPLOSION			
EXPOSURE		PREVENT GENERATION OF MISTS! STRICT HYGIENE!	
• **INHALATION**		Ventilation.	Fresh air, rest. Refer for medical attention.
• **SKIN**	MAY BE ABSORBED! Dry skin. Redness. Chloracne (further see Inhalation).	Protective gloves. Protective clothing.	Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention.
• **EYES**	Redness. Pain.	Safety goggles, face shield.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
• **INGESTION**	Headache. Numbness. Fever.	Do not eat, drink, or smoke during work.	Rest. Refer for medical attention.

SPILLAGE DISPOSAL	STORAGE	PACKAGING & LABELLING
Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT let this chemical enter the environment (extra personal protection: complete protective clothing including self-contained breathing apparatus).	Separated from food and feedstuffs. Cool. Dry. Keep in a well-ventilated room.	Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. Xn symbol R: 33 S: 35 Note: C UN Hazard Class: 9 UN Packing Group: II

SEE IMPORTANT INFORMATION ON BACK

ICSC: 0939

Prepared in the context of cooperation between the International Programme on Chemical Safety & the Commission of the European Communities © IPCS CEC 1993

International Chemical Safety Cards

POLYCHLORINATED BIPHENYL (AROCLOR 1254)

ICSC: 0939

IMPORTANT DATA	**PHYSICAL STATE; APPEARANCE:** LIGHT YELLOW VISCOUS LIQUID. **PHYSICAL DANGERS:** **CHEMICAL DANGERS:** The substance decomposes in a fire producing irritating and toxic gases. **OCCUPATIONAL EXPOSURE LIMITS (OELs):** TLV: ppm; 0.5 mg/m^3 (skin) (ACGIH 1991-1992).	**ROUTES OF EXPOSURE:** The substance can be absorbed into the body by inhalation of its aerosol, through the skin and by ingestion. **INHALATION RISK:** A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20°C. **EFFECTS OF SHORT-TERM EXPOSURE:** The substance irritates the eyes (see Notes). **EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact with skin may cause dermatitis chloracne. The substance may have effects on the liver. Animal tests show that this substance possibly causes toxic effects upon human reproduction.
PHYSICAL PROPERTIES	Relative density (water = 1): 1.5 Solubility in water: none	Vapour pressure, Pa at 25°C: 0.01 Octanol/water partition coefficient as log Pow: 6.30 (estimated)
ENVIRONMENTAL DATA	In the food chain important to humans, bioaccumulation takes place, specifically in water organisms. It is strongly advised not to let the chemical enter into the environment.	

NOTES

Changes into a resinous state (pour point) at 10°C. Distillation range: 365°-390°C. No open cup flash point to boiling. The symptoms other than the chloracne and liver effects may be in part due to contaminants of the PCB.

Transport Emergency Card: TEC (R)-914

ADDITIONAL INFORMATION

ICSC: 0939 **POLYCHLORINATED BIPHENYL (AROCLOR 1254)**

IMPORTANT LEGAL NOTICE:	Neither the CEC or the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information. This card contains the collective views of the IPCS Peer Review Committee and may not reflect in all cases all the detailed requirements included in national legislation on the subject. The user should verify compliance of the cards with the relevant legislation in the country of use.

ATTACHMENT 2

STANDARD OPERATING PROCEDURES FOR EMERGENCIES DUE TO

- **COLD AND STRESS MONITORING**
- **HEAT AND STRESS MONITORING**

DRAFT

COLD STRESS

Field operations during winter months can create a variety of hazards for the employee. Frostbite, frostnip, and hypothermia can be experienced and, if not remedied, cause severe health effects and even death. Therefore, it is important that all employees are able to recognize the symptoms of these conditions and correct the problem as quickly as possible.

A. THE EFFECTS OF COLD

Persons working outdoors in temperatures at or below freezing may experience frostbite. Extreme cold for a short time may cause severe injury to the body surface or result in profound generalized cooling, causing death. Extremities such as fingers, toes, and ears are most susceptible.

Prolonged exposure to extreme cold produces the following symptoms: shivering, numbness, low body temperature, drowsiness, and marked muscular weakness.

Two factors influence the development of a cold injury: ambient temperature and wind velocity. Windchill is used to describe the chilling effect of moving air in combination with low temperatures. Table 1 shows a windchill chart. As a general rule, the greatest incremental gain in windchill occurs when a wind velocity increases from 5 mph to 10 mph. Additionally, water conducts heat 240 times faster than air. Therefore, the body cools dramatically when personal protective equipment is removed and clothing underneath is perspiration-soaked.

There are three categories of cold-injury: frostnip, frostbite, and hypothermia.

1. Frostnip

Frostnip is the initial symptom of frostbite and is characterized by a whitened area of the skin accompanied by a burning or painful feeling.

Emergency Care

Warm the affected area either by body heat or warm (not hot) water.

2. Frostbite

Frostbite is local tissue damage caused by exposure to low temperatures. Ice crystals form, either superficially or deeply, in the fluids and underlying soft tissue of the skin. The nose, cheeks, ears, fingers, and toes are most commonly affected.

Frostbite Symptoms

- Skin is cold, hard, white, and numb.
- Skin may be blistering.

DRAFT

It is important to protect the frozen area from further injury, to warm the affected area rapidly, and to maintain respiration. Never allow the affected area to refreeze. This may lead to further damage and result in eventual amputation.

It is also important to remember that areas that have had frostbite are more susceptible to recurrent frostbite.

3. Hypothermia

Hypothermia results from prolonged exposure to the cold thereby lowering the body's core temperature. Cold does not necessarily mean temperatures below freezing, as hypothermia can be caused by temperatures above 32°F when the person is hungry, wet, tired, and over-exerted. The target organ of hypothermia is the brain.

Hypothermia Symptoms

- Severe shivering.
- Abnormal behavior characterized by decreased efficiency, decreased level of communication, forgetfulness, repetitive behavior, poor motor skills, poor judgment, and general apathy.
- Listlessness and sleepiness.
- Weakness, inability to walk, and repeated falling.
- Later stages include collapse, stupor, unconsciousness, and eventual death.

During hypothermia, the body's thermoregulatory mechanisms may shut down. Shivering is the body's way of warming itself. At 95°F, the body will produce maximum shivering. At 87.8°F, the body loses its capacity to shiver. Table 2 lists the signs of hypothermia. The worker's exposure to cold should be immediately terminated when severe shivering becomes evident.

It is important to note that if a victim is found in a remote area, despite the death-like appearance, the person may be saved. All attempts should be made to revive the victim.

Hypothermia Emergency Care

All stages of hypothermia are treated by either passive or active rewarming. Passive rewarming is accomplished by better conservation of the patient's body heat. However, the victim's thermoregulatory mechanisms must be intact.

Active rewarming means heat is applied to the victim by an external source, either surficially and/or through the core. Treatment includes:

- Preventing further heat loss. Remove the victim to warm, dry place (out of the wind, cold, and rain/snow).

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flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of diuretic and circulatory effect.

For work practices at or below -12°F (10°F) ECT, the following shall apply:

1. The worker shall be under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
3. New employee shall not be required to work full-time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
4. The weight and bulkiness of clothing shall be included in estimating the required work performance and weights to be lifted by the worker.
5. The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used. The worker should be protected from drafts to the greatest extent possible.
6. The workers shall be instructed in safety and health procedures. The training program shall include as a minimum instruction in:
   a. Proper rewarming procedures and appropriate first aid treatment.
   b. Proper clothing practices.
   c. Proper eating and drinking habits.
   d. Recognition of impending frostbite.
   e. Recognition signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
   f. Safe work practices.

Special caution shall be exercised when working with toxic substances. Cold exposure may require reduced exposure limits.

Eye protection for workers employed out-of-doors in a snow and/or ice-covered terrain shall be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals are required where there is an expanse of snow coverage causing a potential eye exposure hazard.

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TABLE 1

TABLE 1

COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)*

Estimated Wind Speed (in mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	**LITTLE DANGER** In < hr with dry skin. Maximum danger of false sense of security				**INCREASING DANGER** Danger from freezing of exposed flesh within one minute				**GREAT DANGER** Flesh may freeze within 30 seconds.			
Trenchfoot and immersion foot may occur at any point on this chart.												

*Developed by U. S. Army Research Institute of Environmental Medicine, Natick, MA.

THRESHOLD LIMIT VALUES WORK I-UP SCHEDULE FOR FOUR-HOUR SHIFT*

AIR TEMPERATURE — SUNNY SKY		NO NOTICEABLE WIND		5 MPH WIND		10 MPH WIND		15 MPH WIND		20 MPH WIND	
°C (APPROX)	°F	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS	MAXIMUM WORK PERIOD	NUMBER OF BREAKS
1. -26° TO -28°	-15° TO -19°	(NORMAL BREAKS)	1	(NORMAL BREAKS)	1	75 MINUTES	2	55 MINUTES	3	40 MINUTES	4
2. -29° TO -31°	-20° TO -24°	(NORMAL BREAKS)	1	75 MINUTES	2	55 MINUTES	3	40 MINUTES	4	30 MINUTES	5
3. -32° TO -34°	-25° to -29°	75 MINUTES	2	55 MINUTES	3	40 MINUTES	4	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE	
4. -35° TO -37°	-30° TO -34°	55 MINUTES	3	40 MINUTES	4	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE			
5. -38° TO -39°	-35° to -39°	40 MINUTES	4	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE					
6. -40° TO -42°	-40° TO -44°	30 MINUTES	5	NON-EMERGENCY WORK SHOULD CEASE							
7. -43° & BELOW	-45° & BELOW	NON-EMERGENCY WORK SHOULD CEASE									

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Notes: (a) Schedule applies to moderate to heavy work activity with warm-up beaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with four breaks in a 4-hour period (Step 5).

(b) The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.

(c) If only the windchill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: (1) special warm-up breaks should be initiated at a windchill of about 1750 W/m^2; (2) all non-emergency work should have cased at or below a windchill of 2250 W/m^2. In general the warm-up schedule provided above slightly under compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

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*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labour.

Field operations during the summer months can create a variety of hazards to the employee. Heat cramps, heat exhaustion, and heat stroke can be experienced; and if not remedied, can threaten life or health. Therefore, it is important that all employees be able to recognize symptoms of these conditions and be capable of arresting the problem as quickly as possible.

A. THE EFFECTS OF HEAT

As the result of normal oxidation processes within the body, a predictable amount of heat is generated. If the heat is liberated as it is formed, there is no change in body temperature. If the heat is liberated more rapidly, the body cools to a point at which the production of heat is accelerated and the excess is available to bring the body temperature back to normal.

Interference with the elimination of heat leads to its accumulation and thus to the elevation of body temperature. As a result, the person is said to have a fever. When such a condition exists, it produces a vicious cycle in which certain body processes speed up and generate additional heat. Then the body must eliminate not only the normal but also the additional quantities of heat.

Heat produced within the body is brought to the surface largely by the bloodstream and escapes to the cooler surroundings by conduction and radiation. If air movement or a breeze strikes the body, additional heat is lost be convection. However, when the temperature of the surrounding air becomes equal to or rises above that of the body, all of the heat must be lost by vaporization of the moisture or sweat from the skin surface. As the air becomes more humid (contains more moisture), vaporization from the skin slows down. Thus, on a day when the temperature is 95 to 100°F, with high humidity and little or no breeze,, conditions are ideal for the retention of heat within the body. It is on such a day, or more commonly a succession of such days (a heat wave), that medical emergencies due to heat are likely to occur. Such emergencies are classified in three categories: heat cramps, heat exhaustion, and heat stroke.

1. HEAT CRAMPS

Heat cramps usually affect people who work in hot environments and perspire a great deal. Loss of salt from the body causes very painful cramps of the leg and abdominal muscles. Heat cramps also may result from drinking iced water or other drinks either too quickly or in too large a quantity.

Heat Cramp Symptoms. The symptoms of heat cramp are:

- Muscle cramps in legs and abdomen,
- Pain accompanying the cramps,
- Faintness, and
- Profuse perspiration.

Heat Cramp Emergency Care. Remove the patient to a cool place. Give him sips of liquids such as "Gatorade" or its equivalent. Apply manual pressure to the cramped muscle. Remove the patient to a hospital if there is any indication of a more serious problem.

