RESOURCE CONTROLS

474 Broadway • Pawtucket, RI 02860

MASSACHUSETTS CONTINGENCY PLAN RELEASE NOTIFICATION AND CLASS B-1 PARTIAL RESPONSE ACTION OUTCOME STATEMENT

27 Village Street
Somerville, Massachusetts

Prepared for:

Ms. Adele Santos
100 Memorial Drive
Unit 8-7B
Cambridge, MA 02142-1330

Prepared by:

Resource Control Associates, Inc.
474 Broadway
Pawtucket, Rhode Island 02860

Assessment ▪ Remediation ▪ Engineering

April 26, 2004

CONTENTS

1.0 INTRODUCTION 1

1.1 Purpose and Class of Partial Response Action Outcome Statement 1
1.2 Disposal Site Name, Address and Release Tracking Number 1
1.3 Responsible Party 1
1.4 Licensed Site Professional 1

2.0 SITE DESCRIPTION AND HISTORY 1

3.0 SITE HYDROGEOLOGICAL CHARACTERISTICS 2

3.1 Subsurface Investigations 2
3.2 Soil Description 4
3.3 Groundwater Flow 4
3.4 Depth to Bedrock/Bedrock Type 4
3.5 Potential for Flooding 4
3.6 Natural Resources 4

4.0 NATURE AND EXTENT OF CONTAMINATION 4

4.1 Analytical Summary 4
4.2 Source of Contamination 5
4.3 Contaminants of Concern 5
4.4 Nature of Contamination 5
4.5 Extent of Contamination 6
4.6 Presence and Distribution of Non-Aqueous Phase Liquids 7
4.7 Characterization of Background Concentrations of Contaminants 7
4.8 Data Usability 7

5.0 ENVIRONMENTAL FATE AND TRANSPORT AND CONCEPTUAL SITE MODEL 8

5.1 Storm Water Runoff 9
5.2 Transport Through Groundwater, Soil and Bedrock 9
5.3 Transport Along Preferential Pathways 9
5.4 Partitioning to Air 10
5.5 Food Chain Pathways 10

6.0 EXPOSURE ASSESSMENT 10

6.1 Potential Human and Environmental Receptors 10
6.2 Identification of Applicable Groundwater and Soil Categories 10
6.3 Exposure Points 11
6.4 Exposure Routes 11
6.5 Exposure Point Concentrations 11

7.0 METHOD 3 RISK CHARACTERIZATION 12

7.1 Introduction and Applicability of the Method 3 Risk Characterization 12
7.2 Results of the Method 3 Risk Characterization 12

8.0 SUMMARY AND CONCLUSIONS 12

9.0 LIMITATIONS 13

TABLES

Table 1 Summary of Soil Analytical Results
Table 2 Summary of Groundwater Analytical Results

FIGURES

Figure 1 Locus Map
Figure 2 MCP Site Scoring Map
Figure 3 Site Plan
Figure 4 Water Table Elevation Plan

APPENDICES

Appendix A Copies of BWSC103 (Release Notification Form) and BWSC104 (Class B-1 Partial Response Action Outcome Statement)
Appendix B Copies of Public Notification Correspondence
Appendix C Drilling Logs
Appendix D Well Monitoring Forms
Appendix E Conceptual Site Model
Appendix F Laboratory Analytical Reports
Appendix G Method 3 Risk Characterization
Appendix H Copies of Sanborn® Maps
Appendix I Additional Limitations

1.0 INTRODUCTION

1.1 Purpose and Class of Partial Response Action Outcome Statement

This Massachusetts Contingency Plan (MCP) Release Notification and Class B-1 Partial Response Action Outcome Statement was prepared to satisfy the requirements of the MCP as set forth at 310 CMR 40.0333(2) (120-day release notification) and 40.1056 (RAO Statement). Copies of forms BWSC103 and BWSC104 are included in Appendix A of this report. Copies of correspondence providing the City of Somerville Mayor and Board of Health with notification of the availability of this document are included in Appendix B.

1.2 Disposal Site Name, Location and Release Tracking Number

The Disposal Site (hereinafter referred to as the "Site") is located at 27 Village Street in Somerville, Massachusetts. Since notification of Site conditions is being provided to the MADEP simultaneously with submittal of this document, no Release Tracking Number (RTN) has been assigned to the Site.

The property on which the Site is located (the "Property") is approximately 0.35 acre in area and is utilized for residential and commercial (custom printing) purposes. The Site comprises the entire Property. The UTM coordinates of the Site are 4,668,049 m Northing, and 291,392 m Easting.

The location of the Site is depicted on the Locus Map (Figure 1) and MCP Site Scoring Map (Figure 2). Site details are depicted on the Site Plan (Figure 3).

1.3 Responsible Party

Response actions at the Site have been conducted by Adele Santos, 100 Memorial Drive, Unit 8-7B, Cambridge, MA 02142-1330. She can be reached at (617) 253-4402.

1.4 Licensed Site Professional

The Licensed Site Professional of Record for the Site is Patrick D. Corcoran, LSP No. 9810; Resource Control Associates, Inc., 474 Broadway, Pawtucket, RI 02860-1377; (401) 728-6860.

2.0 SITE DESCRIPTION AND HISTORY

Two building strictures are located on the Property (see the Site Plan, Figure 3). The larger building (Building 1), which is of brick construction, is located long the western edge of the Subject Property and was constructed in approximately 1875. The northern third of the building area is used for residential purposes, and the remaining portion of Building 1 consists of an open-air courtyard/garden area, an open-air performing space, and bleachers, and is currently utilized as a children's theatre.

Building 2 is located along the eastern border of the Subject Property and was constructed between the 1940s and 1950s. Building 2 is constructed of concrete block with a flat roof and is currently utilized for custom letter-press printing operations. During site investigations, paint thinner, kerosene, alcohol, oil and printing ink were observed in Building 2, in containers of less than one gallon each. The printing business reportedly generates approximately four gallons of waste solvent (primarily mineral spirits) per year, and oily rags, which are shipped off-site for recycling and disposal.

Historically, the Property was used as a foundry and machine shop. A foundry casting pit is located beneath the residential portion of Building 1. The pit is filled with spent foundry sand, and a layer of gravel on top of the foundry sand. The specific metals and materials used in the historic foundry operations are unknown.

The southern portion of the Property, adjacent to Village Street, is paved. The remainder of the Property not covered by the building footprints is vegetated. The Property is served by underground water supply, sanitary sewer, and natural gas lines. A 275-gallon AST is located at the north end of Building 2. The AST is not connected to the building and does not appear to be in use. No staining was observed in the vicinity of the AST. According to the owner of the printing business, Building 2 has not utilized oil heat since approximately 1985. A storm water drywell, which is reportedly not connected to sewer lines, is located immediately outside the courtyard of Building 1. No staining was observed in the vicinity of the drywell.

The Property, which is located in a dense urban commercial and residential area, is abutted to the north by active railroad tracks, to the east by a drum recycler, to the west by an access road and a vacant parcel, and to the south by Village Street, beyond which are residential properties.

3.0 SITE HYDROGEOLOGICAL CHARACTERISTICS

Resource Controls conducted a property-transfer environmental site assessment in November 2003. Based on the findings of the assessment, a subsurface investigation of the Property was conducted to characterize subsurface soil and groundwater conditions at the Property, in consideration of historic foundry and machine shop operations, current printing press operations, and the presence of an unused AST, foundry casting pit and drywell on the Property, and the presence of a drum recycling operation on an abutting parcel.

3.1 Subsurface Investigations

3.1.1 Soil Sampling

On December 1, 2003, six soil borings, three of which were completed as groundwater monitoring wells, were installed on the Property, using Geoprobe™ “direct-push method”. One of the soil borings (SB-3) was installed using hand methods owing to space constraints. Each boring was advanced to a depth of 10 to 12 feet below grade. Soil boring logs, which include lithologic and stratigraphic descriptions, headspace screening data, and well construction details, are included as Appendix C.

The monitoring wells were constructed of 1.0-inch diameter, thread-coupled PVC. Seven to ten foot lengths of machine-cut, 0.01-inch slot well screening were installed at a minimum of 5 feet below the observed water table elevation to ensure an adequate and representative water supply for groundwater sampling. Each well was completed with a locking gripper cap, cement-grouted into place.

Soil samples were collected from each boring at five-foot intervals from the ground surface to a maximum of 12 feet below grade. Each sample was observed and described by a geologist and field screened for the presence of volatile organic vapors using a 10.6 eV photoionization detector (PID) in accordance with the MADEP Jar Headspace Method.

Based on headspace screening, field observations, sample depth, and proximity to environmental conditions of concern identified in the property transfer site assessment, soil samples were selected and submitted for laboratory analysis of total petroleum hydrocarbon (TPH) by EPA Method 8100M, volatile organic compounds (VOCs) by EPA Method 8260B, polychlorinated biphenyls (PCBs) by EPA Method 8082, and various metals by EPA Methods 6010B and 7471A. The samples were collected in clean containers provided by the laboratory, labeled in the field, and transported to the laboratory under standard chain-of-custody protocol.

On January 9, 2004, eleven additional soil borings were installed on the Property, using Geoprobe "direct-push method". Each boring was advanced to a depth of 10 to 12 feet below grade. Soil boring logs, which include lithologic and stratigraphic descriptions, headspace screening data, and well construction details, are included as Appendix C.

Soil samples were collected from each boring at four-foot intervals from the ground surface to a maximum of eight feet below grade. Each sample was observed and described by a geologist and field screened for the presence of volatile organic vapors using a 10.6 eV photoionization detector (PID) in accordance with the MADEP Jar Headspace Method.

Based on headspace screening, field observations, sample depth, and proximity to environmental conditions of concern identified in the property transfer site assessment, soil samples were selected and submitted for laboratory analysis of extractable petroleum hydrocarbon (EPH) with polycyclic aromatic hydrocarbons (PAHs) by MADEP Method EPH-98-1, and total arsenic, lead and zinc by EPA Methods 6010B. The samples were collected in clean containers provided by the laboratory, labeled in the field, and transported to the laboratory under standard chain-of-custody protocol.

On March 1, 2004, seven additional soil borings were installed on the Property using an electric hammer drill. Each boring was advanced to a depth of approximately 1.5 to three feet below grade. Soil boring logs, which include lithologic and stratigraphic descriptions, headspace screening data are included as Appendix C.

Based on headspace screening, field observations, sample depth, and proximity to environmental conditions of concern identified in the property transfer site assessment, soil samples were selected and submitted for laboratory analysis of total lead by EPA Method 6010B. The samples were collected in clean containers provided by the laboratory, labeled in the field, and transported to the laboratory under standard chain-of-custody protocol.

Laboratory reports for the soil sampling events conducted on December 1, 2003 and January 9 and March 1, 2004 are included in Appendix E, and are summarized in Table 1. The results of analysis are discussed in Section 4.1.

3.1.2 Groundwater Monitoring

The depth to the water table was gauged on December 1, 2003 and January 9, 2004. As shown on the well monitoring forms (Appendix D), the depth to the water table ranged from approximately five to 11 feet below grade.

On December 1, 2003, groundwater samples were collected from monitoring wells installed at the Site. Prior to sampling, a minimum of three calculated well volumes of water were purged from each well. The wells were then allowed time to fully recharge before sampling.

Groundwater samples collected from monitoring wells MW-1 and MW-3 were submitted for laboratory analysis of TPH, VOCs and the eight RCRA metals. The samples collected from monitoring well MW-2 was submitted for laboratory analysis of TPH and VOCs. Samples were collected in clean containers provided by the laboratory, labeled in the field, and transported to the laboratory under standard chain-of-custody protocol.

3.2 Soil Description

As depicted on the drilling logs (Appendix C), soils encountered at the Site generally consisted of fine to medium sand and gravel, with some silt. Soils encountered from the surface to depths of approximately two feet also typically included fill material such as brick debris and ash.

3.3 Groundwater Flow

On January 9, 2004, groundwater elevation data was collected from the monitoring wells to determine the direction of groundwater flow. Monitoring well elevations were determined by surveying the height of the well risers relative to an arbitrary benchmark elevation. Based on elevation and well gauging data, groundwater at the Property is inferred to flow in a southerly direction. A Water Table Elevation Contour Plan is included as Figure 4.

3.4 Depth to Bedrock/Bedrock Type

Subsurface explorations were limited to a depth of approximately 12 feet below grade. Bedrock was not encountered during soil boring activities conducted at the Site, and no outcrops are visible in the immediate site vicinity. According to the United Stated Geological Survey (USGS) Bedrock Geologic Map of Massachusetts (1983), the Site is located within the Milford-Dedham Zone, Boston Basin. Bedrock underlying area is mapped as Cambridge Argillite.

3.5 Potential for Flooding

FEMA Flood Insurance Rate Map (FIRM) Community Panel 250214 0001B (07/17/1986) shows that the Site is located outside the 500-year flood zone. Based on the foregoing, there appears to be little potential for flooding at the Site.

3.6 Natural Resources

The MCP Site Scoring Map (Figure 2) indicates that the Site is not located within a potentially productive aquifer, no public water supplies are located within one-half mile of the Site, and that none of the following natural resource areas are located on or within 500 feet of the Site: approved Zone II areas, Interim Wellhead Protection Areas, Zone A areas, Areas of Critical Environmental Concern, Sole Source Aquifers, wetlands habitats, or wetlands.

