PROPOSED PLAN OF REMEDIAL ACTION

9 Vandever Avenue/Delaware Job Corps
Wilmington, DE

DNREC Project No. DE 1241

April 2002

Delaware Department of Natural Resources and Environmental Control
Division of Air and Waste Management
Site Investigation & Restoration Branch
391 Lukens Drive
New Castle, Delaware 19720

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1.0. INTRODUCTION

The 9 Vandever Avenue/Delaware Job Corps site (site) is located on the northeast corner of Vandever Avenue and Buena Vista Street in Wilmington, Delaware. The site is bordered on the south by Vandever Avenue and on the north by 22nd Street. The 2.21-acre site is currently vacant with the sole structure on the site being a boiler chimney. The State of Delaware, Department of Administrative Services, the owner of the site, wanted to obtain a certification of completion, therefore, they entered into the Department of Natural Resources and Environmental Control (DNREC) Voluntary Cleanup Program (VCP) under the provisions of the Delaware Hazardous Substance Cleanup Act, 7 Del. C. Chapter 91 (HSCA). Through a VCP Agreement, the owner agreed to investigate the potential risks posed to the public health, welfare, and the environment at the site. The owner contracted EA Engineering, Science, Technology, Inc. (EA) to perform a Remedial Investigation (RI) and Feasibility Study (FS) of the site.

The purpose of the RI and FS was to: 1) collect additional information from the site to refine site knowledge from previous investigations; 2) delineate and determine the extent of potential contamination, and its possible migration and environmental impacts; and 3) determine the level of risk posed by the contaminants, and based upon this analysis, evaluate remedial alternatives.

This document is DNREC's proposed plan of remedial action (proposed plan") for the site. It is based on the results of the previous investigations performed at the site. This proposed plan is issued under the provisions of the HSCA and the Regulations Governing Hazardous Substance Cleanup ("Regulations"). It presents the Department's assessment of the potential health and environmental risks posed by the site.

As described in Section 12 of the Regulations, DNREC will provide notice to the public and an opportunity for the public to comment on the proposed plan. At the comment period's conclusion, DNREC will review and consider all of the comments received and then DNREC will issue a final plan of remedial action (final plan). The final plan will designate the selected remedy for the site. All previous investigations of the site, the proposed plan, the comments received from the public, DNREC responses to those comments, and the final plan will constitute the Remedial Decision Record for the site.

Section 2 presents a summary of the site description and history. Section 3 provides a description of the remedial investigation results. Section 4 presents a discussion of the remedial action objectives. Section 5 presents the proposed plan of remedial action. Section 6 discusses public participation requirements.

2.0. SITE DESCRIPTION AND HISTORY

2.1 Site Setting

The site is located on the northeast corner of Vandever Avenue and Buena Vista Street in Wilmington, Delaware (Figures 1 & 2). The site is bordered on the south by Vandever Avenue and on the north by 22nd Street. The site consists of 2.21 acres of land (New Castle County tax parcel number 2602230409). The site is currently vacant with the sole structure on the site being a boiler chimney.

The surrounding land use is densely commercial and residential. The State of Delaware and the United States Department of Labor are in the process of constructing a non-residential Job Corps Center with a recreational facility on the subject property. The proposed Job Corps Center will include a building, a fenced in basketball court, a childcare center with a playground, parking lots, and landscaped areas.

2.2 Site and Project History

Qore Property Sciences, through a review of historical aerial photographs, United States Geologic Survey topographic maps, historical Sanborn fire insurance maps and city directories, investigated the historical use of the site. The documentation shows that the site was a textile mill and clothing manufacturing plant from the 1880s through the 1990s. The historical uses of this area of Wilmington were leather works, shipbuilding, lumberyards, coal companies, and carriage works.

The Department of Administrative Services of the State of Delaware acquired the property in March 1999 and entered into a VCP Agreement in November 2001 with DNREC to perform a RI. The objectives of the RI were to evaluate potential risks to human health, welfare and the environment posed by the site.

3.0 INVESTIGATION RESULTS

Previous investigations were conducted at the site in 1999 and in 2000. Qore Property Sciences conducted an Environmental Site Assessment (ESA) of the site including a Phase I ESA in April 1999. Batta Environmental Associates, Inc. conducted a Tier 1 Investigation (Tier 1) of the site in October 2000 and removed an underground storage tank in July 2000. Duffield Associates, Inc. conducted a Geotechnical Evaluation (GE) of the site in March 2000.

The Tier 1 and the GE provided some insight into the types and levels of contaminants that are present on the site and confirmed that the site consists of fill material intermixed with sand and clay. The fill material contains red crushed brick, gravel, cinders, ash, slag, concrete, and other materials. During the investigations, it was determined that the fill material was present from 0 to 15 feet below grade with an average thickness of 8.5 feet. EA conducted a Facility Evaluation (FE) in May 2001 and the RI at the site in December of 2001.

During the FE, EA collected twenty soil samples from ten soil boring locations with groundwater samples collected at three of those locations. During the RI in December 2001, EA installed eight temporary monitor wells and collected three additional ground-water samples to determine the groundwater flow direction at the site.