If cold packs are available, place them under the arms, around the neck, at the ankles, or at any place where blood vessels that lie close to the skin can be cooled. Protect the patient from injury during convulsions, especially from tongue biting.

B. AVOIDANCE OF HEAT-RELATED EMERGENCIES

Please note that in the case of heat cramps or heat exhaustion, "Gatorade" or its equivalent is suggested as part of the treatment regime. The reason for this type of liquid refreshment is that such beverages will return much-needed electrolytes to the system. Without these electrolytes, body systems cannot function properly, thereby increasing the represented health hazard. Therefore, when personnel are working in situations where the ambient temperatures and humidity are high, and especially in situations where protection Levels A, B, and C are require, the site safety officer must:

- Assure that all employees drink plenty of fluids ("Gatorade" or its equivalent);
- Assure that frequent breaks are scheduled so overheating does not occur; and
- Revise work schedules, when necessary, to take advantage of the cooler parts of the day (e.g., 5:00 a.m. to 1:00 p.m. and 6:00 p.m. to nightfall).
- Assure that workers are acclimated before allowing them to work for extended periods. Heat induces a series of physiological and psychological stresses that the individual worker must adjust to during the first week of heat exposure. Workers should slowly work into their peak work performance over a two-week period. Workers absent from the site several days must be allowed to become reacclimated.

If protective clothing must be worn, especially Levels A and B, the suggested guidelines for ambient temperature and maximum wearing time per excursion are given in the following Table:

Suggested guidelines for continuous use of
Level A or Level B protection:

Ambient Temperature (°F)	Maximum Wearing Time per Excusion (minutes)
Above 90	15
85 to 90	30
80 to 85	60
70 to 80	90
60 to 70	120
50 to 60	180

HEAT STRESS MONITORING

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NAME: ______________________ DATE/TIME: ________________

SITE: ________________

COMPANY: ______________________ LOCATION: ________________

__Pulse Rate Monitoring__ (30 second rest prior to first measurement):

Starting Time: __________ Pulse Rate: ________ beats/minute;

rest 30 sec.; ___________; rest 30; ___________ b/m;

rest 30 sec.; ___________; rest 60; ___________ b/m;

rest 60 sec.; ___________; rest 60: ___________ b/m;

Starting Time: __________ Pulse Rate: ________ beats/minute;

rest 30 sec.; ___________; rest 30; ___________ b/m;

rest 30 sec.; ___________; rest 60; ___________ b/m;

rest 60 sec.; ___________; rest 60: ___________ b/m;

Starting Time: __________ Pulse Rate: ________ beats/minute;

rest 30 sec.; ___________; rest 30; ___________ b/m;

rest 30 sec.; ___________; rest 60; ___________ b/m;

rest 60 sec.; ___________; rest 60: ___________ b/m;

Starting Time: __________ Pulse Rate: ________ beats/minute;

rest 30 sec.; ___________; rest 30; ___________ b/m;

rest 30 sec.; ___________; rest 60; ___________ b/m;

rest 60 sec.; ___________; rest 60: ___________ b/m;

__Method of Measurement:__

Carotid Artery: __________; Instrument (specify type): ______________

Self-Determined & Reported: ________

Site Safety Officer: __________(Contractor); ________(Contract Monitor)

____
Site Safety Officer

ATTACHMENT 3

ON-SITE DOCUMENTATION FORMS

PARSONS

PARSONS INFRASTRUCTURE & TECHNOLOGY

PLAN ACCEPTANCE FORM
SITE SAFETY AND HEALTH PLAN

I have read and agree to abide by the contents of the Safety and Health Plan for the following project:

____

____
Name (print)

____
Signature

____
Date

Return to Project Health and Safety Officer **before** work at the site.

PARSONS
PARSONS INFRASTRUCTURE & TECHNOLOGY

ACCIDENT REPORT FORM

EMPLOYER

1. Name: ____________________

2. Mail Address: ____________________
(No. and Street) (City or Town) (State and Zip)

3. Location: ____________________
(if different from mail address)

INJURED OR ILL EMPLOYEE

4. Name: ____________________ Social Sec. No.: __________
(first) (middle) (last) Employee No: __________

5. Home Address: ____________________
(No. and Street) (City or Town) (State and Zip)

6. Age: ________ 7. Sex: male ( ) female ( )

8. Date of injury or illness: __________ Time of accident: __________

9. Occupation: ____________________
(specific job title, **not** the specific activity employee was performing at time of injury)

10. Department: ____________________
(enter name of department in which injured person is employed, even though they may have been temporarily working in another department at the time of injury)

THE ACCIDENT OR OCCUPATIONAL ILLNESS

11. Place of accident or exposure: ____________________
(No. and Street) (City or Town) (State and Zip)

12. Project: ____________________

13. Was place of accident or exposure on employer's premises? Yes ( ) No ( )

14. How did the accident occur? ____________________
(describe fully the events that resulted in the injury of occupational illness.

____
Tell what happened and how. Name objects and substances involved. Give details on all factors that led to

____
accident. Use separate sheet for additional space).

15. What was the employee doing when injured? ______________________
(be specific—was employee using tools or equipment
____
or handling material?)

16. Witness to Accident: ______________________
(Name) (Affiliation) (Phone No.)
____
(Name) (Affiliation) (Phone No.)

17. Name the object or substance that directly injured the employee: ______________________
(for example, object that struck
____
employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in
____
cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.)

18. Did the accident result in employee fatality? Yes ( ) No ( )

19. Number of lost days _____/ restricted workdays ____ resulting from injury or illness?

OTHER

20. Name and address of physician: ______________________
(No. and Street) (City or Town) (State and Zip)

21. If hospitalized, name and address: ______________________
(No. and Street) (City or Town) (State and Zip)

22. Initial diagnosis of injury/occupational illness: ______________________

Date of report: ______________ Prepared by: ______________________

Official position:______________________

23. Treatment rendered: ☐ first aid ☐ medical treatment
____
____

PARSONS

PARSONS INFRASTRUCTURE & TECHNOLOGY

ACCIDENT REPORT FOLLOW-UP

Employee: ______________________ Date of injury or illness: ________________

ANALYSIS – What caused the accident. Why did it happen:

Primary cause:

Contributing factors:

PREVENTIVE/CORRECTIVE ACTION – State what will be done to prevent reoccurrence.

Immediate action:

Who is responsible: __________________ Completion date(s): __________________

Long-term action:

Who is responsible: __________________ Completion date(s): __________________

Closed by: ____

3. Facility Health and Safety Representative Date

FORM HS07-03
K:\HS\MANUALS\CORPH&S\STDFORMS\HS07-03.W7

REV 7

Air Monitoring Instument
Calibration Log

Parsons Engineering Science,Inc.	Client:	Date:
Project:		Project #:
Instrument Type:	Instrument Model:	Instument S/N:

Date	Calibration Gas Concentration	Pre-adjusted Reading	Adjustment Required? Yes/No	Span Gas Concentration Setting	Post-Cal Span Gas Reading	Maintenance Notes	Initials

Field Monitoring Form

Parsons Engineering Science

Date:

Project: ______________________

Location: ______________________

Project No.: __________

Inspector: __________

Crew: __________

Location: __________

Weather: AM ______________________________

PM

Time:	PID	Particulate	Comments:

ATTACHMENT 4

PERSONAL PROTECTIVE EQUIPMENT PROGRAM

RESPIRATORY PROTECTION PROGRAM

Prepared for

THE ENGINEERING-SCIENCE NORTHEAST OPERATIONS OFFICE

June 1990

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1.0 OBJECTIVE

The objective of the Respiratory Protection Program is to provide Engineering-Science, Inc. (ES) Northeast Operations field personnel with sufficient information and guidance to adequately protect themselves from potential inhalation hazards during hazardous waste or industrial field operations. The use of respirators to protect personnel from inhalation hazards is permitted by OSHA under 29 CFR Part 1910.134 when other more positive methods of protection, such as engineering controls (e.g., ventilation) or work practices (e.g., substitution) are not feasible.

2.0 NEED FOR RESPIRATORY PROTECTION

OSHA has established safe exposure levels for various airborne contaminants that may be encountered at sites during field operations. If worker exposure to these substances exceeds the OSHA permissible exposure limits, OSHA requires that feasible engineering controls and administrative measures be instituted to reduce worker exposure to within acceptable levels. If controls are not feasible, employers are required to provide the appropriate, approved respirators for employee protection. Because of the nature of site work in general, traditional industrial hygiene engineering controls are not usually feasible. Hence, respirators must be relied upon as a means for protecting workers at hazardous waste sites. All respiratory protection practices for ES Denver personnel, including selection and use, shall be in accordance with this program.

3.0 MINIMUM REQUIREMENTS OF AN ACCEPTABLE RESPIRATOR PROGRAM

OSHA has established the requirements for a minimally acceptable program under 29 CFR Part 1910.134. A copy of this standard is included as Appendix A in this manual. Elements that must be incorporated into an OSHA-acceptable program include the following:

- Approved respiratory devices must be properly selected.
- A determination must be made regarding the need for respiratory protective devices.
- An employee training program must be established in which the employee becomes familiar with the respiratory protective devices and is trained in the proper selection and use of respirators and their limitations.
- There must be provisions for:
  The proper maintenance, storage, inspection and repair of respirators.
  Testing for the proper fit of the respiratory protective equipment.
  Medical screening of employees to determine if they are physically able to perform their assigned work while using of respiratory protective equipment.
- Written standard operating procedures for the selection and use of respiratory protective equipment.

4.0 ESTABLISHMENT OF THE RESPIRATOR PROGRAM

Personnel with specific responsibilities for the implementation of the program include the following:

- Perception of odor while wearing a respirator.
- Resistance in breathing during respirator use.
- Fatigue due to respirator use.

5.0 RESPIRATOR SELECTION

The investigation of hazardous waste sites presents workers with a number of environmental conditions, some of which are better defined than others. It is not the purpose of this document to provide precise decision logic criteria encompassing every potential environmental situation. Each situation is unique. This document recognizes that many decisions concerning respiratory protection selection involve aspects of risk assessment. This procedure ensures that all relevant data are considered in the process of conducting respiratory proectection risk assessments, resulting in the selection of specific respiratory protective equipment items appropriate for protection against hazardous chemical exposure. Steps to take include:

1. Assimilate all available information pertaining to the hazard including: past activities, suspected materials, historical information, land use, analytical data, nature of current activities, etc.
2. Evaluate the relevance and timeliness of the data to determine the appropriate protective level needed for the task.
    a) Is the analytical data relevant?
    b) Was the past sampling or monitoring conducted during the same season as is anticipated for the activities planned? If not, what implication might this hold?
    c) Was past sampling or monitoring conducted from a medium which is pertinent to the evaluation of hazards associated with the activities specified in the task work plan?
3. Identify substances present at the work area.
4. Utilizing the subject areas listed below, evaluate all of the known or suspected chemicals on site. Topics requiring elaboration are detailed in the decision logic criteria section (see Figure 1).
    a) Permissible Exposure Limits (PEL), Threshold Limit Values (TLV).
    b) Eye irritation potential for substance (see below, decision logic criteria section).
    c) Warning properties of substance (see below, decision logic criteria section).
    d) Immediately Dangerous to Life and Health (IDLH) cocnentrations (see below, decision logic criteria section).
    e) Any possibility of poor sorbent efficiency at IDLH concentrations and below.
    f) Is there a possibility of severe skin irritation resulting from skin contact with corrosive gases (see below, decision logic criteria).
    g) The vapor pressure of the substance.
    h) Any possibility of high heat of reaction with sorbent material in cartridge or canister (see below, decision logic criteria).
    i) Is there a possibility of shock sensitivity of chemical being sorbed onto the cartridge or canister (see below, decision logic criteria).

5. Determine the physical state(s) of the substance as it is likely to be encountered at the hazardous waste site. It will be either:
   a) a gas or vapor;
   b) particulate (dust, fume, or mist), or
   c) a combination of (a) and (b).
6. Oxygen deficient atmospheres (ANSI Z88.2-1980) — air-purifying respirators shall not be worn in environments deficient in oxygen (< 19.5% by volume or partial pressure less than 100 mm of mercury).