According to Mr. Harold Vaughan, Senior Sanitary Inspector of the City of Somerville Department of Health, no private drinking water wells are known to be located within 0.5 miles of the Site.

4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 Analytical Summary

Results of field screening of samples obtained during drilling activities completed at the Site (see Section 3.0) are depicted on the drilling logs (Appendix C). Laboratory reports of analysis of soil and groundwater samples collected during investigations described herein are attached in Appendix F. Soil and groundwater data are summarized on Tables 1 and 2, respectively.

4.1.1 Soil Analysis

The following list summarizes the compounds detected in soil:

- *Petroleum Hydrocarbons*: C9-C18 aliphatic, C19-C36 aliphatic, and C11-C22 aromatic EPH hydrocarbon fractions.
- *PAHs*: phenanthrene
- *Inorganics and metals***:** Aluminum, arsenic, barium, cadmium, chromium, lead, magnesium, mercury, nickel, silver, and zinc.

4.1.2 Groundwater Analysis

The following list summarizes the compounds detected in groundwater.

- *VPH Target Analytes*: Methyl t-butyl ether
- *Volatile Organic Compounds*: Methyl t-butyl ether and acetone
- *Metals**:*** Cadmium.

4.2 Source of Contamination

Based on investigations completed to date, the most likely source of lead contamination has been identified as historic foundry operations, and the presence of fill material containing ash. It is Resource Controls opinion that concentrations of lead in excess of 1,000 mg/kg are likely due to historic foundry operations, and that lower concentrations of lead are likely due to the presence of fill material containing ash. The source of petroleum and VOC contamination is unknown, but is possibly related to the historic use of the Property as a machine shop. No additional sources have been found elsewhere on the Site.

4.3 Contaminants of Concern

The identification of contaminants of potential concern (CoPC) is discussed in Section 2.2 of the Method 3 Risk Characterization (Appendix F). In summary, CoPCs for soil include petroleum hydrocarbons, phenanthrene, and metals (arsenic, barium, cadmium, lead, mercury, nickel, silver, and zinc). No CoPCs were identified in groundwater.

4.4 Nature of Contamination

The predominant CoPC at the Site is lead. Lead, as well as other metal CoPCs, are slowly to moderately mobile, with low vapor pressures (except mercury, which has a moderate to high vapor pressure), low solubility in water, densities higher than water, low partition coefficient, and high specific gravity. Lead and other metals are persistent and bioaccumulate.

Petroleum hydrocarbons detected in soil are slowly to moderately mobile, moderate to high vapor low solubility in water, and densities lower than water, moderate to high partition coefficient, and low specific gravity. Petroleum hydrocarbons are non-persistent and generally do not bioaccumulate.

4.5 Extent of Contamination

The horizontal and vertical extent of the Site is defined as the locations of soil containing CoPCs at levels exceeding background concentrations. Background levels are discussed in Section 4.7.

Based upon laboratory analytical results, the zinc and petroleum hydrocarbon contamination appears to be limited to the area of the casting pit.

Based upon a comparison of laboratory analytical results to the background concentrations of CoPCs as presented in Section 2.1.4 of the Method 3 Risk Characterization (Appendix G), the vertical extent of lead in soil contamination extends from the ground surface to approximately five to six feet bgs.

As previously stated, it is Resource Controls opinion that concentrations of lead in excess of 1,000 mg/kg are likely due to historic foundry operations. Concentrations of lead in excess of 1,000 mg/kg were reported in a soil sample collected from within the foundry casting pit (SB-4), where soil encountered was predominantly black, fine sand. Lead concentrations in excess of 1,000 mg/kg were also reported from two sampling locations proximate to the former foundry building, where similar sands were also identified (SB-2 and SB-15).

As indicated in the drilling logs (Appendix C), fill material consisting of ash, brick and wood debris was identified in multiple locations in shallow soils at the Site. Lead contamination of less than 1,000 mg/kg was also identified in shallow soils at multiple locations across the Site. Consequently, it is Resource Controls opinion that lead concentrations less than 1,000 mg/kg are attributable to the presence of fill material containing ash.

As stated above, the horizontal extent of the Site is defined as the locations of soil containing CoPCs at levels exceeding background concentrations. Based on laboratory analytical results, concentrations of lead exceeding background concentrations were reported up to the (approximate) property boundary of the Property. According to historic Sanborn® maps of the property and the vicinity, the following conclusions can be drawn:

- According to the Sanborn map dated 1900, the Property and vicinity were already developed at that time;
- Historically, the area around the Property has been a mixture of both industrial and residential uses. Industrial uses have included machine shops, storage and iron works;
- From approximately 1933 to 1950, the abutting property to the east of the Property was the Somerville Charcoal Company.

Refer to Appendix H for copies of Sanborn maps.

Based upon the preceding discussion, as well as soil data collected from other sites in Somerville, it is Resource Controls opinion that the presence of lead contamination is a regional issue, is likely related to the presence of fill material, and that the Site, which consists of the entire Property, is a portion of a larger disposal site. The releases identified herein were discovered during implementation of a property transfer assessment, prior to the RP's acquisition of the Property. The RP did not cause or contribute to the release area located on the property or to the balance of the Disposal Site located beyond the property line. Therefore, it is Resource Controls opinion that the Responsible Party (RP) for this Site has reached the appropriate liability endpoint, as described in Section 5C of Massachusetts General Law Chapter (M.G.L.) 21e, the "Massachusetts Oil and Hazardous Material Release Prevention and Response Act." In addition, the RP understands that achieving the liability endpoint requires the RP to meet all of the requirements outlined in Section 5C of M.G.L. Chapter 21e.

4.6 Presence and Distribution of Non-Aqueous Phase Liquids

Non-aqueous phase liquids (NAPL) have not been observed in monitoring wells during groundwater monitoring events completed at the Site.

4.7 Characterization of Background Concentrations of Contaminants

A discussion of background concentrations of CoPCs is presented in Section 2.1.4 of the Method 3 Risk Characterization (Appendix H).

4.8 Data Usability

The MCP, as set forth at 310 CMR 40.0017 and 40.0191(2)(c), requires that analytical and environmental monitoring data be scientifically valid and defensible, and of a level of precision and accuracy commensurate with its stated or intended use. Taking into consideration relevant policies and guidelines issued by the MADEP and the U.S EPA, 310 CMR 40.0017 (3)(i) further indicates that all response action submittals shall include details on any known conditions or findings which may affect the validity of analytical data, including unsatisfactory results obtained for blank, duplicate, surrogate or spiked samples.

To facilitate application of these broad performance standards, MADEP published a "Compendium of Analytical Methods (CAM)," which provides a series of recommended protocols for the acquisition, analysis, and reporting of analytical data in support of MCP decisions. The section of the CAM entitled, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data* (MADEP, WSC-CAM-VIIA, July 31, 2003) states that those electing to utilize these protocols will be assured of "Presumptive Certainty" of data acceptance by MADEP reviewers.

As stated in the document, the following criteria must be met to achieve Presumptive Certainty:

- Use the "MCP Analytical Methods" detailed in the CAM;
- Adopt the Tentatively Identified Compound (TIC) reporting requirements specified for the individual testing procedures in the CAM;
- Quality Assurance and Quality Control Guidelines for the acquisition and reporting of analytical data
- Comply with the applicable QC analytical requirements prescribed for the individual testing procedures in the CAM;
- Collect and analyze field QC samples at the frequencies prescribed in the CAM; and
- Adopt the reporting formats and elements specified in the CAM.

As documented herein, the analysis of soil and groundwater samples was completed using various methods, including MADEP Methods EPH-98-1, EPA Method 8100M, EPA Method 8260B, EPA Method 8082, and EPA Methods 6010B and 7471A,which are appropriate based on the documented source of the release.

The laboratory reports included in Appendix D met the appropriate QA/QC requirements applicable to EPH and VOC analysis, with the following exceptions:

- Soil sample SB-11 was diluted prior to analysis analyzed for EPH with PAHs. According to the project narrative section of the laboratory report, the sample had surrogate recoveries outside of the recommended limits due to the sample dilution. According to Karyn Raymond, Project Manager for Groundwater Analytical, the dilution of this sample should have no effect on the reported analytical results.

- Soil samples MW-1 and MW-2 were submitted for laboratory analysis for VOCs by EPA Method 8260. According to the project narrative section of the laboratory report, lab control sample (LCS) analyte ter-butyl alcohol was above the recommended recovery limits. According to Karyn Raymond, Project Manager for Groundwater Analytical, this would tend to overestimate the reported analytical results.

- Groundwater samples MW-1, MW-2 and MW-3 were submitted for VOCs by EPA Method 8260. According to the project narrative section of the laboratory report, lab control sample (LCS) analyte ter-butyl alcohol and 1,4-dioxane were above the recommended recovery limits. According to Karyn Raymond, Project Manager for Groundwater Analytical, this would tend to overestimate the reported analytical results.

With respect to field QA/QC, the samples were collected using Resource Controls' standard operating procedures, and upon collection, the samples were placed in coolers containing ice packs, stored at a temperature of 4 ^{o}C prior to pickup by the laboratory's courier, and managed under strict chain-of-custody protocol.

As outlined in the CAM, matrix spike samples are required when conducting laboratory analysis for metals and for total cyanide, for both soil and groundwater samples, at a frequency of one matrix spike per 20 samples. During the initial December 2003 subsurface investigation at the site, Resource Controls collected soil samples for various metals as a screening tool to determine which metals represented CoPCs. Based on laboratory analytical results, arsenic, zinc and lead were reported in soil excess of RCS-1 Reportable Concentrations. All other metals analyzed for, such as aluminum, barium, selenium and silver, were reported below the reportable concentrations. Consequently, subsequent analysis for metals was limited to arsenic, lead and zinc, and matrix spike soil samples were collected for arsenic (SB-11), zinc (SB-9) and lead (SB-7).

One matrix spike sample (MW-2) was collected for various metals in groundwater, including lead, zinc and arsenic.

Based on the foregoing, a review of field practices, and a review of the laboratory reports, it is the opinion of the LSP named herein that the analytical data obtained from samples collected in 2004 have a level of precision and accuracy commensurate with the state and intended use, and meet the criteria set forth by the MADEP for Presumptive Certainty.

5.0 ENVIRONMENTAL FATE AND TRANSPORT AND CONCEPTUAL SITE MODEL

To assess the potential for human or environmental receptors to be exposed to the compounds of concern identified by this investigation, all reasonable exposure points were identified. The migration pathway of contaminants from their source to the exposure point consists of a release source, a release mechanism, and a transport medium, must be defined to evaluate the significance of these exposure points.

Potential exposure to human and environmental receptors is summarized in the Conceptual Site Model (Appendix E). The following is a detailed discussion of the summaries provided in the Conceptual Site Model.

Based on the physical and chemical properties of the COCs described above, the COCs will preferentially partition themselves between various environmental media such as water, soil, air and biological tissue. This partitioning potentially enhances the potential for human exposure. Partitioning mechanisms include physical transport to alternative exposure points.

Each of these mechanisms is considered with respect to the site-specific migration pathways identified in this investigation. These pathways include:

- Transport via storm water runoff;
- Transport through groundwater, soil and bedrock;
- Transport along preferential pathways (subsurface utilities);
- Partitioning to air; and
- Food chain pathways.

5.1 Storm Water Runoff

As indicated in Table 1, petroleum hydrocarbons and metals are present in surficial (0-2' bgs) soil. With the exception of the southern portion of the Property, the area of the Site that is not covered by a building footprint is not paved. Consequently, there is potential for storm water runoff to affect the release, or for the release to affect storm water. However, the nearest surface water body (the Charles River) is approximately one mile from the Site, and storm water runoff from the Site is not considered to represent a significant migration pathway.

5.2 Transport Through Groundwater, Soil And Bedrock

During the aforementioned subsurface investigations at the Site, bedrock was not encountered. Based on the locations of the deepest monitoring wells, bedrock is located more than 12 feet bgs. As stated in Section 5.4, the vertical extent of soil contamination is approximately seven feet bgs across the Site. Based on the foregoing, the subject release has likely not affected bedrock at the Site. Consequently, the migration of contaminants of concern through bedrock is not considered a significant potential pathway.

As stated in Section 4.3, the CoPCs at the Site are various metals, phenanthrene and petroleum hydrocarbons. As stated in Section 4.4, these materials are slowly to moderately mobile. Lead and other metals are persistent, while petroleum hydrocarbons are not. Lead, which is the predominant CoPC at the Site, tends to bond to soil particles and is unlikely to move from soil into water except under acidic conditions. The movement of lead from soil will also depend upon the physical and chemical characteristics of the soil. Consequently, the migration of contaminants of concern through soil is not considered a significant potential pathway.

As stated in the Executive Summary of the Method 3 Risk Characterization (Appendix G), significant concentrations of CoPC were not identified in groundwater. Consequently, the migration of contaminants of concern through groundwater is not considered a significant potential pathway.

5.3 Transport Along Preferential Pathways

The Site has municipal water and sewer service, and is heated by natural gas. All three utilities access the Site from Valley Street.

Typically, natural gas and water utilities are installed less than four feet below grade. Municipal sewer lines are typically deeper, approximately eight to ten feet below grade. As stated in Section 3.12, the depth to water at the Site is approximately five feet or greater.

