6/1/01 - 01762

Work Plan

Additional Remedial Investigation at SWMU 14, Q-50 PWC Satellite Accumulation Area

Naval Station Norfolk

Norfolk, Virginia

CONTRACT TASK ORDER 0131

June 2001

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Under the

LANTDIV Clean II Program
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Prepared by

CH2MHILL

Virginia Beach, Virginia

Figure 1-1

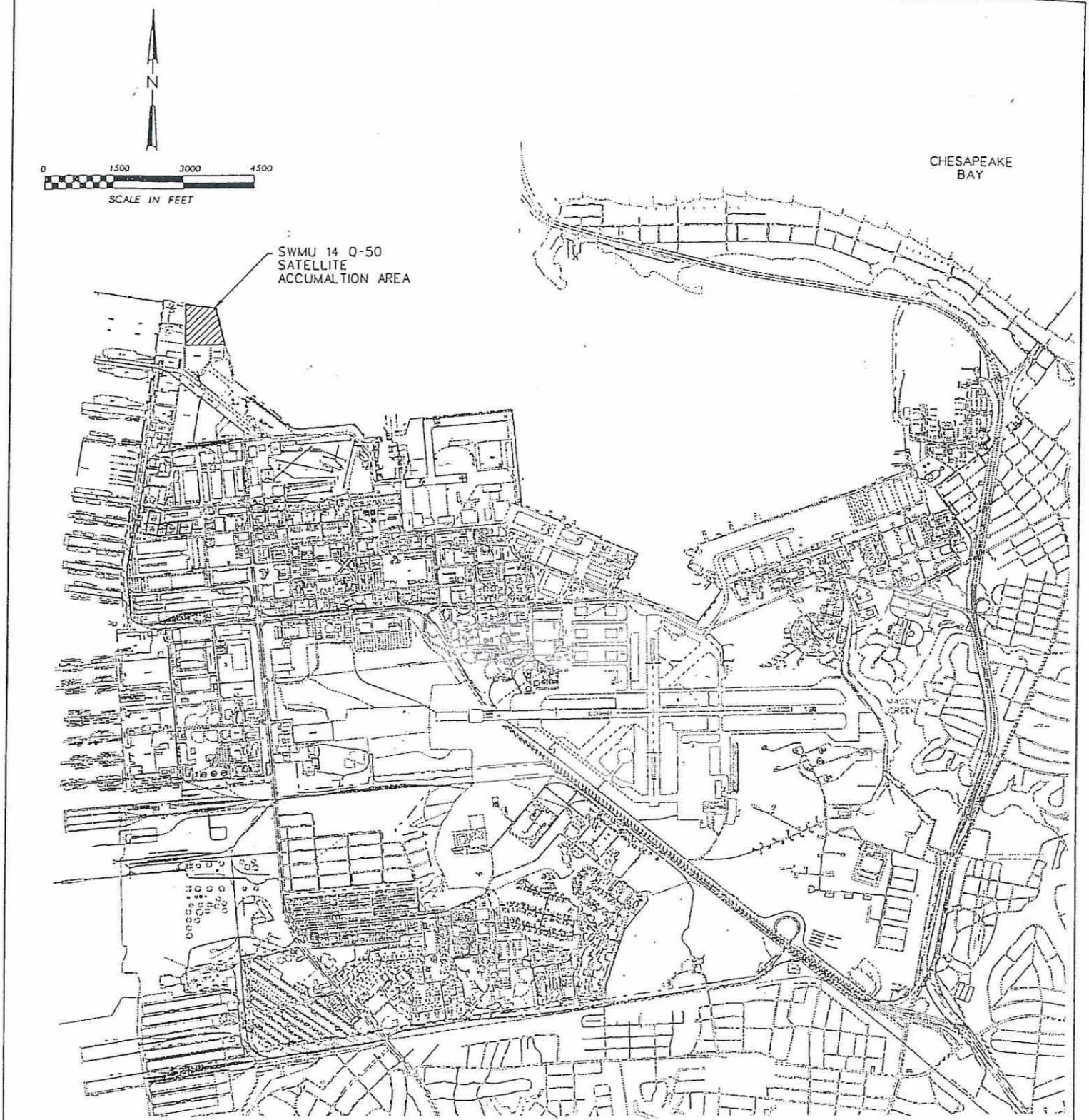

Figure 1-1
SITE LOCATION
SWMU 14/Q-50
Naval Base Norfolk

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2.0 Initial Evaluation and Sampling Rationale

This section presents an evaluation of available background information and existing conditions for SWMU 14 included in this evaluation. In addition, this section also presents the proposed sampling and rationale for execution of sampling for work related to this Remedial Investigation Work Plan.

Specific sampling techniques and analytical methods proposed for the investigation are documented in Section 3.

2.1 SWMU 14 – Q-50 Satellite Accumulation Area

Site Summary

SWMU 14 is located in the northeast corner of Sewell's Point at Naval Station Norfolk (NSN). The site consists of a concrete storage pad surrounded by a grass-covered field. The approximate dimensions of the pad are 15 feet by 25 feet. SWMU 14 was a 90-day hazardous waste accumulation area where wastes, generated through various waste streams, were processed (sampled, identified, labeled, packaged) before being shipped to storage and eventual disposal. Petroleum staining at several areas was observed during previous site visits. A review of a 1982 EPIC aerial photo of the site showed a drum storage area and scrap metal pile to the north and east, respectively of the concrete storage pad. In addition, historical plans of the area showed stockpiled railroad ties and metal debris to the northeast of the storage pad.

Areas of stained soil were observed at SWMU 14 during the RFA site inspection performed in 1992. There was no mention of soil staining or other indication of possible contamination during the RRR Study field activities. Sampling and analysis of the surface soil were performed in October 1995 during the Phase I RRR study. Additional samples were collected in September 1996 during the Phase II RRR study. A Supplemental Investigation was completed at SWMUs 6, 9, 10 and 14 in 1998.

Following the results of the 1998 Supplemental Investigation, an additional investigation was completed for SWMU 14. Additional surface soil, subsurface soil, and groundwater sampling was conducted as part of this investigation. The data assessment was presented to the NSN Tier I Partnering Team and included a comparison of soil and groundwater analytical data to human health risk assessment screening levels. Recommendations from the NSN Tier I Partnering Team include additional surface soil sampling, subsurface soil sampling, and groundwater sampling as described in this work plan.

Summary of Previous Investigations

The following studies/reports have been completed to evaluate the presence of contamination and potential exposure pathways associated with SWMU 14 at NSN:

- Phase I Relative Risk Ranking Study (1996)

- Phase II Relative Risk Ranking Study (1996)
- Supplemental Investigation (1998)
- Additional Investigation (1999)
- Geophysical Survey (2000)

These investigations are described next.

Relative Risk Ranking Studies and 1998 Supplemental Investigation Summary

Baker Environmental, Inc. has completed two Relative Risk Ranking (RRR) studies to evaluate the presence of contamination and potential exposure pathways associated with the SWMUs at NSN. The results of the first study are documented in the *Final Relative Risk Ranking System Data Collection Sampling and Analysis Report, Naval Base, Norfolk, Virginia,* dated January 9, 1996. During the Phase I RRR study, samples were collected at SWMUs 9, 10, and 14. The results of the second study are documented in the *Draft Phase II Relative Risk Ranking System Data Collection Sampling and Analysis Report, Naval Base, Norfolk, Virginia* dated December 9, 1996. During the *Phase II* study, additional sampling was conducted at SWMUs 10, and 14. A Supplemental Investigation was completed at SWMUs 6, 9, 10 and 14 and the results are presented in *SWMU Supplemental Investigation Report, Naval Base Norfolk, Virginia,* dated July, 1998. The analytical protocol and results of the Phase I RRR Study, the Phase II RRR Study, and the Supplemental Investigation are summarized in the following narrative.

Concentrations of detected chemicals were compared to the following current USEPA screening and regulatory screening criteria for each sample matrix: 1) risk-based residential and industrial concentrations (RBCs) for soil, 2) USEPA tap water RBCs and drinking water Maximum Contaminant Levels (MCLs) for groundwater, and 3) the USEPA Region III Biological Technical Assistance Group (BTAG) screening values for sediments.

Nine surface soil samples were collected at SWMU 14 during the Phase I and II RRR study. The Phase I samples were analyzed for VOCs, SVOCs, metals, and cyanide. Phase II samples were analyzed for VOCs, SVOCs, Pesticides/PCBs, and metals. A total of ten groundwater samples were collected and analyzed during the Phase I and II RRR Study and the Supplemental Investigation field activities at SWMU 14 and were also analyzed for VOCs, SVOCs, Pesticides/ PCBs, and metals.

Groundwater

A total of ten groundwater samples were collected and analyzed during the Phase I and II RRR Study and the SWMU Supplemental Investigation field activities at SWMU 14. Groundwater at this SWMU was estimated to flow east to northeast, towards Willoughby Bay. The assumed upgradient groundwater sample at SWMU 14 was collected at NBW14-DW05. Groundwater exceedences are shown in Figure 2-1, and the data is summarized below:

- Concentrations of chlorobenzene, benzene, chloromethane, 1,4-dichlorobenzene, vinyl chloride, methylene chloride, pentachlorophenol, benzo(a)anthracene,

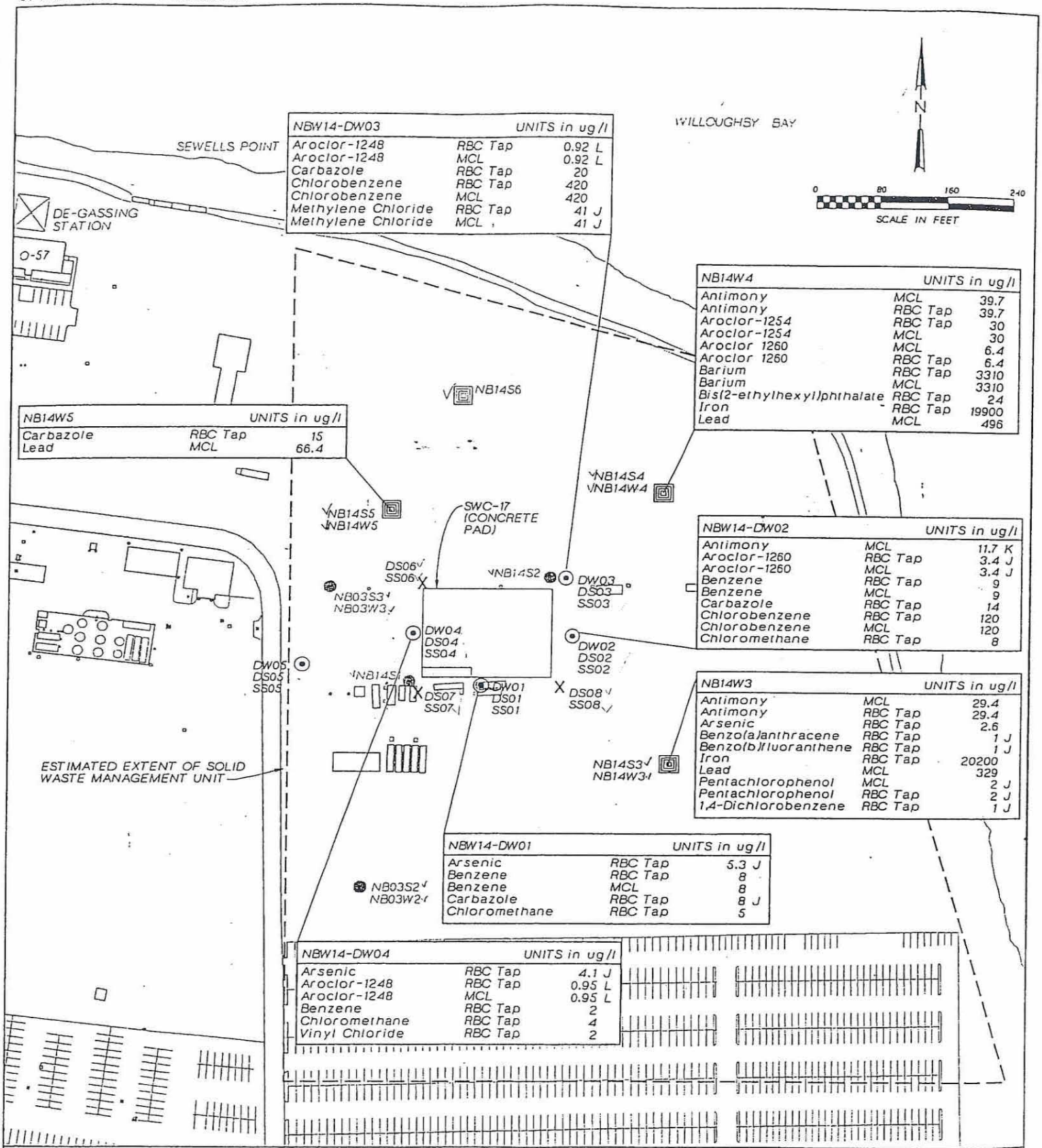

Figure 2-1
SWMU 14 - Q-50
AREA RRR STUDY/
1998 SUPPLEMENTAL INVESTIGATION
GROUNDWATER EXCEEDANCES
Naval Station, Norfolk

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- benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, carbazole, Aroclor-1248, Aroclor-1254, Aroclor-1260, antimony, arsenic, barium, and iron exceeded background and the tap water RBCs in at least one groundwater sample collected at SWMU 14.

- Concentrations of chlorobenzene, benzene, methylene chloride, pentachlorophenol, Aroclor-1248, Aroclor-1254, Aroclor-1260, antimony, barium, and lead exceeded the drinking water MCLs in at least one sample.

- No contaminants were detected in upgradient location DW05, indicating the contaminants are site related

Soil

A total of seventeen surface and eight subsurface soil samples were collected at SWMU 14 during the RRR Study and 1998 Supplemental Investigation field activities. Compounds detected at concentrations that exceeded the residential and/or industrial RBCs are shown in Figure 2-2 and are summarized below:

- Eleven contaminants were detected at concentrations exceeding the residential and/or industrial RBCs or the lead soil screening criteria in the soil samples.

- Residential RBCs and background concentrations were exceeded in at least one sample for the following compounds: Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, Aroclor-1254, antimony, arsenic, iron, and copper. Benzo(a)pyrene, dibenz(a,h)anthracene, Aroclor-1254, and arsenic concentrations also exceeded the industrial RBCs in at least one sample. In addition, lead exceeded the soil screening criteria at two locations.

- Five contaminants were detected at concentrations exceeding the residential and/or industrial RBCs in the subsurface soil samples.

- Benzo(a)pyrene, Benzo(b)fluoranthene, and Aroclor-1248 were detected at concentrations exceeding the residential RBCs and background concentrations at one location. Arsenic concentrations exceeded the residential RBC and background concentration at all sampling locations. In addition, arsenic concentrations exceeded the industrial RBC at 6 locations.

Sediment

Two sediment samples were collected at SWMU 14 during the Phase II RRR Study field activities. Compounds detected at concentrations that exceeded the screening criteria are shown in Figure 2-3 and summarized below:

- In all, fourteen contaminants were detected at concentrations exceeding the BTAG-Sediment values.

- Acenapthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, N-nitrosodiphenylamine, phenanthrene, pyrene, chromium, copper, lead, and zinc concentrations exceeded the BTAG sediment screening values in at least one sediment sample.

The previous investigations identified the presence of SVOCs , PCBs and metals in soils at levels exceeding the RBCs. However, the source and extent of the contaminants were not delineated. Potential sources include former locations of railroad ties, scrap metal, drums

NB14S6			
Antimony	RBC-Residential	55.4	mg/kg
Arsenic	RBC-Residential	28.4	mg/kg
Arsenic	RBC-Industrial	28.4	mg/kg
Benzo(a)pyrene	RBC-Residential	760	ug/kg
Benzo(b)fluoranthene	RBC-Residential	1900	ug/kg
Copper	RBC-Residential	12300	mg/kg
Dibenzo(a,h)anthracene	RBC-Residential	160 J	ug/kg
Iron	RBC-Residential	77000	mg/kg
Lead	Soil Screening Level	1550	mg/kg

NB14S5			
Arsenic	RBC-Residential	11.5	mg/kg
Arsenic	RBC-Industrial	11.5	mg/kg
Benzo(a)pyrene	RBC-Residential	250 J	ug/kg
Iron	RBC-Residential	28600	mg/kg
Lead	Soil Screening Level	1550	mg/kg

NB14S2			
Arsenic	RBC-Residential	2.7	mg/kg
Benzo(a)pyrene	RBC-Residential	260 J	ug/kg

NBW14-DS06			
Arsenic	RBC-Residential	8	mg/kg
Arsenic	RBC-Industrial	8	mg/kg
Benzo(a)pyrene	RBC-Residential	96 J	ug/kg
NBW14-SS06			
Arsenic	RBC-Residential	12	mg/kg
Arsenic	RBC-Industrial	12	mg/kg
Benzo(a)pyrene	RBC-Residential	220 J	ug/kg

NBW14-DS04			
Arsenic	RBC-Residential	9	mg/kg
Arsenic	RBC-Industrial	9	mg/kg
Benzo(a)pyrene	RBC-Residential	150 J	ug/kg
Iron	RBC Residential	27100	mg/kg
NBW14-SS04			
Arsenic	RBC-Residential	10.8	mg/kg
Arsenic	RBC-Industrial	10.8	mg/kg
Benzo(a)anthracene	RBC-Residential	5400	ug/kg
Benzo(a)pyrene	RBC Residential	2300	ug/kg
Benzo(a)pyrene	RBC-Industrial	2300	ug/kg
Benzo(b)fluoranthene	RBC-Residential	3900	ug/kg
Iron	RBC -Residential	41000	mg/kg

NBW14-DS05			
Arsenic	RBC-Residential	15.9	mg/kg
Arsenic	RBC-Industrial	15.9	mg/kg
Iron	RBC-Residential	31900	mg/kg
NBW14-SS05			
Arsenic	RBC-Residential	11.6	mg/kg
Arsenic	RBC-Industrial	11.6	mg/kg
Benzo(a)pyrene	RBC-Residential	170 J	ug/kg

NB14S1			
Arsenic	RBC-Residential	13.3	mg/kg
Arsenic	RBC-Industrial	13.3	mg/kg
Benzo(a)pyrene	RBC-Residential	440	ug/kg

NBW14-DS07			
Arsenic	RBC-Residential	10.1	mg/kg
Arsenic	RBC-Industrial	10.1	mg/kg
Benzo(a)pyrene	RBC-Residential	410 J	ug/kg
Benzo(b)fluoranthene	RBC Residential	900 J	ug/kg
NBW14-SS05			
Arsenic	RBC-Residential	16	mg/kg
Arsenic	RBC-Industrial	16	mg/kg
Benzo(a)pyrene	RBC-Residential	190 J	ug/kg

NBW14-DS03			
Arsenic	RBC-Residential	1.7	mg/kg
NBW14-SS03			
Arsenic	RBC-Residential	11.2	mg/kg
Arsenic	RBC-Industrial	11.2	mg/kg
Benzo(a)pyrene	RBC-Residential	310 J	ug/kg
NBW14-SS03P			
Arsenic	RBC-Residential	2.8	mg/kg