The samples were analyzed for contaminants listed on the Target Analyte List (TAL) and the Target Compound List (TCL). The analytical results were first compared to the DNREC Uniform-Risk Based Remediation Standards (URS) in a non-critical water resource area, using the unrestricted use (i.e., residential use) risk scenario as a screen in order to determine potential contaminants of concern (COCs). Those chemicals whose concentrations exceeded the unrestricted use URS were selected as COCs and included in a human health risk assessment and ecological risk assessment screening.

<u>Soil Results</u>

There were no volatile organic compounds (VOCs), pesticides, or polychlorinated biphenyls (PCBs) detected above the unrestricted use URS values in any of the surficial soil samples, which were taken between 6 inches and 2 feet below ground surface (bgs), or any of the subsurface soil samples, which were taken between 6 feet and 20 feet bgs, at any of the ten soil boring locations.

However, two surficial and three subsurface soil samples from five of the RI soil boring locations contained one or more polynuclear aromatic hydrocarbons (PAHs) at concentrations exceeding their respective unrestricted and/or restricted use (i.e., commercial use) URS values. Table 1 contains the summary of the soil analytical data for semivolatile organic compounds (SVOCs) including the PAHs, the restricted and unrestricted use URS values for the analytes, and highlights the concentrations of analytes from samples that exceeded either or both URS value.

Benzo(a)pyrene was the only PAH that exceeded both the unrestricted use URS value of 0.09 mg/kg as well as the restricted use URS value of 0.80 mg/kg at all five soil boring locations with concentrations ranging up to 19 mg/kg.

All of the other PAHs detected in surficial soil samples at concentrations in exceedance of their respective restricted and unrestricted URS values were found in soil boring SB-1, which is located in the vicinity of the boiler chimney. Those PAHs included benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Those same four PAHs were also detected above their unrestricted use URS values in soil boring locations SB-3, SB-8 and SB-9.

Two surficial and two subsurface soil samples from four of the RI soil boring locations contained one or more TAL metals at concentrations in exceedance of their respective restricted and unrestricted use URS values. Table 2 contains the summary of the soil analytical data for TAL metals, the restricted and unrestricted use URS values for the analytes, and highlights the concentrations of analytes from samples that exceeded either or both URS values.

Arsenic was the only metal that exceeded both its restricted use URS value of 0.4 mg/kg and its unrestricted use URS value of 4 mg/kg with a concentration of 63.8 mg/kg. This exceedance was reported from soil boring location SB-8, which is also located in the vicinity of the boiler chimney.

The other metals detected in soil samples above their unrestricted use URS values were aluminum, antimony, iron, and vanadium. They were reported in soil boring locations SB-1, SB-2 and SB-8.

Groundwater Results

The results of the RI identified several VOCs, SVOCs, and metals at concentrations exceeding the respective groundwater URS values from the eight groundwater samples taken during the FE and RI at the site.

Seven of the samples contained VOCs, which exceeded the URS for groundwater. For example, 1,1-dichloroethene was detected in four samples at concentrations up to 12 micrograms per liter (μg/L) that exceed the groundwater URS of 0.04 ug/L. Table 3 contains the summary of the groundwater analytical data for VOCs, SVOCs, and TAL metals, the groundwater URS values for the analytes, and highlights the concentrations of analytes from groundwater samples that exceeded their URS values.

With the exception of naphthalene, all of the SVOCs that were detected in samples in excess of their respective groundwater URS were found in temporary well point GW-2. Those SVOCs included 2-methylnapthalene, acenapthene, dibenzofuran, fluorene, and phenanthrene.

Seven of the groundwater samples contained manganese at concentrations up to 3,090 ug/L while four of the groundwater samples contained iron at concentrations up to 4,510 μg/L. Both the iron and manganese URS values are based upon drinking water Secondary Maximum Contaminant Level standards of 300 μg/L and 50 μg/L, respectively, and represent non-enforceable aesthetic standards. Four of the samples contained barium in concentrations up to 450 ug/L, which exceeds the groundwater URS for barium of 200 ug/L.

Risk Assessment

A human health risk assessment was performed on surface soil, subsurface soil, and ground water at the site assuming a restricted use risk setting and development of the site with buildings including a child daycare facility, parking areas, and recreational areas. The risk assessment was performed to evaluate the potential for risks to human health from exposure to contaminants in soil or groundwater at or originating from the site. Qualitative and quantitative assessments of potential human health risks posed by the site were conducted in accordance with the DNREC Guidance, U.S. Environmental Protection Agency Guidance and the approved project work plan.

Benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene, aluminum, antimony, arsenic, iron, and vanadium were identified as COCs in surface soil at the site. With the exception of antimony, these same COCs were identified in the subsurface soil at the site.

Aluminum, antimony, arsenic, barium, iron, manganese, acenaphthene, dibenzofuran, fluorene, 2-methylnaphthalene, naphthalene, phenanthrene, 1,1,2-trichloroethane, 1,1-dichloroehtene, benzene, chloroform, tetrachloroethene, trichloroethene, and vinyl chloride were identified as COCs in groundwater under the site.

Risks to daycare children and Job Corps workers were not quantified for the following reasons: 1) the exposure pathways of surface soil or subsurface soil to these receptors will be eliminated by covering the site by hardscape, parking lots or buildings and removing surface soil to an approximate depth of 18 inches from areas not covered by the aforementioned and replacing it with clean fill borrow material; and 2) the site is serviced by public water supply and a Groundwater Management Zone (GMZ) restricts groundwater use in Wilmington; therefore, exposure to site groundwater (at a depth of 10 – 12 feet bgs) to daycare children and Job Corps workers is not expected.