As stated in Section 5.2, significant concentrations of CoPC were not identified in site groundwater samples. Consequently, the migration of contaminants of concern along preferential pathways is not considered a significant potential pathway.

5.4 Partitioning to Air

Given that the CoPCs are non-volatile, partitioning from soil to soil gas is not expected to represent a significant migration pathway. However, dusts associated with the release may be present in outdoor air and indoor air spaces and the transfer of CoPCs to dust particles represents a potential migration pathway. Inhalation of contaminated airborne particles and dust is considered in the Method 3 risk characterization (Appendix G).

5.5 Food Chain Pathways

The Site is located in a densely developed urban area, no surface water bodies or associated wetlands are located near the Site, and no migration of CoPCs to wetlands or surface water bodies is expected. Therefore, no current and potential environmental receptors were identified. Exposure pathways involving ingestion of homegrown produce are addressed in the Method 3 Risk Characterization (Appendix G).

6.0 EXPOSURE ASSESSMENT

6.1 Potential Human and Environmental Receptors

The identification of potential human and environmental receptors is discussed in the Method 3 Risk Characterization (Appendix F). In summary, the most sensitive current and future potential human receptors were identified as adult and child residents (high frequency/high intensity of use). Other potential receptors include adult and child visitors and trespassers, adult workers, construction/utility workers, and maintenance workers.

6.2 Identification of Applicable Groundwater and Soil Categories

6.2.1 Applicable Groundwater Categories

Groundwater categories summarized in the MCP (310 CMR 40.0932) are based on the potential for three distinct types of exposure. More than one groundwater category may apply to a specific area. The groundwater category of GW-1 is not applicable to the Site since groundwater at this site does not meet any of the criteria defined under the MCP [310 CMR 40.0932]. No public or private drinking water supply wells within 1,000 feet of the site. In addition, the Site is not located within Zone II Areas, Interim Wellhead Protection Areas, or Zone A areas, and no Potentially Productive Aquifers are located within 500 feet of the Site. The classification of GW-2 is applicable within 30 feet of occupied buildings on the basis that the average annual depth to groundwater is less than 15 feet below the ground surface. The GW-3 classification is applicable at all areas of the Site since groundwater at all sites is categorically classified GW-3.

6.2.2 Applicable Soil Categories

Three categories of soil, based on the accessibility of soil to potential receptors, and frequency and intensity of Site use, are defined in the MCP at 310 CMR 40.0933. The accessibility of soil is dependent on the depth of the soil and whether it underlies pavement or a building or permanent structure. However, based on current potential human receptors (see Section 6.1), and the MADEP soil category selection matrix (310 CMR 40.0933), the following soil categories are applicable under current site activities and use:

Location/Depth	Unpaved Areas	Paved Areas	Beneath Buildings
Grade to 3 ft.	S-1	S-1	S-3
3 to 15 ft.	S-1	S-1	S-3
Greater than 15 ft.	S-3	S-3	S-3

However, given the potential for all soils to be exposed during redevelopment, as a conservative measure, for the purpose of the Method 3 risk characterization, all on-site soil was considered to be categorized as "S-1."

6.3 Exposure Points

In consideration of current and foreseeable site activities and use, exposure points identified at the Site, as discussed in detail in the Method 3 Risk Characterization (Appendix G), include:

- For current and foreseeable residential receptors, surficial soils in children's outdoor play areas, soils used in vegetable and flower gardens, yards, and dusts within interior living spaces;
- For construction/utility workers, soils to a depth of 15 feet; and
- For maintenance workers, surficial soils in landscaped areas.

6.4 Exposure Routes

The following potential exposure routes, in consideration of current and unrestricted site activities and use, are discussed in detail in the Method 3 Risk Characterization (Appendix G):

- Residential receptor exposure routes that involve ingestion of soil, ingestion of homegrown vegetables, dermal contact with soils, and inhalation and ingestion of inhaled airborne particulates;
- Construction/utility worker exposure routes that involve incidental ingestion of soil, dermal contact with soil, and inhalation and ingestion of inhaled airborne particulates. The construction/utility worker scenario is protective of other less intense (i.e., reduced physical contact with site media) and less frequent contact with soils;
- Maintenance worker exposure routes that involve incidental ingestion of soils, dermal contact with soil, and inhalation and ingestion of airborne particulate; and
- On-site worker exposure routes involve inhalation and ingestion of inhaled airborne particulates.

Exposure routes involving ingestion and use of groundwater were not evaluated since groundwater not classified as GW-1. Quantitative exposure estimates are presented in Table 7 of the Method 3 Risk Characterization (Appendix G).

6.5 Exposure Point Concentrations

The determination of exposure point concentrations of CoPCs in soil, groundwater, and as particulates in indoor air and outdoor air are discussed in detail in Section 2.4.5 of the Method 3 risk characterization (Appendix G). Table 7, included in the risk characterization, provides a summary of exposure point concentrations of COCs in the media identified above.

7.0 METHOD 3 RISK CHARACTERIZATION

7.1 Introduction and Applicability of the Method 3 Risk Characterization

The Method 3 Risk Characterization, attached as Appendix G, was conducted in accordance with 310 CMR 40.0900 of the MCP, and the MADEP Guidance for Disposal Site Risk Characterization – In Support of the Massachusetts Contingency Plan (MADEP, 1995), to evaluate potential risk of harm to health, safety, public welfare and the environment posed by Site conditions. As specified in the MCP, application of Method 3 Risk Characterization is acceptable for any site.

7.2 Results of the Method 3 Risk Characterization

The Method 3 Risk Characterization (see Appendix G) concluded that a condition of No Significant Risk of Harm to Human Health, Safety, Public Welfare and the Environment exists at the Site for current and future conditions.

8.0 SUMMARY AND CONCLUSIONS

This report was compiled to meet requirements set forth in the Massachusetts Contingency Plan (MCP) at 310 CMR 40.0000 for 120-day notification and Class B-1 P-RAO Statement. The scope of assessment work implemented was designed to collect, develop and evaluate sufficient information to support conclusions regarding the source, nature, extent, and potential effects of the release of oil and/or hazardous materials (OHM) at the Site, the risk of harm posed by the Site to health, safety, public welfare and the environment, and the need to conduct remedial actions at the Site. The P-RAO Statement, including the Method 3 Risk Characterization, demonstrates that a condition of "No Significant Risk" has been attained at all areas of the Site for current and foreseeable conditions, and a Class B-1 P-RAO has been attained.

Based on the information contained in this report, the following conclusions are offered:

- Through investigations and response actions completed, the portion of the Disposal Site evaluated by the subject document has been defined as the property located at 27 Village Street, Somerville, Massachusetts.
- Contaminants of potential concern (CoPC) identified at the Site included petroleum hydrocarbons, phenanthrene, and metals (arsenic, barium, cadmium, lead, mercury, nickel, silver, and zinc).
- No exposure points other than soil (including dust) and groundwater were identified.
- No potential environmental receptors were identified.
- A Method 3 Risk Characterization demonstrated that a condition of No Significant Risk to human health, safety, public welfare and the environment exists at the Site for under current and future conditions.
- A Permanent Solution as defined in the MCP has been attained at the Site and no additional response actions are required.
- Based on response actions completed at the Site, which did not include the performance of remedial actions, the requirements for a Class B-1 P-RAO have been met at the Site.

9.0 LIMITATIONS

This report addresses the environmental characteristics of the subject property with regard to the release of or possible presence of oil and/or hazardous materials. It is not intended to guarantee that the subject property is or is not free from conditions, materials or substances that could adversely impact the environment or pose a threat to public health and safety. Rather, it is intended to be used as a summary of available information on existing conditions, the conclusions of which are based upon a reasonable and knowledgeable review of evidence found in accordance with normally accepted industry standards and protocols, within the scope and budget established with the client. Should further research on the subject property be warranted, Resource Controls must review any additional data obtained and the conclusions presented herein may be modified accordingly.

This report in total has been prepared on behalf of and for the exclusive use of Ms. Adele Santos, solely for use in an environmental evaluation of the subject property. This document or any part thereof, may not be altered, used, relied upon or reproduced by any party other than Ms. Adele Santos, without first obtaining written permission from Resource Controls.

Conclusions stated herein are based on the available information summarized herein and refer only to the specific subject property investigated. No warranty is implied or given and the report is subject to the agreement for the work, including the Standard Terms and Conditions attached to said agreement, as well as Additional Limitations bound herein.

TABLES

TABLE 1
SOIL LABORATORY ANALYTICAL RESULTS

SANTOS/VILLAGE STREET
27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

Sample Identification	MW-1	MW-2	SB-2	SB-3	SB-4	SB-5	SB-5	SB-6	SB-6	SB-7	SB-7	SB-8	SB-9	SB-10	SB-11	SB-11	SB-12	SB-13	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19	SB-20	SB-21	SB-22	SB-23	MCP Reportable Concentrations	MCP Method 1 Soil Standards					
Depth Sampled	1'-2'	5'-6'	1'-2'	3'-4'	1'-2'	1'-2'	7'-8'	1'-2'	7'-8'	1'-2'	5'-6'	7'-8'	7'-8'	1'-2'	0'-1'	6'-7'	6'-7'	1'-2'	6'-7'	1'-2'	1'-2'	1-3'	1-3'	1-2'	1-2'	0.5-1.5'	1-2'	1-3'	0.5-2'		S-1		S-2		S-3	
Date Sampled	12/1/2003	12/1/2003	12/1/2003	12/1/2003	12/1/2003	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	RCS-1	GW-2	GW-3	GW-2	GW-3	GW-2	GW-3
TOTAL PETROLEUM HYDROCARBONS (mg/kg)																																				
Total Petroleum Hydrocarbons	470	70	190	--	2,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	200	800	800	2,000	2,000	5,000	5,000
CYANIDE (mg/kg)																																				
Cyanide	--	--	< 1.3	< 1.1	< 1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100	100	100	100	100	400	400
POLYCHLORINATED BIPHENYLS (PCBs) by EPA Method 8082 (ug/kg)																																				
Aroclor 1016	--	--	--	< 94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Aroclor 1221	--	--	--	< 94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Aroclor 1232	--	--	--	< 94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Aroclor 1242	--	--	--	< 94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Aroclor 1248	--	--	--	< 94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Aroclor 1254	--	--	--	< 94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Aroclor 1260	--	--	--	< 94	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,000	2,000	2,000	2,000	2,000	2,000	2,000
METALS by EPA Method 6010B and 7471A (mg/kg)																																				
Aluminum	--	--	--	5,100	4,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS	NS	NS	NS
Arsenic	81	3.3	7.7	8.0	8.3	--	--	12	< 1.5	--	--	--	--	--	10	< 1.1	1.5	4.4	2.0	--	--	--	--	--	--	--	--	--	--	30	30	30	30	30	30	30
Barium	40	< 24	69	40	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,000	1,000	1,000	2,500	2,500	5,000	5,000
Cadmium	26	< 0.60	25	20	4.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30	30	30	80	80	80	80
Chromium	< 12	< 12	< 13	18	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,000	1,000	1,000	2,500	2,500	5,000	5,000
Lead	280	33	2,200	240	1,600	380	< 12	--	--	570	36	< 12	19	76	--	--	--	--	--	660	1,100	590	61	380	620	230	210	64	170	300	300	300	600	600	600	600
Magnesium	--	--	--	1,300	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS	NS	NS	NS	NS	NS	NS
Mercury	0.22	< 0.039	0.088	0.39	0.16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20	20	20	60	60	60	60
Nickel	--	--	--	< 12	230	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	300	300	300	700	700	700	700
Selenium	< 24	< 24	< 25	< 24	< 21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	400	400	400	2,500	2,500	2,500	2,500
Silver	< 6.0	< 6.0	< 6.3	< 6.0	7.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100	100	100	200	200	200	200
Zinc	--	--	--	2,100	3,000	--	--	--	--	--	--	--	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,500	2,500	2,500	2,500	2,500	5,000	5,000
EXTRACTABLE PETROLEUM HYDROCARBONS by MADEP Method (mg/kg)																																				
C9-C18 Aliphatic Hydrocarbons	--	--	--	--	--	--	--	82	--	--	--	--	< 35	--	< 180	--	< 35	< 33	--	--	--	--	--	--	--	--	--	--	--	1,000	1,000	1,000	2,500	2,500	5,000	5,000
C19-C36 Aliphatic Hydrocarbons	--	--	--	--	--	--	--	270	--	--	--	--	< 35	--	360	--	< 35	96	--	--	--	--	--	--	--	--	--	--	--	2,500	2,500	2,500	5,000	5,000	5,000	5,000
C11-C22 Aromatic Hydrocarbons	--	--	--	--	--	--	--	210	--	--	--	--	< 35	--	480	--	< 35	71	--	--	--	--	--	--	--	--	--	--	--	200	800	800	2,000	2,000	5,000	5,000
Naphthalene	--	--	--	--	--	--	--	< 0.57	--	--	--	--	< 0.58	--	< 2.9	--	< 0.58	< 0.55	--	--	--	--	--	--	--	--	--	--	--	4	100	100	1,000	1,000	1,000	1,000
2-Methylnaphthalene	--	--	--	--	--	--	--	< 0.57	--	--	--	--	< 0.58	--	< 2.9	--	< 0.58	< 0.55	--	--	--	--	--	--	--	--	--	--	--	4	500	500	1,000	1,000	2,000	1,000
Phenanthrene	--	--	--	--	--	--	--	3.8	--	--	--	--	< 0.58	--	30	--	< 0.58	2.7	--	--	--	--	--	--	--	--	--	--	--	100	1,000	100	2,500	100	2,500	100
Acenaphthene	--	--	--	--	--	--	--	< 0.57	--	--	--	--	< 0.58	--	< 2.9	--	< 0.58	< 0.55	--	--	--	--	--	--	--	--	--	--	--	20	1,000	1,000	2,500	2,500	5,000	4,000
Acenaphthylene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100	100	100	2,500	1,000	2,500	1,000
Fluorene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	400	1,000	1,000	2,000	2,000	5,000	4,000
Anthracene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	100	1,000	1,000	2,500	2,500	5,000	5,000
Fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,000	1,000	1,000	2,000	1,000	5,000	1,000
Pyrene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	700	700	700	2,000	2,000	5,000	5,000
Benzo[a]anthracene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.7	0.7	0.7	1	1	4	4
Chrysene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7	7	7	10	10	40	40
Benzo[b]fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.7	0.7	0.7	1	1	4	4
Benzo[k]fluoranthene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7	7	7	10	10	40	40
Benzo[a]pyrene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Ideno[1,2,3-c,d]pyrene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.7	0.7	0.7	1	1	4	4
Dibenzo[a,h]anthracene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.7	0.7	0.7	0.7	0.7	0.8	0.8
Benzo[g,h,I]perylene	--	--	--	--	--	--	--	--	--	--	--	--	< 0.58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1,000	1,000	1,000	2,500	2,500	2,500	2,500