5.1 DECISION LOGIC CRITERIA

5.1.1 Skin Adsorption and Irritation

A supplied-air suit may provide skin protection from extremely toxic substances which may be absorbed through the skin or cause severe skin irritation. Most information concerning skin irritation is not quantitative but rather is presented in commonly used descriptive terms, such as "a strong skin irritant, highly irritating to the skin" and "corrosive to the skin." Decisions made concerning skin irritation are judgmental and are often based on this non-quantitative information. As a guideline for the use of the supplied-air suit for substances that are sorbed through the skin, a single skin penetration LD50 of 2 g/kg for any animal species is used.

5.1.2 Poor Warning Properties

Air-purifying devices cannot be used to protect against organic vapors with poor warning properties. Warning properties include odor, eye irritation, taste imparting characteristics, and respiratory irritation. Warning properties provide an indication to the wearer of possible cartridge exhaustion or of poor face piece fit. Adequate warning properties can be assumed when the substances odor, taste, or irritation effects are detectable and persistent at concentrations at or below the permissible exposure limit.

If the odor or irritation threshold of a substance is more than two times greater than the PEL, this substance should be considered to have poor warning properties. Some substances have extremely low thresholds of odor and irritation in relation to the permissible exposure limit. These substances can be detected by a worker within the face piece of the respirator even when the respirator is functioning properly. These substances are considered to have poor warning properties (see Table 1).

Although 30 CFR Part 11[*1] does not specifically eliminate the use of air-purifying respirators for pesticides with poor warning properties, prudent practices dictate that a respirator should not be used to protect against any substance with poor warning properties.

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[*] The primary technical criteria for what constitutes a permissible respirator is determined by the technical requirements of 30 CFR Part 11 (Department of Interior, Bureau of Mines, Respiratory Protective Devices and Test for Permissibility).

Table 1

Comparison of Selected Odor Thresholds and TIVs for Chemical Compounds

Compounds	Odor Threshold (ppm)	TLV (ppm)
Group 1 - Odor Threshold and TLV Approximately the Same		
Cyclohexane	300	300
Cyclohexanol	100	50
Epichlorhydrin	10	5
Ethylene diamine	11	10
Hydrogen chloride	10	5
Methyl acetate	200	200
Methylamine	10	10
Methyl chloroform	500	350
Nitrogen dioxide	5	3
Propyl alcohol	200	200
Turpentine	200	100
Group 2 - Odor Threshold from 2 to 10 Times the TLV		
Acrolein	0.2	0.1
Acrylonitrile	21.0	2.0
Allyl alcohol	7.0	2.0
Arsine	0.21	0.05
1,2-Dichloroethylene	500.0	200.0
Dichloroethyl ether	35.0	5.0
Dimethyl acetamide	46.0	10.0
Ethyl benzene	200.0	100.0
Hydrogen selenide	0.3	0.05
Isopropyl glycidyl ether (IGE)	300.0	50.0
Group 3 - Odor Threshold Equal to or Greater than 10 Times TLV		
Bromoform	530.0	0.5
Camphor (synthetic)	1.6-200	2.0
Carbon tetrachloride	75.0	5.0
Chloroacetophenone	1.0	0.05
Chloroform	200.0	10.0
Chloropicrin	1.0	0.1
Diglycidyl ether (DGE)	5.0	0.1
Dimethylformamide	100.0	10.0
Ethylene oxide	500.0	1.0
Methyl formate	2000.0	100.0
Methanol	2000.0	200.0
Methyl cyclohexanol	500.0	50.0
Phosgene	1.0	0.1
Toluene 2,4-diisocyanate (TDI)	2.0	0.005

5.1.2.2 Half-Mask Respirators

A half-mask respirator fits from under the chin to above the nose. One or two cartridges are used to filter the air and discarded once the use limits are reached. Whereas the quarter-mask is approved for only dusts, the half-mask has approved cartridges for pesticides, organic vapors, dusts, mists, fumes, acid gases, ammonia, and several combinations.

5.1.2.3 Full Face Mask Respirators

The whole face, including the eyes, is protected by the full face mask. It gives 5 times the protection of a half-mask (full face mask PF = 50, half-mask PF = 10). Full Face masks are more expensive, but the added protection is certainly advantageous, no matter how small the risk in a given situation.

5.1.2.4 Atmosphere Supplying Respirators

Atmosphere supplying respirators provide from 5 minutes to several hours of breathing air. The amount of protection provided is based upon the type of face piece and its mode of operation. The full face mask provides the best protection.

Of the three modes of operation, continuous, demand, and pressure-demand, the pressure-demand mode provides the best protection.

There are two types of atmosphere supplying respirators that the Atlanta office uses: airline and self-contained breathing apparatus (SCBA). A description of each is presented below.

5.2.4.1 Airline Respirator

This respirator uses an airline to transport clean compressed air to the wearer. The mode of operation may be either continuous, demand, or pressure-demand. This respirator may be worn in an IDLH environment if: (1) it is pressure-demand type, and (2) it incorporates an escape SCBA into the system, however, no more than 300 feet of airline is allowed.

5.2.4.2 Self-Contained Breathing Apparatus

The self-contained breathing apparatus (SCBA) allows the wearer to carry a cylinder of compressed air or oxygen without the confinement of a hose or airline.
The North 801 and MSA Ultralite are the two types of SCBAs used by Engineering-Science. Both are open-circuit SCBAs. The North respirator is approved for demand and pressure demand modes. Greater protection is afforded, however, when these respirators are operated in the pressure demand mode.

5.2.4.3 Escape

Engineering-Science will provide and ensure that all employees will carry an escape respirator where exposure to extremely toxic substances may occur. (An extremely toxic substance is defined as a gas or vapor having an LC50 equal to or less than 10 ppm). An escape SCBA must have at least 5 minutes of breathing air stored in a small cylinder or coiled stainless-steel tube. Escape devices should never be used for entry into hazardous atmospheres.

4.3 SELECTION OF RESPIRATORS USING ACTIVITY MEASUREMENTS

Identification and evaluation of the contaminants that exist at a particular time provide the basis for selection of a respirator. However, real-time monitoring of activities at sites will be conducted using direct reading air monitoring instruments as the index of hazard. Therefore, respirators must be selected prior to initiating an activity, based on characterizations of groundwater and soils, knowledge of the area and associated waste, and previous measurements of worker exposure levels for the same or very similar tasks under similar conditions. Once a level of protection has been chosen, it can be modified based on real-time activity measurements, supplemented with background information and professional judgment.

Below are the allowed modifications. Please note carefully the qualifiers.

- Level B to Level D

This modification may be made in the sustained absence of volatiles or particulates as measured on real-time equipment and at the direction of the PHSO.

- Level C to Level D
  Same as Level B to Level D
- Level D to Level B

May be made at the direction of the PHSO based on the magnitude of the measurements and on professional judgment.

- Level C to Level B

Permissible at the direction of the PHSO in cases where total volatiles or particulate measurements exceed the preset action level based on characterization on the expected contaminants.

- Level D to Level C

Permissible at the direction of the PHSO when total volatiles or particulates exceed the preset action level based on characterization of the expected contaminants and when PEL-TWA measurements are being taken concurrently.

- Level B to Level C

May be made at the direction of the PHSO only when the contaminants and their concentrations are known. This modification should not be used without substantial knowledge of all the chemicals involved and their expected behavior in relation to change in concentration and effect on absorbent cartridges.

Table 3

Respirator Training

Lecture and Discussion

- Discussion of classification of respirators (e.g., air purifying and atmosphere-supplying respirators)
- Discussion of respirator capabilities and limitations.
- Instruction on setting "action levels".
- Instruction on OSHA Standard for respiratory protection.
- Proper fitting.
- Classroom and field training in recognizing and copy with emergencies.

Workshop and Field Exercise

- Field exercise in Levels A, B, and C protective ensembles.
- Disassembly and reassembly of respirators emphasizing components, their function, and their relation to the overall function of the respirator.
- Inspection of respirators.
- Proper donning and field fit testing.
- Fit testing with a test atmosphere.
- Cleaning, maintenance, and storage.

TABLE 4
ENGINEERING SCIENCE, INC.
BOSTON OFFICE
FIT-TEST RECORD LOG

NAME OF EMPLOYEE: ____________________

LOCATION: ES BOSTON OFFICE (101 HUNTINGTON AVE., BOSTON, MA.)

SIGNATURE: ____________________ DATE: __________

NAME OF FIT-TESTER: ____________________

SIGNATURE: ____________________ DATE: __________

TYPE OF RESPIRATOR:	FULL FACE
MANUFACTURER:	NORTH
MODEL:	7600-8A
CORRECTIVE LENSES:	YES

TYPE OF TEST	PASS/FAIL
ISOAMYL ACETATE	P F
IRRITANT SMOKE	P F

- Air delivery hose.
- Harness integrity.

7.2 CLEANING AND STORAGE

The health and safety equipment manager is responsible for inspecting and cleaning (if necessary) all respirators returning from the field. Cleaning is accomplished either by using the manufacturers cleaner-sanitizer or by hand washing with a mild soap solution followed by a thorough rinse and air drying. After cleaning, sanitizing and inspecting the respirator, the equipment manager will repackage and store the respirator in an area protected against dust, sunlight, heat, extreme cold, excessive moisture or damaging chemicals. The respirators must be packed and stored so the exhalation valve will rest in a normal position. When respirators are used routinely in the field, they must be cleaned daily by the assigned person.

7.3 MAINTENANCE

Continued usage of respirators will require periodic repair or replacement of component parts of the equipment. Replacement of parts and repair of air purifying respirators, in most cases, present few problems. The manufacturer will provide replacement parts. Replacement parts for respiratory protective devices must be those of the manufacturer of the equipment. Substitution of parts from a different brand or type of respirator will invalidate the approval of the respirator. Maintenance of SCBA equipment is more difficult, primarily because of the valve and regulator assembly. Because of this, regulations require that SCBA equipment be returned to the manufacturer for adjustment or repair.

All maintenance required on a respirator must be recorded in the respirator's log book.

8.0 MEDICAL ASPECTS OF RESPIRATOR USE

Engineering-Science policy provides that no personnel will be permitted to wear a respirator without clearance from a physician to do so. The diagnostic protocol for a fit-to-work classification includes as assessment of the worker's ability to use air purifying respirators and SCBAs. The examining physician will have clinical data, including spirometry, x-ray, and cardiac-function data as well as physical observations on which to base a conclusion. Some individuals, especially those with marginal respiratory and cardiac functions, may experience a sense of choking (angina) when using respirators. If this is distinct and persistent, the worker should not be allowed to wear respiratory protective equipment. A specific conclusion addressing this requirement must accompany the worker's fit-to-work statement from the examining physician.

9.0 EVALUATION OF THE RESPIRATOR PROGRAM

The respirator program will be periodically evaluated by the Office Health and Safety Representative and modified as appropriate.

The auditing of respirator practices will determine whether the appropriate respirators are being selected and worn properly. Examination of respirators in use and in storage will indicate how well the equipment is being maintained. The results of periodic audits of

Table 6

Facepiece Inspection Sheet

Device:

ID#:

Date inspected:

Inspected by:

Checklist

Rubber facepiece:

Rubber head harness:

Rubber hose:

Exhalation valve:

Inhalation valves (APR):

Speaking diaphram:

Remarks:

O-rings (APR)

Cartridge (APR)

Type:

Exp. date:

Washing
Sanitization:

Antifogging Agent Application
on lenses:

respirator storage and use, consultations with wearers, measurements of hazard levels in work areas, and medical surveillance of wearers will be reviewed and analyzed to determine the effectiveness of the respirator program. Evidence of excessive exposure to hazards will be followed up to determine why inadequate protection was provided, and action will be taken to prevent a repeat of this problem.

APPENDIX A

OSHA RESPIRATORY PROTECTION STANDARD

(29 CFR Part 1910.134)

OCCUPATIONAL SAFETY AND HEALTH STANDARDS
SUBPART I — PERSONAL PROTECTIVE EQUIPMENT

(Code of Federal Regulations, Title 29, Chapter XVII, Part 1910, Subpart I; 36 FR 10466, May 29, 1971; amended at 36 FR 15105, August 13, 1971; 37 FR 22231, October 18, 1972; republished at 39 FR 23502, June 27, 1974; standard provision revoked at 43 FR 49726, October 24, 1978; amended at 49 FR 5322, February 10, 1984)

Subpart I—Personal Protective Equipment

§ 1910.132 General requirements.