NB14S4			
Arsenic	RBC-Residential	9.5	mg/kg
Arsenic	RBC-Industrial	9.5	mg/kg
Aroclor-1254	RBC-Residential	3100	ug/kg
Aroclor-1254	RBC-Industrial	3100	ug/kg
Benzo(a)pyrene	RBC-Residential	2500	ug/kg
Benzo(a)pyrene	RBC-Industrial	2500	ug/kg
Benzo(b)fluoranthene	RBC-Residential	3500	ug/kg
Dibenzo(a,h)anthracene	RBC-Residential	860	ug/kg
Dibenzo(a,h)anthracene	RBC-Industrial	860	ug/kg
Indeno(1,2,3-c,d)pyrene	RBC-Residential	2300	ug/kg

NBW14-DS02			
Arsenic	RBC-Residential	5.4	mg/kg
Arsenic	RBC-Industrial	5.4	mg/kg
NBW14-SS02			
Arsenic	RBC-Residential	16.9	mg/kg
Arsenic	RBC-Industrial	16.9	mg/kg
Benzo(a)pyrene	RBC-Residential	220 J	ug/kg

NBW14-DS08			
Arsenic	RBC-Residential	2.7	mg/kg
Benzo(a)pyrene	RBC-Residential	130 J	mg/kg
Iron	RBC-Residential	29400	ug/kg
NBW14-DS08DL			
Aroclor-1248	RBC-Residential	480 D	ug/kg
NBW14-SS08			
Arsenic	RBC-Residential	13.5	mg/kg
Arsenic	RBC-Industrial	13.5	mg/kg
Benzo(a)pyrene	RBC-Residential	140 J	ug/kg

NB14S3			
Arsenic	RBC-Residential	5.6	mg/kg
Arsenic	RBC-Industrial	5.6	mg/kg

NBW14-DS01			
Arsenic	RBC-Residential	11.3	mg/kg
Arsenic	RBC-Industrial	11.3	mg/kg
Benzo(a)pyrene	RBC-Residential	320 J	ug/kg
NBW14-SS01			
Arsenic	RBC-Residential	13.2	mg/kg
Arsenic	RBC-Industrial	13.2	mg/kg
Benzo(a)pyrene	RBC-Residential	140 J	ug/kg

SEWELLS POINT

WILLOUGHBY BAY

SEWELLS POINT

DE-CARSING STATION

Q-51

NB14S6

NB14S5
NB14W5

NB14S4
NB14W4

NB14S2

NB03S3
NB03W3

DS06
SS06

DW03
DS03
SS03

DW04
DS04
SS04

DW02
DS02
SS02

NB14S1

DW05
DS05
SS05

DS07
SS07

DW01
DS01
SS01

DS08
SS08

NB14S3
NB14W3

SWC-17
(CONCRETE PAD)

ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

NB03S2
NB03W2

N

0 100 200 300

SCALE IN FEET

LEGEND

- NB03S2 — PHASE I RRR SURFACE SOIL SAMPLING LOCATION
- NB03W2 — PHASE I RRR SURFACE SOIL AND GROUNDWATER SAMPLING LOCATION
- NB14S6 — PHASE II RRR SURFACE SOIL SAMPLING LOCATION
- NB14S3 NB14W3 — PHASE II RRR SURFACE SOIL AND GROUNDWATER SAMPLING LOCATION
- X — SI SUBSURFACE AND SURFACE SOIL SAMPLING LOCATION
- ESTIMATED EXTENT OF WASTE DISPOSAL AREA
- SI GEOPROBE GROUNDWATER, SUBSURFACE AND SURFACE SOIL SAMPLING LOCATION

QUALIFIERS

J- Estimated value

Figure 2-2
SWMU 14 - Q-50
AREA RRR STUDY/
1998 SUPPLEMENTAL INVESTIGATION
SOIL EXCEEDANCES
Naval Station, Norfolk

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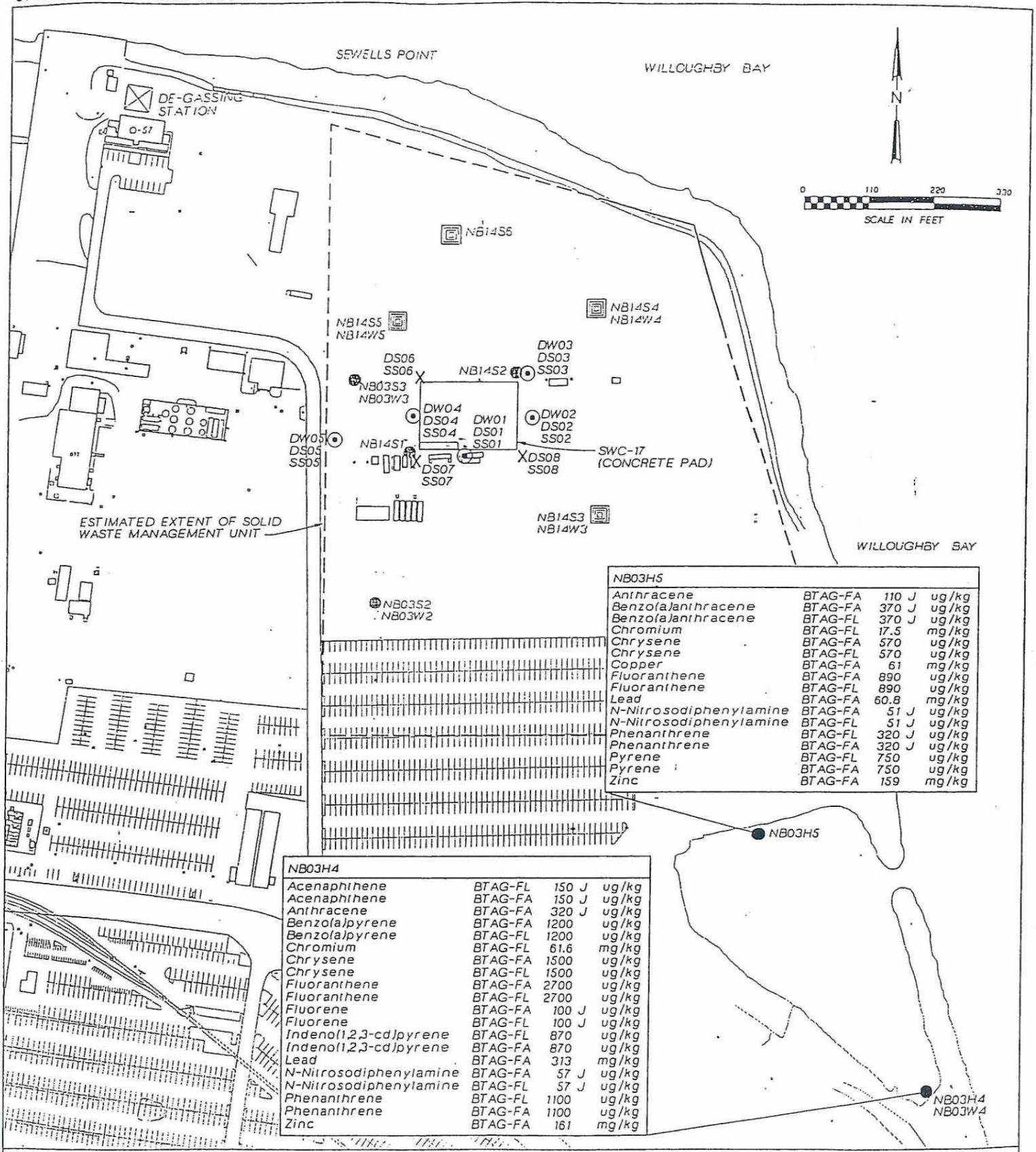

NB03H5			
Anthracene	BTAG-FA	110 J	ug/kg
Benzo(a)anthracene	BTAG-FA	370 J	ug/kg
Benzo(a)anthracene	BTAG-FL	370 J	ug/kg
Chromium	BTAG-FL	17.5	mg/kg
Chrysene	BTAG-FA	570	ug/kg
Chrysene	BTAG-FL	570	ug/kg
Copper	BTAG-FA	61	mg/kg
Fluoranthene	BTAG-FA	890	ug/kg
Fluoranthene	BTAG-FL	890	ug/kg
Lead	BTAG-FA	60.8	mg/kg
N-Nitrosodiphenylamine	BTAG-FA	51 J	ug/kg
N-Nitrosodiphenylamine	BTAG-FL	51 J	ug/kg
Phenanthrene	BTAG-FL	320 J	ug/kg
Phenanthrene	BTAG-FA	320 J	ug/kg
Pyrene	BTAG-FL	750	ug/kg
Pyrene	BTAG-FA	750	ug/kg
Zinc	BTAG-FA	159	mg/kg

NB03H4			
Acenaphthene	BTAG-FL	150 J	ug/kg
Acenaphthene	BTAG-FA	150 J	ug/kg
Anthracene	BTAG-FA	320 J	ug/kg
Benzo(a)pyrene	BTAG-FA	1200	ug/kg
Benzo(a)pyrene	BTAG-FL	1200	ug/kg
Chromium	BTAG-FL	61.6	mg/kg
Chrysene	BTAG-FA	1500	ug/kg
Chrysene	BTAG-FL	1500	ug/kg
Fluoranthene	BTAG-FA	2700	ug/kg
Fluoranthene	BTAG-FL	2700	ug/kg
Fluorene	BTAG-FA	100 J	ug/kg
Fluorene	BTAG-FL	100 J	ug/kg
Indeno(1,2,3-cd)pyrene	BTAG-FL	870	ug/kg
Indeno(1,2,3-cd)pyrene	BTAG-FA	870	ug/kg
Lead	BTAG-FA	313	mg/kg
N-Nitrosodiphenylamine	BTAG-FA	57 J	ug/kg
N-Nitrosodiphenylamine	BTAG-FL	57 J	ug/kg
Phenanthrene	BTAG-FL	1100	ug/kg
Phenanthrene	BTAG-FA	1100	ug/kg
Zinc	BTAG-FA	161	mg/kg

LEGEND

- NB03S2 — PHASE I RRR SURFACE SOIL SAMPLING LOCATION
- NB03W2 — PHASE I RRR SURFACE SOIL AND GROUNDWATER SAMPLING LOCATION
- NB14S6 — PHASE II RRR SURFACE SOIL SAMPLING LOCATION
- NB14S3 NB14W3 — PHASE II RRR SURFACE SOIL AND GROUNDWATER SAMPLING LOCATION
- ESTIMATED EXTENT OF WASTE DISPOSAL AREA
- SI GEOPROBE GROUNDWATER, SUBSURFACE AND SURFACE SOIL SAMPLING LOCATION

QUALIFIERS

J- Estimated value

Figure 2-3
SWMU 14 - Q-50
AREA RRR STUDY/
1998 SUPPLEMENTAL INVESTIGATION
SEDIMENT EXCEEDANCES
Naval Station, Norfolk

Soil

Soil analytical data collected was evaluated against risk-based residential and industrial concentrations (RBCs) and revised background concentrations for soil. Figure 2-4 presents the RI (Phase I) soil exceedences. The following list of chemicals exceeded both Residential RBCs and background concentrations: antimony, arsenic, cadmium, copper, iron, vanadium, aroclor-1242, aroclor-1248, aroclor-1254, aroclor-1260, dieldrin, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

The following chemicals exceeded both Industrial RBCs and background concentrations: arsenic, aroclor-1260, and benzo(a)pyrene. Therefore, the only chemicals in soil that exceeded all screening criteria (background levels, Residential RBCs, and Industrial RBCs) were arsenic, aroclor-1260, and benzo(a)pyrene.

Groundwater

Groundwater analytical data were evaluated against USEPA drinking water Maximum Contaminant Levels (MCLs). Figure 2-5 presents the RI (Phase I) groundwater exceedences. The following chemicals exceeded drinking water Maximum Contaminant Levels (MCLs) in groundwater: barium (total and filtered), thallium (total and filtered), pentachlorophenol, benzene, chlorobenzene, and vinyl chloride.

Geophysical Survey

A geophysical survey was performed in June, 2000 to further characterize the subsurface conditions at the site. A copy of the survey report is contained in Appendix B. The data indicates that there are numerous high intensity magnetic anomalies located throughout the survey area. These types of anomalies are typical of buried ferrous objects. The anomalies tend to terminate in the southeast and southwest corners of the survey area indicating the possible boundary of the fill material. A GPR profile was performed on the extensive anomalies located on the eastern side of the concrete slab. However, these results were inconclusive, possibly due to oxidation of the buried material or the close proximity of groundwater.

Supplemental Investigation (RI Phase II)

Based on a complete review of all available analytical data collected during previous investigations and a consensus item established by the NSN Tier I Partnering Team, additional investigation was proposed. The objectives of the RI Phase II investigation at the SWMU 14 were to:

- Further characterize the nature and extent of the contamination.
- Establish background concentration values upgradient of the waste.
- Investigate several anomalies detected during the geophysical survey.

The RI Phase II sampling included:

- Twenty surface and seventeen subsurface soil samples were collected to characterize the source and downgradient extent of contamination. Each of the surface and subsurface soil samples were analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals.

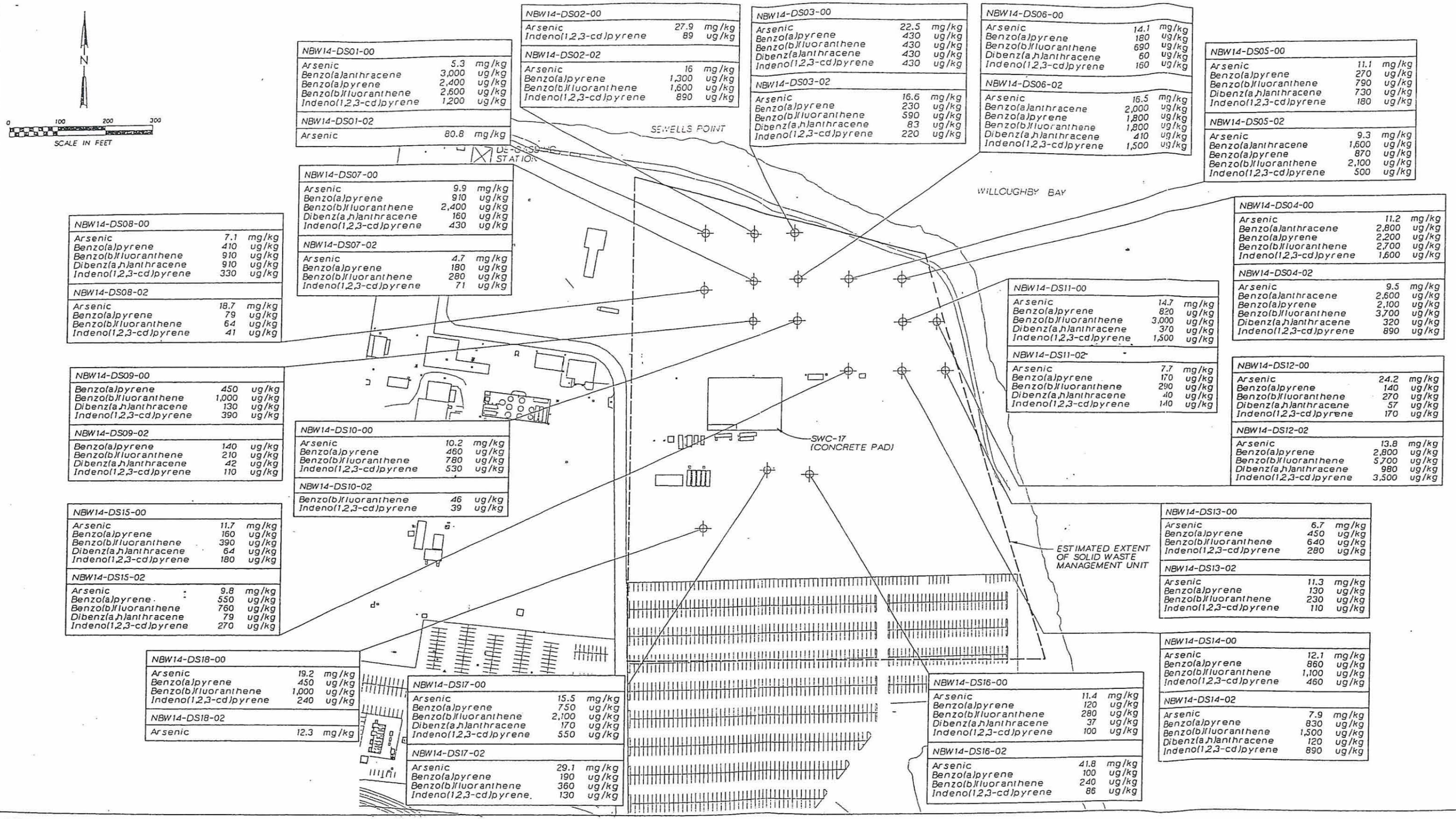

Figure 2-4
SWMU 14 - Q-50
AREA RI (PHASE I)
SOIL EXCEEDANCES
Naval Station, Norfolk

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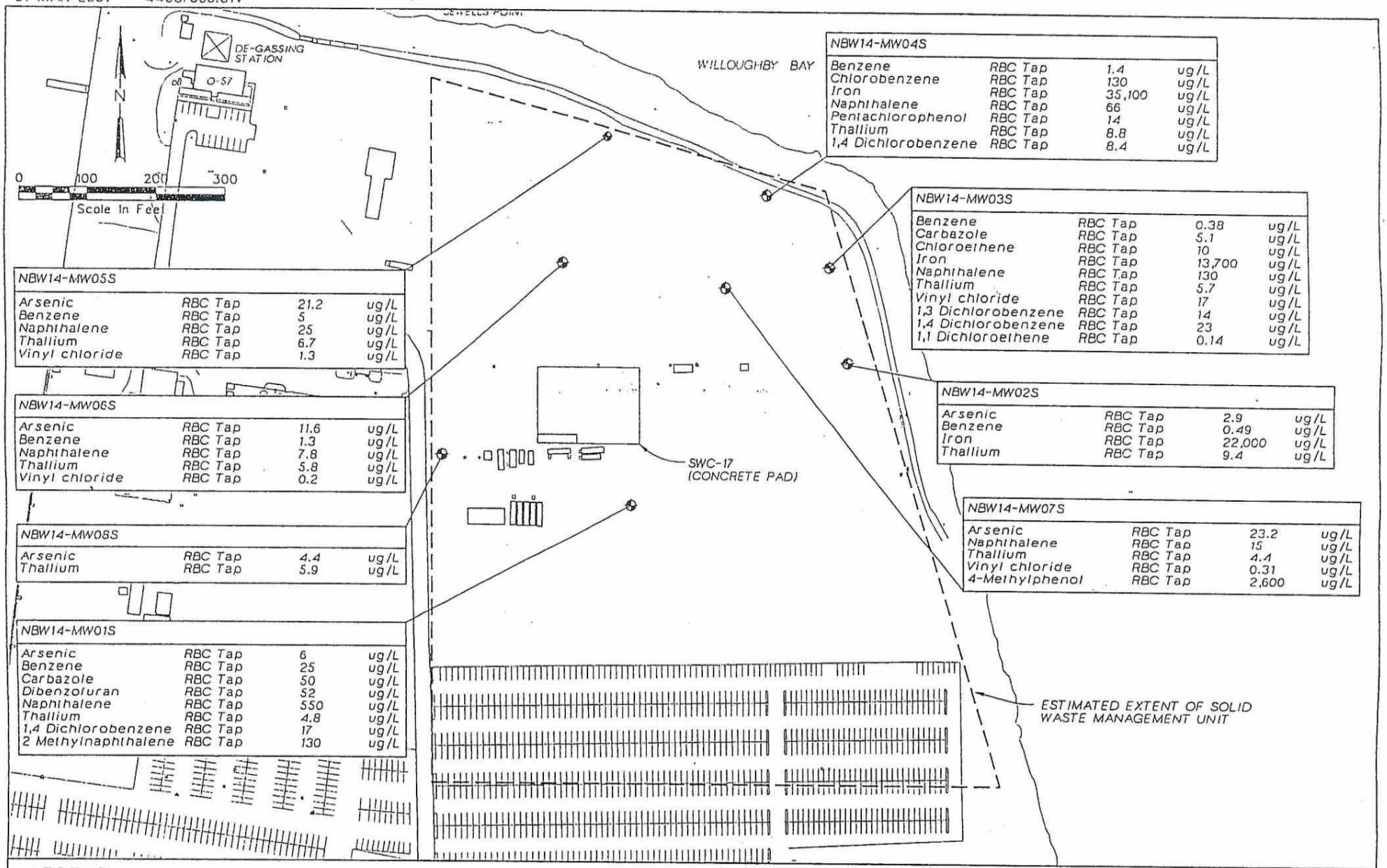

LEGEND

MONITORING WELL LOCATION

ESTIMATED EXTENT OF WASTE DISPOSAL AREA

Figure 2-5
SWMU 14 - Q-50
AREA RI (PHASE I)
GROUNDWATER EXCEEDENCES
Naval Station, Norfolk

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- Six monitoring wells were installed and constructed of 2-inch diameter PVC well casings and well screens. The wells extended to a depth of approximately 15 feet depending on the depth to first encountered water. The monitoring wells were installed using a HSA drill rig with 4 ¼" inner diameter auger stems. Following well installation and well development, groundwater samples were collected from all six monitoring wells and analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals (total and dissolved).