NOTES:
ug/kg = micrograms per kilogram (parts per billion).
mg/kg = milligrams per kilogram (parts per million).
< 1.3 = Reported concentration below method detection limit of 1.3.
Soil samples from MW-1 and MW-2 were analyzed for volatile organic compounds using EPA method 8260B. Reported concentrations were below method detection limitsand MCP Reportable Concentration for RCS-1.
BOLD = Exceeds MCP Method 1 S-1 GW-2/GW-3 Soil Standards.
-- = Not analyzed.
NS = No standard.

TABLE 2
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

Santos/Village Street
27 Village Street
Somerville, Massachusetts

Sample Identification	MW-1	MW-2	MW-3	MCP Method 1 Groundwater Standards	
Date Sampled	12/1/2003	12/1/2003	12/1/2003	GW-2	GW-3
VOLATILE ORGANIC COMPOUNDS by EPA Method 8260B (ug/L)					
Acetone	< 10	19	< 10	50,000	50,000
Methy tert-Butyl Ether	< 0.5	0.6	< 0.5	50,000	50,000
Other Volatile Organic Compounds	BRL	BRL	BRL		
TOTAL PETROLEUM HYDROCARBONS by EPA Method 8100 (mg/L)					
Total Petroleum Hydrocarbons	< 0.5	< 0.5	< 0.5	1	20
DISSOLVED METALS by EPA Method 6010B and 7471A (mg/L)					
Arsenic	< 0.01	--	< 0.01	NS	0.4
Barium	< 0.2	--	< 0.2	NS	30
Cadmium	0.012	--	< 0.005	NS	0.01
Chromium	< 0.01	--	< 0.01	NS	2
Lead	< 0.005	--	< 0.005	NS	0.03
Mercury	< 0.0002	--	< 0.0002	NS	0.001
Selenium	< 0.05	--	< 0.05	NS	0.08
Silver	< 0.007	--	< 0.007	NS	0.007

NOTES:
mg/L = milligrams per liter (parts per million)
ug/L = micrograms per liter (parts per billion)
Bold values exceed the MCP Reportable Concentration RCGW-2
BRL = Reported concentration below method detection limit and MCP Reportable Concentration for RCGW-2
-- = Not Analyzed

FIGURES

Source: MassGIS, Commonwealth of Massachusetts Executive Office of Environmental Affairs
USGS Topographic Map - Boston North Quadrangle

0 500 1,000 2,000 Feet

SCALE: 1:24,000

N W E S

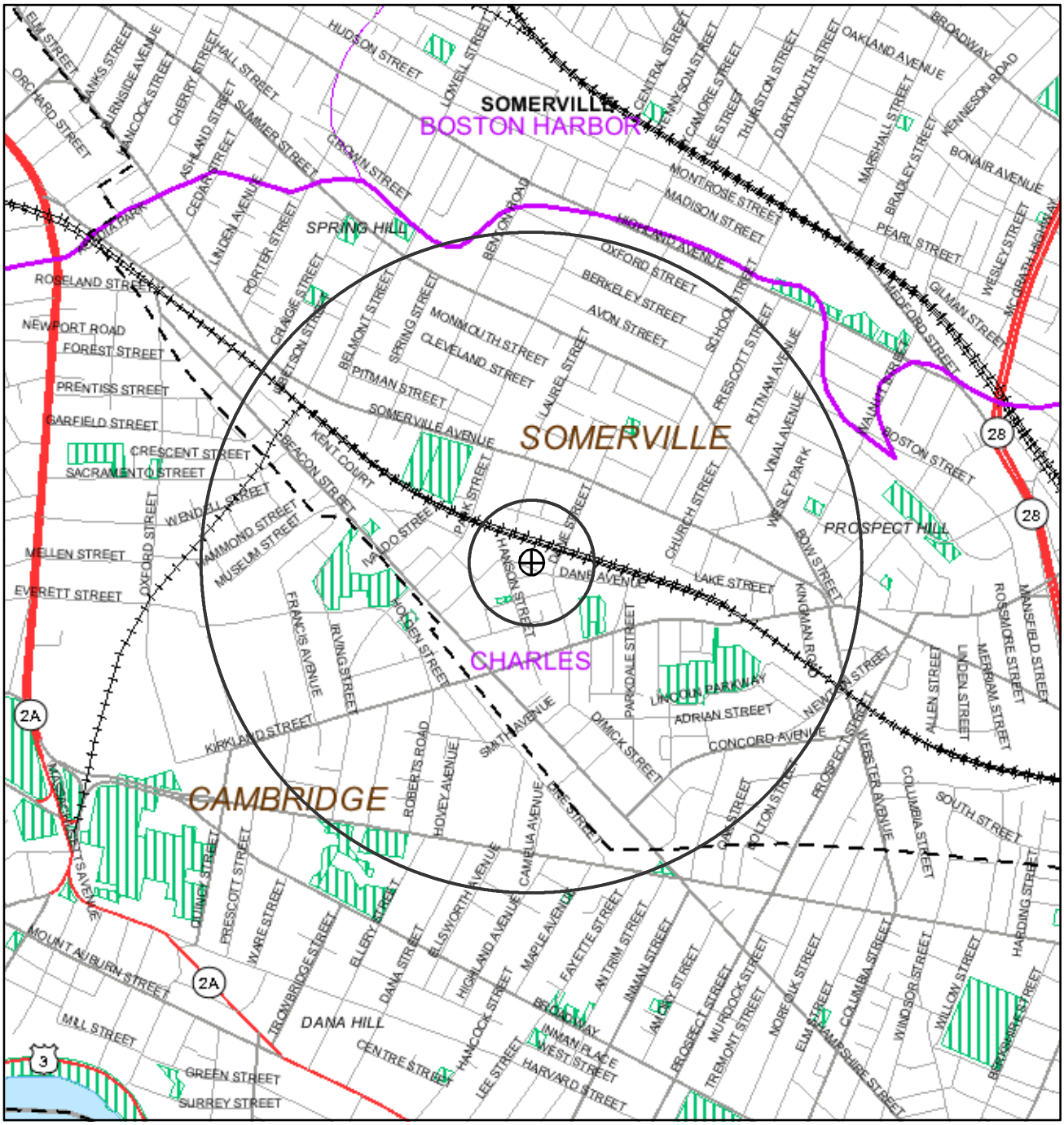
RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

LOCUS MAP

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY	PROJECT	PRINT DATE	FIGURE
JV	A6550	11/21/2003	1

P:\6000\6550.00 Santos, Village St, Env. Assmnt. Svcs\Graphics-WIP\GIS\A6550 Locus Topo Map.mxd



Source: MassGIS, Commonwealth of Massachusetts Executive Office of Environmental Affairs

0 500 1,000 2,000 Feet

SCALE: 1:15,000

N W E S

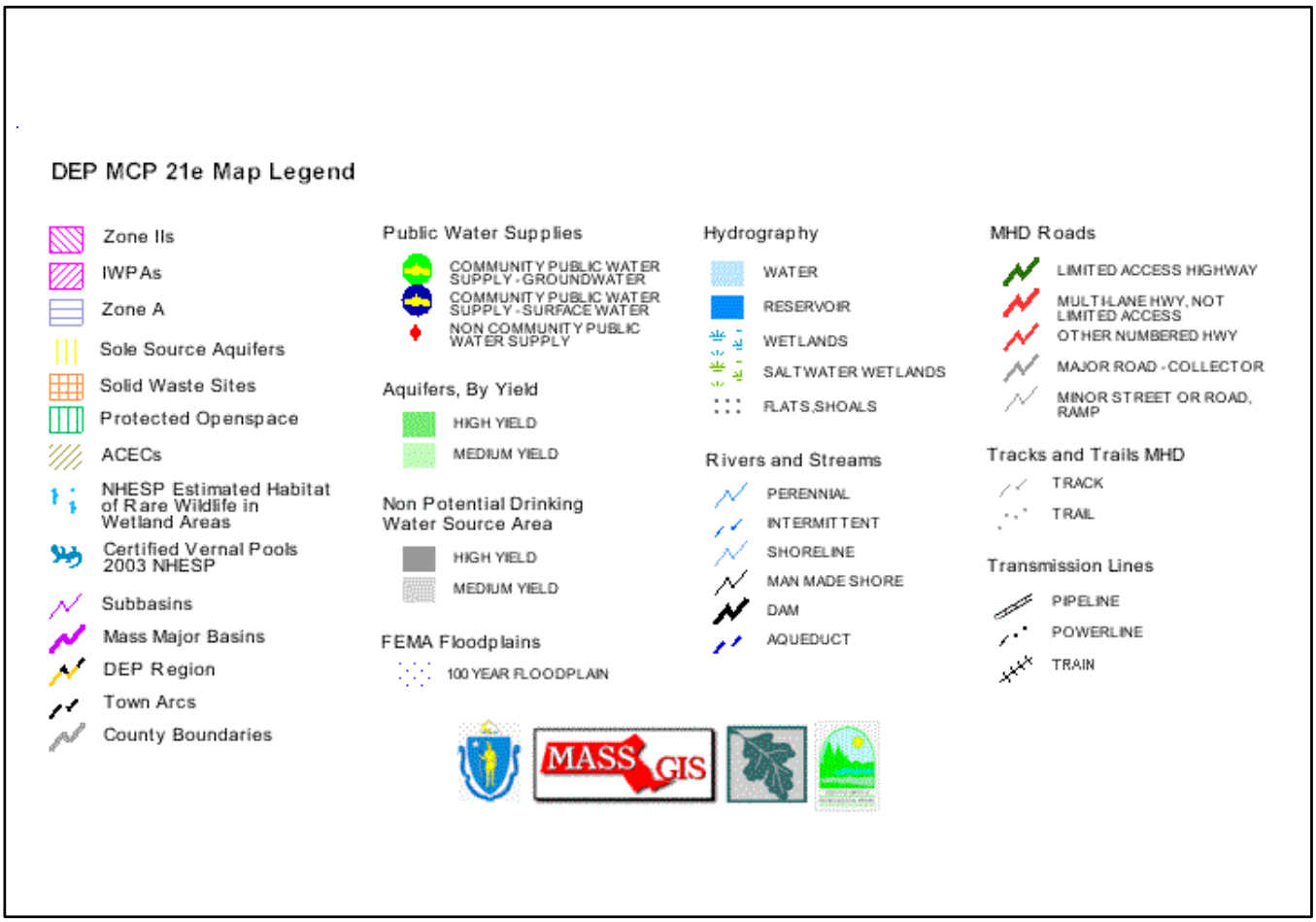
RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

MCP SITE SCORING MAP

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY	PROJECT	PRINT DATE	FIGURE
JV	A6550	11/21/2003	2A

P:\6000\6550.00 Santos, Village St, Env. Assmnt. Svcs\Graphics-WIP\GIS\A6550 MCP Site Scoring Map.mxd



Source: MassGIS, Commonwealth of Massachusetts Executive Office of Environmental Affairs