(a) *Application.* Protective equipment, including personal protective equipment for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation or physical contact.

(b) *Employee-owned equipment.* Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

(c) *Design.* All personal protective equipment shall be of safe design and construction for the work to be performed.

§ 1910.133 Eye and face protection.

(a) *General.* (1) Protective eye and face equipment shall be required where there is a reasonable probability of injury that can be prevented by such equipment. In such cases, employers shall make conveniently available a type of protector suitable for the work to be performed, and employees shall use such protectors. No unprotected person shall knowingly be subjected to a hazardous environmental condition. Suitable eye protectors shall be provided where machines or operations present the hazard of flying objects, glare, liquids, injurious radiation, or a combination of these hazards.

(2) Protectors shall meet the following minimum requirements:

(i) They shall provide adequate protection against the particular hazards for which they are designed.

(ii) They shall be reasonably comfortable when worn under the designated conditions.

(iii) They shall fit snugly and shall not unduly interfere with the movements of the wearer.

(iv) They shall be durable.

(v) They shall be capable of being disinfected.

(vi) They shall be easily cleanable.

(vii) Protectors should be kept clean and in good repair.

(3) Persons whose vision requires the use of corrective lenses in spectacles, and who are required by this standard to wear eye protection, shall wear goggles or spectacles of one of the following types:

(i) Spectacles whose protective lenses provide optical correction.

(ii) Goggles that can be worn over corrective spectacles without disturbing the adjustment of the spectacles.

(iii) Goggles that incorporate corrective lenses mounted behind the protective lenses.

(4) Every protector shall be distinctly marked to facilitate identification only of the manufacturer.

(5) When limitations or precautions are indicated by the manufacturer, they shall be transmitted to the user and care taken to see that such limitations and precautions are strictly observed.

(6) Design, construction, testing, and use of devices for eye and face protection shall be in accordance with American National Standard for Occupational and Educational Eye and Face Protection, Z87.1-1968.

§ 1910.134 Respiratory protection.

(a) *Permissible practice.* (1) In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used pursuant to the following requirements.

(2) Respirators shall be provided by the employer when such equipment is necessary to protect the health of the employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protective program which shall include the requirements outlined in paragraph (b) of this section.

(3) The employee shall use the provided respiratory protection in accordance with instructions and training received.

(b) *Requirements for a minimal acceptable program.* (1) Written standard operating procedures governing the selection and use of respirators shall be established.

(2) Respirators shall be selected on the basis of hazards to which the worker is exposed.

(3) The user shall be instructed and trained in the proper use of respirators and their limitations.

[4] [Removed]

[1910.134(b)(4) deleted by 49 FR 5322, February 10, 1984]

[5] Respirators shall be regularly cleaned and disinfected. Those used by more than

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care of respirators shall be adjusted to the type of plant, working conditions, and hazards involved, and shall include the following basic services:

(i) Inspection for defects (including a leak check),

(ii) Cleaning and disinfecting,

(iii) Repair,

(iv) Storage.

Equipment shall be properly maintained to retain its original effectiveness.

(2) (i) All respirators shall be inspected routinely before and after each use. A respirator that is not routinely used but is kept ready for emergency use shall be inspected after each use and at least monthly to assure that it is in satisfactory working condition.

(ii) Self-contained breathing apparatus shall be inspected monthly. Air and oxygen cylinders shall be fully charged according to the manufacturer's instructions. It shall be determined that the regulator and warning devices function properly.

(iii) Respirator inspection shall include a check of the tightness of connections and the condition of the facepiece, headbands, valves, connecting tube, and canisters. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

(iv) A record shall be kept of inspection dates and findings for respirators maintained for emergency use.

(3) Routinely used respirators shall be collected, cleaned, and disinfected as frequently as necessary to insure that proper protection is provided for the wearer. Respirators maintained for emergency use shall be cleaned and disinfected after each use.

[1910.134(f)(3) amended by 49 FR 5322, February 10, 1984]

(4) Replacement or repairs shall be done only by experienced persons with parts designed for the respirator. No attempt shall be made to replace components or to make adjustment or repairs beyond the manufacturer's recommendations. Reducing or admission valves or regulators shall be returned to the manufacturer or to a trained technician for adjustment or repair.

(5) (i) After inspection, cleaning, and necessary repair, respirators shall be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators placed at stations and work areas for emergency use should be quickly accessible at all times and should be stored in compartments built for the purpose. The compartments should be clearly marked. Routinely used respirators, such as dust respirators, may be placed in plastic bags. Respirators should not be stored in such places as lockers or tool boxes unless they are in carrying cases or cartons.

(ii) Respirators should be packed or stored so that the facepiece and exhalation valve will rest in a normal position and function will not be impaired by the elastomer setting in an abnormal position.

(iii) Instructions for proper storage of emergency respirators, such as gas masks and self-contained breathing apparatus, are found in "use and care" instructions usually mounted inside the carrying case lid.

(g) *Identification of gas mask canisters.* (1) The primary means of identifying a gas mask canister shall be by means of properly worded labels. The secondary means of identifying a gas mask canister shall be by a color code.

(2) All who issue or use gas masks falling within the scope of this section shall see that all gas mask canisters purchased or used by them are properly labeled and colored in accordance with these requirements before they are placed in service and that the labels and colors are properly maintained at all times thereafter until the canisters have completely served their purpose.

(3) On each canister shall appear in bold letters the following:

(i)—

Canister for ....
(Name for atmospheric contaminant)
or

Type N Gas Mask Canister

(ii) In addition, essentially the following wording shall appear beneath the appropriate phrase on the canister label: "For respiratory protection in atmospheres containing not more than ...... percent by volume of ....
....................................."
(Name of atmospheric contaminant)

(iii) [Revoked]

(4) Canisters having a special high-efficiency filter for protection against radionuclides and other highly toxic particulates shall be labeled with a statement of the type and degree of protection afforded by the filter. The label shall be affixed to the neck end of, or to the gray stripe which is around and near the top of, the canister. The degree of protection shall be marked as the percent of penetration of the canister by a 0.3-micron-diameter dioctyl phthalate (DOP) smoke at a flow rate of 85 liters per minute.

(5) Each canister shall have a label warning that gas masks should be used only in atmospheres containing sufficient oxygen to support life (at least 16 percent by volume), since gas mask canisters are only designed to neutralize or remove contaminants from the air.

(6) Each gas mask canister shall be painted a distinctive color or combination of colors indicated in Table I-1. All colors used shall be such that they are clearly identifiable by the user and clearly distinguishable from one another. The color coating used shall offer a high degree of resistance to chipping, scaling, peeling, blistering, fading, and the effects of the ordinary atmospheres to which they may be exposed under normal conditions of storage and use. Appropriately colored pressure sensitive tape may be used for the stripes.

[Section 1910.134(g)(3)(iii) revoked at 43 FR 49726, October 24, 1978 1978 effective November 24, 1978]

TABLE I-1

Atmospheric contaminants to be protected against	*Colors assigned**
Acid gases	White.
Hydrocyanic acid gas	White with ½-inch green stripe completely around the canister near the bottom
Chlorine gas	White with ½-inch yellow stripe completely around the canister near the bottom
Organic vapors	Black.
Ammonia gas	Green.
Acid gases and ammonia gas	Green with ½-inch white stripe completely around the canister near the bottom.
Carbon monoxide	Blue.
Acid gases and organic vapors	Yellow.
Hydrocyanic acid gas and chloropicrin vapor.	Yellow with ½-inch blue stripe completely around the canister near the bottom
Acid gases, organic vapors, and ammonia gases.	Brown.
Radioactive materials, excepting tritium and noble gases.	Purple (Magenta).
Particulates (dusts, fumes, mists, fogs, or smokes) in combination with any of the above gases or vapors.	Canister color for contaminant, as designated above, with ½-inch gray stripe completely around the canister near the top.
All of the above atmospheric contaminants	Red with ½-inch gray stripe completely around the canister near the top

*Gray shall not be assigned as the main color for a canister designed to remove acids or vapors.

NOTE: Orange shall be used as a complete body, or stripe color to represent gases not included in this table. The user will need to refer to the canister label to determine the degree of protection the canister will afford.

APPENDIX G

SPILL TECHNOLOGY AND REMEDIATION SERIES (STARS) MEMO #1
PETROLEUM-CONTAMINATED SOIL GUIDANCE POLICY

New York State Department of Environmental Conservation • *Home* • *Site Map*

Division of Environmental Remediation More STARS

Spill Technology and Remediation Series (STARS)
STARS MEMO #1

Petroleum-Contaminated Soil Guidance Policy
(Last Revised, August 1992)

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SECTION I - PURPOSE AND APPLICABILITY

The goal at each petroleum spill site is to remove the spilled petroleum product from the soil in the most efficient and safe manner in order that the soil may be returned to a reusable product. When complete removal is not possible, practical, or cost effective, the objective is to remediate the contaminated media to concentration levels which will protect groundwater, human health and the environment.

The Petroleum-Contaminated Soil Guidance Policy is intended to provide direction on the handling, disposal and/or reuse of non-hazardous petroleum-contaminated soils. The reuse or disposal options for excavated soils vary depending on the level of treatment provided consistent with protecting the public health and the environment. While this document does not establish standards, it is intended as guidance in determining whether soils have been contaminated to levels which require investigation and remediation.

This document also constitutes a determination of beneficial use by the Department, as defined in Solid Waste Regulation NYCRR Part 360. Petroleum-contaminated soil, if determined to satisfy the criteria herein, can be reused or disposed of as directed in this guidance. Therefore, soils which meet beneficial use conditions are no longer a solid waste in accordance with NYCRR Part 360-1.2(a)(4).

This guidance is intended for Regional Spill Investigators, Regional Solid Waste staff and responsible parties to assist them in determining the acceptability of remedial activities at a petroleum spill site or in determining the acceptability of a site assessment. It may be applied to both excavated and non-excavated material. The evaluation method and guidance values included in this guidance may be used to determine the limits of contamination, such as defining the extent of contamination in an excavation which contains contaminated material. Situations may exist where results of sampling analysis will require interpretations or subjective judgment, as with certain nuisance characteristics such as odors. These interpretations and judgments will be made solely by the DEC representative on site. There may be instances where the DEC will opt to digress from this guidance to establish cleanup goals reflecting site-specific circumstances at a particular petroleum spill site.

The guidance may also be used by responsible parties to develop corrective action plans which will achieve the criteria set forth in this document.

Robert G. Hampston (signature) Director Division of Construction Management	Norman H. Nosenchuck (signature) Director Division of Solid Waste

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SECTION II - HAZARDOUS WASTE DETERMINATION

An initial determination (1) must be made on all excavated petroleum-contaminated soil as to whether or not it is a hazardous waste. The hazardous waste determination typically involves laboratory analysis to quantify contaminant concentrations in the waste material. The DEC and EPA regulations, however, allow the generator of the waste to use knowledge of the waste and/or laboratory analysis to make a hazardous waste determination. Petroleum-contaminated soils are generally stored on site while laboratory analysis results are obtained and evaluated. As long as the material is segregated from the environment by impervious material, such as polyethylene sheeting, the petroleum-contaminated soil may remain on site until appropriate laboratory results are available and interpreted.

A petroleum-contaminated soil is considered a characteristic hazardous waste when it exhibits any of the following characteristics: ignitability, corrosivity, reactivity, or toxicity, as defined in 6NYCRR Part 371, Section 371.3, or 40 CFR Section 261. Knowledge of soils contaminated with virgin petroleum products indicates that those waste materials do not demonstrate ignitability, corrosivity, or reactivity characteristics. Therefore, the only characteristic of concern for virgin petroleum-contaminated soil is toxicity. The Toxicity Characteristic (TC) Rule identifies benzene and lead as compounds which may cause petroleum-contaminated waste to be hazardous. Analysis of additional parameters may be necessary for petroleum-contaminated soil located at sites where other contaminants may be present. Refer to Appendix A for more specific information regarding the procedures for hazardous waste determination, and the TC Rule regulatory levels.