All analytical data collected was compared to the following current USEPA screening and regulatory screening criteria for each sample matrix:

3) risk-based residential and site background concentrations (RBCs) for soil, and

4) USEPA drinking water Maximum Contaminant Levels (MCLs) for groundwater

The human health risk assessment evaluation of the data was limited to developing/approving the list of criteria used for screening at SWMU 14. The interpretation was limited to comparing measured sample concentrations to these screening values. This evaluation did not include calculation of risks to potential receptors.

Soil

Soil analytical data collected was evaluated against risk-based residential and industrial concentrations (RBCs) and revised background concentrations for soil. Figure 2-6 presents the soil exceedences for RI (Phase II). The following list of chemicals exceeded both Residential RBCs and background concentrations: arsenic, antimony, lead, manganese, and thallium.

Groundwater

Groundwater analytical data were evaluated against USEPA drinking water Maximum Contaminant Levels (MCLs). Figure 2-7 presents the groundwater exceedences for RI (Phase II). The following chemicals exceeded drinking water Maximum Contaminant Levels (MCLs) in groundwater: Total arsenic, dissolved arsenic, and benzene.

Other

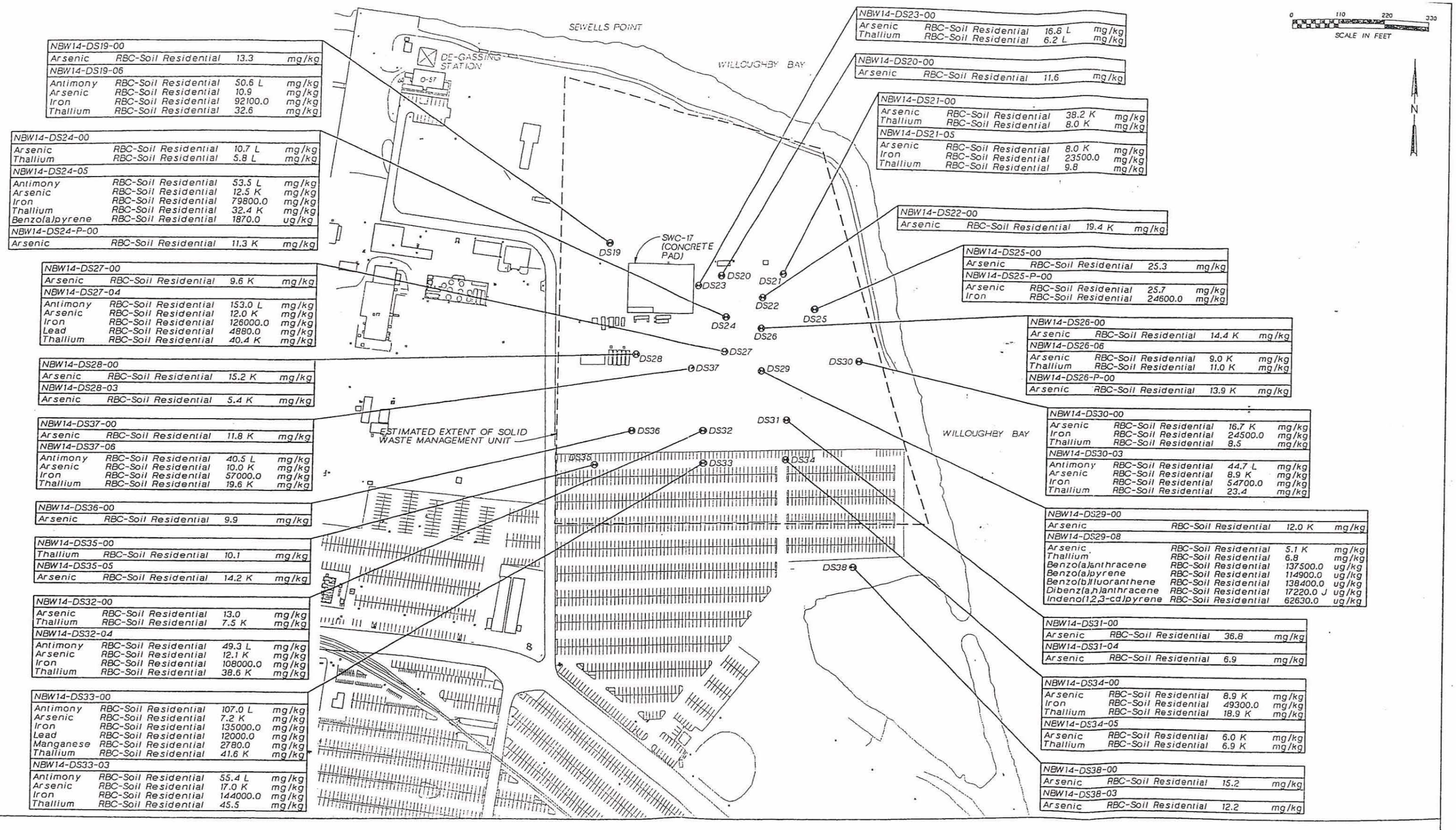
During the RI (Phase II) field investigation, a subsurface container was encountered while performing boring NBW14-DS19. The container is believed to be metallic and may be a tank of some kind. What appeared to be product was noted to be present on the drilling augers upon their removal. The boring was backfilled with bentonite clay and relocated away from the tank.

SWMU 14 RI (Phase III) Sampling Rationale

The objectives of the RI (Phase III) are as follows:

- Further characterize the nature and extent of soil and groundwater contamination associated with the SWMU 14/Q-50 Area.

- Determine, to the extent possible, the western and southern limits of waste/fill material associated with the SWMU 14/Q-50 Area and establish background levels upgradient of the material.



NBW14-DS19-00			
Arsenic	RBC-Soil Residential	13.3	mg/kg
NBW14-DS19-06			
Antimony	RBC-Soil Residential	50.6 L	mg/kg
Arsenic	RBC-Soil Residential	10.9	mg/kg
Iron	RBC-Soil Residential	92100.0	mg/kg
Thallium	RBC-Soil Residential	32.6	mg/kg

NBW14-DS24-00			
Arsenic	RBC-Soil Residential	10.7 L	mg/kg
Thallium	RBC-Soil Residential	5.8 L	mg/kg
NBW14-DS24-05			
Antimony	RBC-Soil Residential	53.5 L	mg/kg
Arsenic	RBC-Soil Residential	12.5 K	mg/kg
Iron	RBC-Soil Residential	79800.0	mg/kg
Thallium	RBC-Soil Residential	32.4 K	mg/kg
Benzo(a)pyrene	RBC-Soil Residential	1870.0	ug/kg
NBW14-DS24-P-00			
Arsenic	RBC-Soil Residential	11.3 K	mg/kg

NBW14-DS27-00			
Arsenic	RBC-Soil Residential	9.6 K	mg/kg
NBW14-DS27-04			
Antimony	RBC-Soil Residential	153.0 L	mg/kg
Arsenic	RBC-Soil Residential	12.0 K	mg/kg
Iron	RBC-Soil Residential	126000.0	mg/kg
Lead	RBC-Soil Residential	4880.0	mg/kg
Thallium	RBC-Soil Residential	40.4 K	mg/kg

NBW14-DS28-00			
Arsenic	RBC-Soil Residential	15.2 K	mg/kg
NBW14-DS28-03			
Arsenic	RBC-Soil Residential	5.4 K	mg/kg

NBW14-DS37-00			
Arsenic	RBC-Soil Residential	11.8 K	mg/kg
NBW14-DS37-06			
Antimony	RBC-Soil Residential	40.5 L	mg/kg
Arsenic	RBC-Soil Residential	10.0 K	mg/kg
Iron	RBC-Soil Residential	57000.0	mg/kg
Thallium	RBC-Soil Residential	19.6 K	mg/kg

NBW14-DS36-00			
Arsenic	RBC-Soil Residential	9.9	mg/kg

NBW14-DS35-00			
Thallium	RBC-Soil Residential	10.1	mg/kg
NBW14-DS35-05			
Arsenic	RBC-Soil Residential	14.2 K	mg/kg

NBW14-DS32-00			
Arsenic	RBC-Soil Residential	13.0	mg/kg
Thallium	RBC-Soil Residential	7.5 K	mg/kg
NBW14-DS32-04			
Antimony	RBC-Soil Residential	49.3 L	mg/kg
Arsenic	RBC-Soil Residential	12.1 K	mg/kg
Iron	RBC-Soil Residential	108000.0	mg/kg
Thallium	RBC-Soil Residential	38.6 K	mg/kg

NBW14-DS33-00			
Antimony	RBC-Soil Residential	107.0 L	mg/kg
Arsenic	RBC-Soil Residential	7.2 K	mg/kg
Iron	RBC-Soil Residential	135000.0	mg/kg
Lead	RBC-Soil Residential	12000.0	mg/kg
Manganese	RBC-Soil Residential	2780.0	mg/kg
Thallium	RBC-Soil Residential	41.6 K	mg/kg
NBW14-DS33-03			
Antimony	RBC-Soil Residential	55.4 L	mg/kg
Arsenic	RBC-Soil Residential	17.0 K	mg/kg
Iron	RBC-Soil Residential	144000.0	mg/kg
Thallium	RBC-Soil Residential	45.5	mg/kg

NBW14-DS23-00			
Arsenic	RBC-Soil Residential	16.8 L	mg/kg
Thallium	RBC-Soil Residential	6.2 L	mg/kg

NBW14-DS20-00			
Arsenic	RBC-Soil Residential	11.6	mg/kg

NBW14-DS21-00			
Arsenic	RBC-Soil Residential	38.2 K	mg/kg
Thallium	RBC-Soil Residential	8.0 K	mg/kg
NBW14-DS21-05			
Arsenic	RBC-Soil Residential	8.0 K	mg/kg
Iron	RBC-Soil Residential	23500.0	mg/kg
Thallium	RBC-Soil Residential	9.8	mg/kg

NBW14-DS22-00			
Arsenic	RBC-Soil Residential	19.4 K	mg/kg

NBW14-DS25-00			
Arsenic	RBC-Soil Residential	25.3	mg/kg
NBW14-DS25-P-00			
Arsenic	RBC-Soil Residential	25.7	mg/kg
Iron	RBC-Soil Residential	24600.0	mg/kg

NBW14-DS26-00			
Arsenic	RBC-Soil Residential	14.4 K	mg/kg
NBW14-DS26-06			
Arsenic	RBC-Soil Residential	9.0 K	mg/kg
Thallium	RBC-Soil Residential	11.0 K	mg/kg
NBW14-DS26-P-00			
Arsenic	RBC-Soil Residential	13.9 K	mg/kg

NBW14-DS30-00			
Arsenic	RBC-Soil Residential	16.7 K	mg/kg
Iron	RBC-Soil Residential	24500.0	mg/kg
Thallium	RBC-Soil Residential	8.5	mg/kg
NBW14-DS30-03			
Antimony	RBC-Soil Residential	44.7 L	mg/kg
Arsenic	RBC-Soil Residential	8.9 K	mg/kg
Iron	RBC-Soil Residential	54700.0	mg/kg
Thallium	RBC-Soil Residential	23.4	mg/kg

NBW14-DS29-00			
Arsenic	RBC-Soil Residential	12.0 K	mg/kg
NBW14-DS29-08			
Arsenic	RBC-Soil Residential	5.1 K	mg/kg
Thallium	RBC-Soil Residential	6.8	mg/kg
Benzo(a)anthracene	RBC-Soil Residential	137500.0	ug/kg
Benzo(a)pyrene	RBC-Soil Residential	114900.0	ug/kg
Benzo(b)fluoranthene	RBC-Soil Residential	138400.0	ug/kg
Dibenz(a,h)anthracene	RBC-Soil Residential	17220.0 J	ug/kg
Indeno(1,2,3-cd)pyrene	RBC-Soil Residential	62630.0	ug/kg

NBW14-DS31-00			
Arsenic	RBC-Soil Residential	36.8	mg/kg
NBW14-DS31-04			
Arsenic	RBC-Soil Residential	6.9	mg/kg

NBW14-DS34-00			
Arsenic	RBC-Soil Residential	8.9 K	mg/kg
Iron	RBC-Soil Residential	49300.0	mg/kg
Thallium	RBC-Soil Residential	18.9 K	mg/kg
NBW14-DS34-05			
Arsenic	RBC-Soil Residential	6.0 K	mg/kg
Thallium	RBC-Soil Residential	6.9 K	mg/kg

NBW14-DS38-00			
Arsenic	RBC-Soil Residential	15.2	mg/kg
NBW14-DS38-03			
Arsenic	RBC-Soil Residential	12.2	mg/kg

LEGEND

⊕ SOIL BORING

Figure 2-6
SWMU 14 - Q-50
AREA RI (PHASE II)
SOIL EXCEEDENCES
Naval Station, Norfolk

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- Determine the nature of the anomaly encountered at boring location NBW14-DS19 during the RI (Phase II) field activities.
- Collect surface water and sediment samples from the pond located at the southeastern corner of the SWMU 14/Q-50 Area in order to begin assessment of any impacts associated with surface run off and groundwater discharge to the surrounding water bodies.

The following recommendations for the SWMU 14 RI Phase III are based on a complete review of all available analytical data collected during previous investigations and a consensus item established by the NSN Tier I Partnering Team. The proposed RI Phase III soil boring and monitoring well locations are presented on Figure 2-8 and will include:

02-MAR-2001 44081068.dlv

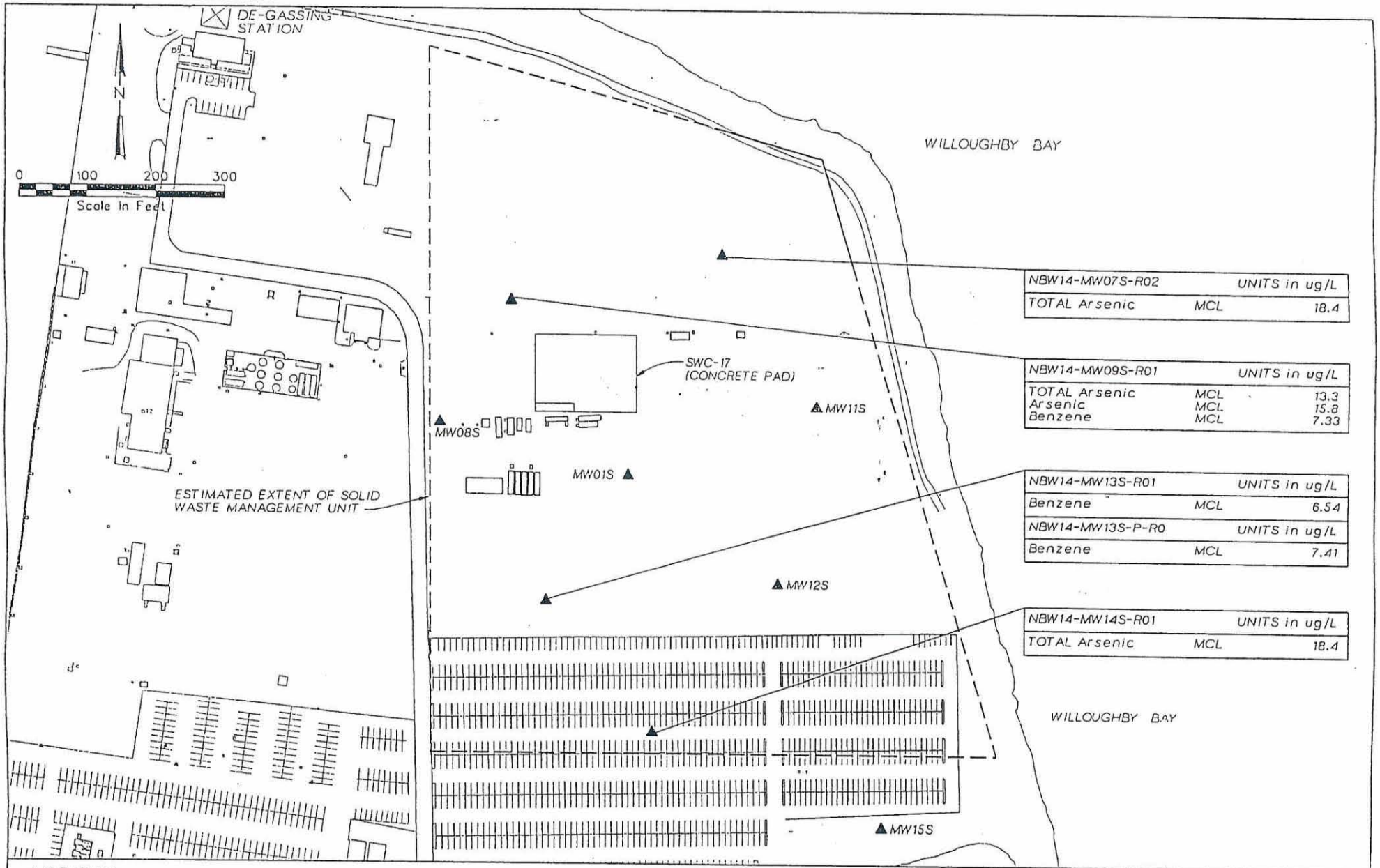
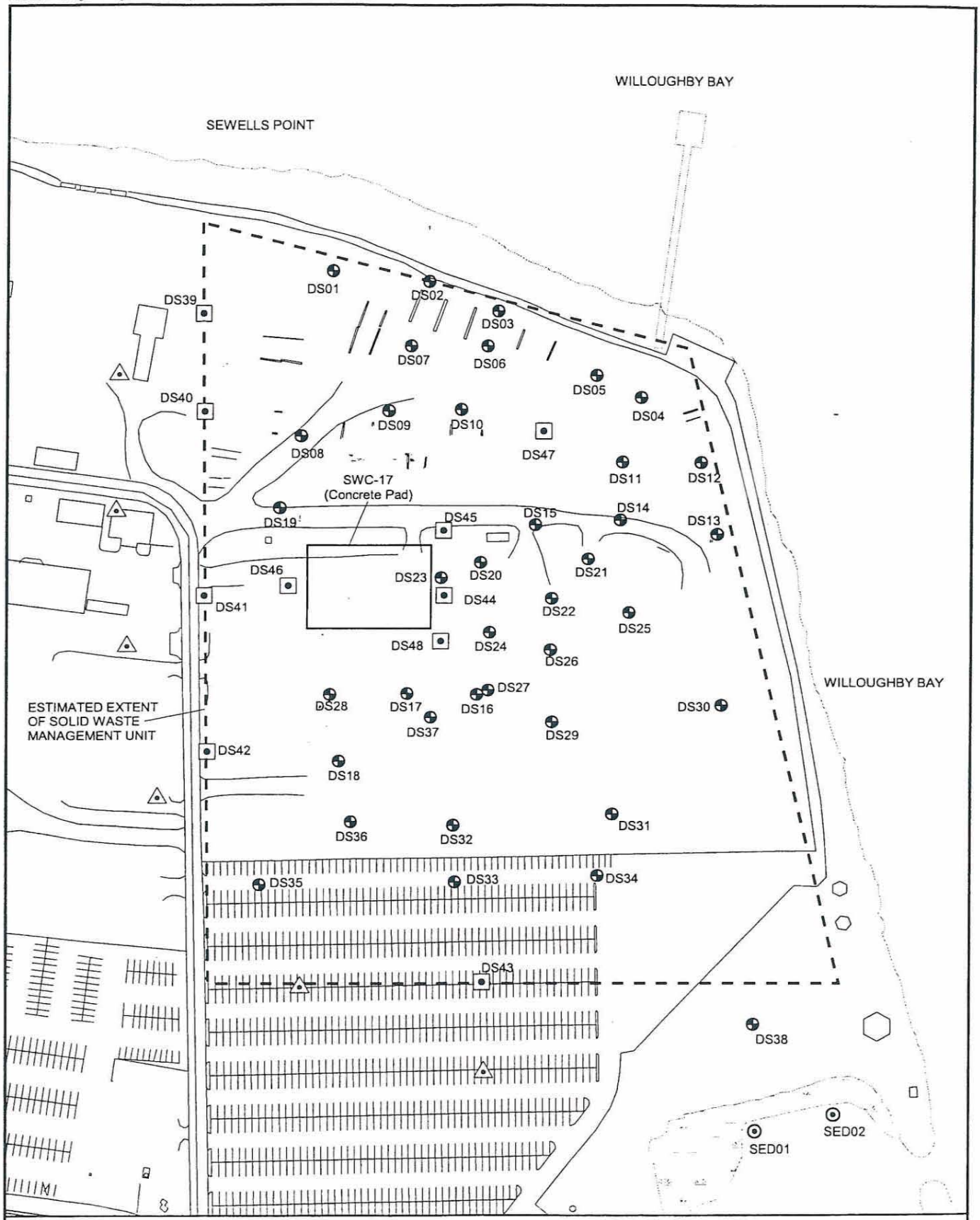


Figure 2-7
SWMU 14 - Q-50
AREA RI (PHASE II)
GROUNDWATER EXCEEDANCES
Naval Station, Norfolk

CH2MHILL

File Path: v:\18gis\nsn\figures\154408.apr



LEGEND

- Existing Soil Boring Location
- Proposed Soil Boring Location
- Proposed "Contingency" Soil Boring Location
- Proposed Sediment Sampling Location

N

0 200 400 Feet

Figure 2-8
SWMU 14 - Q-50
Area RI (Phase III)
Proposed Sampling Locations
Naval Station Norfolk

CH2MHILL

Perimeter Soil Borings

A total of five soil borings (NBW14-DS39, NBW14-DS40, NBW14-DS41, NBW14-DS42, and NBW14-DS43) will be performed along the suspected outer limits of the SWMU 14 to identify the lateral extent of waste/fill material associated with these areas. The soil borings will extend through any encountered waste/fill material. It is estimated that the borings will reach to a maximum depth of 20 feet below ground surface. The soil borings will be installed using a HSA drill rig with 4 ¼" inner diameter auger stems. Based on the results of these initial soil borings, it is estimated that up to six additional 'contingency' soil borings may be installed in order to better define the lateral extent of waste/fill material. A surface and subsurface soil sample will be obtained from each of these soil borings and analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals.

Contingency Soil Borings

A total of six contingency borings are anticipated in order to accurately define the extent of waste/fill material along the western and southern boundaries of the area. These borings (if installed) will follow the same installation and sampling procedures as above.

Dioxin/Pentachlorophenol Sampling

Five soil borings (NBW14-DS44 through NBW14-DS48) will be installed within the interior of the SWMU 14 in order to collect soil samples for dioxin and pentachlorophenol analyses. These borings will be completed as near as possible to historical boring locations in which PCB/Pesticides were located. The corresponding historical locations are: NB14-DW02, NB14-DW03, NB14-DW04, NB14-S4, and NB14-DS08. Two soil samples will be obtained from each of these soil borings and analyed for dioxin and SVOCs. It should be noted that although pentachlorophenol is a targeted contaminant for these samples, the SVOC analysis will provide pentachlorophenol as well as other semi-volatile concentrations.

Monitoring Wells

It is anticipated that up to four of the soil borings will be converted to monitoring wells. Following well installation and well development, groundwater samples will be collected from all new monitoring wells and analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals (total and dissolved).

Test Pit

It is proposed that an exploratory test pit be performed in order to positively identify the origin of the anomaly encountered at soil boring NBW14-DS19 during the RI (Phase II) field activities. A backhoe is anticipated to be sufficient to accomplish this task. Once the origin of the anomaly is determined, the partnering team will discuss additional actions.

Sediment/Surface water Sampling

Two sediment and surface water samples will be collected from the lagoon located in the southeastern portion of the area. The sample locations will approximately coincide with the stormwater outfall located on the northwestern corner of the lagoon and the drainage swale located on the northern side of the lagoon. The samples will be analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals.

3.0 Technical Approach and Investigation Procedures

This section details the technical approach developed to perform the sampling activities associated with the SWMU 14 RI Phase III as described in this work plan. The goal of the sampling effort is to supplement data collected during previous investigations at Naval Station Norfolk, and to make a recommendation for additional action or no further action based on the data interpretation. As described in Section 2, a review of the available analytical data collected during previous investigations was performed and sampling locations were selected based on this review. In addition, the work plan was joint scoped by the NSN Tier I Partnering Team with representatives from LANTDIV, VADEQ, USEPA, and CH2M Hill at the January 2001 and March 2001 meetings in Virginia Beach, Virginia.

The tasks included in the technical approach are listed below. The remainder of this section provides detailed discussions of investigation procedures.

- Task 1: Project Planning
- Task 2: Field Investigation
- Task 3: Sample Analysis and Validation
- Task 4: Data Evaluation
- Task 5: Site Investigation Report

3.1 Task 1: Project Planning

This task consists of the preparation of Project Plans associated with the supplemental site investigations. Meetings and project management activities are also documented.

Work Plan

A Master Work Plan (WP), Master Sampling and Analysis Plan (SAP), and Master Health and Safety Plan (HASP) have been prepared for the activities to be performed for Installation Restoration Program (IRP) investigations at NSN (Final Master Project Plan, Volumes I and II, Naval Base, Norfolk, Norfolk, Virginia, October 1997). The Master SAP consists of three documents: the Master Field Sampling Plan (FSP), the Master Quality Assurance Project Plan (QAPP), and the Master Investigation-Derived Waste Management Plan (IDWMP). LANTDIV, in conjunction with the United States Environmental Protection Agency (USEPA) Region III, and the Virginia Department of Environmental Quality (VDEQ) has agreed that one set of Master plans will provide the background information needed to understand base-wide site conditions, the approach to be used for investigations, and general types of activities to be accomplished.

This document and the attached Appendix A: Site-Specific Checklists will supplement the Master Plans with site-specific information for the additional investigation at each of the SWMUs. The HASP, FSP, QAPP, and IDWMP are presented as checklists of items based on the existing Master Work Plans (including other supporting documentation, and additions/deviations from the Master Plan), and are submitted as an Appendix to this document.

The following presents a description of each element of the site-specific plans.

- Site-Specific Investigation-Derived Waste Plan Checklist: The IDWMPs will describe procedures used for the handling and disposal of waste materials generated during the SWMU investigations. These waste materials will include personal protective equipment, soils, well-purge water and decontamination fluids. The plans also describe the potential means of disposal, if deemed necessary.

- Site-Specific Quality Assurance Project Plan Checklist: The QAPP checklist describes the data quality objectives (DQOs); samples to be collected and analyses to be performed; analytical quantitation limits; quality assurance/quality control (QA/QC) acceptance criteria; data reduction, validation, and reporting; internal QC procedures (field and laboratory); and corrective action.

  CH2M HILL will not begin field sampling at each site until the NTR receives confirmation that laboratory QAPP requirements have been met. The subcontracted analytical laboratory will be Naval Facility Environmental Service Center (NFESC)-certified and will conform to their approved Laboratory Quality Assurance Plan (LQAP). In addition, CH2M HILL will prepare and meet the QAPP requirements as specified by the Navy.

- Site-Specific Field Sampling Plan Checklist: The site-specific work plan checklist describes the field tasks to be performed; the field measurements to be taken; the sampling program (i.e. nomenclature); sampling locations; and applicable standard operating procedures (SOPs).

- Site-Specific Health and Safety Plan Checklist: A HASP will be prepared for each site to address activity-specific precautions, such as HAZWOPER-regulated tasks; hazards of concern; contaminants of concern; personnel; instrumentation required; and decontamination procedures.

  The HASP must be reviewed and approved by both the NTR and the Safety/Health Officer of the facility. This plan governs all aspects of the project. The onsite portion of the study shall not begin until this plan has been approved by the NTR.

Meetings

During the course of the investigations, meetings will be held to discuss the proposed project schedule and findings with the NSN Tier I partnering team. CH2M HILL will provide minutes of the meetings to LANTDIV and Naval Station Norfolk.

Project Management

The activities involved in project management include daily technical support and guidance, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, subcontractor coordination, preparation of monthly progress reports, and communication and coordination of events with LANTDIV and NSN. Project management will be an ongoing task.

3.2 Task 2: Field Investigation

This task involves efforts related to fieldwork support, the field investigation, and surveying.

Field Work Support

Fieldwork support includes subcontractor procurement, mobilization, and utility clearance, as described in the following subsections.

Subcontractor Procurement

As part of the initial field mobilization to NSN, CH2M HILL will procure hollow stem auger monitoring well installation, surveying, IDW disposal , analytical laboratory, and data validation services for work at the Base. The subcontracted analytical laboratory will meet NFESC Level D quality control.

The firms providing these services shall be procured using the Basic Ordering Agreements (BOAs) under the CLEAN II contract. In cases where BOAs are not in place for services required under this task order, CH2M HILL will provide subcontractor services in accordance with procedures that will be established between CH2M HILL's contract administrator and LANTDIV's contracting officer.

Mobilization/Demobilization

Mobilization includes procurement of necessary field equipment, and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.

Demobilization activities include time for IDW sampling and general site restoration prior to the return transport of field equipment and crew. IDW generated during field activities will be containerized in 55-gallon drums for storage. The 55-gallon drums will be properly labeled and stored at a location designated by LANTDIV and NSN prior to disposal.

The IDW disposal method will be dependent on characterization analytical results. Based on previous investigations, it is anticipated that the IDW generated will be disposed of as non-hazardous waste.

Utility Clearance

Utility clearances will be performed prior to the start of any subsurface investigation activities at the site. CH2M HILL will coordinate subsurface utility clearances with the Miss Utility group and the Public Works Center (PWC) at the Base. CH2M HILL will be responsible for insuring that all appropriate contacts have been made with Base personnel

and that clearances have been given for proposed subsurface sampling locations, including marking of utilities near the areas of proposed subsurface sampling locations, prior to the initiation of field operations.

Field Sampling Activities

The goal of the sampling effort is to collect further data at SWMU 14 and determine what additional action is necessary. A description of the activities follows. The number of samples to be collected from each medium of concern at the site is summarized in Table 3-1.

Perimeter Soil Borings

A total of five soil borings (NBW14-DS39, NBW14-DS40, NBW14-DS41, NBW14-DS42, and NBW14-DS43) will be performed along the suspected outer limits of the SWMU 14 to identify the lateral extent of waste/fill material associated with these areas. The soil borings will extend through any encountered waste/fill material. It is estimated that the borings will reach to a maximum depth of 20 feet below ground surface. The soil borings will be installed using a HSA drill rig with 4 ¼" inner diameter auger stems. Based on the results of these initial soil borings, it is estimated that up to six additional 'contingency' soil borings may be installed in order to better define the lateral extent of waste/fill material. A surface and subsurface soil sample will be obtained from each of these soil borings and analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals.

Dioxin/Pentachlorophenol Sampling

Five soil borings (NBW14-DS44 through NBW14-DS48) will be installed within the interior of the SWMU 14 in order to collect soil samples for dioxin and pentachlorophenol analyses. These borings will be completed as near as possible to historical boring locations in which PCB/Pesticides were located. The corresponding historical locations are: NB14-DW02, NB14-DW03, NB14-DW04, NB14-S4, and NB14-DS08. Two soil samples will be obtained from each of these soil borings and analyed for dioxin and SVOCs. It should be noted that although pentachlorophenol is a targeted contaminant for these samples, the SVOC analysis will provide pentachlorophenol as well as other semi-volatile concentrations.

Monitoring Wells

It is anticipated that up to four of the soil borings will be converted to monitoring wells. Following well installation and well development, groundwater samples will be collected from all new monitoring wells and analyzed for TCL VOCs, TCL SVOCs, TCL Pesticides/PCBs, and TAL metals (total and dissolved).

Test Pit

It is proposed that an exploratory test pit be performed in order to positively identify the origin of the anomaly encountered at soil boring NBW14-DS19 during the RI (Phase II) field activities. A backhoe is anticipated to be sufficient to accomplish this task. Once the origin of the anomaly is determined, the partnering team will discuss additional actions.

Soil Sampling Procedures

Table 3-2 presents the required containers, preservatives, and holding times for soil samples. Table 3-3 presents a summary of the number of soil samples to be submitted for analysis (including QA/QC samples).

Table 3-1

Analytical Sample Summary for SWMU 14 Supplemental Site Investigation

	Site	SWMU 14
Media	Parameter	Number of Samples
Surface Soil	TCL VOCs	10-16
	TCL SVOCs	10-16
	TCL Pesticides/PCBs	10-16
	TAL Metals	10-16
	Dioxin	5
	TCL SVOCs Pentachlorophenol (PCP)	5
Subsurface Soil	TCL VOCs	10-16
	TCL SVOCs	10-16
	TCL Pesticides/PCBs	10-16
	TAL Metals	10-16
	Dioxin	5
	TCL SVOCs Pentachlorophenol (PCP)	5
Sediment	TCL VOCs	2
	TCL SVOCs	2
	TCL Pesticides/PCBs	2
	TAL Metals	2
Groundwater	TCL VOCs	4
	TCL SVOCs	4
	TCL Pesticides/PCBs	4
	TAL Metals (dissolved)	4
	TAL Metals (total)	4

Table 3-1 continued

Analytical Sample Summary for SWMU 14 Supplemental Site Investigation

	Site	SWMU 14
Media	**Parameter**	**Number of Samples**
Surface Water	TCL VOCs	2
	TCL SVOCs	2
	TCL Pesticides/PCBs	2
	TAL Metals (dissolved)	2
	TAL Metals (total)	2
Total Number of Samples		138-186

Table 3-2

Required Containers, Preservatives, and Holding Times for Soil Samples

Analysis	Sample Container	Preservative	Holding Time	Volume of Sample Collected
TCL VOCs	4-oz wide mouth glass jars w/teflon-lined cap	Cool to 4° C	14 days	Fill completely
TCL SVOCs	4-oz wide mouth glass jars w/ teflon-lined cap	Cool to 4° C	14 days	Fill completely
TCL Pest/PCB	4-oz wide mouth glass jars w/ teflon-lined cap	Cool to 4° C	14 days	Fill completely
TAL Metals	4-oz wide mouth glass jars w/teflon-lined cap	None	6 months	Fill to shoulder
Dioxin	8-oz wide mouth glass jars w/teflon-lined cap	Cool to 4° C	14 days	Fill to shoulder
PCP	8-oz wide mouth glass jars w/teflon-lined cap	Cool to 4° C	14 days	Fill to shoulder

Table 3-3

Summary of Soil Samples for Submittal to the Offsite Laboratory for Analysis

Laboratory Parameter	Samples	Field Duplicates[1]	Field Blanks[2]	Trip Blanks[3]	Matrix Spikes[4]	Equipment Blanks[5]	Matrix Total
TCL VOCs	21-33	3-4	2	8-10	2-3	8-10	44-62
TCL SVOCs	21-33	3-4	2	0	2-3	8-10	44-62
TCL Pest/PCB	21-33	3-4	2	0	2-3	8-10	44-62
TAL Metals	21-33	3-4	2	0	2-3	8-10	44-62
Dioxin	10	1	2	0	1	3-4	17-19
PCP	10	1	2	0	1	3-4	17-19

Notes:

[1]Field Duplicates are collected at a frequency of 1 per 10.

[2]Field blanks are collected at a frequency of 1 per source per event or 1 per week of sampling

[3]Trip blanks are shipped with samples submitted for volatile analysis. Trip blanks are collected at a frequency of 1 per cooler of volatile samples.

[4]Matrix spike/matrix spike duplicates (MS/MSD) are collected at a frequency of 1 per 20.