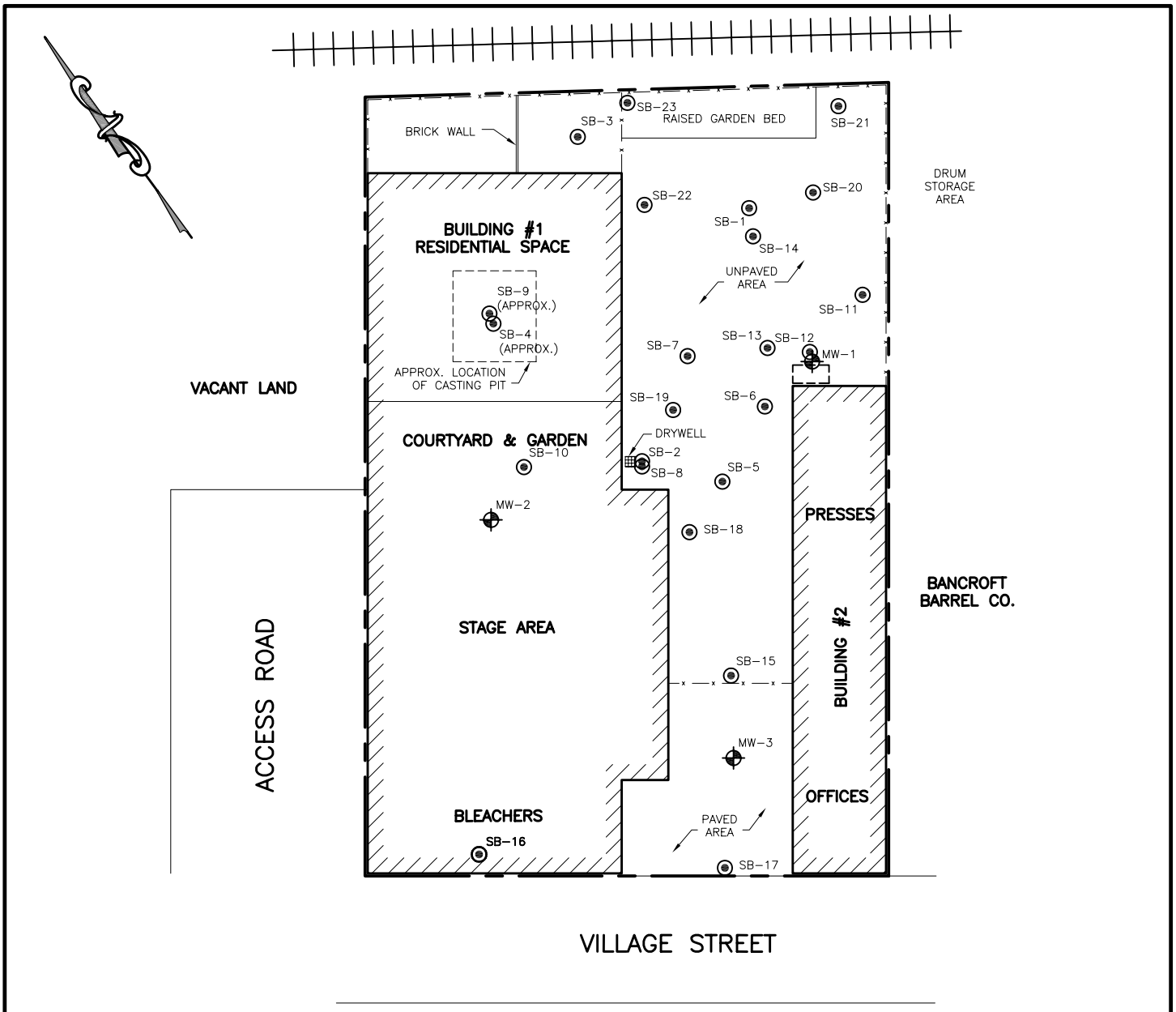
RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

MCP SITE SCORING MAP LEGEND

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY	PROJECT	PRINT DATE	FIGURE
JV	A6550	11/21/2003	2B

P:\6000\6550.00 Santos, Village St, Env. Assmnt. Svcs\Graphics-WIP\GIS\A6550 MCP Site Scoring Map Legend.mxd



LEGEND

- SIDEWALK/CONCRETE
- APPROXIMATE SUBJECT PROPERTY BOUNDARY
- BUILDING
- CHAIN LINK FENCE
- RAILROAD TRACKS
- MW-1 MONITORING WELL
- SB-1 SOIL BORING

0 7.5 15 30

Approx. Scale 1 inch = 30 feet

RESIDENTIAL PROPERTIES

NOTE: DRAWING WAS CREATED FROM FIELD TECHNICHIAN'S NOTES AND MEASUREMENTS DATED DECEMBER 1, 2003.

RESOURCE CONTROLS

474 Broadway, Pawtucket, RI 02860
401.728.6860 Fax 401.727.1849

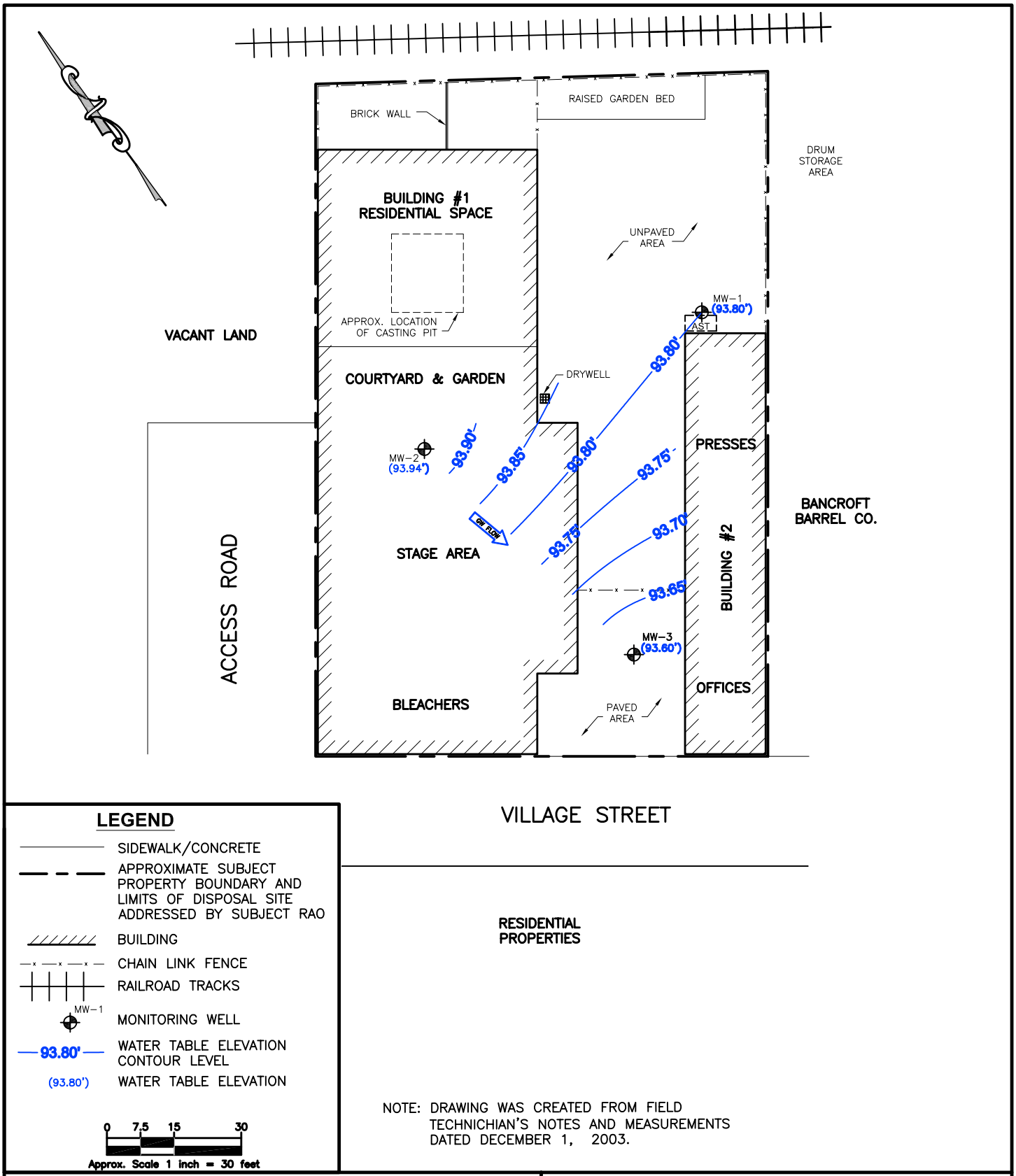
90 Madison Street, Worcester, MA 01608
508.798.6552 Fax 508.798.9186

SITE PLAN

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY:	PROJECT	PRINT DATE	FIGURE
SJS	A6550	01/16/04	2

P:\6000\A6550\GRAPHICS\CAD\A6550 SITE SKETCH.DWG



NOTE: DRAWING WAS CREATED FROM FIELD TECHNICHIAN'S NOTES AND MEASUREMENTS DATED DECEMBER 1, 2003.

RESOURCE CONTROLS

474 Broadway, Pawtucket, RI 02860
401.728.6860 Fax 401.727.1849

90 Madison Street, Worcester, MA 01608
508.798.6552 Fax 508.798.9186

WATER TABLE ELEVATION PLAN

27 VILLAGE STREET SOMERVILLE, MASSACHUSETTS

DRAWN BY:	PROJECT	PRINT DATE	FIGURE
SJS	A6550	01/16/04	4

P:\6000\A6550\GRAPHICS\CAD\A6550 GW CONTOUR 01_09_04.DWG

APPENDIX A

Copies of BWSC103 (Release Notification Form) and BWSC104 (Class B-1 Response Action Outcome Statement)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC103

Release Tracking Number
☐ - ☐

RELEASE NOTIFICATION & NOTIFICATION RETRACTION FORM

Pursuant to 310 CMR 40.0335 and 310 CMR 40.0371 (Subpart C)

A. RELEASE OR THREAT OF RELEASE LOCATION:

1. Release Name/Location Aid: _____
2. Street Address: 27 Village Street
3. City/Town: Somerville 4. ZIP Code: 02143-3722

B. THIS FORM IS BEING USED TO: (check one)

☒ 1. Submit a **Release Notification**

☐ 2. Submit a **Retraction of a Previously Reported Notification** of a release or threat of release including supporting documentation required pursuant to 310 CMR 40.0335 (Section C is not required)

(All sections of this transmittal form must be filled out unless otherwise noted above)

C. INFORMATION DESCRIBING THE RELEASE OR THREAT OF RELEASE (TOR):

1. Date and time of Oral Notification, if applicable: _____ (mm/dd/yyyy) Time: _____ (hh:mm) ☐ AM ☐ PM
2. Date and time you obtained knowledge of the Release or TOR: 03/31/2004 (mm/dd/yyyy) Time: _____ (hh:mm) ☐ AM ☐ PM
3. Date and time release or TOR occurred, if known: _____ (mm/dd/yyyy) Time: _____ (hh:mm) ☐ AM ☐ PM

Check all Notification Thresholds that apply to the Release or Threat of Release:
(for more information see 310 CMR 40.0310 - 40.0315)

4. 2 HOUR REPORTING CONDITIONS
   - ☐ a. Sudden Release
   - ☐ b. Threat of Sudden Release
   - ☐ c. Oil Sheen on Surface Water
   - ☐ d. Poses Imminent Hazard
   - ☐ e. Could Pose Imminent Hazard
   - ☐ f. Release Detected in Private Well
   - ☐ g. Release to Storm Drain
   - ☐ h. Sanitary Sewer Release (Imminent Hazard Only)

5. 72 HOUR REPORTING CONDITIONS
   - ☐ a. Subsurface Non-Aqueous Phase Liquid (NAPL) Equal to or Greater than 1/2 Inch
   - ☐ b. Underground Storage Tank (UST) Release
   - ☐ c. Threat of UST Release
   - ☐ d. Release to Groundwater near Water Supply
   - ☐ e. Release to Groundwater near School or Residence
   - ☐ f. Substantial Release Migration

6. 120 DAY REPORTING CONDITIONS
   - ☒ a. Release of Hazardous Material(s) to Soil or Groundwater Exceeding Reportable Concentration(s)
   - ☒ b. Release of Oil to Soil Exceeding Reportable Concentration(s) and Affecting More than 2 Cubic Yards
   - ☐ c. Release of Oil to Groundwater Exceeding Reportable Concentration(s)
   - ☐ d. Subsurface Non-Aqueous Phase Liquid (NAPL) Equal to or Greater than 1/8 Inch and Less than 1/2 Inch

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC103

Release Tracking Number
☐ - ☐

RELEASE NOTIFICATION & NOTIFICATION RETRACTION FORM

Pursuant to 310 CMR 40.0335 and 310 CMR 40.0371 (Subpart C)

C. INFORMATION DESCRIBING THE RELEASE OR THREAT OF RELEASE (TOR): (cont.)

7. List below the Oils (O) or Hazardous Materials (HM) that exceed their Reportable Concentration (RC) or Reportable Quantity (RQ) by the greatest amount.

O or HM Released	CAS Number, if known	O or HM	Amount or Concentration	Units	RCs Exceeded, if Applicable (RCS-1, RCS-2, RCGW-1, RCGW-2)
Lead	7439921	HM	2,200	MG/KG	RCS-1
Zinc	7440666	HM	3,000	MG/KG	RCS-1
Arsenic	7440382	HM	81	MG/KG	RCS-1
Total Petroleum Hydrocarbons	None	O	2,600	MG/KG	RCS-1

☐ 8. Check here if a list of additional Oil and Hazardous Materials subject to reporting is attached.