If the contaminated soil has been excavated and if the hazardous waste criteria apply, then the contaminated soil is classified as a hazardous waste. Excavated soil which is hazardous due to any non-petroleum component will be referred to the Division of Hazardous Waste Remediation, and the Division of Hazardous Substances Regulation to determine appropriate remedial actions.

If in-situ soil is contaminated by a petroleum product, and if the above hazardous waste criteria are met, the site will be remediated under the direction of the Bureau of Spill Prevention and Response to provide for protection of human health and environmental quality. In-situ soil, which violates any of the hazardous waste criteria due to any non-petroleum component, will be referred to the Division of Hazardous Waste Remediation, and the Division of Hazardous Substances Regulation to determine appropriate remedial actions.

---

[1] *In-situ or excavated soils which could contain contaminants other than petroleum products, by virtue of laboratory analysis, site history, visual observations, etc., will be sampled and analyzed by either the responsible party or by the Bureau of Spill Prevention and Response (BSPR). The Division of Hazardous Substance Regulation (DHSR) will provide assistance to BSPR staff (for state-funded projects) and responsible parties in making hazardous waste determination for their generated waste.*

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SECTION III - SOIL CLEANUP GUIDELINES

There are four essential guidelines which must be satisfied in order for soil to be considered acceptably remediated or not sufficiently contaminated. These are: A) protection of the groundwater; B) protection of human health; C) protection of fish and wildlife and the environment in which they live; and D) protection against objectionable nuisance characteristics. Compliance with these guidelines is satisfied by analysis of soil samples for contaminant concentrations and leachability, and subsequent comparison of the sampling results to guidance values, values which have been determined to be acceptable by DEC.

Contaminant concentrations are determined using EPA standard Methods 8021 or 8270. Leachability is determined using a procedure known as the Toxicity Characteristic Leaching Procedure (TCLP). Satisfactory protection of groundwater is indicated by TCLP Extraction Guidance Values or by TCLP Alternative Guidance Values. Satisfactory protection of human health is indicated by Human Health Guidance Values. Satisfactory protection of water body sediment is indicated by Sediment Guidance Values. Finally, satisfactory protection against objectionable nuisance characteristics is indicated by the lack of odor and by each contaminant concentration being less than 10,000 ppb. Tables 1and 2 in Section VIII list the contaminants of concern and their corresponding guidance values for acceptable soil concentrations for components of gasoline and fuel oil, respectively. Analysis of additional parameters may be necessary for petroleum-contaminated soil located at sites where other contaminants may be present.

The procedures used when evaluating soil samples to satisfy these guidelines are discussed further in this section.

A. Protection of Groundwater

The presence of a contaminant in the soil does not determine its potential for groundwater contamination. Soil particles can adsorb contaminants which will not be released through infiltration and groundwater recharge mechanisms. Therefore, it is the leachability of the soil which must be measured. To be protective of groundwater quality, the soil must not leach contaminants to the groundwater at concentrations which violate groundwater standards. The **Toxicity Characteristic Leaching Procedure (TCLP)** has been accepted by the Department (2) as a method of determining leachability of petroleum-contaminated soil.

The Toxicity Characteristic Leaching Procedure (TCLP) is an extraction process designed to address the leaching potential of organic and inorganic contaminants. It is used to simulate the actual site-specific leaching potential of individual contaminants present in the soil. In the extraction process, the soil sample is mixed with an acid solution and shaken for approximately eighteen hours. For non-volatile organic and inorganic compounds, the soil/acid solution is filtered to produce an extract liquid. For volatile organic compounds, the soil/acid solution is held in a Zero Headspace Extractor (ZHE), preventing the escape of volatile organics, and a liquid extract is squeezed out of the soil/acid solution. The extracted liquid is then analyzed to determine the concentration of the petroleum compounds in question. If the concentrations in the extract are less than or equal to the groundwater standards, then the soil may be considered environmentally acceptable for groundwater protection. Tables 1 and 2 in Appendix B identify the TCLP Extraction Guidance Values for the primary components of gasoline and fuel oil. The tabulated TCLP Extraction Guidance Values are equal to the NYSDEC groundwater standards or the NYSDOH drinking water standards, whichever is more stringent.

---

2 Accepted by NYSDEC Cleanup Standards Task Force.

An alternative approach to the actual extraction process of the TCLP laboratory procedure which may be a cost-saving shortcut is to evaluate the concentration of the contaminant in the soil and mathematically determine if it will satisfy the leachate criteria. The TCLP laboratory procedure requires the soil sample to be diluted by a ratio of 20:1 when preparing the sample for the acidic extraction, and subsequent leachate analysis. Assuming that the entire mass of the contaminants present in the soil will leach out during the extraction process, the dilution factor of 20 can be applied to the actual soil contaminant concentration to give a maximum possible contaminant concentration obtainable in the leachate.

If a contaminant concentration in the soil is known, then the maximum possible contaminant concentration in the TCLP extract can be determined by the following equation:

$$\begin{array}{l}\text{Contaminant}\\ \text{Concentration in Soil}\\ \text{(ug/kg or ppb)}\end{array} \div 20 = \begin{array}{l}\text{Maximum Possible Contaminant}\\ \text{Concentration in Extract Liquid}\\ \text{(ug/l pr ppb)}\end{array}$$

If the maximum possible contaminant concentration in the extract liquid, as determined by the above equation, is less than or equal to the contaminant's TCLP Extraction Guidance Value, then the contaminant satisfies the groundwater quality protection criterion. If the calculated maximum possible contaminant concentration in the extract liquid is greater than the TCLP Extraction Guidance Value, then no conclusion can be drawn and groundwater quality protection must be confirmed by actually performing the TCLP extraction for that contaminant.

Example:

If the total concentration of Toluene in the soil as determined by Method 8021 is 100 ug/kg or 100 ppb for Sample A and 140 ug/kg or 140 ppb for Sample B, and the groundwater standard is 5 ppb then:

Sample A is: 100 ug/kg ÷ 20 = 5 ug/l = 5 ppb

Sample B is: 140 ug/kg ÷ 20 = 7 ug/l > 5 ppb

Sample A is considered to have satisfied groundwater protection by the TCLP extraction test for Toluene at 5 ppb. In Sample B, the calculated extract value is greater than 5 ug/l, therefore, no conclusion can be drawn from the calculation, and an actual TCLP extraction test must be performed.

To simplify this alternative approach, TCLP Alternative Guidance Values, which are equal to 20 times the TCLP Extraction Guidance Values, have been included in Tables 1 and 2. Therefore, if a contaminant's soil concentration is known, it can simply be compared to the TCLP Alternative Guidance Values.

The above methodology can also be used to make the hazardous waste determination, with the soil or sediment concentration compared to the respective hazardous waste limit for the leachate. A considerable decrease in analytical costs may be realized if the above equation is used to evaluate contaminant concentration acceptability.

In summary, if the contaminant concentrations in the soil are less than or equal to the TCLP Alternative Guidance Values, or if the contaminant

concentrations in the soil extract are less than or equal to the TCLP Extraction Guidance Values, then the soil is considered environmentally acceptable for groundwater quality protection.

B. Protection of Human Health

Protection of human health is an essential requirement of both treatment and reuse of petroleum-contaminated soil. EPA has published health-based standards for many contaminants in soil. The standards are contained in the Health Effects Assessment Summary Table (HEAST REPORT). These standards were derived from methodologies based on soil ingestion values for carcinogens and systemic toxicants.

The appropriate health-based soil Guidance Values are listed in Tables 1 and 2 for the primary components of gasoline and fuel oil.

If the contaminant concentrations in the soil are less than or equal to the Human Health Guidance Values, then the soil is considered safe for human health concerns.

C. Protection of Fish and Wildlife

Protection of fish and wildlife must be satisfied when dealing with contaminated sediment. Some Sediment Guidance Values for protection of aquatic life and animals which consume aquatic life, have been developed and are noted in Tables 1 and 2. Where sediments are contaminated, these Guidance Values should be used. The appropriate natural resource division (eg. Marine, Fish & Wildlife, etc.) should be contacted for situations involving sediment contaminants which do not have tabulated Sediment Guidance Values. If a spill has occurred at a location that may be sensitive to wildlife (eg. wetlands), the Division of Fish and Wildlife should be consulted to determine whether the soil cleanup levels are adequate for natural resource protection.

If the contaminant concentrations in the sediment are less than or equal to the tabulated Sediment Guidance Values, then the sediment is considered environmentally acceptable for fish and wildlife concerns.

D. Protection Against Objectionable Nuisance Characteristics

Petroleum-contaminated soil must not exhibit objectionable nuisance characteristics to be eligible for some reuse options described later in this guidance and listed in Table 3.

1) ***Petroleum-Type Odors***

The soil must not exhibit any discernible petroleum-type odors in order to be considered for the reuse options identified later in this guidance. Odor determinations for state-funded spill projects will be made by the Regional Spill Investigator. Odor determinations for responsible party (RP) sites are the responsibility of the RP. The Regional Spill Investigator may or may not be available to assess the odor criteria at all sites. When the Regional Spill Investigator is on-site, he/she may override the decision of the RP if, in the investigator's opinion, sufficient odors still persist. Determinations by DEC Spill Investigators do not relinquish a responsible party's responsibilities or liabilities under the law.

2) ***Contaminant Concentrations***

The soil shall not contain any contaminant at a concentration above **10,000 ug/kg (10,000 ppb).** This maximum individual contaminant concentration should support the above odor determination, since some petroleum constituents will not leach at high concentrations but may exhibit odors.

If the soil does not exhibit petroleum-type odors and does not contain any individual contaminant at greater than 10,000 ppb, then the soil is considered acceptable for nuisance characteristics.

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SECTION IV - GUIDANCE VALUES

A. Gasoline-Contaminated Soils

Table 1 lists the primary gasoline components of concern. The table identifies the compound names, the preferred EPA laboratory methods for determining contaminant concentration, the detection limits for a liquid matrix (water), the detection limits for a solid matrix (soil), the TCLP Extraction Guidance Values (C_w), the TCLP Alternative Guidance Values (C_a), the Human Health Guidance Values (C_h), and the Sediment Guidance Values (C_s).

Although EPA Method 8021 is preferred, other laboratory methods may be used with prior approval from the DEC Regional Spill Investigator. Other proposed methods should be evaluated on their ability to quantify the compounds of concern at acceptable detection levels.

The tabulated detection limits are the practical quantitation limits (PQLs). The PQL is the lowest level that can be measured within specified limits of precision during routine laboratory operations on most matrices. Efforts should be made to obtain the best detection possible when selecting a laboratory.

To demonstrate groundwater quality protection via the TCLP Extraction Method, the concentration of the hydrocarbon compound in the TCLP extract, as determined by EPA Method 8021 for a liquid matrix, must be less than or equal to the TCLP Extraction Guidance Value, C_w.

-or-

To demonstrate groundwater quality protection via the TCLP Alternative Method, the concentration of the hydrocarbon compound in the soil, as determined by EPA Method 8021 for a solid matrix, must be less than or equal to the TCLP Alternative Guidance Value, C_a.

To demonstrate human health protection, the concentration of the hydrocarbon compound in the soil, as determined by EPA Method 8021 for a solid matrix, must be less than or equal to the Human Health Guidance Value, C_h.

To demonstrate fish and wildlife protection, the concentration of the hydrocarbon compound in the soil, as determined by EPA Method 8021 for a solid matrix, must be less than or equal to the Sediment Guidance Value C_s.

Meeting this requirement is only necessary when dealing with contaminated sediment.

To demonstrate nuisance protection, the soil must not exhibit petroleum-type odors, and must not contain any contaminant at greater than 10,000 ppb, as determined by EPA Method 8021 for a solid matrix.

When the Guidance Value or standard is below the detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard, as long as the reported laboratory detection limits are reasonably close to the listed PQLs.

B. Fuel Oil-Contaminated Soil

Table 2 lists the primary fuel oil components of concern. As with Table 1, Table 2 identifies compound names, preferred EPA laboratory methods, detection limits, and Guidance Values.

Although EPA Methods 8021 and 8270 are preferred for identifying compounds of concern for gasoline and fuel oil, other laboratory methods may be used with prior approval from the DEC Regional Spill Investigator. Other proposed methods should be evaluated on their ability to quantify the compounds of interest at acceptable detection levels.