[5]Equipment blanks are collected at a frequency of 1 per day.

Soil Sampling Techniques

The RI Phase III involves the collection of soil samples. Split-spoon sampling is the technique that will be employed during the soil-sampling phase of the investigation. The applicable Standard Operating Procedures (SOPs) for the collection of soil samples are included in Volume 2 of the Master Project Plan.

Groundwater Sampling Procedures

Table 3-4 presents the required containers, preservatives, and holding times for groundwater samples. Table 3-5 presents a summary of the number of groundwater samples to be submitted for analysis.

Groundwater Sampling Technique

The SWMU supplemental site investigation involves the installation of monitoring wells and the subsequent collection of groundwater samples from the monitoring wells. Grab groundwater samples will be collected from monitoring wells after installation and development has been completed. Standard groundwater samples will be collected from monitoring wells following well purging and development. The applicable SOPs for monitoring well installation, well development, and the collection of groundwater samples are located in Volume 2 of the Master Project Plan.

Sampling Equipment Decontamination

All non-disposable sampling equipment will be decontaminated immediately after each use. The applicable SOPs for the decontamination of personnel and equipment from Volume 2 of the Master Project Plan are included with the Field Sampling Plan checklist.

Sample Designation

Sampling locations and samples collected during the course of field work will be assigned unique designations to allow the sampling information and analytical data to be entered into the existing Geographic Information System (GIS) Data Management system currently being developed for NSN under a separate CTO. The following sections describe the sample designation specifications that will be followed by field personnel.

Specifications for Field Location Data

Field station data is information assigned to a physical location in the field at which a sample is collected. For example, a soil boring that has been installed will require a name that will uniquely identify it with respect to other soil boring locations, or other types of sampling locations. The station name provides for a key in the database to which any samples collected from that location can be linked, to form a relational database.

A listing of the location identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all field activities. Each station will be designated by an alphanumeric code that will identify the station location by facility, site type, site number, station type, and sequential station number. The schema that will be used to identify field station data is documented in Table 3-6.

Table 3-4

Required Containers, Preservatives, and Holding Times for Groundwater Samples

Analysis	Sample Container	Preservative	Holding Time	Sample Volume
TCL VOCs	40-ml glass vial w/teflon-lined cap	HCL to pH<2; Cool to 4° C	14 days	Fill completely; no air bubbles
TCL SVOCs	1-liter amber glass bottle w/teflon-lined cap.	Cool to 4° C	7 days to extraction, 40 days to analysis	Fill to shoulder
TCL Pest./PCBs	1-liter amber glass bottle w/teflon-lined cap	Cool to 4° C	7 days to extraction, 40 days to analysis	Eill to shoulder
TAL Metals (total)	1-liter (or 500 ml depending upon the laboratory) polyethylene bottle	HNO_3 to pH<2; Cool to 4° C	6 months	Fill to shoulder
TAL Metals (dissolved)	1-liter (or 500 ml depending upon the laboratory) polyethylene bottle	HNO_3 to pH<2; Cool to 4° C	6 months	Fill to shoulder

Table 3-5

Summary of Groundwater Samples for Submittal to the Offsite Laboratory for Analysis

Laboratory Parameter	Samples	Field Duplicates[1]	Field Blanks[2]	Trip Blanks[3]	Matrix Spikes[4]	Equip. Blanks[5]	Matrix Total
TCL VOCs	4	1	1	1	1	0	8
TCL SVOCs	4	1	1	0	1	0	7
TCL Pest/PCB	4	1	1	0	1	0	7
TAL Metals (total)	4	1	1	0	1	0	7
TAL Metals (dissolved)	4	1	1	0	1	1	8

Notes:

[1]Field Duplicates are collected at a frequency of 1 per 10.

[2]Field blanks are collected at a frequency of 1 per source per event or 1 per week of sampling

[3]Trip blanks are shipped with samples submitted for volatile analysis. Trip blanks are collected at a frequency of 1 per cooler of volatile samples.

[4]Matrix spike/matrix spike duplicates (MS/MSD) are collected at a frequency of 1 per 20.

[5]Equipment blanks are collected at a frequency of 1 per day.

Table 3-6 Field Station Schema		
First Segment	**Second Segment**	
Facility, Station Type, Site Number	Station Type	Station Number, Qualifier
AAANNN	AA	NNNA
Notes: "A"= alphabetic "N"= numeric		
Facility: NB = Norfolk Naval Base Station Type: W = SWMU Site Number: 14 = Q-50 Satellite Accumulation Area	Sample Type: DS = Soil Boring Location MW = Monitoring Well Station Number: Sequential Station Number Qualifier: S = Shallow D = Deep K = Background	

Specifications for Analytical Data

Analytical data will be generated through sampling of various media at NSN. Each analytical sample collected will be assigned a unique sample identifier. The schema used as a guide for labeling analytical samples in the field is documented below. The format that will be used for electronic deliverables from the analytical laboratory and the data validator is documented below.

Sample Identification Schema

A standardized numbering system will be used to identify all samples collected during water and soil sampling activities. The numbering system will provide a tracking procedure to ensure accurate data retrieval of all samples taken. A listing of the sample identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all sampling activities. Sample identification for all samples collected during the investigations will use the following format.

Each sample will be designated by an alphanumeric code that will identify the facility, site, matrix sampled, and contain a sequential sample number. QA/QC samples will have a unique sample designation. The guide for sample identification is documented in Table 3-7. If one qualifier is pertinent to the sample ID but another is not, only the Table 3-6 applicable qualifiers will be used. A non-utilized character space does not have to be maintained.

Electronic Deliverable File Format

An offsite laboratory will analyze the samples collected as part of the SWMU 14 Site Investigation described in this work plan and tabulate the results in an electronic format specified by CH2M HILL. The data validator will add data validation qualifiers to the table of analytical results. In addition to hard copy data package deliverable, CH2M HILL will receive an electronic file from the data validator in a table format that will facilitate downloading into a database. The format that will be used for electronic deliverables is tabulated in Table 3-8.

Surveying

Sampling locations at each SWMU will be horizontally located using a global positioning system (GPS) following field activities. In addition, monitoring well casing elevations will be surveyed within one-onehundreth of an inch by a qualified surveyor. All survey data will be tied in to the Virginia State Plane coordinate system.

3.3 Task 3: Sample Analysis and Validation

This task involves efforts related to the sample management and data validation. CH2M HILL will be responsible for tracking sample analysis and obtaining results from the laboratory. The analytical data generated during the SWMUs Investigation field program will be validated by an independent data validation subcontractor according to EPA standard procedures.

Table 3-7
Sample Designation Schema

First Segment	Second Segment		Third Segment
Facility, Station, and Site Number	Sample Type	Sample Location + Sample Qualifier	Additional Qualifiers (sample depth, sampling round, etc.)
AAANN	AA	NNNA or NNAA	ANN or NNNN

Notes: "A"= alphabetic "N"= numeric

Facility:

NB = Norfolk Naval Base

Station Type:

W = SWMU

Site Number:

14 = Q-50 Satellite Accumulation Area

Sample Type:

DS = Soil Boring
TB = Trip Blank
EB = Equipment Blank
FB = Field Blank

MW = Monitoring Well

Sample Location:

1. Station Samples (NNA)

NNA – refers to sequential station number

NN**A** – letter qualifier for Deep (D) or Shallow (S)

2. QC Samples (NNN)

NNN – numbered sequentially for each type of blank (i.e., 1, 2, etc.) collected for that day's sampling

N**NN** - refers to month of sampling event

Sample Qualifiers:

F = filtered sample

P = duplicate sample

K = background sample

Additional Qualifiers:

1. Monitoring Well Groundwater Sample (refers to sampling round for that well):

R01 - Round 1
R02 - Round 2
R03 - Round 3

2. Soil Boring Subsurface Sample (refers to depth of sample):

Enter depth of top of sample interval

3. QC Samples

NNNN - refers to day and year of sampling event

Table 3-8

Analytical Data Electronic Deliverable

Field Name	Field Type	Description
Sample_ID	A20	The CH2M HILL sample ID (taken from the chain of custody)
Analysis_Group	A8	The analysis performed on the sample. We classify our samples into six main groups: VOA, SVOA, METAL, PEST/PCB, and FMETAL (for filtered samples)
Date_Analyzed	D	The date the sample was analyzed.
Date_Received	D	The date the sample was received in the lab.
Date_Collected	D	The date the sample was collected.
Lab_Sample_ID	A15	The lab sample ID.
Dilution_Factor	N	The dilution factor used, if applicable.
SDG_Number	A6	The SDG number.
CAS_Number	A6-A2-A1	CAS Number of the compound being analyzed (Note that the CAS number must consist of three number segments of defined length, separated by dashes).
Chem_Name	A50	The compound being analyzed.
Ana_Value	N	The analyzed result.
Std_Qual	A5	The lab qualifiers, if any (e.g., U, UJ, B)
DV_Qual	A5	The data validation qualifier (e.g., J, R)
Units	A10	The unit of the result (e.g., MG/L)
Detect_Limit	N	The detection limit for the compound.
Method	A15	Analytical method used to analyze the sample fraction.

Note:
*Analytical data must be delivered in a format compatible with Microsoft Excel

Sample Analysis

All analyses of soil and groundwater will be conducted at a contracted laboratory that fulfills all requirements of the U.S. Navy's QA/QC Program Manual and EPA's CLP. A signed certificate of analysis will be provided with each laboratory data package, along with a certificate of compliance certifying that all work was performed in accordance with the applicable federal, state, and local regulations. All analyses will be performed following the highest level of Navy guidance. Analyses will include the proper ratio of field QC samples recommended by NFESC guidance for the DQOs.

This task includes checking the data from the laboratory and converting it into an electronic format that can be readily incorporated into the GIS Data Management system for NSN.

Field Quality Control Procedures

Quality control duplicate samples and blanks are used to provide a measure of the internal consistency of the samples and to provide an estimate of the components of variance and the bias in the analytical process. The details with regard to the number and frequency of field QC samples to be collected during the site investigations are provided above in Table 3-3 (for soil samples) and Table 3-5 (for groundwater samples).

Blanks

Blanks provide a measure of cross-contamination sources, decontamination efficiency, and other potential errors that can be introduced from sources other than the sample. ASTM Type II water will be used for blanks. Four types of blanks can be generated during sampling activities: trip blanks, field blanks, equipment rinsate blanks, and temperature blanks.

One trip blank will be included in each cooler used for the daily shipment of VOC samples. If more than one cooler is being sent on a given day, all of the VOC samples should be placed in one cooler, if possible, to minimize the number of trip blanks needed. The trip blanks will be prepared before each sampling event, shipped or transported to the field with the sampling bottles, and returned unopened for analysis. Trip blanks will indicate if there is contamination during shipment to the field, from storage in the field, or from shipment from the field to the analytical laboratory.

One field blank will be collected per sampling event. If sampling events extend beyond one week (five working days) or for windy and dusty field conditions, the number of field blanks should be increased. Field blanks are used to determine the chemical quality of water used for such procedures as decontamination and blank collection.

One equipment blank per sample medium will be obtained for each day of sampling. Equipment blanks will give an indication of the efficiency of decontamination procedures.

EPA has also requested that a temperature blank be included in each cooler containing samples for CLP analyses so that the laboratory can record the temperature without disturbing the samples. The temperature blank will be labeled, but will not be given a sample number nor will be listed as a sample on the COC form.

Duplicates

Field duplicate samples will be collected at a frequency of 1 per 10 field samples per matrix. The location from which the duplicates are taken will be randomly selected. Each duplicate sample will be split evenly into two sample containers and submitted for analysis as two independent samples.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of 1 for every 20 field samples collected. Analytical results of these samples indicate the impact the matrix (water and soil) has on extracting the analyte for analysis. MS/MSD samples give an indication of the laboratory's analysis accuracy and precision within the sample matrix. Data validators will use these results to evaluate the accuracy of the analytical data.

Data Validation

Analytical results will be validated by CH2M HILL subcontractors approved by the Navy. Data validators will use EPA Region III guidance. Data that should be qualified will be flagged appropriately. Results for QA/QC samples will be reviewed and the data will be qualified further, if necessary. Finally, the data set as a whole will be examined for consistency, anomalous results, and reasonableness.

3.4 Task 4: Data Evaluation

This task includes reviewing historical data and data generated under this CTO, including generation of figures and tables summarizing the data.

Analytical data will be collected during this investigation in the form of laboratory analytical results and data validation results. This task also includes the evaluation of validated laboratory data and field-generated data. The data evaluation will include incorporation of historical data from the RRR reports (Final Relative Risk Ranking System Data Collection, Sampling and Analysis Report, Naval Base, Norfolk, Virginia, January 9, 1996 and Draft Relative Risk Ranking System Data Collection, Sampling and Analysis Report, Naval Base, Norfolk, Phase II, December 9, 1996) and the 1998 and 1999 Supplemental Investigation with results obtained under this CTO, tabulation of the data, and generation of figures and/or tables associated with data (e.g., sample location maps).

3.5 Task 5: Site Investigation Report

A Draft SWMU 14 Supplemental Site Investigation Report will be prepared for submittal to the NSN Tier I Team. Based on the Tier I Team's evaluation of the results presented in the Draft Report, a Final Report will be prepared.

4.0 Project Management and Staffing

The CH2M HILL Activity Manager designated for the oversight of this project is Mr. John Tomik. Mr. Tomik will be supported by Mr. Matt Schulze, who will be the CTO Manager for this CTO. Mr. Tomik will be responsible for such activities as technical support and oversight, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, and coordination with LANTDIV, NSN, and subcontractors.

The SWMUs Supplemental Site Investigation field program will be directed by qualified CH2M HILL staff members. In addition, CH2M HILL will perform soil and groundwater sampling. CH2M HILL will notify LANTDIV and NSN which CH2M HILL personnel will mobilize to the site prior to initiating field activities.

5.0 Contractual Services

This section documents the anticipated subcontract services required for the completion of tasks documented in this work plan. The SWMU Site Investigation will require subcontract services from the following:

- Hollow Stem Auger Monitoring Well Installation
- Hollow Stem Auger Soil Borings
- Analytical Laboratory
- Data Validation
- Surveyors
- IDW Disposal

CH2M HILL HEALTH AND SAFETY PLAN

This Health and Safety Plan (HSP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Site Safety Coordinator (SSC) is to be familiar with these SOPs and the contents of this plan. CH2M HILL's personnel and subcontractors must sign Attachment 1.

Project Information and Description

PROJECT NO: 154408

CLIENT: Navy CLEAN II

PROJECT/SITE NAME: SWMU 14 Additional Remedial Investigation/ Naval Station Norfolk

SITE ADDRESS: Naval Station Norfolk, VA

CH2M HILL PROJECT MANAGER: Francisco, Ben

CH2M HILL OFFICE: VBO

DATE HEALTH AND SAFETY PLAN PREPARED: 07/11/01

DATE(S) OF SITE WORK: August 20 - 27, 2001

SITE ACCESS: None

SITE SIZE: 178,000 square ft

SITE TOPOGRAPHY: Flat

PREVAILING WEATHER: Windy, generally very warm in the summer.

SITE DESCRIPTION AND HISTORY: SWMU 14 is located in the northeast corner of Sewell's Point at Naval Station Norfolk (NSN). The site consists of a concrete storage pad surrounded by a grass-covered field. The approximate dimensions of the pad are 15 feet by 25 feet. SWMU 14 was a 90-day hazardous waste accumulation area where wastes, generated through various waste streams, were processed (sampled, identified, labeled, packaged) before being shipped to storage and eventual disposal. Petroleum staining at several areas was observed during previous site visits. A review of a 1982 EPIC aerial photo of the site showed a drum storage area and scrap metal pile to the north and east, respectively of the concrete storage pad. In addition, historical plans of the area showed stockpiled railroad ties and metal debris to the northeast of the storage pad.

DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED: Oversight of hollow stem auger drilling, well installation, excavation, surveying, and IDW drum sampling. Collection of sediment, soil, and groundwater samples.

Site Map

This page is reserved for a Site Map.

Note locations of Support, Decontamination, and Exclusion Zones; site telephone; first aid station; evacuation routes; and assembly areas.

Table of Contents

1 Tasks to be Performed Under this Plan

1.1 Description of Tasks

(Reference Field Project Start-up Form)

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Section 1.2) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 8.2 for procedures related to "clean" tasks that do not involve hazardous waste operations and emergency response (Hazwoper).

- **Hazwoper-Regulated Tasks**

- Test pit excavation
- Drilling
- Well installation
- Groundwater monitoring
- Sediment sampling
- Hand augering
- Excavation
- Surface water sampling
- Surface soil sampling
- Surveying
- Investigation-derived waste (drum) sampling and disposal
- Observation of material loading for offsite disposal

1.1.2 Non-Hazwoper-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state Hazwoper regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-Hazwoper-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

TASKS	CONTROLS
• General heavy equipment work (excavation, grading, etc.)	• Brief on hazards, limits of access, and emergency procedures.
• Waste removal/hauling	• Wear Orange Vests while around heavy equipment. • Post contaminant areas as appropriate (refer to Section 8.2 for details) • Sample and monitor as appropriate (refer to Section 5.0)

1.2 Task Hazard Analysis

(Refer to Section 2 for hazard controls)

POTENTIAL HAZARDS	TASKS							
	Test pit/ excavation	Drilling, geoprobe, and well installation & abandonment	Groundwater monitoring	Surface water and sediment sampling from the shore or water	Hand augering	Surveying	IDW drum sampling and disposal	Observation of loading material for offsite disposal
Flying debris/objects	X	X		X	X		X	X
Noise > 85dBA	X	X						X
Electrical	X	X	X					
Suspended loads	X	X						X
Buried utilities, drums, tanks	X	X			X			
Slip, trip, fall	X	X	X	X	X	X	X	X
Back injury	X	X	X	X	X		X	
Confined space entry								
Trenches / excavations	X							
Visible lightning	X	X	X	X	X	X	X	X
Vehicle traffic								X
Elevated work areas/falls	X			X				
Fires	X	X		X			X	
Entanglement		X			X			
Drilling		X						
Heavy equipment	X	X						X
Working near water				X				
Working from boat								
IDW Drum Sampling							X	

2 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the SSC for clarification.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 6. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records, and be promptly submitted to the HSM.

Project-specific frequency for completing self-assessments: **Weekly**

2.1 Project-Specific Hazards

2.1.1 Arsenic

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met.
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.
- Avoid skin and eye contact with liquid and particulate arsenic or arsenic trichloride.
- Arsenic is considered a "Confirmed Human Carcinogen."
- Arsenic particulates (inorganic metal dust) are odorless. Vapor and gaseous odor varies depending upon specific organic arsenic compound.
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person.

2.1.2 Lead

The following requirements pertain to lead abatement activities:

- Work activities involving cutting, grinding, burning, welding, and other abrasive operations performed on any painted and/or coated surfaces should be treated as having an increased potential for lead exposure.
- Surfaces suspected of containing lead shall be treated as lead unless documentation and/or testing results indicate otherwise.
- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met.
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.
- Do not launder work clothes with ordinary clothes.
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person.