However, under current and future conditions construction/excavation workers could be exposed to surface soil, subsurface soil, and groundwater. Therefore, the risks to construction workers were quantified for exposure to a combination of surface soil and groundwater and subsurface soil and groundwater. Risks from incidental soil ingestion, dermal contact with soil, and inhalation of COCs in construction dust were quantified for surface soil and subsurface soil separately. Groundwater risks were quantified for the incidental ingestion of groundwater, dermal contact with groundwater, and the inhalation of volatiles emanating from groundwater and added to either surface or subsurface soil risks.

Acceptable cancer risks (2×10^{-6}) were found for subsurface soil and groundwater construction worker exposures, considering the DNREC remediation standard of 10^{-5}. Once target organs were considered, noncancer risks for subsurface soil and groundwater exposures to construction workers were below the DNREC remediation standard of a hazard index (HI) of 1.0.

A cancer risk level of 1.4×10^{-5} was found for construction worker exposure to surface soil and ground water. The primary contributors to this cancer risk were arsenic (4×10^{-6}) and benzo(a)pyrene in surface soil (6.7×10^{-6}). These risks are being driven by surface soil samples SB-8 (arsenic at 64 mg/kg) and SB-1 (benzo(a)pyrene at 19 mg/kg). These samples are located in the vicinity of the standing boiler chimney, and surface soil in this area would be removed during construction and replaced with clean borrow fill. Consequently, these risks will be ameliorated by this action. Once target organs were considered, noncancer risks were not greater than the DNREC hazard index of 1.0.

Groundwater loading values were calculated to evaluate the possible effects of groundwater discharge into the Brandywine Creek, approximately 600 feet to the southwest of the site. Loading values for all organic and metallic analytes detected in groundwater during both RI investigations were calculated based upon the measured groundwater flow rate at the site and the flow rate of the Brandywine Creek. Based upon these calculations, it was determined that there were no exceedances of Delaware's Surface Water Quality Standards by the discharge of site groundwater into the Brandywine.

4.0 REMEDIAL ACTION OBJECTIVES

According to Section 8.4 (1) of the Regulations, site-specific remedial action objectives (RAOs) must be established for all plans of remedial action. The Regulations provide that DNREC set objectives for land use, resource use and cleanup levels that are protective of human health and the environment.

Qualitative objectives describe in general terms what the ultimate result of the remedial action, if necessary, should be. The following qualitative objectives are determined to be appropriate for the site:

- Prevent exposure to impacted media by future site users;
- Minimize potential exposure to site COCs for construction workers at the site; and
- Continue the use of public water for all purposes to the surrounding community.

These objectives are consistent with the current use of the site as a commercial use in an urban setting, New Castle County zoning policies, state regulations governing water supply and worker health and safety.

Based on the qualitative objectives, the quantitative objectives are:

1. Prevent human exposure to soils and groundwater contaminated by VOCs, PAHs, and metals that would result in a carcinogenic risk exceeding 1×10^{-5} or a hazard index of 1.0 by stabilizing, containing or removing soil with COCs greater than the DNREC unrestricted use URS criteria;
2. Prevent ingestion of groundwater contaminated by VOCs, PAHs, and metals above DNREC groundwater URS values, and
3. Prevent discharge of groundwater contaminated by VOCs, PAHs, and metals above Delaware Surface Water Quality Standards.

Four remedial options were evaluated by EA in the RI and FS for their ability to accomplish the RAOs:

ALTERNATIVE 1- No Further Action.

Under this option the affected material would have been left in its original condition.

ALTERNATIVE 2 — Containment, Removal, and Disposal And/or Replacement of Surface Impacted Material

This option involves the removal of impacted surface material (surface soil with reported concentrations of benzo(a)pyrene and/or arsenic above the restricted URS) around the existing smokestack where unacceptable risk to construction workers was identified in the risk assessment, installing an earthen barrier beneath the proposed child daycare center where DNREC screening results for metals exceeded the unrestricted URS, and installing a permeable geotextile fabric between the barrier and the native material.

The first 12 to 18-inches of the surface soil (approximately 170 to 400 cubic yards of soil) with concentrations of arsenic and benzo(a)pyrene reported above the restricted use URS values would be excavated, containerized, and transported to an offsite treatment facility. The same amount of clean fill will be brought in and compacted and graded into place. A permeable geotextile fabric will be installed between the clean fill barrier and the native material. This soil removal action would remove the contaminants that pose an unacceptable risk to construction workers.

To insure that the area of impacted soil is removed, a statistics based soil sampling approach will be developed and samples will be collected and submitted for laboratory analysis of SVOC and metals according to HSCA requirements. If any of the reported results from the analysis are above the respective restricted use URS values for soil, further soil excavation will occur in the area of reported elevated concentrations. This process of excavation and sampling will continue until all of the impacted soil has been excavated as confirmed by soil sampling.

To mitigate the human exposure to the surface soil with concentrations of arsenic (as identified in the screening analysis) above the unrestricted and restricted URS around the proposed child daycare center, this option proposes to cover the surface of the proposed child daycare playgrounds with approximately 18-inches of clean, compacted fill. It is also proposed that a permeable geotextile be placed between the clean fill and the native surface soil to create a physical barrier to identify this contact area.