D. PERSON REQUIRED TO NOTIFY:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☐ c. change in the person notifying

2. Name of Organization: _____

3. Contact First Name: Adele 4. Last Name: Santos

5. Street: 100 Memorial Drive, Unit 8-7B 6. Title: Owner

7. City/Town: Cambridge 8. State: MA 9. ZIP Code: 02142-1330

10. Telephone: (617) 253-4402 11. Ext.: _____ 12. FAX: (617) 253-9417

☐ 13. Check here if attaching names and addresses of owners of properties affected by the Release or Threat of Release, other than an owner who is submitting this Release Notification (required).

E. RELATIONSHIP OF PERSON TO RELEASE OR THREAT OF RELEASE:

☒ 1. RP or PRP ☒ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☐ e. Other RP or PRP Specify: _____

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Otherwise Required to Notify Specify Relationship: _____

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC103

RELEASE NOTIFICATION & NOTIFICATION RETRACTION FORM

Release Tracking Number

☐ - ☐

Pursuant to 310 CMR 40.0335 and 310 CMR 40.0371 (Subpart C)

F. CERTIFICATION OF PERSON REQUIRED TO NOTIFY:

1. I, Adele Santos, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: Adele Naudé Santos
Signature

3. Title: Owner

4. ~~For~~: ADÈLE NAUDÉ SANTOS
(Name of person or entity recorded in Section D)

5. Date: 29 April 04
mm/dd/yyyy

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section D.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. ZIP Code: _____

11. Telephone: _____ 12. Ext.: _____ 13. FAX: _____

YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.0580 (Subpart E) & 40.1056 (Subpart J)

Release Tracking Number
☐ - ☐

A. SITE LOCATION:

1. Site Name/Location Aid: _____

2. Street Address: 27 Village Street

3. City/Town: Somerville 4. ZIP Code: 02143-3722

☐ 5. Check here if a Tier Classification Submittal has been provided to DEP for this disposal site.
☐ a. Tier 1A ☐ b. Tier 1B ☐ c. Tier 1C ☐ d. Tier 2

6. If a Tier I Permit has been issued, provide Permit Number: _____

B. THIS FORM IS BEING USED TO: (check all that apply)

1. List Submittal Date of RAO Statement (if previously submitted): _____ mm/dd/yyyy

☐ 2. Submit a **Response Action Outcome (RAO) Statement**

☐ a. Check here if this RAO Statement covers additional Release Tracking Numbers (RTNs). RTNs that have been previously linked to a Primary Tier Classified RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - ☐ ☐ - ☐

☐ 3. Submit a **Revised Response Action Outcome Statement**

☐ a. Check here if this Revised RAO Statement covers additional Release Tracking Numbers (RTNs), not listed on the RAO Statement or previously submitted Revised RAO Statements . RTNs that have been previously linked to a Primary Tier Classified RTN do not need to be listed here.

b. Provide additional Release Tracking Number(s) covered by this RAO Statement. ☐ - ☐ ☐ - ☐

☒ 4. Submit a **Response Action Outcome Partial (RAO-P) Statement**

Check above box, if any Response Actions remain to be taken to address conditions associated with this disposal site having the Primary RTN listed in the header section of this transmittal form. This RAO Statement will record only an RAO-Partial Statement for that RTN. A final RAO Statement will need to be submitted that references all RAO-Partial Statements and, if applicable, covers any remaining conditions not covered by the RAO-Partial Statements.

☐ 5. Submit an optional **Phase I Completion Statement** supporting an RAO Statement

☐ 6. Submit a **Periodic Review Opinion evaluating the status of a Temporary Solution** for a Class C RAO Statement (Section E is optional)

☐ 7. Submit a **Retraction** of a previously submitted **Response Action Outcome Statement** (Sections D & E are not required)

(All sections of this transmittal form must be filled out unless otherwise noted above)

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.0580 (Subpart E) & 40.1056 (Subpart J)

Release Tracking Number
☐ - ☐

C. DESCRIPTION OF RESPONSE ACTIONS: (check all that apply, for volumes list cumulative amounts)

- ☒ 1. Assessment and/or Monitoring Only
- ☐ 2. Temporary Covers or Caps
- ☐ 3. Deployment of Absorbent or Containment Materials
- ☐ 4. Temporary Water Supplies
- ☐ 5. Structure Venting System
- ☐ 6. Temporary Evacuation or Relocation of Residents
- ☐ 7. Product or NAPL Recovery
- ☐ 8. Fencing and Sign Posting
- ☐ 9. Groundwater Treatment Systems
- ☐ 10. Soil Vapor Extraction
- ☐ 11. Bioremediation
- ☐ 12. Air Sparging
- ☐ 13. Removal of Contaminated Soils

☐ a. Re-use, Recycling or Treatment ☐ i. On Site Estimated volume in cubic yards _____

☐ ii. Off Site Estimated volume in cubic yards _____

iia. Facility Name: _____ Town: _____ State: _____

iib. Facility Name: _____ Town: _____ State: _____

iii. Describe: _____

☐ b. Landfill

☐ i. Cover Estimated volume in cubic yards _____

Facility Name: _____ Town: _____ State: _____

☐ ii. Disposal Estimated volume in cubic yards _____

Facility Name: _____ Town: _____ State: _____

☐ 14. Removal of Drums, Tanks or Containers:

a. Describe Quantity and Amount: _____

_____

b. Facility Name: _____ Town: _____ State: _____

c. Facility Name: _____ Town : _____ State: _____

C. DESCRIPTION OF RESPONSE ACTIONS (cont.): (check all that apply, for volumes list cumulative amounts)

☐ 15. Removal of Other Contaminated Media:

a. Specify Type and Volume: _____

_____

b. Facility Name: _____ Town: _____ State: _____

c. Facility Name: _____ Town: _____ State: _____

☐ 16. Other Response Actions:

Describe: _____

_____

☐ 17. Use of Innovative Technologies:

Describe: _____

D. RESPONSE ACTION OUTCOME CLASS:

Specify the Class of Response Action Outcome that applies to the disposal site, or site of the Threat of Release.
Select **ONLY** one Class.

☐ **1. Class A-1 RAO**: Specify one of the following:

☐ a. Contamination has been reduced to background levels. ☐ b. A Threat of Release has been eliminated.

☐ **2. Class A-2 RAO:** You **MUST** provide justification that reducing contamination to or approaching background levels is infeasible.

☐ **3. Class A-3 RAO**: You **MUST** provide an implemented Activity and Use Limitation (AUL) and justification that reducing contamination to or approaching background levels is infeasible.

☐ **4. Class A-4 RAO**: You **MUST** provide an implemented AUL, justification that reducing contamination to or approaching background levels is infeasible, and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface or below an engineered barrier is infeasible. If the permanent solution relies upon an engineered barrier, you must also provide a Phase III report justifying the selection of the engineered barrier.

D. RESPONSE ACTION OUTCOME CLASS (cont.):

☒ **5. Class B-1 RAO: Specify one of the following:**

☐ a. Contamination is consistent with background levels ☒ b. Contamination is **NOT** consistent with background levels.

☐ **6. Class B-2 RAO**: You **MUST** provide an implemented AUL.

☐ **7. Class B-3 RAO**: You **MUST** provide an implemented AUL and justification that reducing contamination to less than Upper Concentration Limits (UCLs) 15 feet below ground surface is infeasable.

☐ **8. Class C RAO**: Specify one:

☐ a. Monitoring ☐ b. Passive Operation and Maintenance

☐ c. Active Operation and Maintenance (defined at 310 CMR 40.0006)

E. RESPONSE ACTION OUTCOME INFORMATION:

1. Specify the Risk Characterization Method(s) used to achieve the RAO described above:

☐ a. Method 1 ☐ b. Method 2 ☒ c. Method 3

☐ d. Method Not Applicable-Contamination reduced to or consistent with background, or Threat of Release abated

2. Specify all Soil and Groundwater Categories. More than one Soil Category and more than one Groundwater Category may apply at a Site. Be sure to check off all **APPLICABLE** categories.

a. Soil Category(ies) Applicable:

☐ i. S-1/GW-1 ☐ iv. S-2/GW-1 ☐ vii. S-3/GW-1

☒ ii. S-1/GW-2 ☐ v. S-2/GW-2 ☒ viii. S-3/GW-2

☒ iii. S-1/GW-3 ☐ vi. S-2/GW-3 ☒ ix. S-3/GW-3

b. Groundwater Category(ies) Impacted:

☐ i. GW-1 ☒ ii. GW-2 ☒ iii. GW-3 ☐ iv. No Groundwater Impacted

3. Specify remediation conducted.

☐ a. Check here if soil remediation was conducted.

☐ b. Check here if groundwater remediation was conducted.

4. Estimate the number of acres this RAO Statement applies to: 0.4

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.0580 (Subpart E) & 40.1056 (Subpart J)

Release Tracking Number
[ ] - [ ]

F. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that either an **RAO Statement, Phase I Completion Statement and/or Periodic Review Opinion** is being provided,* the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 9810

2. First Name: Patrick 3. Last Name: Corcoran

4. Telephone: (401) 728-6860 5. Ext.: 6. FAX: (401) 727-1849

7. Signature:

8. Date: 05/03/2004
mm/dd/yyyy

9. LSP Stamp:

COMMONWEALTH OF MASSACHUSETTS
PATRICK D. CORCORAN No. 9810
REGISTERED LICENSED SITE PROFESSIONAL

G. PERSON MAKING SUBMITTAL:

1. Check all that apply: [ ] a. change in contact name [ ] b. change of address [ ] c. change in the person undertaking response actions

2. Name of Organization:

3. Contact First Name: Adele 4. Last Name: Santos

5. Street: 100 Memorial Drive, Unit 8-7B 6. Title: Owner

7. City/Town: Cambridge 8. State: MA 9. ZIP Code: 02142-1330

10. Telephone: (617) 253-4402 11. Ext.: 12. FAX: (617) 253-9417

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.0580 (Subpart E) & 40.1056 (Subpart J)

Release Tracking Number
☐ - ☐

H. RELATIONSHIP TO RELEASE OR THREAT OF RELEASE OF PERSON MAKING SUBMITTAL:

☒ 1. RP or PRP ☒ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☐ e. Other RP or PRP Specify: _____

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Making Submittal Specify Relationship: _____

I. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☐ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of an RAO Statement that relies on the public way/rail right-of-way exemption from the requirements of an AUL.

☒ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of a RAO Statement with instructions on how to obtain a full copy of the report.

☒ 4. Check here to certify that documentation is attached specifying the location of the Site, or the location and boundaries of the Disposal Site subject to this RAO Statement. If submitting an RAO Statement for a PORTION of a Disposal Site, you must document the location and boundaries for both the portion subject to this submittal and, to the extent defined, the entire Disposal Site.

☐ 5. Check here if required to submit one or more AULs. You must submit an AUL Transmittal Form (BWSC113) and a copy of each implemented AUL related to this RAO Statement. Specify the type of AUL(s) below: (required for Class A-3, A-4, B-2, B-3 RAO Statements)

☐ a. Notice of Activity and Use Limitation b. Number of Notices submitted: _____

☐ c. Grant of Environmental Restriction d. Number of Grants submitted: _____

☐ 6. If an RAO Compliance Fee is required for any of the RTNs listed on this transmittal form, check here to certify that an RAO Compliance Fee was submitted to DEP, P. O. Box 4062, Boston, MA 02211.

☐ 7. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Address/Location Aid. Send corrections to the DEP Regional Office.

☒ 8. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC104

RESPONSE ACTION OUTCOME (RAO) STATEMENT

Pursuant to 310 CMR 40.0580 (Subpart E) & 40.1056 (Subpart J)

Release Tracking Number
☐ - ☐

J. CERTIFICATION OF PERSON MAKING SUBMITTAL:

1. I, Adele Santos, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

2. By: Adele Naude Santos (Signature) 3. Title: Owner

4. ~~For:~~ ADELE NAUDE' SANTOS (Name of person or entity recorded in Section G) 5. Date: 29th April 04. (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section G.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. ZIP Code: _____

11. Telephone: _____ 12. Ext.: _____ 13. FAX: _____

YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

APPENDIX B

Copies of Public Notification Correspondence

RESOURCE
CONTROLS

The proven solution to your environmental needs.

April 26, 2004

Joseph A. Curtatone, Mayor
City of Somerville
Somerville City Hall
93 Highland Avenue
Somerville, MA 02143

SUBJECT: Notice of Availability of Class B-1 Partial Response Action Outcome Statement
27 Village Street
Somerville, Massachusetts

Dear Mayor Curtatone:

As required by the Massachusetts Contingency Plan (310 CMR 40.1403), notice is hereby given that a Class B-1 Response Action Outcome Statement for the above referenced site has been submitted to the Massachusetts Department of Environmental Protection (MADEP). This document is available for review and copying at the MADEP Northeast Region File Facility, Department of Transitional Assistance Building, 35 Congress Street, Shetland Office Park, Salem, MA 01970-7305. The telephone number of the Northeast Region File Facility is 978 740-0809.

Should you have any questions, please contact either of the undersigned.

Very truly yours,

RESOURCE CONTROL ASSOCIATES, INC.

Patrick D. Corcoran, LSP No. 9810
Senior Chemical Engineer

Robert C. Atwood, PE, LSP
President and CEO

cc: Adele Santos
MADEP

TFN/lap

474 Broadway
Pawtucket, RI 02860-1377
401 728-6860
Fax 401 727-1849

90 Madison Street
Suite 303
Worcester, MA 01608
508 798-6552
Fax 508 798-9186

www.resourcecontrols.com
www.cleanstart.com

RESOURCE
CONTROLS

The proven solution to your environmental needs.