Since there is no single laboratory method which will analyze for all of the volatile and semi-volatile compounds of concern, it is generally necessary to use more than one laboratory method for fuel oil analysis. Both volatile and semi-volatile compounds must be addressed initially, but a reduced list of analytes may be acceptable for subsequent sampling depending upon the initial results.

As with Table 1, the detection limits in Table 2 are PQLs. Efforts should be made to obtain the best detection possible when selecting a laboratory.

Experience has shown that soil containing some of the insoluble semi-volatile compounds at high concentrations can exhibit a distinct odor even though the substances will not leach from the soil. Therefore, the maximum individual contaminant concentration of 10,000 ppb is instituted to help address this problem. In addition, anytime a soil exhibits discernible petroleum odors, even if it has met the numerical criteria, it shall not be considered clean enough for some reuse options under 6NYCRR Part 360, as described later in this document.

Odor determination is subjective. Since there is no recognized odor measuring device, some discrepancies may arise between responsible parties and the DEC on this subject. In order to document odor determinations and to address the need for remediation due to odors, the following approaches may be considered: (1) direct the laboratory to identify and quantify all pollutants present in the soil and/or leachate samples instead of just the method's target compounds; and (2) establish site-specific conditions based on an evaluation of the characteristics of the site. The determination and evaluation of odors remains a subject requiring further research and policy development.

Some of the semi-volatiles are carcinogens, and subsequently have groundwater quality Guidance Values of 0.002 ppb. The TCLP Extraction Guidance Values are 0.002 ppb, and the TCLP Alternative Guidance Values are 0.04 ppb. The solid matrix detection limit does not approach this low value. Therefore, when these compounds are determined to be present, the TCLP Extraction Method and the Alternative Guidance Values must be satisfied to demonstrate groundwater quality protection for these particular contaminants.

The following compounds listed in Table 2 are affected by this limitation: benzo (a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; benzo(a)pyrene; chrysene; benzo(ghi)perylene; and indeno(1,2,3-cd)pyrene.

Particular attention should be paid to the Human Health Guidance Values for fuel oil-contaminated soil. While the majority of the semi-volatiles have health Guidance Values considerably higher than the contaminant concentration generally encountered at spill sites, there are seven compounds listed in Table 2 which have Human Health Guidance Values lower than the detection limits. When any of these compounds (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene) are present, the Human Health Guidance Value most likely will be the limiting factor for achieving acceptable cleanup levels.

To demonstrate groundwater quality protection via the TCLP Extraction Method, the concentrations of the hydrocarbon compounds in the TCLP extract, as determined by EPA Methods 8021 and 8270 Base/Neutral for a liquid matrix, must be less than or equal to the TCLP Extraction Guidance Value, C_w;

-or-

To demonstrate groundwater quality protection via the TCLP Alternative Method, the concentrations of the hydrocarbon compounds in the soil, as determined by EPA Methods 8021 and 8270 Base/Neutral for a solid matrix, must be less than or equal to the TCLP Alternative Guidance Value, C_a. As described above, the TCLP Alternative Method is not a sufficient demonstration of groundwater protection for some contaminants.

To demonstrate human health protection, the concentrations of the hydrocarbon compounds in the soil, as determined by EPA Methods 8021 and 8270 Base/Neutral for a solid matrix, must be less than or equal to the Human Health Guidance Value, C_h.

To demonstrate fish and wildlife protection, the concentrations of the hydrocarbon compounds in the soil, as determined by EPA Methods 8021 and 8270 Base/Neutral for a solid matrix, must be less than or equal to the Sediment Guidance Value, C_s. Meeting this requirement is only necessary when dealing with contaminated sediment.

To demonstrate nuisance protection, the soil must not exhibit petroleum-type odors, and must not contain any contaminant at greater than 10,000 ppb, as determined by EPA Methods 8021 and 8270 Base/Neutral for a solid matrix.

When the Guidance Value or standard is below the .detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard, as long as the reported laboratory detection limits are reasonably close to the listed PQLs.

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SECTION V - LABORATORY ANALYSIS

There are a variety of laboratory methods, established by the USEPA and the NYS

Department of Health (DOH), which can be used to analyze petroleum-contaminated soils. The selection of appropriate laboratory methods depends on the compounds of concern, the detection limits for each compound, the nature of the samples to be analyzed, the capabilities of the laboratory, and the regulatory limits or Guidance Values to be achieved. The methods recommended and most often used for petroleum-contaminated soils are EPA Standard Methods 8021, 8270 (Base/Neutrals) and the TCLP extraction process. In every case, the NYSDEC will evaluate laboratory results from NYSDOH-approved laboratories only.

Each laboratory method identifies compounds which can be quantified with an acceptable degree of precision and accuracy. Many laboratory methods have petroleum compounds as target compounds, along with non-petroleum compounds. Method 8270, for example, identifies acid extractable hydrocarbons and base/neutral extractable hydrocarbons. The semi-volatile constituents of petroleum products are a sub-set of the base/neutral extractable compounds under Method 8270. Therefore, when requesting this analysis, base/neutrals only should be specified.

Some laboratories may be able to quantify non-target compounds of concern with particular methods. For example, there is no laboratory method which lists MTBE (methyl t-butyl ether) as a target compound; however, laboratories can include MTBE in their analysis using Method 8021. Therefore, when requesting this analysis, Method 8021 plus MTBE should be specified.

Each laboratory method establishes minimum concentrations of the target compounds which can be detected under ideal conditions using that particular procedure. These Method Detection Limits (MDLs) are rarely achievable under actual conditions in an analytical laboratory. Laboratories report their actual detection limits as Practical Quantitation Limits (PQLs). The PQLs for analysis on a liquid matrix are generally four times the MDLs. With a solid matrix, the PQLs will be affected by the quantity of contamination present, categorized as low, medium or high concentrations. Lower PQLs are generally possible with low level soil contamination. Laboratories must identify their PQLs when reporting analytical results.

Laboratories and methods to be utilized should be selected according to the best detection possible for the compounds of interest, and the regulatory or guidance levels needed to be achieved. For example, Table 2 indicates that naphthalene is a target compound for Method 8021 and Method 8270. Both of these methods can provide detection levels in a liquid matrix below the TCLP Extraction Guidance Value of 10 ppb. Therefore, either method could be used for analysis of a liquid matrix of naphthalene. However, for a solid matrix, Method 8021 is capable of providing much better detection of naphthalene than Method 8270. If the soil concentrations for naphthalene will be compared to the TCLP Alternative Guidance Value of 200 ppb, then Method 8021 should be used instead of Method 8270. If the soil concentrations for naphthalene will be compared only with the nuisance protection level of 10,000 ppb, or the Human Health Guidance Value of 300,000 ppb, then both Method 8021 and Method 8270 are capable of providing satisfactory detection levels for naphthalene.

Initial laboratory analysis should address the full range of compounds which may be present, considering the petroleum products involved. In consideration of prior laboratory results, potential contaminants may be eliminated from subsequent sampling analysis lists. As the contaminants are identified or eliminated, it may be appropriate to change laboratory methods during a project, to avoid unnecessary laboratory expenses. In addition, it may be appropriate to discuss analytical work with the laboratory in terms of the actual compounds of interest rather than method numbers and their defined target compounds. The final laboratory results for a project, however, should address the same full range of compounds as the initial sampling results, to confirm that the interim results did not overlook the appearance of other compounds. For example, gasoline-contaminated soil which is undergoing on-site bioremediation should be analyzed initially using Method 8021 plus MTBE. If only benzene, toluene, ethyl benzene and xylenes are detected, then Method 8020 could be used for interim sampling events. Upon completion of the bioremediation project, the soil should be analyzed using Method 8021 plus MTBE, to demonstrate the satisfaction of the Guidance Values applicable to the selected reuse option.

A detailed description of analytical protocols and procedures is .available in the DEC ***Sampling Guidelines and Protocols*** manual.

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SECTION VI - SAMPLING

Samples should be collected in such a manner so as to best characterize the extent of contamination of the soil in question. There is no specific number or type of samples which will apply to all situations and best engineering judgment will have to be used. The type of sample, grab or composite, will vary depending upon the constituent being identified. While grab samples come from one location, composites come from several locations and are joined to form one sample. When volatiles are in question, care must be taken when collecting composite samples to minimize the loss of volatiles during handling. In order to minimize handling of volatiles, several grab samples are preferred, with confirmatory composite samples. When sampling for semi-volatiles, several composite samples are preferred, with confirmatory grab samples.

The treatment process (if any) will also have a bearing as to how well a soil may be characterized. Low temperature thermal treatment units (e.g. rotary kiln dryers) process soil resulting in a more homogeneous mixture than would be obtained from a stationary pile. The following guidance is offered to assist the Regional Spill Investigator in determining the number and types of samples which should be requested for various treatment scenarios. More comprehensive samples may be required depending on the reuse or disposal alternative to be used.

The responsible party and the Regional Spill Investigator should agree on a sampling plan and review procedure before the samples are collected. All sample results submitted for regulatory compliance must be analyzed by New York State Department of Health approved laboratories.

A detailed description of soil sampling protocols and procedures is available in the DEC ***Sampling Guidelines and Protocols*** manual.

A. Tank Pit

If there is a question as to the extent of residual contamination, or if comprehensive documentation is necessary, a tank pit may be sampled for laboratory analysis.

A total of five samples should be taken from the excavation. One composite sample from each of the side walls at a distance approximately one third up from the bottom of the pit. Several samples should also be collected to form one composite sample from the bottom of the pit. Any remaining samples should be grab samples from areas with greater potential for contamination such as stained soils, adjacent to a corrosion hole, opposite a manway, or opposite a tank opening. All samples shall be taken no less than six inches below the exposed surface being sampled. Samples for compositing should be taken from random locations on the floor and walls of the tank pit.

B. Soil Pile

The number of samples required for an excavated pile will be related to the quantity of soil stockpiled. The table below can be used as a guide in determining the appropriate number of samples. If, in the opinion of the Regional Spill Investigator, additional samples are warranted, they should be requested.

Recommended Number of Soil Pile Samples

CONTAMINANT:	SEMI-VOLATILES		VOLATILES	
SAMPLE TYPE:	Grab	Composite	Grab	Composite
SOIL QUANTITY (yd ^{3}):				
0-50	1	1	1	1
50-100	1	2	2	1
100-200	1	3	3	1
200-300	1	4	4	1
300-400	2	4	4	2
400-500	2	5	5	2
500-800	2	6	6	2
800-1000	2	7	7	2
>1000 - Proposed Sampling plan shall be submitted for approval on site specific basis				

Best engineering judgment is needed to determine the most appropriate sampling locations. The objective of the sampling is to characterize the extent of contamination of the pile. Consideration should be given to how the soil was stockpiled. Is the most contaminated soil toward the top? Are areas visibly contaminated? How high and how long is the pile? It may be preferable to divide the pile into manageable segments. Samples should be taken from within the pile. Surface soil should not be used as sampling material. Samples shall be collected in accordance with proper sample collection techniques. All samples must be collected in glass containers with air-tight sealable tops.

Using the above sampling table, considering the factors mentioned above, and applying best engineering judgment, an acceptable evaluation of the contaminant concentrations in the soil can be made.

C. Processed Soil

Processed soil is soil which undergoes physical handling during a treatment process. Examples of treatment processes are rotary kiln dryers (low temperature thermal treatment units) or soil washing units. Soil under these conditions are more homogeneously mixed; therefore, individual samples are more likely to characterize the entire lot. Since these processes are continuous in nature, the samples should be collected over a period of time similar to that described below:

1. A sample may be collected every twenty minutes for a period of two hours. The samples are then mixed to form one composite sample. This frequency will continue until all soils are processed. The twenty minute composite interval is a guideline which can be adjusted based on the

amount of soil processed and the processing period. Testing protocols are specifically defined in the treatment unit's operating permit.

2. At least one grab sample should be taken for every two sets of composites.
3. A minimum of two samples (1 grab, 1 composite) should be taken for any treated soil batch.