Placement of a deed restriction on the property: a) limiting the site to non-residential uses; b) prohibiting any digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities on the property without the prior written approval of the DNREC; and c) prohibiting the installation of any water well on, or use of groundwater at, the site without the prior written approval of DNREC. In addition, the site will remain a part of the Wilmington GMZ.

ALTERNATIVE 3 — Removal of Impacted Material and Replacement

Under this option, the first 12 to 18-inches of soil would be removed from across the entire site where no building or hardscape is anticipated to cover it. This soil will be containerized, transported, and

treated offsite. Additionally, the same volume of clean fill would be required to replace the excavated material. This action would remove the surface soil with concentrations reported greater than the unrestricted use URS values. This would therefore, diminish the exposure pathway for human contact to the surface and subsurface soil.

To perform this option, approximately 3,380 – 3,780 cubic yard^{s} would be excavated and treated and disposed offsite. Placement of a cap and cover in the form of concrete pad-based structures and associated asphalt parking areas will occur.

A Soils Management Plan will be developed to address disposition of any contaminated soils disturbed during excavation and construction activities.

At least six inches of top soil and grass seeding is proposed on areas that will not be covered by buildings or hardscape areas.

Placement of a deed restriction on the property: a) limiting the site to non-residential uses; b) prohibiting any digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities on the property without the prior written approval of the DNREC; and c) prohibiting the installation of any water well on, or use of groundwater at, the site without the prior written approval of DNREC. In addition, the site will remain a part of the Wilmington GMZ.

ALTERNATIVE 4—In Situ Treatment of Impacted Material

To perform this remedial method (stabilization/solidification), a reagent is added to transform the soil into a solid form. Solidification immobilizes the contaminants within the crystalline structure of the solidified material, thus reducing the contaminant leaching potential and the exposure pathways to the surface.

To perform this option, approximately 45,600 – 50,975 square feet of the site would be treated to a depth of 18-inches below grade. This area consists of all exposed surface area exposed upon completion of the Wilmington Job Corp Center. This option would stabilize the contaminants therefore eliminating the potential exposure pathway of the surface and subsurface soil to the public.

Three to six inches of top soil and grass seeding is proposed on all area that will not be covered with buildings or hardscape areas.

Placement of a deed restriction on the property: a) limiting the site to non-residential uses; b) prohibiting any digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities on the property without the prior written approval of DNREC; and c) prohibiting the installation of any water well on, or use of groundwater at, the site without the prior written approval of DNREC. In addition, the site will remain a part of the Wilmington GMZ.

5.0 PROPOSED PLAN OF REMEDIAL ACTION

Based on the criteria outline above, Alternatives 2, 3, and 4 provide protection to human health, welfare, and the environment. Alternatives 3 and 4 offer a higher degree of protection to exposure to soil impacted with COCs to the public than Alternative 2. Alternative 3 would remove all surface soil

impacted (the first 12 to 18-inches of soil) with COCs from areas of the site that are not to be covered by buildings or parking lots whereas Alternative 4 would only immobilize the COCs. While Alternative 2 can be readily performed and completed at a substantially lower cost, it would leave potential COCs in the surface soil throughout the site. Therefore, additional sampling will be required to fill in existing data gaps. Additional sampling may substantially increase the cost of Alternative 2 in the long-term above Alternative 3 and significantly delay the construction of the Future Job Corp Center.

Based on DNREC-SIRB's evaluation of the site information and the above remedial action objectives, the recommended remedial actions for the site consist of the following activities as described below:

1. Performance of Alternative 3: Removal of Impacted Material and Replacement as outlined above to ensure longer-term unrestricted use of the site, to avoid delays of additional sampling, and to avoid the costs associated with additional sampling.

2. Placement of a deed restriction on the property: a) limiting the site to non-residential uses; b) prohibiting any digging, drilling, excavating, grading, constructing, earth moving, or any other land disturbing activities on the property without the prior written approval of DNREC and c) prohibiting the installation of any water well on, or use of groundwater at, the site without the prior written approval of DNREC. In addition, the site will remain a part of the Wilmington GMZ.

6.0 PUBLIC PARTICIPATION

The Department actively solicits public comments or suggestions on the Proposed Plan of Remedial Action and welcomes opportunities to answer questions. Please direct written comments to:

Attention: Robert C. Asreen, Jr.
DNREC Site Investigation and Restoration Branch
391 Lukens Drive
New Castle, Delaware 19720

The comment period begins April 16, 2002, and ends at the close of business (4:30 p.m.) May 6, 2002. A public hearing will be held on the Proposed Plan at the Caravel State Building auditorium on May 9, 2002 at 6 P.M.