The following requirements pertain to lead contaminated soils:

- Work shall progress in a sequence from less contaminated to more contaminated areas.
- Water should be added to soils prior to and during excavation, air rotary drilling, and other activities that create or have the potential to create airborne lead contaminated dust. For air rotary drilling operations, water can be added to the boring to reduce dust generation from the cyclone. Depending upon soil type, watering of soil may be required several days prior to commencing ground intrusive activities.
- Personnel working in the vicinity of lead contaminated soil shall wear disposable coveralls or equal and exercise enhanced personal hygiene (i.e., frequent hand washing prior to eating, drinking, and smoking; separation of work and street clothing/footwear; etc.).

2.1.4 Radar Hazards

- Airports and all branches of the military use radar of significant power for buildings, towers, aircraft, ships, armor vehicles and installations in general. Radar devices may emit harmful microwave radiation emissions.
- Microwave radiation is absorbed by the body and dissipated in the tissue as heat.
- The penetration ability of the radiation depends on the wavelength. Microwave wavelengths of 25-200 centimeters have the ability to reach the internal organs with potentially damaging effects. Wavelengths less than 25 centimeters are absorbed and dissipated by the skin and the human body is thought to be transparent to microwave wavelengths greater than 200 centimeters.
- The health effects of microwave radiation include deep burns and thermal damage to any organ or organ system with low blood flow, most notably the lenses of the eyes. If adequate time has elapsed between exposures, the repair mechanisms of the lens seems to limit damage.
- Studies have demonstrated that chronic microwave exposure can cause both psychological changes, disrupting task and function control, as well as chronic depression. Further studies suggest a possible relationship between mongolism (Down's Syndrome) in offspring and previous exposure of the male parent to radar, however the study was not conclusive.
- Microwave radiation can not be seen and it's effects can not be felt until serious damage has already occurred.
- Because of the inconclusive effects of microwave radiation, OSHA has set a conservative exposure limit of 10 milliwatt per square centimeter (10 mW/cm^2) averaged over any 6 minute period.
- Warning signs must be posted in areas where potentially damaging microwave radiation exists.
- The prevention method for microwave radiation exposure is to not be in the path of radar or other microwave emitting devices by either ensuring that the device is not operating or ensuring that there is sufficient shielding between you and the microwave source.

2.1.5 Vinyl Chloride

- Do not enter regulated work areas unless training, medical monitoring, and PPE requirements established by the competent person have been met.
- Do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas.
- Vinyl Chloride is considered a "Confirmed Human Carcinogen."
- A Short Term Exposure Limit (STEL: 15 minutes) exists for this material.
- Vinyl Chloride has a mild, sweet, chloroform-like odor.
- Respiratory protection and other exposure controls selection shall be based on the most recent exposure monitoring results obtained from the competent person.

2.1.6 Drilling

(Reference CH2M HILL SOP HS-35, *Drilling*)

- Only authorized personnel are permitted to operate drill rigs.
- Stay clear of areas surrounding drill rigs during every startup.
- Stay clear of the rotating augers and other rotating components of drill rigs.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Do not wear loose-fitting clothing or other items such as rings or watches that could get caught in moving parts. Long hair should have it restrained.
- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
- Smoking around drilling operations is prohibited.
- The Drilling Self-Assessment Safety Checklist has been included for additional reference- Attachment #8.

2.1.7 Excavation

(Reference CH2M HILL SOP HS-32, *Excavations*)

- Do not enter the excavations unless completely necessary, and only after the competent person has completed the daily inspection and has authorized entry.
- Follow all excavation entry requirements established by the competent person.
- Do not enter excavations where protective systems are damaged or unstable.
- Do not enter excavations where objects or structures above the work location may become unstable and fall into the excavation.
- Do not enter excavations with the potential for a hazardous atmosphere until the air has been tested and found to be at safe levels.
- Do not enter excavations with accumulated water unless precautions have been taken to prevent excavation cave-in.
- H&S Self-Assessment Checklist – Excavations, found in Attachment 6 of this plan, should be used to evaluate excavations prior to entry.

2.1.8 Earthmoving Equipment

(Reference CH2M HILL SOP HS-27, *Earthmoving Equipment*)

- Only authorized personnel are permitted to operate earthmoving equipment.
- Maintain safe distance from operating equipment and stay alert of equipment movement. Avoid positioning between fixed objects and operating equipment and equipment pinch points, remain outside of the equipment swing and turning radius. Pay attention to backup alarms, but not rely on them for protection. Never turn your back on operating equipment.
- Approach operating equipment only after receiving the operator's attention. The operator shall acknowledge your presence and stop movement of the equipment. Caution shall be used when standing next to idle equipment; when equipment is placed in gear it can lurch forward or backward. Never approach operating equipment from the side or rear where the operator's vision is compromised.
- When required to work in proximity to operating equipment, wear high-visibility vests to increase visibility to equipment operators. For work performed after daylight hours, vests shall be made of reflective material or include a reflective stripe or panel.
- Do not ride on earthmoving equipment unless it is specifically designed to accommodate passengers. Only ride in seats that are provided for transportation and that are equipped with seat belts.
- Stay as clear as possible of all hoisting operations. Loads shall not be hoisted overhead of personnel.
- Earthmoving equipment shall not be used to lift or lower personnel.
- If equipment becomes electrically energized, personnel shall be instructed not to touch any part of the equipment or attempt to touch any person who may be in contact with the electrical current. The utility company or appropriate party shall be contacted to have line de-energized prior to approaching the equipment.
- H&S Self Assessment Checklist- Earthmoving Equipment, found in Attachment 6 of this plan should be reviewed by staff.

2.1.9 Working over/near water

- Personnel working over or near water, where the danger of drowning exists, must be constantly protected by guardrail systems, safety nets, or personal fall arrest systems. Where fall protection systems are not provided, personnel shall wear life jackets or buoyant work vests.

2.1.10 IDW Drum Sampling

Personnel are permitted to handle and/or sample drums containing investigation-derived waste (IDW) only; handling or sampling other drums requires a plan revision or amendment approved by the CH2M HILL HSM. The following control measures will be taken when sampling drums containing IDW:

- Minimize transportation of drums.
- Sample only labeled drums or drums known to contain IDW.
- Use caution when sampling bulging or swollen drums. Relieve pressure slowly.
- If drums contain, or potentially contain, flammable materials, use non-sparking tools to open.
- Picks, chisels, and firearms may not be used to open drums.

- Reseal bung holes or plugs whenever possible.
- Avoid mixing incompatible drum contents.
- Sample drums without leaning over the drum opening.
- Transfer the content of drums using a method that minimizes contact with material.
- PPE and air monitoring requirements specified in Sections 4 and 5 must address IDW drum sampling.
- Spill-containment procedures specified in Section 7 must be appropriate for the material to be handled.

2.2 General Hazards

2.2.1 General Practices and Housekeeping

(Reference CH2M HILL SOP HS-20, *General Practices*)

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness require enough illumination intensity to read a newspaper without difficulty.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.

2.2.2 Hazard Communication

(Reference CH2M HILL SOP HS-05, *Hazard Communication)*

The SSC is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.
- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

2.2.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods)*

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

2.2.4 Lifting

(Reference CH2M HILL SOP HS-29, *Lifting*)

- Proper lifting techniques must be used when lifting any object.
  - Plan storage and staging to minimize lifting or carrying distances.
  - Split heavy loads into smaller loads.
  - Use mechanical lifting aids whenever possible.

- Have someone assist with the lift -- especially for heavy or awkward loads.
- Make sure the path of travel is clear prior to the lift.

2.2.5 Fire Prevention

(Reference CH2M HILL SOP HS-22, *Fire Prevention*)

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
  - be maintained in a fully charged and operable condition,
  - be visually inspected each month, and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

2.2.6 Heat Stress

(Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SSC/DSC to avoid progression of heat-related illness.

SYMPTOMS AND TREATMENT OF HEAT STRESS

	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool–but not cold–water. Call ambulance, and get medical attention immediately!

Monitoring Heat Stress

These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress.
The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

2.2.7 Cold Stress

(Reference CH2M HILL SOP HS-09, *Heat and Cold Stress*)

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SSC/DSC to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS

	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm–but **not** hot–water. Have victim drink warm fluids, but **not** coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but **not** coffee or alcohol. Get medical attention.

2.2.8 Compressed Gas Cylinders

- Valve caps must be in place when cylinders are transported, moved, or stored.
- Cylinder valves must be closed when cylinders are not being used and when cylinders are being moved.
- Cylinders must be secured in an upright position at all times.
- Cylinders must be shielded from welding and cutting operations and positioned to avoid being struck or knocked over; contacting electrical circuits; or exposed to extreme heat sources.
- Cylinders must be secured on a cradle, basket, or pallet when hoisted; they may not be hoisted by choker slings.

2.2.9 Procedures for Locating Buried Utilities

Local Utility Mark-Out Service

Name: Public Works Center
Phone: 757-444-6414

- Where available, obtain utility diagrams for the facility.
- Review locations of sanitary and storm sewers, electrical conduits, water supply lines, natural gas lines, and fuel tanks and lines.
- Review proposed locations of intrusive work with facility personnel knowledgeable of locations of utilities. Check locations against information from utility mark-out service.
- Where necessary (e.g., uncertainty about utility locations), excavation or drilling of the upper depth interval should be performed manually
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change n advancement of auger or split spoon).
- When the client or other onsite party is responsible for determining the presence and locations of buried utilities, the SSC should confirm that arrangement.

2.2.10 Confined Space Entry

(Reference CH2M HILL SOP HS-17, *Confined Space Entry*)

No confined space entry will be permitted. Confined space entry requires additional health and safety procedures, training, and a permit. If conditions change such that confined-space entry is necessary, contact the HSM to develop the required entry permit.
When planned activities will not include confined-space entry, permit-required confined spaces accessible to CH2M HILL personnel are to be identified before the task begins. The SSC is to confirm that permit spaces are properly posted or that employees are informed of their locations and hazards.

2.3 Biological Hazards and Controls

2.3.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

2.3.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

2.3.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permanone and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for

symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

2.3.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SSC and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

2.3.5 Bloodborne Pathogens

(Reference CH2M HILL SOP HS-36, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-36, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

2.3.6 Other Anticipated Biological Hazards

NONE

2.4 Radiological Hazards and Controls

Refer to CH2M HILL's *Corporate Health and Safety Program, Program and Training Manual,* and *Corporate Health and Safety Program, Radiation Protection Program Manual*, for standards of practice in contaminated areas.

Hazards	Controls
None Known	None Required

2.5 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Arsenic	GW:24.2 SB:80.8 SS:16.9	0.01 mg/m^3	5 Ca	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyperpigmentation	NA
Benzene	GW:0.025 SB:0.043 SS:0.005	1 ppm	500 Ca	Eye, nose, skin, and respiratory irritation; headache; nausea; dermatitis; fatigue; giddiness; staggered gait; bone marrow depression	9.24
2-Butanone (Methyl Ethyl Ketone, MEK)	GW:0.07633 SB:0.06967 SS:	200 ppm	3,000	Eye, skin, and nose irritation; headache; dizziness; vomiting; dermatitis	9.54
Cadmium	GW. SB:39.1 SS:2.8	0.005 mg/m^3	9 Ca	Pulmonary edema, coughing, chest tightness/pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, difficulty breathing, loss of sense of smell, emphysema, mild anemia	NA
Carbon Tetrachloride	GW: SB: SS:	2 ppm	200 Ca	Central nervous system (CNS) depression, nausea, vomiting, eye and skin irritation, liver and kidney injury, drowsiness, dizziness	11.47
Chlordane	GW: SB: SS:	0.5 mg/m^3	100 Ca	Blurred vision, confusion, ataxia, delirium, coughing, abdominal pain, nausea, vomiting, diarrhea, irritability, tremors anuria	UK
Chlorobenzene	GW:0.130 SB: SS:0.151	10 ppm	1,000	Skin, eye, and nose irritation; drowsiness; uncoordination; CNS depression	9.07
Chloroform	GW: SB: SS:	2 ppm	500 Ca	Dizziness, mental dullness, nausea, confusion, disorientation, headache, fatigue, eye and skin irritation, anesthesia, enlarged liver	11.42
Chromium (as Cr(II) & Cr(III))	GW: SB: SS:	0.5 mg/m^3	25	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Chromium (hexavalent)	GW:0.0032 SB:187 SS:22.2	0.01 mg/m^3	15 Ca	Irritated respiratory system, nasal septum perforation, liver and kidney damage, leucytosis, leupen, monocytosis, eosinophilla, eye injury, conjunctivitis, skin ulcer, sensitization dermatitis	NA
Cobalt (Metal, Dusts, and Fumes)	GW: SB:16.4 SS:6.8	0.05 mg/m^3	20	Coughing, difficulty breathing, wheezing, decreased pulmonary function, diffuse nodule fibrosous, dermatitis, respiratory hypersensitivity, asthma	NA
Cresol (all isomers of 2-, 3-, & 4-methylphenol)	GW:2.6 SB:0.64 SS:	5 ppm	250	Eye, skin, and mucous membrane irritant; CNS effects including confusion, depression, and respiratory failure; difficulty breathing; irregular rapid respiration; weak pulse; eye and skin burns; dermatitis; lung, liver, kidney, and pancreas damage	8.98

2.5 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
DDT	GW:0.000018 SB:0.15 SS:0.0049	0.5 mg/m^3	500 Ca	Paresthesia of tongue, lips, hand, and face; tremors; dizziness; confusion; headache; fatigue; convulsion; eye and skin irritation; vomiting	UK
Dibutylphthalate (DBP)	GW: SB: SS:0.53	5 mg/m^3	4,000	Eye, upper respiratory system, and stomach irritant	UK
o-Dichlorobenzene (1,2-Dichlorobenzene)	GW:0.0043 SB: SS:0.269	25 ppm	200	Nose and eye irritation, liver and kidney damage, skin blisters	9.06
p-Dichlorobenzene (1,4-Dichlorobenzene)	GW:0.017 SB: SS:	10 ppm	150 Ca	Headache, eye irritation, nausea, vomiting, swelling periorbital, profus rhinitis, jaundice, cirrhosis	8.98
1,1-Dichloroethane	GW:0.0076 SB: SS:	100 ppm	3,000	CNS depression, skin irritation; liver, kidney, and lung damage	11.06
1,2-Dichloroethane (Ethylene Dichloride)	GW: SB: SS:	1 ppm	50 Ca	CNS depression, nausea, vomiting, dermatitis, eye irritation, liver, kidney, and CNS damage; corneal opacity	11.05
Bis-(2-ethylhexyl)phthalate (DEHP, DOP)	GW:0.0029 SB:9.9 SS:22	5 mg/m^3	5,000 Ca	Eye and mucous membrane irritant	UK
Endosulfan	GW:3.4E-6 SB:0.11 SS:0.0068	0.1 mg/m^3	NL	Irritated skin, nausea, confusion, agitation, flushing, dry mouth, tremor, convulsion, headache	UK
Ethyl Benzene	GW:0.014 SB:0.00605 SS:	100 ppm	800	Eye, skin, and mucous membrane irritation; headache; dermatitis; narcotic; coma	8.76
Lead	GW:0.0132 SB: SS:12000	0.05 mg/m^3	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
Mercury	GW:1E-4 SB:3.1 SS:0.17	0.05 mg/m^3	10	Skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pneumontitis, tremors, insomnia, irritability, indecision, headache, fatigue, weakness, GI disturbance	

2.5 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)
Naphthalene	GW:1.9 SB:51.75 SS:0.55	10 ppm	250	Eye irritation, headache, confusion, excitement, nausea, vomiting, abdominal pain, bladder irritation, profuse sweating, dermatitis, corneal damage, optical neuritis	8.12
PCBs (Limits as Aroclor 1254)	GW: SB: SS:0.59	0.5 mg/m^3	5 Ca	Eye and skin irritation, acne-form dermatitis, liver damage, reproductive effects	UK
PNAs (Limits as Coal Tar Pitch)	GW: SB: SS:	02 mg/m^3	80 Ca	Dermatitis and bronchitis	UK
1,1,2,2-Tetrachloroethane (Tetrachlorethane)	GW: SB: SS:	1 ppm	100 Ca	Nausea, vomiting, abdominal pain, finger tremors, jaundice, hepatitis, liver tenderness, monocytosis, kidney damage, dermatitis	11.10
Tetrachloroethylene (PCE)	GW: SB: SS:0.00225	25 ppm	150 Ca	Eye, nose, and throat irritation; nausea; flushed face and neck; vertigo; dizziness; sleepiness; skin redness; headache; liver damage	9.32
1,1,2-Trichloroethane	GW:2.09E-4 SB: SS:	10 ppm	100 Ca	Eye and nose irritation, CNS depression, liver damage, dermatitis	11.00
Trichloroethylene (TCE)	GW:2.1E-4 SB: SS:	50 ppm	1,000 Ca	Headache, vertigo, visual disturbance, eye and skin irritation, fatigue, giddiness, tremors, sleepiness, nausea, vomiting, dermatitis, cardiac arrhythmia, paresthesia, liver injury	9.45
Toluene	GW:0.048 SB:0.1242 SS:0.007	50 ppm	500	Eye and nose irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, excessive tearing, nervousness, muscle fatigue, paresthesia, dermatitis, liver and kidney damage	8.82
Xylenes	GW:0.086 SB:0.06334 SS:	100 ppm	900	Irritated eyes, skin, nose, and throat; dizziness; excitement; drowsiness; incoherence; staggering gait; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis	8.56
Vinyl Chloride	GW:0.017 SB: SS:	1 ppm	NL Ca	Weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, pallor or cyanosis of extremities	9.99
Vinylidene Chloride (1,1-dichloroethylene)	GW:1.53E-4 SB: SS:	1 ppm	NL Ca	Eye, skin, and throat irritation; dizziness; headache; nausea; difficult breathing; liver and kidney dysfunction; pneumonitis	10.0

2.5 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum[a] Concentration (ppm)	Exposure Limit[b]	IDLH[c]	Symptoms and Effects of Exposure	PIP[d] (eV)

Footnotes:

[a] Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water).

[b] Appropriate value of PEL, REL, or TLV listed.

[c] IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen.

[d] PIP = photoionization potential; NA = Not applicable; UK = Unknown.

2.6 Potential Routes of Exposure

Dermal: Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.	**Inhalation:** Vapors and contaminated particulates. This route of exposure is minimized through proper respiratory protection and monitoring, as specified in Sections 4 and 5, respectively.	**Other:** Inadvertent ingestion of contaminated media. This route should not present a concern if good hygiene practices are followed (e.g., wash hands and face before drinking or smoking).

3 Project Organization and Personnel

3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL SOPs HS-01, *Medical Surveillance,* and HS-02, *Health and Safety Training)*

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated "SSC" have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SSC with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated "FA-CPR" are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least one FA-CPR designated employee must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Pregnant employees are to be informed of and are to follow the procedures in CH2M HILL's SOP HS-04, *Reproduction Protection*, including obtaining a physician's statement of the employee's ability to perform hazardous activities before being assigned fieldwork.