D. Aboveground (Ex-Situ) Treatment

Typical aboveground treatment technologies are bioremediation and soil vapor extraction. Soil remediated under these conditions will be mixed (tilled) and spread evenly over a wide area. The soil will be spread to a uniform thickness, usually no higher than two feet, although depths may be higher for soil vapor extraction treatment. The shallow depth makes sample collection an easy process. The number of required samples can be based on the quantity of soil being treated (see above table). Depth of the sample can be anywhere from six inches to the bottom of the treatment layer. Care must be taken not to penetrate the liner material. The sampling locations and depths must be randomized.

E. Non-Excavated (In-Situ) Treatment

Treatment of non-excavated soil is similar to .aboveground treatment in that the contamination is spread over a wide area. It differs, however, in that the depths of the contaminated zone are varied and usually extend much deeper. Once the volume of contaminated material is determined, the above table can be used to determine the number of required samples. The sampling locations and depths must be randomized.

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SECTION VII - MANAGEMENT OF EXCAVATED (EX-SITU) CONTAMINATED SOILS

Once non-hazardous petroleum-contaminated soil is moved from its original state, it is by definition a solid industrial waste and must be managed in accordance with Part 360 and transported in accordance with Part 364 regulations. There are several alternatives available to properly handle this contaminated soil.

A. Soils Which Do Not Meet Guidance Values

Soils which do not meet the guidance values can be processed under a specific DEC Beneficial Use Determination (BUD), such as at an approved hot-mix asphalt batching plant or at a cold-mix asphalt plant, disposed of at a DEC authorized landfill, or treated on site.

1) Reuse Under Specific Beneficial Use Determinations

The DEC Division of Solid Waste has made Beneficial Use Determinations (BUD's) under 6 NYCRR Part 360, identifying recycling or re-use activities which are not subject to Part 360 regulations. The use of petroleum-contaminated soil in a manufacturing process to produce a marketable product may be eligible for BUD issuance. Each manufacturing process operator must maintain compliance with the specific requirements of the issued BUD. Hot-mix and cold-mix asphalt manufacturing are two examples of processes which have received BUD's, and other processes may be approved by the Division of Solid Waste in the future.

a. Reuse at an Approved Asphalt Batching Plant

Several asphalt plants have been authorized to accept non-hazardous contaminated soil, for use as aggregate, provided the plant is in compliance with any other DEC regulations which may apply to the facility. For example, the use of petroleum-contaminated soil may require a modification of the facility's air emission permit.

b. Production of Cold-Mix Asphalt

A Beneficial Use Determination (BUD) has been issued to the process which combines liquid asphalt emulsion with the contaminated soil to produce a cold-mix asphalt. Approval to process petroleum-contaminated soil to produce a cold-mix asphalt is issued by the Spill Response Program. The applicant must satisfy specific testing requirements prior to receiving approval to process. Each BUD identifies allowable uses for the manufactured cold-mix asphalt and any qualifying conditions and post-treatment testing protocols.

These asphalt products, if being stockpiled or transported for disposal rather than reuse, no longer meet the requirements for these BUDs and are subject to all applicable regulatory provisions of 6NYCRR Parts 360 and 364.

PCS containing asphalt products, which are left in a stockpile and are not being beneficially used, remain a solid waste until such use is accomplished. ***These materials shall be removed from the stockpile for beneficial use in accordance with their beneficial use approval requirements, or disposal if necessary, as rapidly as possible.***

2) Disposal at an Authorized Landfill

A DEC-authorized landfill is one which either has an operating permit or is under a consent order. While this is not the preferred method of dealing with contaminated soil, it may be the most economical or, due to site constraints, the only alternative. Additional restrictions may be required by the landfill operators prior to accepting materials at their facilities.

3) Treatment On Site

Non-hazardous petroleum-contaminated soil may be treated on the site of generation without a DEC Part 360 Permit. Depending on the treatment technologies being utilized, other DEC permits may be required for air emissions and water discharges.The soil treatment processes may involve excavation of soils, securely stockpiling the soils until treatment is initiated, aboveground treatment of the soils, and/or placement of soils back into an excavation for treatment. The Regional Spill Investigator should require a remedial plan, signed by the responsible party, prior to the placement of contaminated soils into an excavation for treatment.

If the soil is to be placed back in an excavation for treatment, and if the excavation is determined to be uncontaminated, the excavation must be prepared and lined in such a manner to protect it against contamination from the soil which will be treated. However, if the excavation is contaminated it shall be the decision of the Regional Spill Investigator as to whether a liner is necessary.

All excavated soil shall be placed on an impervious material (eg: polyethylene sheeting) with the sides banked so as to control and contain run-off. During periods when no treatment is on-going, the surface of the pile(s) must also be covered with an impervious material.

The site may have to be evaluated for its impact to the ambient air. Cross media contamination shall be minimized and aesthetic or nuisance issues shall be addressed. If space on the site is limited, or if the protection of the public health is in jeopardy, then on-site treatment will not be allowed and soil must be removed to a permitted location for treatment or disposal.

There are several methods of on-site soil treatment. Typical among these are soil venting, bioremediation, soil washing and low temperature thermal treatment. All treatment should be evaluated based on its ability to achieve the desired result in the most economical and efficient manner.

B. Soils Which Meet Guidance Values

The reuse options available for de-contaminated soil depends upon which particular Guidance Values are satisfied by the soil. Table 3 identifies the reuse options and the Guidance Values which must be met to use each reuse option.

As described earlier, the DEC Division of Solid Waste (DSW) has issued a Generic Beneficial Use Determination (BUD) which exempts petroleum-contaminated soils, which have been successfully incorporated into an asphalt product by a Bureau of Spill Prevention and Response (BSPR) approved producer and which will be utilized in a bonified paving project.

In addition, the DSW has determined that soils which satisfy the appropriate Guidance Values and which will be reused as highway sub-base material, fill for the original excavation, fill elsewhere on the site of generation, or fill off-site at pre-approved locations, are being beneficially used and are exempt from the provisions of 6NYCRR Part 360. These soils are also exempt from 6NYCRR Part 364 since they no longer meet the Part 364 definition of "solid waste".

The reuse options are not listed as a hierarchy; however, off-site reuse is generally less desirable. The Regional Spill Supervisor or his/her designee will review all appropriate soil sampling data to determine if the criteria has been met for the requested reuse option. Upon request from the responsible party, the evaluation of the submitted data shall be documented with a statement from the Regional Spill Supervisor that the soil does or does not meet the criteria for the desired reuse option. **The DEC and its designee assume no liability when evaluating data for a responsible party with regard to the reuse or disposal of the soil in question.** The generator of the soil has the ultimate responsibility for the accurate and precise characterization, and the safe and proper reuse or disposal of the material. In addition, soil which is being reused off site shall not be allowed to be transported prior to the receipt of the laboratory reports confirming that the soil has satisfied the appropriate Guidance Values of this guidance document. **The responsible party shall maintain all field data, laboratory results, and final disposition records for three years.**

The possible reuse options are presented below. Additional uses of decontaminated petroleum-contaminated soil may be identified in a Part 360 Permit or BUD for a specific facility.

1) Reuse as a Construction Material

Soil which satisfies the Guidance Values for groundwater protection, human health protection and nuisance characteristics can be reused as construction material. Construction material can include hot asphalt, cold-mix asphalt, concrete, roadway sub-base, etc. Final destination of the soil shall be identified prior to removal from the site.

2) Returned to the Original Excavation

Soil which satisfies the Guidance Values for groundwater protection, human health protection, and nuisance characteristics, can be placed back in the hole from which it was excavated.

3) Placed Elsewhere on Site

Soil which satisfies the Guidance Values for groundwater protection, human health protection, and nuisance characteristics, can be placed anywhere within the confines of the contiguously-owned property from which it originated.

4) Reuse Off-Site at a Pre-Approved Location

The Regional Spill Engineer and Regional Solid Waste Engineer may .approve a request for an off-site reuse location for remediated soil which satisfies the Guidance Values for groundwater protection, human health protection, and nuisance characteristics. Sites which may be considered for this option are industrial sites, authorized construction and demolition debris landfills, petroleum storage facilities, authorized landfills, or other locations where public access is limited. Written approval must be received from the property owner(s) prior to exercising this reuse option. The responsible party may submit such a request to the Regional Spill Engineer who will coordinate with the Regional Solid Waste Engineer to approve or disapprove the request.

C. Rock Debris

Rock debris, for purposes of this policy, is defined as those rocks which are four (4) inches or greater in diameter. They shall be cleaned of any packed-on petroleum-contaminated soil. These rocks are not treated as a solid waste and can be disposed of as construction and demolition debris.

If rock debris cannot be separated from the petroleum-contaminated soil, it shall be handled as a solid waste in accordance with NYCRR Part 360 and/or Part 364 requirements.

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SECTION VIII - MANAGEMENT OF NON-EXCAVATED (IN-SITU) CONTAMINATED SOIL

In-situ contaminated soil may pose a threat to the groundwater, human health and the environment. These sites must be evaluated to determine the extent of contamination and the appropriate investigative or remedial actions necessary. The soil may be treated in-situ and evaluated by the same guidelines as excavated soil, while taking into account site-specific considerations and conditions.

Additional guidance will be developed to establish procedures for .evaluating the potential impacts of non-excavated (in-situ) contaminated soils. Issues which should be considered when evaluating in-situ contaminated soil are environmental sensitivity of the site, level of residual contamination, soil characteristics, depth to groundwater, present and potential land use. A proper sampling plan will be necessary to determine the number, quantity and depth of samples to properly characterize the site.

SECTION IX - REFERENCES

NYS Department of Environmental Conservation, Cleanup Standards Task Force, ***DRAFT Cleanup Policy and Guidelines***, October 1991.

NYS Department of Environmental Conservation, Division of Hazardous Substances Regulation, ***6NYCRR Part 364, Waste Transporter Permits***, January 12, 1990.

NYS Department of Environmental Conservation, Division of Hazardous Substances Regulation, ***6NYCRR Part 371 Identification and Listing of Hazardous Wastes,*** December 25, 1988.

NYS Department of Environmental Conservation, Division of Solid Waste, ***6NYCRR Part 60 Solid Waste Management Facilities, May 28, 1991.***

NYS Department of Environmental Conservation, Division of Water, ***Sampling Guidelines and Protocols,*** March 1991.

NYS Department of Environmental Conservation, Division of Water, ***Spill Response Guidance Manual***, January 1990.

NYS Department of Environmental Conservation, Division of Water, Technical and Operation Guidance Series (1.1.1), ***Ambient Water Quality Standards and Guidance Values,*** November 15, 1991.

US Environmental Protection Agency, ***40 CFR Part 261 Identification and Listing of Hazardous Wastes***, June 29, 1990.

US Environmental Protection Agency, ***Health Effects Assessment Summary .Table***, April 4,

1991.

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APPENDIX A
HAZARDOUS WASTE DETERMINATION AND REGULATORY LEVELS

In accordance with DEC and EPA regulations, the generator of a waste material must determine if the material is a hazardous waste or a non-hazardous waste. The generator can make this determination using knowledge of the waste and/or laboratory analyses.

A waste material can be a hazardous waste due to its origin, its listed waste content, or its characteristics.

Soil contaminated with virgin petroleum products is a hazardous waste if it exhibits a characteristic of a hazardous waste, namely, ignitability, corrosivity, reactivity, and toxicity. The hazardous waste characteristics, defined in 6NYCRR Part 371, Section 371.3, and 40 CFR Section 261, are described below.

A. Ignitability:

A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

1. Is not a liquid and is capable under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.
2. It is a liquid, other than an aqueous solution containing less than 24 percent ethyl alcohol by volume, and has a flash point less than 60 °C (140 °F).
3. It is an ignitable compressed gas.
4. It is an oxidizer.

In accordance with guidance from the DEC Division of Hazardous Substances Regulation and based on knowledge of the waste, soils contaminated with virgin petroleum products do not exhibit the above properties and do not have to be tested for the ignitability characteristic.

B. Corrosivity:

A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

1. It is aqueous and has pH less than or equal to 2 or greater than or equal to 12.5.
2. It is a liquid and corrodes steel at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55 °C (130 ° F).

Based on knowledge of the waste, soils contaminated with virgin petroleum products do not exhibit the above properties, and do not have to be tested for the corrosivity characteristic.