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Figures 1 & 2 from Remedial Investigation Report

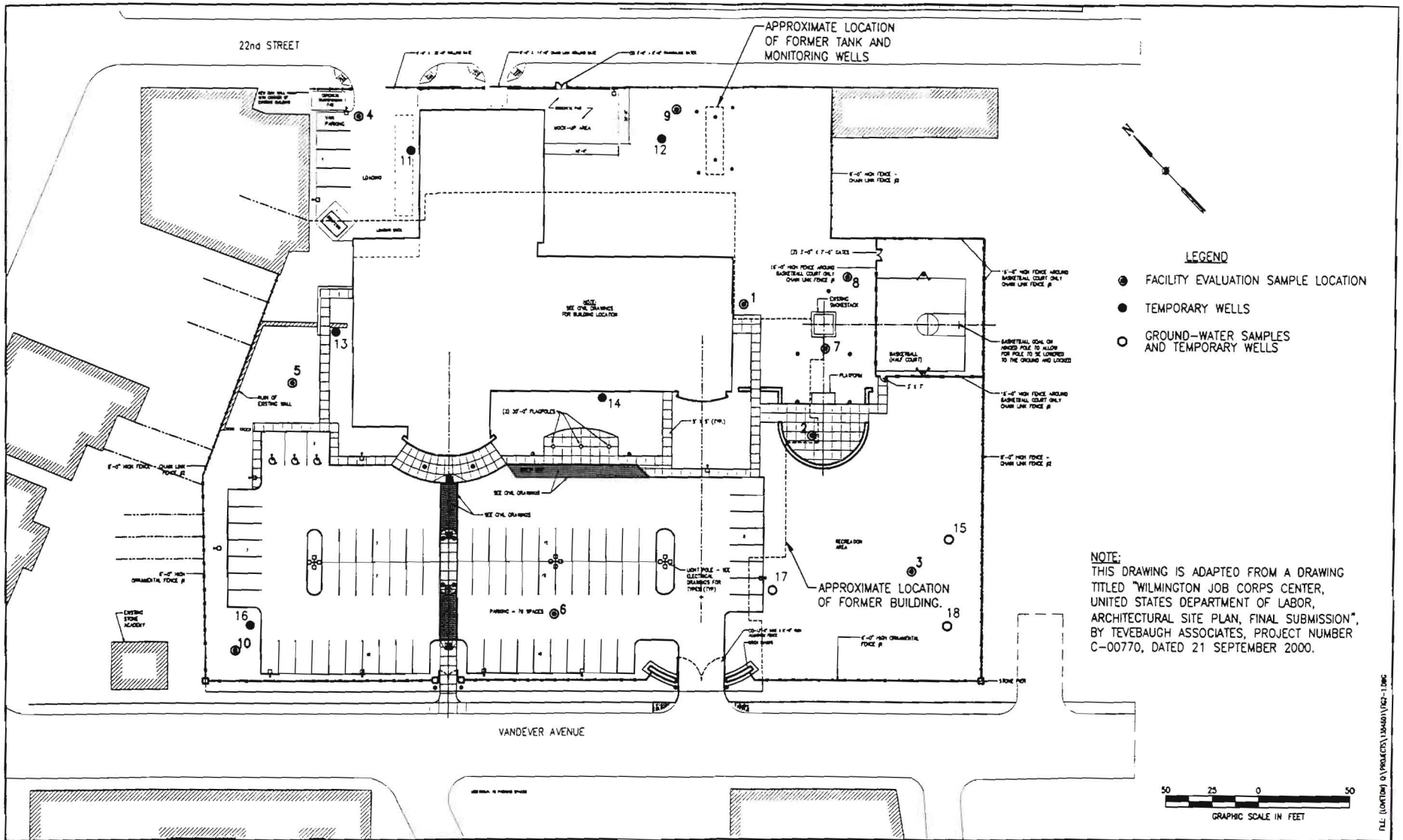
Prepared by EA, Inc., December 2001.

Figure 1: Site Location/Topographic Map

1" = 2000'

Figure 1-1. Site location map showing the RI/FS area, 9 Vandever Avenue, Wilmington, DE. (Source:ADC Map, New Castle County, DE, 8th Edition)

Figure 2: Sampling Locations



EA ENGINEERING, SCIENCE, AND TECHNOLOGY	WILMINGTON JOB CORPS CENTER 9 VANDEVER AVENUE WILMINGTON, DELAWARE	SAMPLE AND TEMPORARY WELL LOCATIONS	DESIGNED BY MM	DRAWN BY WCM	DATE 8-2-01	PROJECT NO. 13846.01	FILE NAME FIG2-1
			CHECKED BY MM	PROJECT MGR. KS	SCALE 1"=50'	DRAWING NO. -	FIGURE 2-1