Employee Name	Office	Responsibility	SSC/FA-CPR
Ben Francisco	VBO	Project Manager/ Field Team Leader	Level C, SSC First-Aid/CPR- Current

3.2 Field Team Chain of Command and Communication Procedures

3.2.1 Client

Contact Name: LANTDIV/Winoma Johnson
Phone: 757-322-4587
Facility Contact Name: PWC Coordinator, Randy Sawyer
Phone: 711, then 887-4990

3.2.2 CH2M HILL

Project Manager: Ben Francisco
Health and Safety Manager: John Longo/ NJO
Field Team Leader: Ben Francisco
Site Safety Coordinator: Ben Francisco
The SSC is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

3.2.3 CH2M HILL Subcontractors

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

Drilling Subcontractor: Parratt-Wolff
Subcontractor Contact Name: Robert Stevens
Telephone: 800/627-7920

The subcontractors listed above are covered by this HSP and must be provided a copy of this plan. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to submit these procedures to CH2M HILL for review before the start of field work. Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SSC should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL's oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SSC is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 6 are to be used by the SSC to review subcontractor performance.

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.
- Request subcontractor(s) to brief the project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

3.2.4 Contractors

(Reference CH2M HILL SOP HS-55, *Subcontractor, Contractor, and Owner*)

Contractor: None
Contractor Contact Name:
Telephone:

This plan does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work, and we must never assume such responsibility through our actions (e.g., advising on H&S issues). In addition to this plan, CH2M HILL staff should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Except in unusual situations when conducted by the HSM, CH2M HILL must never comment on or approve contractor safety procedures. Self-assessment checklists contained in Attachment 6 are to be used by the SSC to review the contractor's performance ONLY as it pertains to evaluating our exposure and safety.

Health and safety related communications with contractors should be conducted as follows:

- Request the contractor to brief CH2M HILL employees and subcontractors on the precautions related to the contractor's work.
- When an apparent contractor non-compliance/unsafe condition or practice poses a risk to CH2M HILL employees or subcontractors:
  - Notify the contractor safety representative
  - Request that the contractor determine and implement corrective actions
  - If needed, stop affected CH2M HILL work until contractor corrects the condition or practice. Notify the client, Project Manager, and HSM as appropriate.
- If apparent contractor non-compliance/unsafe conditions or practices are observed, inform the contractor safety representative. Our obligation is limited strictly to informing the contractor of our observation – the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
- If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative. Our obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of our observation – the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

4 Personal Protective Equipment (PPE)

(Reference CH2M HILL SOP HS-07, *Personal Protective Equipment*, HS-08, *Respiratory Protection*)

PPE Specifications [a]

Task	Level	Body	Head	Respirator [b]
General site entry Surveying Observation of material loading for offsite disposal Oversight of remediation and construction	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat [c] Safety glasses Ear protection [d]	None required
Surface water sampling Sediment sampling Surface soil sampling Hand augering Geoprobe boring	Modified D	Work clothes or cotton coveralls **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Safety glasses Ear protection [d]	None required
Groundwater sampling Soil boring Investigation-derived waste (drum) sampling and disposal	Modified D	**Coveralls:** Uncoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Safety glasses Ear protection [d]	None required.
Test pit excavation Tasks requiring upgrade	C	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	APR, full face, MSA Ultratwin or equivalent; with GME-H cartridges or equivalent[e].
Tasks requiring upgrade	B	**Coveralls:** Polycoated Tyvek® **Boots:** Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers **Gloves:** Inner surgical-style nitrile & outer chemical-resistant nitrile gloves.	Hardhat [c] Splash shield [c] Ear protection [d] Spectacle inserts	Positive-pressure demand self-contained breathing apparatus (SCBA); MSA Ultralite, or equivalent.

Reasons for Upgrading or Downgrading Level of Protection

Upgrade[f]	Downgrade
• Request from individual performing tasks. • Change in work tasks that will increase contact or potential contact with hazardous materials. • Occurrence or likely occurrence of gas or vapor emission. • Known or suspected presence of dermal hazards. • Instrument action levels (Section 5) exceeded.	• New information indicating that situation is less hazardous than originally thought. • Change in site conditions that decreases the hazard. • Change in work task that will reduce contact with hazardous materials.

[a] Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

[b] No facial hair that would interfere with respirator fit is permitted.

[c] Hardhat and splash-shield areas are to be determined by the SSC.

[d] Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

[e] Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

[f] Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SSC qualified at that level is present.

5 Air Monitoring/Sampling

(Reference CH2M HILL SOP HS-06, *Air Monitoring)*

5.1 Air Monitoring Specifications

Instrument	Tasks	Action Levels[a]		Frequency [b]	Calibration
FID: OVA model 128 or equivalent	Drilling and subsurface soil sampling, well installation, test pitting, IDW drum sampling	0-5 ppm 5-10 ppm 10> ppm	Level D Level C Stop Work; re-evaluate	Initially and periodically during task	Daily
PID: OVM with 10.6eV lamp or equivalent	Drilling and subsurface soil sampling, well installation, test pitting, IDW drum sampling	0-5 ppm 5-10 ppm 10> ppm	Level D Level C Stop Work; re-evaluate	Initially and periodically during task	Daily
CGI: MSA model 260 or 261 or equivalent	Drilling and subsurface soil sampling, well installation, test pitting, IDW drum sampling	0-10% : 10-25% LEL: >25% LEL:	No explosion hazard Potential explosion hazard Explosion hazard; evacuate or vent	Continuous during advancement of boring or trench	Daily
O_2Meter: MSA model 260 or 261 or equivalent	Drilling and subsurface soil sampling, well installation, test pitting, IDW drum sampling	>25%[c] O_2: 20.9%[c] O_2: <19.5%[c] O_2:	Explosion hazard; evacuate or vent Normal O_2 O_2 deficient; vent or use SCBA	Continuous during advancement of boring or trench	Daily
Dust Monitor: Miniram model PDM-3 or equivalent	Drilling and subsurface soil sampling, well installation, test pitting, IDW drum sampling	$\leq$ 1 mg/m^3 >1 – 3 mg/m^3 > 3 mg/m^3	Level D Level C; implement dust suppression controls Stop Work; re-evaluate	Initially and periodically during tasks	Zero Daily
Nose-Level Monitor [e]:	Test Pit Excavation, Drilling, Observation of loading materials for disposal.	<85 dB(A) 85-120 dB(A) 120 dB(A)	No action required Hearing protection required Stop; re-evaluate	Initially and periodically during task	Daily

[a] Action levels apply to sustained breathing-zone measurements above background.

[b] The exact frequency of monitoring depends on field conditions and is to be determined by the SSC; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

[c] If the measured percent of O_2 is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O_2 action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O_2 action levels are required for confined-space entry (refer to Section 2).

[d] Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.

[e] Noise monitoring and audiometric testing also required.

5.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
PID: OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
PID: MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
PID: TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
FID: OVA	100 ppm methane	3.0 ± 1.5	100 ppm	1.5 lpm reg T-tubing
FID: TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
Dust Monitor: Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m^3 in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
CGI: MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL ± 5% LEL	1.5 lpm reg direct tubing

5.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

Method Description

Additional air sampling is not necessary at this time. If conditions change, contact the HSM.

Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to:

HSM: **John Longo/NJO**
Other: **Lisa Martin/COR**

6 Decontamination

(Reference CH2M HILL SOP HS-13, *Decontamination*)

The SSC must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SSC. The SSC must ensure that procedures are established for disposing of materials generated on the site.

6.1 Decontamination Specifications

Personnel

- Boot wash/rinse
- Glove wash/rinse
- Outer-glove removal
- Body-suit removal
- Inner-glove removal
- Respirator removal
- Hand wash/rinse
- Face wash/rinse
- Shower ASAP
- Dispose of PPE in municipal trash, or contain for disposal
- Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal

Sample Equipment

- Wash/rinse equipment
- Solvent-rinse equipment
- Contain solvent waste for offsite disposal

Heavy Equipment

- Power wash
- Steam clean
- Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal

6.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SSC should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 6-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SSC to accommodate task-specific requirements.

7 Spill-Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

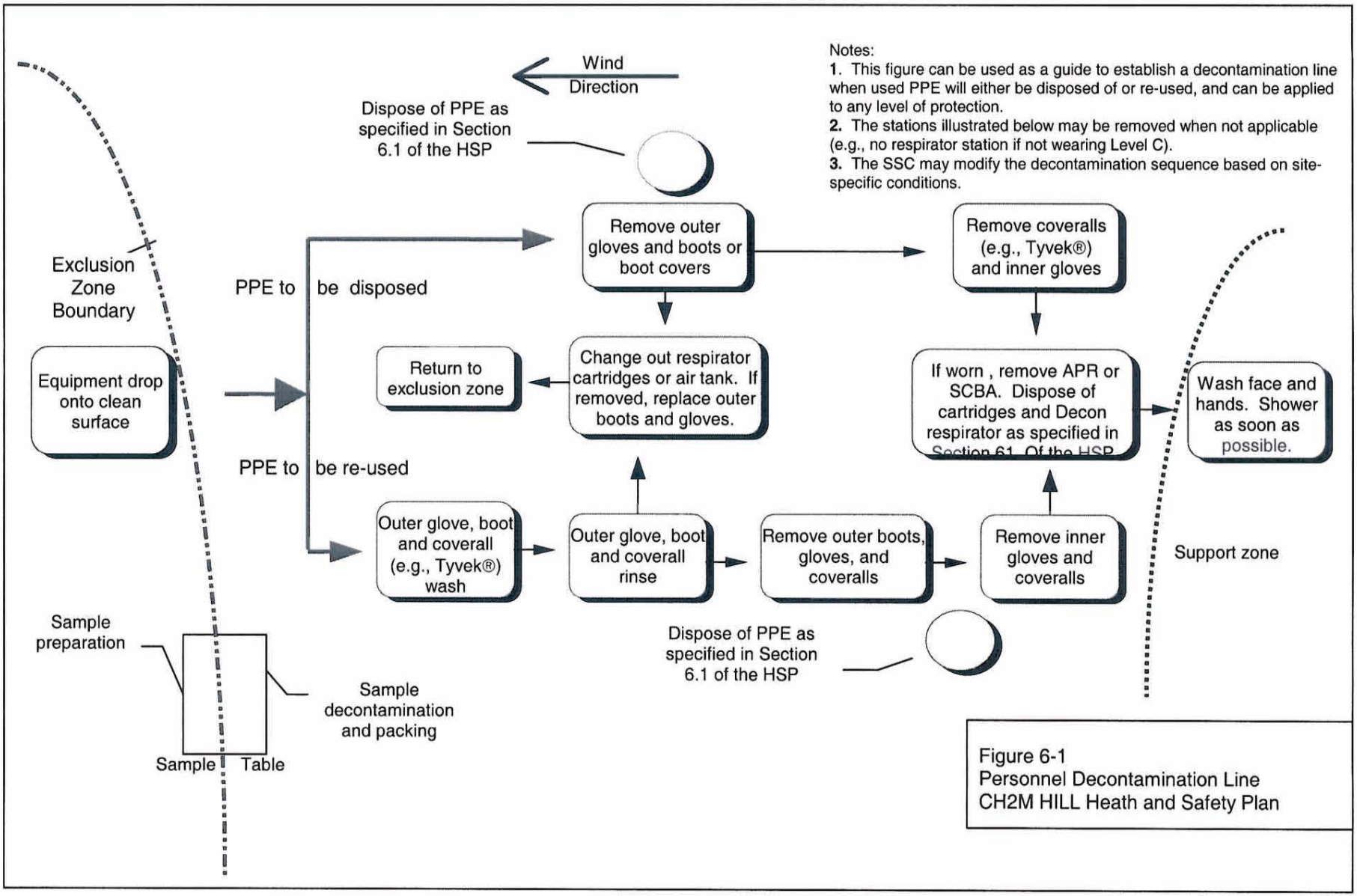


Figure 6-1
Personnel Decontamination Line
CH2M HILL Heath and Safety Plan

8 Site-Control Plan

8.1 Site-Control Procedures

(Reference CH2M HILL SOP HS-11, *Site Control)*

- The SSC will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SSC records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location in accordance with CH2M HILL SOP HS-71, *OSHA Postings*.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the "buddy system."
- Initial air monitoring is conducted by the SSC in appropriate level of protection.
- The SCC is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

8.2 Hazwoper Compliance Plan

(Reference CH2M HILL SOP HS-19, *Site-Specific Written Safety Plans)*

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks (Section 1.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section 1.1.2 do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 2.5 and 5.3 for contaminant data and air sampling requirements, respectively.
- When non-Hazwoper-trained personnel are at risk of exposure, the SSC must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations
  - limitations of their access
  - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hour of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

9 Emergency Response Plan

(Reference CH2M HILL, SOP HS-12, *Emergency Response*)

9.1 Pre-Emergency Planning

The SSC performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post "Exit" signs above exit doors, and post "Fire Extinguisher" signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.

The SSC will evaluate emergency response actions and initiate appropriate follow-up actions.

9.2 Emergency Equipment and Supplies

The SSC should mark the locations of emergency equipment on the site map and post the map.

Emergency Equipment and Supplies	Location
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye Wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle
Additional equipment (specify):	

9.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Notify appropriate response personnel.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

9.4 Emergency Medical Treatment

The procedures listed below may also be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities listed in Section 9.8 (e.g., 911).
- The SCC will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 9.7.

9.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SSC before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SSC and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The SSC will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The SSC will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

9.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

9.7 Incident Notification and Reporting

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CH2M HILL work-related injuries or illnesses, contact and help Human Resources administrator complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.
- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form and submit to the HSM.
- Notify and submit reports to client as required in contract.

10 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

10.1 Original Plan

Written By: Ben Francisco **Date: 07/09/2001**

Approved By: Steve Beck **Date: 7/14/2001**

Co- Approval: Lisa D. Martin **Date: 07/16/2001**

10.2 Revisions

Revisions Made By: **Date:**

Revisions to Plan:

Revisions Approved By: **Date:**

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11 Attachments

Attachment 1: **Employee Signoff Form – Field Safety Instructions**
Attachment 2: **Project-Specific Chemical Product Hazard Communication Form**
Attachment 3: **Chemical-Specific Training Form**
Attachment 4: **Emergency Contacts**
Attachment 5: **Project H&S Forms/Permits**
Attachment 6: **Project Activity Self-Assessment Checklists**
Attachment 7: **Applicable Material Safety Data Sheets**

CH2MHILL

EMPLOYEE SIGNOFF FORM

Health and Safety Plan

- The CH2M HILL project employees and subcontractors listed below have been provided with a copy of this HSP, have read and understood it, and agree to abide by its provisions.

Project Name: SWMU 14 Additional Remedial Investigation/ Naval Station Norfolk **Project Number:** 154408

EMPLOYEE NAME (Please print)	EMPLOYEE SIGNATURE	COMPANY	DATE

CH2MHILL

Project-Specific Chemical Product Hazard Communication Form

This form must be completed prior to performing activities that expose personnel to hazardous chemicals products. Upon completion of this form, the SSC shall verify that training is provided on the hazards associated with these chemicals and the control measures to be used to prevent exposure to CH2M HILL and subcontractor personnel. Labeling and MSDS systems will also be explained.

Project Name: SWMU 14 Additional Remedial Investigation/ Naval Station Norfolk **Project Number:** 154408

MSDSs will be maintained at the following location(s):

Hazardous Chemical Products Inventory

Chemical	Quantity	Location	MSDS Available	Container labels	
				Identity	Hazard
Methane	1 liter, compressed	Support Zone			
Isobutylene	1 liter, compressed	Support Zone			
Pentane	1 liter, compressed	Support Zone			
Hydrochloric acid	< 500 ml	Support Zone / sample bottles			
Nitric acid	< 500 ml	Support Zone / sample bottles			
Sulfuric Acid	< 500 ml	Support Zone / sample bottles			
Sodium hydroxide	< 500 ml	Support Zone / sample bottles			
Methanol	< 1 Gallon	Support/Decon Zones			
Hexane	< 1 Gallon	Support/Decon Zones			
pH buffers	< 500 ml	Support Zone			
MSA Sanitizer	< 1 liter	Support/Decon Zones			
Alconox/Liquinox	< 1liter	Support/Decon Zones			

Refer to SOP HS-05 *Hazard Communication* for more detailed information.

CH2MHILL

CHEMICAL-SPECIFIC TRAINING FORM

Location:	Project # : 154408
HCC:	Trainer:

TRAINING PARTICIPANTS:

NAME	SIGNATURE	NAME	SIGNATURE

REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:

The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

☐ Physical and health hazards

☐ Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)

☐ Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL's written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

Emergency Contacts

24-hour CH2M HILL Emergency Beeper – 888/444-1226

Medical Emergency – 911

Fire/Spill Emergency – 911

Security & Police – 911

Utilities Emergency
Water: 757-444-6414 (Public Works Center)
Gas: 757-444-6414 (Public Works Center)
Electric: 757-444-6414 (Public Works Center)

Designated Safety Coordinator (DSC)
Name: Ben Francisco
Phone: 757-460-3734 x 20

Project Manager
Name: Ben Francisco
Phone: 757-460-3734 x 20

Federal Express Dangerous Goods Shipping
Phone: 800/238-5355

CH2M HILL Emergency Number for Shipping Dangerous Goods
Phone: 800/255-3924

CH2M HILL Medical Consultant
Dr. Peter Greaney
GMG WorkCare, Orange, CA
800/455-6155
(After hours calls will be returned within 20 minutes)

Local Occupational Physician
I & O Medical Center-Hampton
530 Aberdeen Rd., #4302
Hampton, VA 23661
757-825-1100

Corporate Director Health and Safety
Name: Mollie Netherland/SEA
Phone: 206/453-5005
24-hour emergency beeper: 888-444-1226

Health and Safety Manager (HSM)
Name: John Longo/NJO
Phone: 973-316-0159 x 4543

Regional Human Resources Department
Name: Shannon Loos/MKE
Phone: 414-272-1052 x 265

Corporate Human Resources Department
Name: John Monark/COR
Phone: 303/771-0900

Worker's Compensation and Auto Claims
Sterling Administration Services
Phone: 800/420-8926 After hours: 800/497-4566

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

Facility Alarms: None

Evacuation Assembly Area(s): To be determined prior to site activities.