C. Reactivity:

A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has any of the following properties:

1. It is normally unstable and readily undergoes violent change without detonating.
2. It reacts violently with water.
3. It forms potentially explosive mixtures with water.
4. When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
5. It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in quantity sufficient to present a danger to human health or the environment.
6. It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
7. It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.
8. It is a forbidden explosive, a Class A explosive or a Class B explosive.

Based on knowledge of the waste, soils contaminated with virgin petroleum products do not exhibit the above properties, and do not have to be tested for the reactivity characteristic.

D. Toxicity:

If the Toxicity Characteristic Leaching Procedure (TCLP) extract from a representative sample of the waste contain any of the contaminants identified in the attached listing of Hazardous Waste Regulatory levels at concentrations equal to or greater than the values listed, it is a hazardous waste.

With respect to petroleum-contaminated soil, the primary compound of concern is benzene. If the benzene concentration in a TCLP extract is equal to or greater than 500 ppb, the contaminated material is a characteristic hazardous waste. For gasoline contaminated soil, toxicity for lead must also be evaluated.

The regulatory level of benzene in the soil is determined by analyzing the soil using the TCLP extraction method and determining the concentration in the extract.

A second method of determination is to identify the total concentration of the contaminant in the soil. If the total concentration is less than the regulatory level, then the leachate level could not possibly exceed the standard. This approach would save laboratory costs because the TCLP would not have to be run. If the total concentration in the soil exceeds the regulatory level required in the extract, no conclusion can be drawn from these results and a complete TCLP must be run.

Additional Information on Toxicity Characteristics

On March 29, 1990, the U.S. Environmental Protection Agency established the Toxicity Characteristic (TC) Rule. The TC Rule expands the list of contaminants by which a waste can be classified as hazardous due to toxicity, and it replaces the Extraction Procedure Toxicity (EP Tox) with the Toxicity Characteristic Leaching Procedure (TCLP). The TC Rule's specified contaminant list includes the same 14 metals and pesticides as the original toxicity list, plus 25 additional organic chemicals. Each of the 39 listed contaminants has the potential for rendering a particular material a characteristic hazardous waste due to toxicity. Since benzene is one of the 25 organic compounds added to the toxicity list, and since benzene is commonly found in petroleum products, it is possible that petroleum-contaminated soil may classify as a hazardous waste. Limited relief from these hazardous waste regulations is currently available because the TC Rule has specifically deferred petroleum-contaminated soil, groundwater, and debris generated from underground storage tank (UST) releases, until the impact of the regulation is further evaluated.

UST sites are essentially those sites which have underground storage tanks containing transportation fuels, such as gasoline, jet fuel, aviation gas, and diesel fuel. (See 40 CFR Section 280.12 for a more complete definition). The TC Rule does not apply to petroleum-contaminated media produced by a leak from an UST, including associated underground piping. However, DEC regulations state that the materials contaminated by transportation fuels can be hazardous wastes if they exhibit other hazardous waste characteristics, such as toxicity due to lead.

The TC Rule, as published on March 29, 1990, became effective on .September 25, 1990, for large-quantity generators, and March 29, 1991, for small quantity generators. Large quantity generators are defined as those parties who generate 2,200 pounds or more of hazardous waste in any month. Small quantity generators are those parties who generate between 220 and 2,200 pounds of hazardous waste in any month. Until the DEC adopts the TC Rule, waste generators must comply with both the EPA and DEC waste regulations. Refer to the specific regulations of interest for more information.

HAZARDOUS WASTE REGULATORY LEVELS FOR TOXICITY CHARACTERISTIC

CONSTITUENT	REGULATORY LEVEL (mg/L)
Arsenic	5.0
Barium	100.0
Benzene	0.5*
Cadmium	1.0
Carbon tetrachloride	0.5*
Chlordane	0.03*
Chlorobenzene	100.0*
Chloroform	6.0*
Chromium	5.0
o-Cresol	200.0*
m-Cresol	200.0*
Cresol (TOTAL)	200.0*
2,4-D	10.0
1,4-Dichlorobenzene	7.5*
1,2-Dichloroethane	0.5*
1,1-Dichloroethylene	0.7*
2,4-Dinitrotoluene	0.13*
Endrin	0.02
Heptachlor (and its epoxide)	0.008*
Hexachlorobenzene	0.13*
Hexachloro-1,3butadience	0.5*

Hexachloroethane	3.0*
Lead	5.0*
Lindane	0.4
Mercury	0.2
Methoxychlor	10.0
Methyl ethyl ketone	200.0*
Nitrobenzene	2.0*
Pentachlorophenol	100.0*
Pyridine	5.0*
Selenium	1.0
Silver	5.0
Tetrachloroethylene	0.7*
Toxaphene	0.5
Trichloroethylene	0.5*
2,4,5-Trichlorophenol	400.0*
2,4,6-Trichlorophenol	2.0*
2,4,5-TP (Silvex)	1.0
Vinyl chloride	0.2*

*New Toxicity Characteristics Effective 9/25/90

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APPENDIX B
GUIDANCE VALUES AND REUSE OPTIONS

TABLE 1

Guidance Values For Gasoline Contaminated Soil*

Compound	EPA Method	Detection Limit (1) (ppb)		TCLP Extraction Guidance Value (2) C_w (ppb)	TCLP Alternative Guidance Value C_a (ppb)	Human Health Guidance Value C_h (ppb)	Sediment Guidance Value C_s (ppb)
		Liquid	Solid				
Benzene	8021 (8020)	1	2	0.7	14	2.4×10^4	
Ethylbenzene	8021 (8020)	1	2	5	100	8.0×10^6	
Toluene	8021 (8020)	1	2	5	100	2.0×10^7	
o-Xylene	8021 (8020)	2	2	5	100	2.0×10^8	
m-Xylene	8021	2	2	5	100	2.0×10^8	

	(8020)						
p-Xylene	8021 (8020)	2	2	5	100	* * *	
Mixed Xylenes	8021 (8020)	2	2	5	100	2.0×10^8	
Isopropylbenzene	8021	1	1	5	100	* * *	
n-Propylbenzene	8021	1	1	5	100	* * *	
p-Isopropyltoluene	8021	1	1	5	100	* * *	
1,2,4-Trimethylbenzene	8021	1	1	5	100	* * *	
1,3,5-Trimethylbenzene	8021	1	1	5	100	* * *	
n-Butylbenzene	8021	1	1	5	100	* * *	
sec-Butylbenzene	8021	1	1	5	100	* * *	
Naphthalene	8021	1	1	10	200	3.0×10^5	
Methyl t-butyl ether (MTBE) (3)	8021 (8020)	1	1	50	1,000	* * *	

***Nuisance Characteristics Guidance:**
No petroleum-type odors.
No individual contaminant in soil at greater than 10,000 ppb.

(1) The listed Detection Limits are Practical Quantitation Limits (PQLs). The Method Detection Limit (MDL) is the best possible detection. Laboratories report the Practical Quantitation Limit (PQL), which is generally 4 times the MDL. Efforts should be made to obtain the best detection possible when selecting a laboratory. When the Guidance Value or standard is below the detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard.

(2) The TCLP Extraction Guidance Values are equal to the NYSDEC groundwater quality standards or Guidance Values, or the NYSDOH drinking water quality standards or Guidance Values, whichever is more stringent.

(3) Methyl t-butyl ether (MTBE) is not a target compound of Methods 8021 and 8020, but MTBE may be determined using these methods with appropriate quality assurance and quality control measures.

*** No Guidance Value identified in EPA HEAST Report.

TABLE 2
Guidance Values for Fuel Oil Contaminated Soil*

Compound	EPA Method	Detection Limit (ppb) (1)		TCLP Extraction Guidance Value (2) C_w (ppb)	TCLP Alternative Guidance Value C_a (ppb)	Human Health Guidance Value C_h (ppb)	Sediment Guidance Value C_s (ppb)	
		Liquid	Solid				Fresh	Marine
Benzene	8021 (8020)	1	2	0.7	14	2.4×10^4		
	8021							

Ethylbenzene	(8020)	1	2	5	100	8.0 x 10		
Toluene	8021 (8020)	1	2	5	100	2.0×10^{7}		
o-Xylene	8021 (8020)	2	2	5	100	2.0×10^{8}		
m-Xylene	8021 (8020)	2	2	5	100	2.0×10^{8}		
p-Xylene	8021 (8020)	2	2	5	100	* * *		
Mixed Xylenes	8021 (8020)	2	2	5	100	2.0×10^{8}		
Isopropylbenzene	8021	1	1	5	100	* * *		
n-Propylbenzene	8021	1	1	5	100	* * *		
p-Isopropyltoluene	8021	1	1	5	100	* * *		
1,2,4-Trimethylbenzene	8021	1	1	5	100	* * *		
1,3,5-Trimethylbenzene	8021	1	1	5	100	* * *		
n-Butylbenzene	8021	1	1	5	100	* * *		
sec-Butylbenzene	8021	1	1	5	100	* * *		
t-Butyl benzene	8021	1	1	5	100	* * *		
Naphthalene (3)	8021 (8270)	1 (6)	1 (330)	10	200	3.0×10^{5}		
Anthracene	8270	8	330	50	1,000	2.0×10^{7}		
Fluorene	8270	8	330	50	1,000	3.0×10^{6}		
Phenanthrene	8270	22	330	50	1,000	* * *		
Pyrene	8270	8	330	50	1,000	2.0×10^{6}		
Acenaphthene	8270	8	330	20	400	5.0×10^{6}		
Benzo(a) anthracene	8270	31	330	.002	.04 (4)	220	33	18
Fluoranthene	8270	9	330	50	1,000	3.0×10^{6}		
Benzo(b) fluoranthene	8270	19	330	.002	.04 (4)	220	33	18
Benzo(k) fluoranthene	8270	10	330	.002	.04 (4)	220	33	18
Chrysene	8270	10	330	.002	.04 (4)	* * *	33	18
Benzo(a)pyrene	8270	10	330	.002	.04 (4)	61	33	18
Benzo(g.h,i) perylene	8270	10	330	.002	.04 (4)	* * *		
Indeno (1,2,3-cd) pyrene	8270	10	330	.002	.04 (4)	* * *		
Dibenz(a,h) anthracene	8270	10	330	50	1,000	14		

***Nuisance Characteristics Guidance:**
No Petroleum-type odors.

No individual contaminant in soil at greater than 10,000 ppb.

(1) The listed Detection Limits are Practical Quantitation Limits (PQL's). The Method Detection Limit (MDL) is the best possible detection. Laboratories report the Practical Quantitation Limit (PQL), which is generally 4 times the MDL. Efforts should be made to obtain the best detection possible when selecting a laboratory. When the Guidance Value or standard is below the detection limit, achieving the detection limit will be considered acceptable for meeting the Guidance Value or standard.

(2) The TCLP Extraction Guidance Values are equal to the NYSDEC groundwater quality tandards or Guidance Values, or the NYSDOH drinking water quality standards or Guidance Values, whichever is more stringent.

(3) For naphthalene analysis in a liquid matrix, both Method 8021 and Method 8270 can provide satisfactory levels for comparison to the Cw of 10 ppb.

For naphthalene analysis in a solid matrix, Method 8021 is preferred over Method 8270 for comparison to the Ca of 200 ppb. If the Ca Guidance Value is not being used in the soil evaluation, then both Method 8021 and 8270 can provide satisfactory detection levels for comparison to the Ch of 3.0 x 105, and nuisance characteristic of 10,000 ppb.

(4) Due to the high detection limit for a solid matrix, the TCLP Extraction Method must be used to demonstrate groundwater quality protection for these compounds.

*** No Guidance Value identified in EPA HEAST Report.

TABLE 3

Soil Reuse Options

	Minimum Criteria To Be Met (1)		
Reuse Option	**Protection of Groundwater**	**Protection of Human Health**	**Protection Against Nuisance Characteristics**
Asphalt (2) or Concrete Manufacturing			
Cold-Mix Asphalt (2)			
Construction Material	x	x	x
Fill for Original Excavation	x	x	x
Fill Elsewhere On-site	x	x	x
Off-Site at Pre-Approved Location	x	x	x

(1) In addition, the criteria for protection of fish and wildlife must be met when sediments are the waste materials being handled, and when these soils or sediments are being disposed in surface waters, marine waters, or wetland areas.

(2) The soils must satisfy the criteria established under the particular BUD issuance.