Tables 1, 2, & 3 from Remedial Investigation Report

Prepared by EA, Inc., March 2002

Table 1: Soil Analytical Summary SVOCs

Soil Anlaytical Summary

Analyte	*Unrestricted URS	*Restricted URS	SB-1-2	SB-1-2DL	SB-2-2	Field Dup (SB-2-2)	SB-2-8	Field Dup-1 (SB-2-8)	SB-3-5	SB-5-2	SB-7-11	SB-8-2	SB-9-5	SB-10-4
	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
SEMIVOLATILE ORGANIC COMPOUNDS (SVOC)														
Naphthalene	160,000	4,100,000	960 J	NA	ND	ND	ND	ND	ND	ND	ND	ND	270 J	820 J
2-methynaphthalene	160,000	4,100,000	580 J	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	550 J
Acenaphthylene	-	-	220 J	NA	ND	ND	ND	ND	250 J	ND	ND	ND	240 J	380 J
Acenaphthene	470,000	5,000,000	6,500	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	910 J
Dibenzofuran	31,000	820,000	2,600	NA	ND	ND	ND	ND	ND	ND	ND	ND	260 J	1,300 J
Fluorene	310,000	5,000,000	5500 K	NA	ND	ND	ND	ND	ND	ND	ND	290 J	ND	1,600 J
Phenanthrene	1,000,000	5,000,000	36000 K	NA	ND	ND	ND	ND	4300 K	53 J	ND	4,900	3000 K	13,000
Anthracene	1,000,000	5,000,000	12000 K	NA	ND	ND	ND	ND	920 J	ND	ND	910 J	400 J	2,600
Carbazole	32,000	290,000	6500 K	NA	ND	ND	ND	ND	270 J	ND	ND	490 J	200 J	1,400 J
Fluoranthene	310,000	5,000,000	40000 K	NA	ND	ND	ND	ND	5800 K	71 J	ND	6,700	3400 K	9,500
Pyrene	230,000	5,000,000	35000 K	NA	ND	ND	ND	ND	6500 K	71 J	ND	6,600	3500 K	9,200
Benzo(a)anthracene	900	8,000	24000 K	NA	ND	ND	ND	ND	**2900 K**	41 J	ND	**3,500**	**2200 K**	**4,400**
Chrysene	87,000	780,000	20000 K	NA	43 J	ND	ND	ND	3000 K	41 J	ND	3,700	2600 K	4,500
Benzo(b)fluoranthene	900	8,000	18000 K	NA	59 J	ND	ND	ND	**3300 K**	ND	ND	**4,000**	**3500 K**	**4,400**
Benzo(k)fluoranthene	9,000	78,000	8700 K	NA	ND	ND	ND	ND	1,300 J	ND	ND	1300 J	1200 J	1,600 J
Benzo(a)pyrene	90	800	19000 K	NA	ND	ND	ND	ND	2500 K	ND	ND	2,900	2100 K	3,300
Indeno(1,2,3-cd)pyrene	900	8,000	11000 K	NA	ND	ND	ND	ND	**1,500 J**	ND	ND	**1,900 J**	**2800 K**	**2,000**
Dibenz(a,h)anthracene	90	800	2500 K	NA	ND	ND	ND	ND	**430 J**	ND	ND	**560 J**	**510 J**	**570 J**
Benzo(g,h,I)perylene	-	-	9900 K	NA	ND	ND	ND	ND	1,400 J	ND	ND	1,700 J	3600 K	1,800 J
Tentatively Identified Compounds (TIC)														
Cyclohexane	-	-	2,500 BJND	9,400 JND	1,000 BJN	1,600 BJN	1,700 BJN	1,800 BJN	2,000 BJND	100 BJN	ND	1400 BJND	2,700 BJND	1,800 BJND
Dibenzofuran 4 methyl-	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	340 JND
9H-Fluoren-9-One	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	260 JND	550 JND
Dibenzothiophene	-	-	2,300 JND	1,500 JND	ND	ND	ND	ND	ND	ND	ND	ND	ND	650 JND
9.10-Anthracenedione	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1,800 JND
Benzo[b]naphtho[2,3-]furan	-	-	ND	1,000 JND	ND	ND	ND	ND	280 JND	ND	ND	ND	ND	450 JND
7H-Benz[de]anthracen-7-one	-	-	ND	1,200 JND	ND	ND	ND	ND	510 JND	ND	ND	820 JND	610 JND	610 JND
1,4-Dioxane	58,000	520,000	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2,100 JND	ND
2-Phenylnaphthalene	-	-	4,200 JND	ND	ND	ND	ND	ND	640 JND	ND	ND	ND	380 JND	ND
Cyclopenta(def)phenanthrenone	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	250 JND	ND
Tetradecane	-	-	ND	ND	ND	ND	90 JN	ND	ND	ND	ND	ND	ND	ND
Hexadecane	-	-	ND	ND	ND	ND	120 JN	ND	ND	ND	ND	ND	ND	ND
Heptadecane	-	-	ND	ND	ND	ND	130 JN	ND	ND	ND	ND	ND	ND	ND
Acridine	-	-	960 JND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene,2-phenyl-	-	-	ND	2,800 JND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9,10-Dimethylanthracene	-	-	ND	2,300 JND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

*Non-Critical Water Resource Area
NA- Not Analyzed
ND- Not Detected
J- Indicates an estimated value
B- Analyte is found in the associated method blank as well as in the sample
D- Identifies all compound concentrations reported from a secondary dilution analysis
N-Indicates presumptive evidence of a compound
K- Analyte present. Report value may be biased high. Actual value is expected to be lower.
Concentrations are greater than Unrestricted URS
Concentrations are greater than Unrestricted URS and Restricted URS