April 26, 2004

Jack J. Vondras, Chairman
City of Somerville Board of Health
City Hall Annex
50 Evergreen Avenue
Somerville, MA 02145

SUBJECT: Notice of Availability of Class B-1 Partial Response Action Outcome Statement
27 Village Street
Somerville Massachusetts

Dear Mr. Vondras:

As required by the Massachusetts Contingency Plan (310 CMR 40.1403), notice is hereby given that a Class B-1 Response Action Outcome Statement for the above referenced site has been submitted to the Massachusetts Department of Environmental Protection (MADEP). This document is available for review and copying at the MADEP Northeast Region File Facility, Department of Transitional Assistance Building, 35 Congress Street, Shetland Office Park, Salem, MA 01970-7305. The telephone number of the Northeast Region File Facility is 978 740-0809.

Should you have any questions, please contact either of the undersigned.

Very truly yours,

RESOURCE CONTROL ASSOCIATES, INC.

Patrick D. Corcoran, LSP No. 9810
Senior Chemical Engineer

Robert C. Atwood, PE, LSP
President and CEO

cc: Adele Santos
MADEP

TFN:lap

474 Broadway
Pawtucket, RI 02860-1377
401 728-6860
Fax 401 727-1849

90 Madison Street
Suite 303
Worcester, MA 01608
508 798-6552
Fax 508 798-9186

www.resourcecontrols.com
www.cleanstart.com

APPENDIX C

Drilling Logs

DRILLING LOG

RESOURCE CONTROLS

PROJECT:	Santos- Village Street	BORING NO:	SB-12
PROJECT NO.:	A6550	PAGE:	1 of 1
LOCATION:	Somerville, MA	DATE STARTED:	1/9/2004
		DATE FINISHED:	1/9/2004
DRILLING CO.:	New England Geotech	SURFACE ELEVATION:	Unknown
DRILLED BY:	Bill		
INSPECTED BY:	Timothy F. Nevins		

GROUNDWATER OBSERVATIONS

DEPTH	STABILIZATION TIME
~ 5.5-6'	N/A

	CASING	SAMPLER
TYPE:		Geoprobe
SIZE I.D.:		1-1/4"
HAMMER WT.:		
HAMMER FALL:		

DEPTH (FT.)	SAMPLING DEPTH (FT.) *FROM - TO*	SAMPLE DATA ID	PERCENT RECOV.	BLOWS PER 6 INCHES	WELL DATA	STRATA CHANGE (FT.)	LITHOLOGY *(DESCRIPTION OF MATERIALS)*	FIELD TEST DATA (ppm) PID - 10.6 eV
	0-4'		50%				Concrete debris.	
							(0-2') Black-brown fine-medium Sand and fine Gravel.	
2.5'								
	4-8'		75%				(4-5') Brown medium-fine Sand and Brick debris.	
5'								
							(5-6') Black very fine Sand and Silt.	
							(6-7') Grey-brown fine Sand, trace Silt.	6-7' 0.0 ppm
7.5'								
10'								
12.5'								
15'								
17.5'								
20'								

GENERAL REMARKS:

Moisture present at 5.5-6' BG.

Well Materials

- Filter Sand
- Bentonite
- Cement/Grout Mix
- Well Screen
- Well Riser
- Approximate depth to water table.

Lithologic Information

- Asphalt
- Sand
- Silty or Clayey Sand
- Sand & Gravel Mix

* BG = Below Grade.

APPENDIX D

Well Monitoring Forms

RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

WELL MONITORING FORM

Project: Santos/Village Street
Project No.: A6550
Location: Somerville, MA
Date: 12/01/03
Operator: JP
Method: Interface Probe

Well ID	Top of Casing Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Depth to Bottom (feet)	LNAPL Thickness (feet)	LNAPL Specific Gravity (unitless)	Water Equivalent (feet)	Corrected Depth to Water (feet)	Corrected Water Table Elevation (feet)
MW-1	100.38	ND	6.74	10.14	ND		NA	NA	93.64
MW-2	98.85	ND	11.21	12.16	ND		NA	NA	87.64
MW-3	99.99	ND	6.52	12.03	ND		NA	NA	93.47

NM = Not Measured; ND = None Detected at >0.01 feet; NA = Not Applicable; DRY = No Water in Well

NOTES:

RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

WELL MONITORING FORM

Project: Santos/Village Street
Project No.: A6550
Location: Somerville, MA
Date: 01/09/04
Operator: TFN
Method: Interface Probe

Well ID	Top of Casing Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	Depth to Bottom (feet)	LNAPL Thickness (feet)	LNAPL Specific Gravity (unitless)	Water Equivalent (feet)	Corrected Depth to Water (feet)	Corrected Water Table Elevation (feet)
MW-1	100.38	ND	6.58	10.14	ND		NA	NA	93.80
MW-2	98.85	ND	4.91	12.16	ND		NA	NA	93.94
MW-3	99.99	ND	6.39	12.03	ND		NA	NA	93.60

NM = Not Measured; ND = None Detected at >0.01 feet; NA = Not Applicable; DRY = No Water in Well

NOTES:

APPENDIX E

Conceptual Site Model

CONCEPTUAL SITE MODEL

SOURCE	ENVIRONMENTAL EXPOSURE MEDIUM	EXPOSURE POINT	EXPOSURE ROUTE	EXPOSED POPULATION
Former Industrial use	Soil	Play areas, yards, gardens	Ingestion, dermal contact, inhalation	Future residents, visitors, construction/utility workers

APPENDIX F

Laboratory Analytical Reports

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

December 10, 2003

Ms. Maria Meleschnig
Resource Control Associates
474 Broadway
Pawtucket, RI 02860

LABORATORY REPORT

Project: **Village St./A6560**
Lab ID: **67556**
Received: **12-02-03**

Dear Maria:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Eric H. Jensen
Operations Manager

EHJ/kal
Enclosures

GROUNDWATER ANALYTICAL

Sample Receipt Report

Project:	**Village St./A6560**	Delivery:	**GWA Courier**	Temperature:	**5.0'C**
Client:	**Resource Control Associates**	Airbill:	n/a	Chain of Custody:	**Present**
Lab ID:	**67556**	Lab Receipt:	**12-02-03**	Custody Seal(s):	**n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-1	MW-1		Aqueous	12/1/03 0:00	EPA 8260B Volatile Organics with Oxygenates				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C330062	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		
C330050	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		
C330038	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-2	MW-3		Aqueous	12/1/03 0:00	EPA 8260B Volatile Organics with Oxygenates				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C330051	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		
C330063	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		
C330039	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-3	MW-2		Aqueous	12/1/03 0:00	EPA 8260B Volatile Organics with Oxygenates				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C330033	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		
C330021	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		
C330020	40 mL VOA Vial	Industrial	BX10047	HCl	R-3722D	10-30-03	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-4	MW-1		Aqueous	12/1/03 0:00	SM 5520 CF Total Petroleum Hydrocarbons by IR				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C348918	1 L Amber Glass	Proline	BX10214	H2SO4	n/a	n/a	n/a		
C348916	1 L Amber Glass	Proline	BX10214	H2SO4	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-5	MW-3		Aqueous	12/1/03 0:00	SM 5520 CF Total Petroleum Hydrocarbons by IR				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C304497	1 L Amber Glass	Proline	BX10252	H2SO4	R-3778A	11-10-03	n/a		
C348917	1 L Amber Glass	Proline	BX10214	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-6	MW-2		Aqueous	12/1/03 0:00	SM 5520 CF Total Petroleum Hydrocarbons by IR				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C348919	1 L Amber Glass	Proline	BX10214	H2SO4	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-7	MW-1		Aqueous	12/1/03 0:00	EPA 6010B/7470A 8 RCRA Metals Dissolved				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C322899	500 mL Plastic	Proline	BX10302	HNO3	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67556-8	MW-3		Aqueous	12/1/03 0:00	EPA 6010B/7470A 8 RCRA Metals Dissolved				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C322906	500 mL Plastic	Proline	BX10302	None	n/a	n/a	n/a		

GROUNDWATER ANALYTICAL

EPA Method 8260B
Volatile Organics by GC/MS

Field ID:	**MW-1**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**HCl/Cool**
Laboratory ID:	**67556-01**	QC Batch ID:	**VM8-0114-W**
Sampled:	**12-01-03 00:00**	Instrument ID:	**MS-8 Agilent 6890**
Received:	**12-02-03 16:00**	Sample Volume:	**25 mL**
Analyzed:	**12-04-03 16:27**	Dilution Factor:	**1**
Analyst:	**MJB**		

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
75-71-8	Dichlorodifluoromethane	BRL		ug/L	0.5
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-69-4	Trichlorofluoromethane	BRL		ug/L	0.5
60-29-7	Diethyl Ether	BRL		ug/L	2
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
76-13-1	1,1,2-Trichlorotrifluoroethane	BRL		ug/L	5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	2.5
156-60-5	*trans*- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl *tert*- butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
594-20-7	2,2-Dichloropropane	BRL		ug/L	0.5
156-59-2	*cis*- 1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
74-97-5	Bromochloromethane	BRL		ug/L	0.5
109-99-9	Tetrahydrofuran (THF)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
563-58-6	1,1-Dichloropropene	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
74-95-3	Dibromomethane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
123-91-1	1,4-Dioxane	BRL		ug/L	500
10061-01-5	*cis*- 1,3-Dichloropropene	BRL		ug/L	0.5
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	*trans*- 1,3-Dichloropropene	BRL		ug/L	0.5
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
142-28-9	1,3-Dichloropropane	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
106-93-4	1,2-Dibromoethane (EDB)	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
630-20-6	1,1,1,2-Tetrachloroethane	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	*meta*- Xylene and *para*- Xylene	BRL		ug/L	0.5
95-47-6	*ortho*- Xylene	BRL		ug/L	0.5

GROUNDWATER ANALYTICAL

EPA Method 8260B (Continued)
Volatile Organics by GC/MS

Field ID:	**MW-1**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**HCl/Cool**
Laboratory ID:	**67556-01**	QC Batch ID:	**VM8-0114-W**
Sampled:	**12-01-03 00:00**	Instrument ID:	**MS-8 Agilent 6890**
Received:	**12-02-03 16:00**	Sample Volume:	**25 mL**
Analyzed:	**12-04-03 16:27**	Dilution Factor:	**1**
Analyst:	**MJB**		

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
98-82-8	Isopropylbenzene	BRL		ug/L	0.5
108-86-1	Bromobenzene	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5
96-18-4	1,2,3-Trichloropropane	BRL		ug/L	0.5
103-65-1	*n*-Propylbenzene	BRL		ug/L	0.5
95-49-8	2-Chlorotoluene	BRL		ug/L	0.5
108-67-8	1,3,5-Trimethylbenzene	BRL		ug/L	0.5
106-43-4	4-Chlorotoluene	BRL		ug/L	0.5
98-06-6	*tert*-Butylbenzene	BRL		ug/L	0.5
95-63-6	1,2,4-Trimethylbenzene	BRL		ug/L	0.5
135-98-8	*sec*-Butylbenzene	BRL		ug/L	0.5
541-73-1	1,3-Dichlorobenzene	BRL		ug/L	0.5
99-87-6	4-Isopropyltoluene	BRL		ug/L	0.5
106-46-7	1,4-Dichlorobenzene	BRL		ug/L	0.5
95-50-1	1,2-Dichlorobenzene	BRL		ug/L	0.5
104-51-8	*n*-Butylbenzene	BRL		ug/L	0.5
96-12-8	1,2-Dibromo-3-chloropropane	BRL		ug/L	0.5
120-82-1	1,2,4-Trichlorobenzene	BRL		ug/L	0.5
87-68-3	Hexachlorobutadiene	BRL		ug/L	0.5
91-20-3	Naphthalene	BRL		ug/L	0.5
87-61-6	1,2,3-Trichlorobenzene	BRL		ug/L	0.5
75-65-0	*tert*-Butyl Alcohol (TBA)	BRL		ug/L	20
108-20-3	Di-isopropyl Ether (DIPE)	BRL		ug/L	0.5
637-92-3	Ethyl *tert*-butyl Ether (ETBE)	BRL		ug/L	0.5
994-05-8	*tert*-Amyl Methyl Ether (TAME)	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	10	**101 %**	70 - 130 %
1,2-Dichloroethane-d_4	10	9.6	**96 %**	70 - 130 %
Toluene-d_8	10	9.5	**95 %**	70 - 130 %
4-Bromofluorobenzene	10	9.3	**93 %**	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

GROUNDWATER ANALYTICAL

EPA Method 8260B
Volatile Organics by GC/MS

Field ID:	**MW-3**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**HCl/Cool**
Laboratory ID:	**67556-02**	QC Batch ID:	**VM8-0114-W**
Sampled:	**12-01-03 00:00**	Instrument ID:	**MS-8 Agilent 6890**
Received:	**12-02-03 16:00**	Sample Volume:	**25 mL**
Analyzed:	**12-04-03 17:00**	Dilution Factor:	**1**
Analyst:	**MJB**		