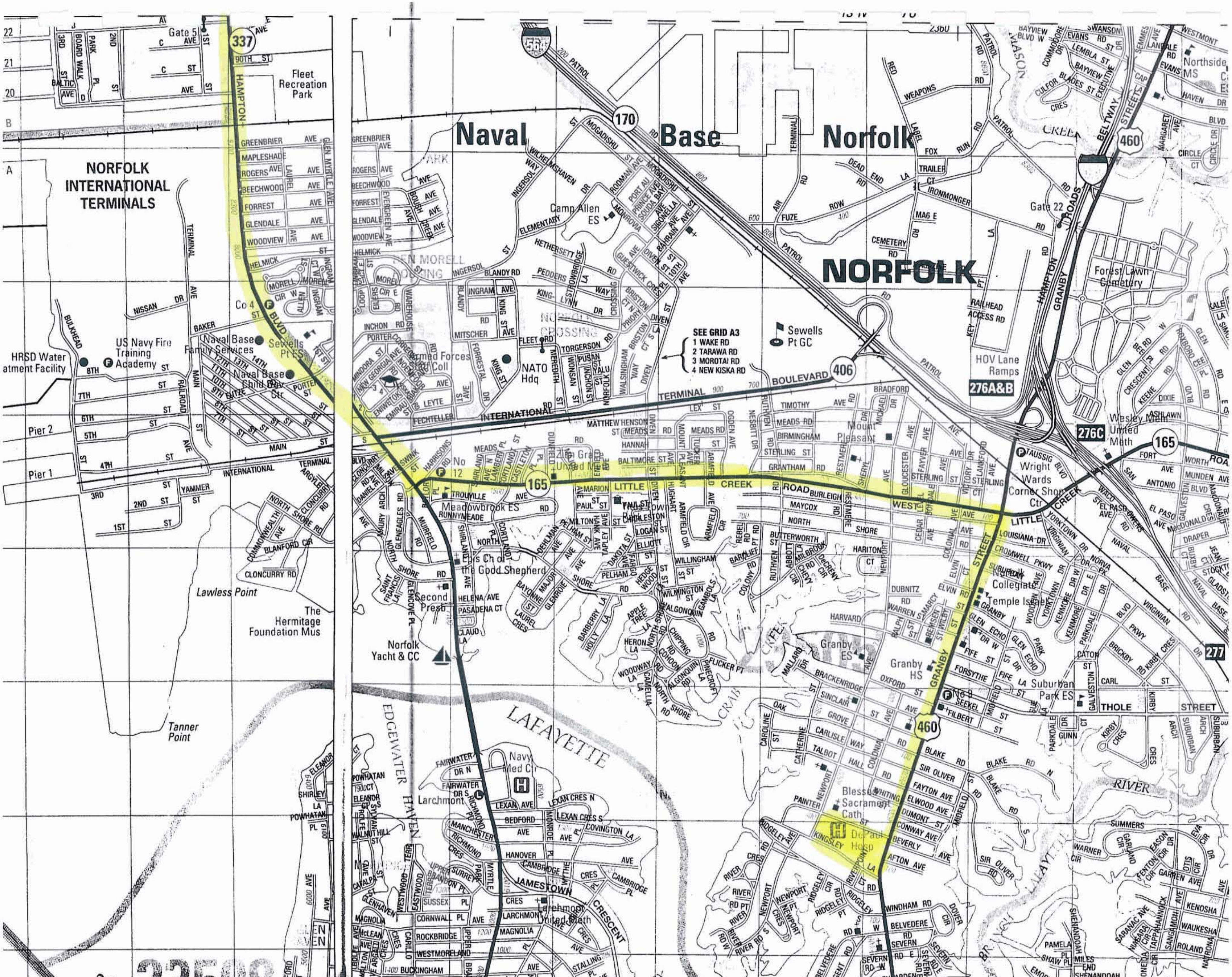
Facility/Site Evacuation Route(s): To be determined prior to site activities.

Hospital Name/Address: DePaul Medical Center
150 Kingsley Ln, Norfolk

Hospital Phone #: 757-889-5000

Directions to Hospital

Include written directions here, and attach or post a highlighted map if needed. See attached map.



Naval Base Norfolk
NORFOLK
NORFOLK INTERNATIONAL TERMINALS
Fleet Recreation Park
HAMPTON BLVD
INTERNATIONAL TERMINAL BOULEVARD
LITTLE CREEK ROAD
GRANBY STREET
HAMPTON ROADS BELTWAY
Camp Allen ES
Sewells Pt GC
SEE GRID A3
1 WAKE RD
2 TARAWA RD
3 MOROTAI RD
4 NEW KISKA RD
NATO Hdq
Armed Forces Staff Coll
Naval Base Family Services
US Navy Fire Training Academy
HRSD Water Treatment Facility
Sewells Pt ES
Naval Base Child Dev Ctr
Pier 1
Pier 2
Meadowbrook ES
Epis Ch of the Good Shepherd
Second Presb
Lawless Point
The Hermitage Foundation Mus
Norfolk Yacht & CC
Tanner Point
Mount Pleasant
Zion Grace United Meth
Wesley Mem United Meth
Wright Wards Corner Shop Ctr
Forest Lawn Cemetery
HOV Lane Ramps
276A&B
276C
277
Norfolk Collegiate
Temple Israel
Granby ES
Granby HS
Suburban Park ES
Blessed Sacrament Cath
DePaul Hosp
Navy Med Ctr
Larchmont
Larchmont United Meth
LAFAYETTE RIVER
EDGEWATER HAVEN
THOLE STREET
Northside MS

Project H&S Forms and Permits

Attachment 6

Project Activity Self-Assessment Checklists

CH2MHILL

H&S Self-Assessment Checklist - DRILLING

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to hazards associated with drilling operations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of a drilling subcontractor is required (complete entire checklist).

SSC/DSC may consult with drilling subcontractors when completing this checklist, but shall not direct the means and methods of drilling operations nor direct the details of corrective actions. Drilling subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the health and safety manager for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to drilling hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with drilling H&S requirements
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the drilling subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-35.

SECTION 1	Yes	No	N/A	N/O
PERSONNEL SAFE WORK PRACTICES (3.1)				
1. Only authorized personnel operating drill rig	☐	☐	☐	☐
2. Personnel cleared during rig startup	☐	☐	☐	☐
3. Personnel clear of rotating parts	☐	☐	☐	☐
4. Personnel not positioned under hoisted loads	☐	☐	☐	☐
5. Loose clothing and jewelry removed	☐	☐	☐	☐
6. Personnel instructed not to approach equipment that has become electrically energized	☐	☐	☐	☐
7. Smoking is prohibited around drilling operation	☐	☐	☐	☐
8. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (3.2.1)				
9. Daily safety briefing/meeting conducted with crew	☐	☐	☐	☐
10. Daily inspection of drill rig and equipment conducted before use	☐	☐	☐	☐
DRILL RIG PLACEMENT (3.2.2)				
11. Location of underground utilities identified	☐	☐	☐	☐
12. Safe clearance distance maintained from overhead powerlines	☐	☐	☐	☐
13. Drilling pad established, when necessary	☐	☐	☐	☐
14. Drill rig leveled and stabilized	☐	☐	☐	☐
DRILL RIG TRAVEL (3.2.3)				
15. Rig shut down and mast lowered and secured prior to rig movement	☐	☐	☐	☐
16. Tools and equipment secured prior to rig movement	☐	☐	☐	☐
17. Only personnel seated in cab are riding on rig during movement	☐	☐	☐	☐
18. Safe clearance distance maintained while traveling under overhead powerlines	☐	☐	☐	☐
19. Backup alarm or spotter used when backing rig	☐	☐	☐	☐
DRILL RIG OPERATION (3.2.4)				
20. Kill switch clearly identified and operational	☐	☐	☐	☐
21. All machine guards are in place	☐	☐	☐	☐
22. Rig ropes not wrapped around body parts	☐	☐	☐	☐
23. Pressurized lines and hoses secured from whipping hazards	☐	☐	☐	☐
24. Drill operation stopped during inclement weather	☐	☐	☐	☐
25. Air monitoring conducted per HSP/FSI for hazardous atmospheres	☐	☐	☐	☐
26. Rig placed in neutral when operator not at controls	☐	☐	☐	☐
DRILL RIG MAINTENANCE (3.2.5)				
27. Defective components repaired immediately	☐	☐	☐	☐
28. Lockout/tagout procedures used prior to maintenance	☐	☐	☐	☐
29. Cathead in clean, sound condition	☐	☐	☐	☐
30. Drill rig ropes in clean, sound condition	☐	☐	☐	☐
31. Fall protection used for fall exposures of 6 feet or greater	☐	☐	☐	☐
32. Rig in neutral and augers stopped rotating before cleaning	☐	☐	☐	☐
33. Good housekeeping maintained on and around rig	☐	☐	☐	☐
DRILLING AT HAZARDOUS WASTE SITES (3.2.6)				
34. Waste disposed of according to HSP	☐	☐	☐	☐
35. Appropriate decontamination procedures being followed, per HSP	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

CH2MHILL

H&S Self-Assessment Checklist - EXCAVATIONS

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees enter excavations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of an excavation subcontractor is required (complete entire checklist).

SSC/DSC may consult with excavation subcontractors when completing this checklist, but shall not direct the means and methods of excavation operations nor direct the details of corrective actions. Excavation subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the health and safety manager for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to excavation hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with excavation H&S requirements
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the excavation subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-32.

SECTION 1	Yes	No	N/A	N/O
PERSONNEL SAFE WORK PRACTICES (3.1)				
1. Competent person has completed daily inspection and has authorized entry	☐	☐	☐	☐
2. Personnel aware of entry requirements established by competent person	☐	☐	☐	☐
3. Protective systems are free from damage and in stable condition	☐	☐	☐	☐
4. Surface objects/structures secured from falling into excavation	☐	☐	☐	☐
5. Potential hazardous atmospheres have been tested and found to be at safe levels	☐	☐	☐	☐
6. Precautions have been taken to prevent cave-in from water accumulation in the excavation	☐	☐	☐	☐
7. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (3.2.1)				
8. Daily safety briefing/meeting conducted with personnel	☐	☐	☐	☐
9. Excavation and protective systems adequately inspected by competent person	☐	☐	☐	☐
10. Defective protective systems or other unsafe conditions corrected before entry	☐	☐	☐	☐
11. Guardrails provided on walkways over excavation 6' or deeper	☐	☐	☐	☐
12. Barriers provided at excavations 6' or deeper when not readily visible	☐	☐	☐	☐
13. Barriers or covers provided for wells, pits, shafts, or similar excavation 6' or deeper	☐	☐	☐	☐
14. Excavating equipment operated safely (use earthmoving equipment checklist in HS-27)	☐	☐	☐	☐
PRIOR TO EXCAVATING (3.2.2)				
15. Location of underground utilities and installations identified	☐	☐	☐	☐
EXCAVATING ACTIVITIES (3.2.3)				
16. Rocks, trees, and other unstable surface objects removed or supported	☐	☐	☐	☐
17. Exposed underground utility lines supported	☐	☐	☐	☐
18. Undermined surface structures supported or determined to be in safe condition	☐	☐	☐	☐
19. Warning system used to remind equipment operators of excavation edge	☐	☐	☐	☐
EXCAVATION ENTRY (3.2.4)				
20. Trenches > 4' deep provided with safe means of egress within 25'	☐	☐	☐	☐
21. Structure ramps designed and approved by competent person	☐	☐	☐	☐
22. Potential hazardous atmospheres tested prior to entry	☐	☐	☐	☐
23. Rescue equipment provided where potential for hazardous atmospheres exists	☐	☐	☐	☐
24. Ventilation used to control hazardous atmospheres and air tested frequently	☐	☐	☐	☐
25. Appropriate respiratory protection used when ventilation does not control hazards	☐	☐	☐	☐
26. Precautions taken to prevent cave-in from water accumulation in the excavation	☐	☐	☐	☐
27. Precautions taken to prevent surface water from entering excavation	☐	☐	☐	☐
28. Protection provided from falling/rolling material from excavation face	☐	☐	☐	☐
29. Spoil piles, equipment, materials restrained or kept at least 2' from excavation edge	☐	☐	☐	☐
EXCAVATION PROTECTIVE SYSTEMS (3.2.5)				
30. Protective systems used for excavations 5' or deeper	☐	☐	☐	☐
31. Protective systems for excavation deeper than 20' designed by registered PE	☐	☐	☐	☐
32. If soil unclassified, maximum allowable slope is 34 degrees	☐	☐	☐	☐
33. Protective systems free from damage	☐	☐	☐	☐
34. Protective system used according to manufacturer recommendations and not subjected to loads exceeding design limits	☐	☐	☐	☐
35. Protective system components securely connected to prevent movement or failure	☐	☐	☐	☐
36. Cave-in protection provided while entering/exiting shielding systems	☐	☐	☐	☐
37. Personnel removed from shielding systems when installed, removed, or vertical movement	☐	☐	☐	☐
PROTECTIVE SYSTEM REMOVAL (3.2.6)				
38. Protective system removal starts and progresses from excavation bottom	☐	☐	☐	☐
39. Protective systems removed slowly and cautiously	☐	☐	☐	☐
40. Temporary structure supports used if failure of remaining components observed	☐	☐	☐	☐
41. Backfilling taking place immediately after protective system removal	☐	☐	☐	☐
EXCAVATING AT HAZARDOUS WASTE SITES (3.2.7)				
42. Waste disposed of according to HSP	☐	☐	☐	☐
43. Appropriate decontamination procedures being followed, per HSP	☐	☐	☐	☐

<u>SECTION 3</u>

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

CH2MHILL

H&S Self-Assessment Checklist - EARTHMOVING EQUIPMENT

This checklist shall be used by CH2M HILL personnel **only** and shall be completed at the frequency specified in the project's HSP/FSI.

This checklist is to be used at locations where: 1) CH2M HILL employees are potentially exposed to hazards associated with earthmoving equipment operations (complete Sections 1 and 3), and/or 2) CH2M HILL oversight of a earthmoving equipment subcontractor is required (complete entire checklist).

SSC/DSC may consult with earthmoving equipment subcontractors when completing this checklist, but shall not direct the means and methods of equipment operations nor direct the details of corrective actions. Earthmoving equipment subcontractors shall determine how to correct deficiencies and we must carefully rely on their expertise. Items considered to be imminently dangerous (possibility of serious injury or death) shall be corrected immediately or all exposed personnel shall be removed from the hazard until corrected.

Completed checklists shall be sent to the health and safety manager for review.

Project Name: _____ Project No.: _____

Location: _____ PM: _____

Auditor: _____ Title: _____ Date: _____

This specific checklist has been completed to:

☐ Evaluate CH2M HILL employee exposures to earthmoving equipment hazards
☐ Evaluate a CH2M HILL subcontractor's compliance with earthmoving equipment H&S requirements
Subcontractors Name: _____

- Check "Yes" if an assessment item is complete/correct.
- Check "No" if an item is incomplete/deficient. Deficiencies shall be brought to the immediate attention of the earthmoving equipment subcontractor. Section 3 must be completed for all items checked "No."
- Check "N/A" if an item is not applicable.
- Check "N/O" if an item is applicable but was not observed during the assessment.

Numbers in parentheses indicate where a description of this assessment item can be found in Standard of Practice HS-27.

SECTION 1	Yes	No	N/A	N/O
PERSONNEL SAFE WORK PRACTICES (3.1)				
1. Only authorized personnel operating earthmoving equipment	☐	☐	☐	☐
2. Personnel maintaining safe distance from operating equipment	☐	☐	☐	☐
3. Personnel and equipment operator in close communication when personnel must be in proximity of operating equipment	☐	☐	☐	☐
4. Personnel approach operating equipment safely	☐	☐	☐	☐
5. Personnel wearing high-visibility and/or reflective vests when close to operating equipment	☐	☐	☐	☐
6. Personnel riding only in seats of equipment cab and using seat belts	☐	☐	☐	☐
7. Personnel not positioned under hoisted loads	☐	☐	☐	☐
8. Personnel not hoisted by equipment	☐	☐	☐	☐
9. Personnel instructed not to approach equipment that has become electrically energized	☐	☐	☐	☐
10. Personnel wearing appropriate PPE, per HSP/FSI	☐	☐	☐	☐

SECTION 2	Yes	No	N/A	N/O
GENERAL (3.2.1)				
11. Daily safety briefing/meeting conducted with crew	☐	☐	☐	☐
12. Daily inspection of equipment and equipment accessories conducted before use	☐	☐	☐	☐
13. At least one fire extinguisher available at the equipment operating area	☐	☐	☐	☐
EARTHMOVING EQUIPMENT COMPONENTS (3.2.2)				
14. Backup alarm or spotter used when backing equipment	☐	☐	☐	☐
15. Operational horn provided on bi-directional equipment	☐	☐	☐	☐
16. Seat belts are provided and used	☐	☐	☐	☐
17. Rollover protective structures (ROPS) provided	☐	☐	☐	☐
18. Braking system capable of stopping full payload	☐	☐	☐	☐
19. Headlights and taillights operable when additional light required	☐	☐	☐	☐
20. Brake lights in operable condition	☐	☐	☐	☐
21. Cab glass provides no visible distortion to the operator	☐	☐	☐	☐
22. Hauling equipment (dump trucks) provided with cab shield or canopy	☐	☐	☐	☐
23. Dump truck beds provided with positive means of support during maintenance or inspection	☐	☐	☐	☐
24. Dump truck operating levers provided with latch to prevent accidental dumping	☐	☐	☐	☐
EARTHMOVING EQUIPMENT PLACEMENT (3.2.3)				
25. Location of underground utilities identified	☐	☐	☐	☐
26. Safe clearance distance maintained while working under overhead powerlines	☐	☐	☐	☐
27. Safe distance is maintained while traveling under powerlines	☐	☐	☐	☐
28. Unattended equipment visibly marked at night	☐	☐	☐	☐
29. Parking brake set when equipment parked and equipment chocked when parked on incline	☐	☐	☐	☐
EARTHMOVING EQUIPMENT OPERATION (3.2.4)				
30. Equipment operated on safe roadways and grades	☐	☐	☐	☐
31. Equipment operated at safe speed	☐	☐	☐	☐
32. Equipment not operated during inclement weather, lightning storms	☐	☐	☐	☐
33. Using equipment to lift loads, other than earth, done according to equipment manufacturer specifications	☐	☐	☐	☐
34. Lifting and hauling capacities are not exceeded	☐	☐	☐	☐
35. Equipment components lowered when not in use	☐	☐	☐	☐
36. All machine guards are in place	☐	☐	☐	☐
37. Air monitoring conducted per HSP/FSI for hazardous atmospheres	☐	☐	☐	☐
EARTHMOVING EQUIPMENT MAINTENANCE (3.2.5)				
38. Defective components repaired immediately	☐	☐	☐	☐
39. Suspended equipment or equipment parts are supported prior to work under or between	☐	☐	☐	☐
40. Lockout/tagout procedures used prior to maintenance	☐	☐	☐	☐
41. Tires on split rims removed using safety tire rack or cage	☐	☐	☐	☐
42. Good housekeeping maintained on and around equipment	☐	☐	☐	☐
EXCAVATING AT HAZARDOUS WASTE SITES (3.2.6)				
43. Waste disposed of according to HSP	☐	☐	☐	☐
44. Appropriate decontamination procedures being followed, per HSP	☐	☐	☐	☐

SECTION 3

Complete this section for all items checked "No" in Sections 1 or 2. Deficient items must be corrected in a timely manner.

Item #	Corrective Action Planned/Taken	Date Corrected

CH2M HILL HEALTH AND SAFETY PLAN

Attachment 7

Applicable Material Safety Data Sheets