Table 2: Soil Analytical Summary Metals

Soil Analytical Summary

Analyte	*Unrestricted URS	*Restricted URS	SB-1-2	SB-2-8	Field Dup 1 (SB-2-8)	SB-7-11	SB-8-2
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
METALS							
Cyanide	160	4,100	ND	ND	ND	ND	0.66
Mercury	10	610	0.024 B	ND	0.021 B	ND	0.60
Aluminum	7,800	200,000	**10,700**	7,070	**8,330**	7,020	3,890
Antimony	3	82	0.055 L	ND	ND	ND	**3.60**
Antimony	3	82	ND	0.21 L	0.20 L	0.14 L	**4.3 L**
Arsenic	11	11	6.5	2.3	2.5	0.77 B	**[illegible]**
Barium	550	14,000	46.8	43.5	48.3	23.6	110
Beryllium	16	410	0.4	0.22L	0.29 L	0.12 L	0.55
Cadmium	4	100	ND	ND	ND	ND	0.4
Calcium	-	-	1690 J	934 J	1140 J	432 J	5790 J
**Chromium	270	610	28.6	14.8	15.7	10.8	23.1
Cobalt	470	12,000	4.4	1.3 L	2.2	1.1 L	6.7
Copper	310	8,200	9.9	1.6	2.8	2.1	145
Iron	2,300	61,000	**20,900**	**6,850**	**10,400**	2,220	**14,600**
Lead	400	1,000	11.9 J	9.5 J	9.2 J	8.4 J	150 J
Magnesium	-	-	1,340	500.0	658	315 B	946
Manganese	160	4,100	142	4.8	14.1	6.1	125
Nickel	160	4,100	7.9	4.5	5.7	4.4	29.7
Potassium	-	-	690	230 B	308 B	203 B	425 B
Selenium	39	1,000	0.31 B	0.097 B	0.15 B	0.15 B	1
Silver	39	1,000	ND	ND	0.020 L	ND	0.45 L
Sodium	-	-	156 B	200 B	181 B	159 B	220 B
Thalium	18	220	0.57 L	0.13 L	0.58 L	ND	0.62 L
Vanadium	55	1,400	40.9 K	29.3 K	51.4 K	18.8 K	**86.4 K**
Zinc	2,300	61,000	34.2 B	8.1 B	9.3 B	9.1B	534 B

*Non-Critical Water Resource Area
**Chromium- Chromium VI and Compounds
ND- Not Detected
B- Not detected substantially above the level reported in the laboratory or field blanks.
J - Analyte present. Reported value may not be accurate or precise (estimated value).
L- Analyte present. Reported value may be biased low. Actual value is expected to be higher.
K - Analyte present. Reported value may be biased high. Actual value is expected to be lower.
Concentrations are greater than Unrestricted URS
~~**Concentrations are greater than Unrestricted and Restricted URS**~~

Table 3: Ground Water Analytical Summary VOCs, SVOCs & Metals

Ground Water Analytical Summary

Analyte	*URS	GW-1	GW-2	GW-9	Field Dup	TRIP BLANKS	GW-15	Field Dup	GW-17	GW-18	TRIP BLANKS
	Groundwater				(GW-9)			(GW-15)			
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Date	5/29/2001	5/29/2001	5/29/2001	5/29/2001	5/29/2001	5/29/2001	12/12/2001	12/12/2001	12/12/2001	12/12/2001	12/12/2001
VOLATILE ORGANIC COMPOUNDS (VOC)											
Vinyl chloride	2/0.02	**14**	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	7/0.04	**12**	ND	**2**	ND	ND	**1 J**	ND	**8**	ND	ND
Acetone	61	3 B	3 B	2B	2 B	4 J	ND	ND	ND	ND	ND
1,1-Dichloroethane	81	23	1	0.8 J	0.6 J	ND	1 J	ND	4 J	ND	ND
2-Butanone (methyl ethyl ketone)	190	2 J	1 J	ND	ND	ND	5 J	ND	ND	10 J	ND
Chlorobenzene	100/11	ND	ND	ND	ND	ND	ND	1 J	ND	ND	ND
Chloroform	100/0.1	ND	**2**	**1**	**1**	ND	ND	ND	**2 J**	**1 J**	ND
cis-1,2-Dichloroethene	70/61	ND	ND	ND	ND	ND	ND	ND	ND	1 J	ND
1,1,1-Trichloroethane	200	ND	2	3	2	ND	ND	ND	ND	ND	ND
Benzene	5/0.4	ND	**2**	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	5/0.2	ND	ND	**0.9 J**	**0.9 J**	ND	ND	ND	ND	ND	ND
Trichloroethene	5/2	ND	ND	ND	ND	ND	ND	ND	ND	**3 J**	ND
Tetrachloroethene	5/1	ND	**6**	ND	ND	ND	ND	ND	ND	**1 J**	ND
Ethylbenzene	700	ND	37	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	10000/1200	ND	7	ND	ND	ND	ND	ND	ND	ND	ND
SEMIVOLATILE ORGANIC COMPOUNDS (SVOC)											
Naphthalene	20/0.7	**3 J**	**290**	ND	ND	NA	ND	ND	ND	ND	NA
2-Methylnaphthalene	12	6 J	**1,200**	ND	ND	NA	ND	ND	ND	ND	NA
Acenaphthene	37	ND	**73 J**	ND	ND	NA	ND	ND	ND	ND	NA
Dibenzofuran	2	ND	**84 J**	ND	ND	NA	ND	ND	ND	ND	NA
1,2-Dichlorobenzene	600/64	ND	ND	ND	ND	ND	ND	2 J	ND	ND	ND
Fluorene	24	ND	**140 J**	ND	ND	NA	ND	ND	ND	ND	NA
Phenanthrene	120	ND	**320**	ND	ND	NA	ND	ND	ND	ND	NA
Tentatively Identified Compounds (TIC)											
Benzo(b)thiophene, 2,3-dihydro	-	5.4 JN	ND	ND	ND	NA	NA	NA	NA	NA	NA
Naphthalene, 1-ethyl-	-	1.2 JN	2000 JND	ND	ND	NA	NA	NA	NA	NA	NA
Decane	-	ND	1100 JND	ND	ND	NA	NA	NA	NA	NA	NA
Undecane,2,6-dimethyl-	-	ND	570 JND	ND	ND	NA	NA	NA	NA	NA	NA
Tridecane	-	ND	720 JND	ND	ND	NA	NA	NA	NA	NA	NA
Tetradecane	-	ND	450 JND	ND	ND	NA	NA	NA	NA	NA	NA
Pentadecane,2,6,10,14-tetramet	-	ND	2300 JND	ND	ND	NA	NA	NA	NA	NA	NA
Cyclohexane	-	28 E	ND	53 E	97 E	NA	NA	NA	NA	NA	NA
1,4-Dioxane	6	ND	ND	**28 JN**	**32 JN**	NA	NA	NA	NA	NA	NA
2-Pentanone, 4-hydroxy-4-methyl	-	2.5 A	ND	2.1 A	7.0 A	NA	NA	NA	NA	NA	NA
Cyclopentasiloxane, decamethyl-	-	ND	ND	1.0 C	1.0 C	NA	NA	NA	NA	NA	NA
Tebuthiuron	-	ND	ND	5.0 JN	4.4 JN	NA	NA	NA	NA	NA	NA
Prometon	55	ND	ND	16 JN	14 JN	NA	NA	NA	NA	NA	NA
METALS											
Aluminum	200	NA	**639**	96.5 B	128 B	NA	35.7 B	36.8 B	163 B	35.4 B	NA
Antimony	6	NA	**7.3 B**	ND	ND	NA	ND	ND	ND	ND	NA
Arsenic	50/0.50	NA	**2.5**	ND	ND	NA	ND L	ND L	ND L	ND L	NA
Barium	2000/260	NA	**376**	73.7	**365**	NA	**450 J**	217 J	259 J	**410 J**	NA
Beryllium	4	NA	ND	ND	ND	NA	ND	ND	ND	ND	NA
Cadmium	5	NA	ND	ND	ND	NA	ND	ND	ND	1.0 B	NA
Calcium	-	NA	111000 J	33100 J	34400	NA	27400	27900	50400	49600	NA
**Chromium	11	NA	1.6	2.9	ND	NA	ND L	ND L	ND L	ND L	NA
Cobalt	220	NA	7.5	ND	ND	NA	33.9 B	34.2 B	7.4 B	10.9 B	NA
Copper	1300	NA	3	2.8	1.5B	NA	ND	ND	ND	ND	NA
Iron	300	NA	**1550**	111	74.5 B	NA	**4510 K**	**4140 K**	**603 K**	101 B	NA
Lead	15	NA	2.1 B	ND	ND	NA	ND L	ND L	ND L	ND L	NA
Magnesium	-	NA	64900	75700 J	69000	NA	17200	17200	24200	26400	NA
Manganese	50	NA	**338**	**70.2 J**	**77.4**	NA	**3090**	**3020**	**554**	**574**	NA
Mercury	2	NA	ND	ND	ND	NA	ND	ND	ND	ND	NA
Nickel	100	NA	5.2 B	2.5	3.8 B	NA	3.9 B	ND	ND	6.9 B	NA
Potassium	-	NA	15400	1160	1100 B	NA	4970 K	4670 K	4360 K	2270 K	NA
Selenium	50	NA	8.6	9.1	6.4	NA	ND L	ND L	ND L	ND L	NA
Silver	100	NA	ND	ND	ND	NA	ND	ND	ND	ND	NA
Sodium	-	NA	56000	15000	16800	NA	112000	109000	73300	74800	NA
Thallium	2	NA	ND	**8.9**	ND	NA	NDL	ND L	ND L	ND L	NA
Vanadium	26	NA	3.8 B	ND	ND	NA	ND	ND	ND	ND	NA
Zinc	2000	NA	151	81	113	NA	35.3 J	14.6 J	27.1 J	59.1 J	NA

NOTE: At Sample Location 1 only a limited volume of water could be recovered. As a result, there was insufficient sample volume to analyze metals in sample GW-1.

*** URS**- Uniform Risk-Based Remediation Standards for Protection of Human Health for Groundwater
****Chromium**- Chromium VI and Compounds
NA- Not Analyzed
ND- Not Detected
J- Analyte present. Reported value may not be accurate or precise (estimated value)
B- Not detected substanitially above the level reported in laboratory or field blanks.
D- When applied, this qualifier identifies all compound concentrations reported from a secondary dilution analysis.
A- This qualifier indicasted that a TIC is a suspected aldol-condensation product.
N-Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling events.
K-Analyte present. Reported value may be biased high. Actual value is expected to be lower.
L-Analyte present. Reported value may be biased low. Actual value is expected to be higher.
Concentrations are greater than *URS and/or **URS
Some analytes have two groundwater URS values presented (e.g., 2/1); the lowest value is to be used for screening purposes (DNREC, Remediation Standards Guidance, HSCA, December 1999)

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