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
75-71-8	Dichlorodifluoromethane	BRL		ug/L	0.5
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-69-4	Trichlorofluoromethane	BRL		ug/L	0.5
60-29-7	Diethyl Ether	BRL		ug/L	2
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
76-13-1	1,1,2-Trichlorotrifluoroethane	BRL		ug/L	5
67-64-1	Acetone	BRL		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	2.5
156-60-5	*trans*- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl *tert*- butyl Ether (MTBE)	BRL		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
594-20-7	2,2-Dichloropropane	BRL		ug/L	0.5
156-59-2	*cis*- 1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
74-97-5	Bromochloromethane	BRL		ug/L	0.5
109-99-9	Tetrahydrofuran (THF)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
563-58-6	1,1-Dichloropropene	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
74-95-3	Dibromomethane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
123-91-1	1,4-Dioxane	BRL		ug/L	500
10061-01-5	*cis*- 1,3-Dichloropropene	BRL		ug/L	0.5
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	*trans*- 1,3-Dichloropropene	BRL		ug/L	0.5
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
142-28-9	1,3-Dichloropropane	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
106-93-4	1,2-Dibromoethane (EDB)	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
630-20-6	1,1,1,2-Tetrachloroethane	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	*meta*- Xylene and *para*- Xylene	BRL		ug/L	0.5
95-47-6	*ortho*- Xylene	BRL		ug/L	0.5

GROUNDWATER ANALYTICAL

EPA Method 8260B (Continued)
Volatile Organics by GC/MS

Field ID:	**MW-3**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**HCl/Cool**
Laboratory ID:	**67556-02**	QC Batch ID:	**VM8-0114-W**
Sampled:	**12-01-03 00:00**	Instrument ID:	**MS-8 Agilent 6890**
Received:	**12-02-03 16:00**	Sample Volume:	**25 mL**
Analyzed:	**12-04-03 17:00**	Dilution Factor:	**1**
Analyst:	**MJB**		

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
98-82-8	Isopropylbenzene	BRL		ug/L	0.5
108-86-1	Bromobenzene	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5
96-18-4	1,2,3-Trichloropropane	BRL		ug/L	0.5
103-65-1	*n*-Propylbenzene	BRL		ug/L	0.5
95-49-8	2-Chlorotoluene	BRL		ug/L	0.5
108-67-8	1,3,5-Trimethylbenzene	BRL		ug/L	0.5
106-43-4	4-Chlorotoluene	BRL		ug/L	0.5
98-06-6	*tert*-Butylbenzene	BRL		ug/L	0.5
95-63-6	1,2,4-Trimethylbenzene	BRL		ug/L	0.5
135-98-8	*sec*-Butylbenzene	BRL		ug/L	0.5
541-73-1	1,3-Dichlorobenzene	BRL		ug/L	0.5
99-87-6	4-Isopropyltoluene	BRL		ug/L	0.5
106-46-7	1,4-Dichlorobenzene	BRL		ug/L	0.5
95-50-1	1,2-Dichlorobenzene	BRL		ug/L	0.5
104-51-8	*n*-Butylbenzene	BRL		ug/L	0.5
96-12-8	1,2-Dibromo-3-chloropropane	BRL		ug/L	0.5
120-82-1	1,2,4-Trichlorobenzene	BRL		ug/L	0.5
87-68-3	Hexachlorobutadiene	BRL		ug/L	0.5
91-20-3	Naphthalene	BRL		ug/L	0.5
87-61-6	1,2,3-Trichlorobenzene	BRL		ug/L	0.5
75-65-0	*tert*-Butyl Alcohol (TBA)	BRL		ug/L	20
108-20-3	Di-isopropyl Ether (DIPE)	BRL		ug/L	0.5
637-92-3	Ethyl *tert*-butyl Ether (ETBE)	BRL		ug/L	0.5
994-05-8	*tert*-Amyl Methyl Ether (TAME)	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	10	**101 %**	70 - 130 %
1,2-Dichloroethane-d_4	10	9.6	**96 %**	70 - 130 %
Toluene-d_8	10	9.4	**94 %**	70 - 130 %
4-Bromofluorobenzene	10	9.3	**93 %**	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

GROUNDWATER ANALYTICAL

EPA Method 8260B
Volatile Organics by GC/MS

Field ID:	**MW-2**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**HCl/Cool**
Laboratory ID:	**67556-03**	QC Batch ID:	**VM8-0114-W**
Sampled:	**12-01-03 00:00**	Instrument ID:	**MS-8 Agilent 6890**
Received:	**12-02-03 16:00**	Sample Volume:	**25 mL**
Analyzed:	**12-04-03 17:33**	Dilution Factor:	**1**
Analyst:	**MJB**		

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
75-71-8	Dichlorodifluoromethane	BRL		ug/L	0.5
74-87-3	Chloromethane	BRL		ug/L	0.5
75-01-4	Vinyl Chloride	BRL		ug/L	0.5
74-83-9	Bromomethane	BRL		ug/L	0.5
75-00-3	Chloroethane	BRL		ug/L	0.5
75-69-4	Trichlorofluoromethane	BRL		ug/L	0.5
60-29-7	Diethyl Ether	BRL		ug/L	2
75-35-4	1,1-Dichloroethene	BRL		ug/L	0.5
76-13-1	1,1,2-Trichlorotrifluoroethane	BRL		ug/L	5
67-64-1	Acetone	**19**		ug/L	10
75-15-0	Carbon Disulfide	BRL		ug/L	5
75-09-2	Methylene Chloride	BRL		ug/L	2.5
156-60-5	*trans*- 1,2-Dichloroethene	BRL		ug/L	0.5
1634-04-4	Methyl *tert*- butyl Ether (MTBE)	**0.6**		ug/L	0.5
75-34-3	1,1-Dichloroethane	BRL		ug/L	0.5
594-20-7	2,2-Dichloropropane	BRL		ug/L	0.5
156-59-2	*cis*- 1,2-Dichloroethene	BRL		ug/L	0.5
78-93-3	2-Butanone (MEK)	BRL		ug/L	5
74-97-5	Bromochloromethane	BRL		ug/L	0.5
109-99-9	Tetrahydrofuran (THF)	BRL		ug/L	5
67-66-3	Chloroform	BRL		ug/L	0.5
71-55-6	1,1,1-Trichloroethane	BRL		ug/L	0.5
56-23-5	Carbon Tetrachloride	BRL		ug/L	0.5
563-58-6	1,1-Dichloropropene	BRL		ug/L	0.5
71-43-2	Benzene	BRL		ug/L	0.5
107-06-2	1,2-Dichloroethane	BRL		ug/L	0.5
79-01-6	Trichloroethene	BRL		ug/L	0.5
78-87-5	1,2-Dichloropropane	BRL		ug/L	0.5
74-95-3	Dibromomethane	BRL		ug/L	0.5
75-27-4	Bromodichloromethane	BRL		ug/L	0.5
123-91-1	1,4-Dioxane	BRL		ug/L	500
10061-01-5	*cis*- 1,3-Dichloropropene	BRL		ug/L	0.5
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/L	5
108-88-3	Toluene	BRL		ug/L	0.5
10061-02-6	*trans*- 1,3-Dichloropropene	BRL		ug/L	0.5
79-00-5	1,1,2-Trichloroethane	BRL		ug/L	0.5
127-18-4	Tetrachloroethene	BRL		ug/L	0.5
142-28-9	1,3-Dichloropropane	BRL		ug/L	0.5
591-78-6	2-Hexanone	BRL		ug/L	5
124-48-1	Dibromochloromethane	BRL		ug/L	0.5
106-93-4	1,2-Dibromoethane (EDB)	BRL		ug/L	0.5
108-90-7	Chlorobenzene	BRL		ug/L	0.5
630-20-6	1,1,1,2-Tetrachloroethane	BRL		ug/L	0.5
100-41-4	Ethylbenzene	BRL		ug/L	0.5
108-38-3/106-42-3	*meta*- Xylene and *para*- Xylene	BRL		ug/L	0.5
95-47-6	*ortho*- Xylene	BRL		ug/L	0.5

GROUNDWATER ANALYTICAL

EPA Method 8260B (Continued)
Volatile Organics by GC/MS

Field ID:	**MW-2**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**HCl/Cool**
Laboratory ID:	**67556-03**	QC Batch ID:	**VM8-0114-W**
Sampled:	**12-01-03 00:00**	Instrument ID:	**MS-8 Agilent 6890**
Received:	**12-02-03 16:00**	Sample Volume:	**25 mL**
Analyzed:	**12-04-03 17:33**	Dilution Factor:	**1**
Analyst:	**MJB**		

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
100-42-5	Styrene	BRL		ug/L	0.5
75-25-2	Bromoform	BRL		ug/L	0.5
98-82-8	Isopropylbenzene	BRL		ug/L	0.5
108-86-1	Bromobenzene	BRL		ug/L	0.5
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/L	0.5
96-18-4	1,2,3-Trichloropropane	BRL		ug/L	0.5
103-65-1	*n*-Propylbenzene	BRL		ug/L	0.5
95-49-8	2-Chlorotoluene	BRL		ug/L	0.5
108-67-8	1,3,5-Trimethylbenzene	BRL		ug/L	0.5
106-43-4	4-Chlorotoluene	BRL		ug/L	0.5
98-06-6	*tert*-Butylbenzene	BRL		ug/L	0.5
95-63-6	1,2,4-Trimethylbenzene	BRL		ug/L	0.5
135-98-8	*sec*-Butylbenzene	BRL		ug/L	0.5
541-73-1	1,3-Dichlorobenzene	BRL		ug/L	0.5
99-87-6	4-Isopropyltoluene	BRL		ug/L	0.5
106-46-7	1,4-Dichlorobenzene	BRL		ug/L	0.5
95-50-1	1,2-Dichlorobenzene	BRL		ug/L	0.5
104-51-8	*n*-Butylbenzene	BRL		ug/L	0.5
96-12-8	1,2-Dibromo-3-chloropropane	BRL		ug/L	0.5
120-82-1	1,2,4-Trichlorobenzene	BRL		ug/L	0.5
87-68-3	Hexachlorobutadiene	BRL		ug/L	0.5
91-20-3	Naphthalene	BRL		ug/L	0.5
87-61-6	1,2,3-Trichlorobenzene	BRL		ug/L	0.5
75-65-0	*tert*-Butyl Alcohol (TBA)	BRL		ug/L	20
108-20-3	Di-isopropyl Ether (DIPE)	BRL		ug/L	0.5
637-92-3	Ethyl *tert*-butyl Ether (ETBE)	BRL		ug/L	0.5
994-05-8	*tert*-Amyl Methyl Ether (TAME)	BRL		ug/L	0.5

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	10	10	**103** %	70 - 130 %
1,2-Dichloroethane-d_4	10	9.8	**98** %	70 - 130 %
Toluene-d_8	10	8.8	**88** %	70 - 130 %
4-Bromofluorobenzene	10	9.2	**92** %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5030B.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **MW-1**
Project: **Village St./A6560**
Client: **Resource Control Associates**

Matrix: **Aqueous**
Received: **12-02-03 16:00**

Lab ID: **67556-04** Sampled: **12-01-03 00:00** Container: **1 L Amber Glass** Preservation: **H2SO4/Cool**

Analyte	Result	Units	RL	DF	Volume	Analyzed	QC Batch	Method	Inst	Analyst
Total Petroleum Hydrocarbons	BRL	mg/L	0.5	1	1,000 mL	12-04-03 13:30	HI-1261-W	SM 5520 CF	1	AAB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: PE 1625 FT-IR

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **MW-3**
Project: **Village St./A6560**
Client: **Resource Control Associates**

Matrix: **Aqueous**
Received: **12-02-03 16:00**

Lab ID: **67556-05** Sampled: **12-01-03 00:00** Container: **1 L Amber Glass** Preservation: **H2SO4/Cool**

Analyte	Result	Units	RL	DF	Volume	Analyzed	QC Batch	Method	Inst	Analyst
Total Petroleum Hydrocarbons	BRL	mg/L	0.5	1	1,000 mL	12-04-03 13:30	HI-1261-W	SM 5520 CF	1	AAB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: PE 1625 FT-IR

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **MW-2**
Project: **Village St./A6560**
Client: **Resource Control Associates**

Matrix: **Aqueous**
Received: **12-02-03 16:00**

Lab ID: **67556-06** Sampled: **12-01-03 00:00** Container: **1 L Amber Glass** Preservation: **H2SO4/Cool**

Analyte	Result	Units	RL	DF	Volume	Analyzed	QC Batch	Method	Inst	Analyst
Total Petroleum Hydrocarbons	BRL	mg/L	0.5	1	1,000 mL	12-04-03 13:30	HI-1261-W	SM 5520 CF	1	AAB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: PE 1625 FT-IR

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**MW-1**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**500 mL Plastic**
Client:	**Resource Control Associates**	Preservation:	**HNO3 / Cool**
Laboratory ID:	**67556-07**	Preserved:	**12-01-03 00:00**
Sampled:	**12-01-03 00:00**	Filtered:	**12-01-03 00:00**
Received:	**12-02-03 16:00**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Volume	Instrument ID	Analyst
EPA 6010B[1]	MB-0923-W	EPA 3010A	12-09-03 10:00	50 mL	ICP-2 PE 3300	MWR
EPA 7470A[2]	MP-1412-W	EPA 7470A	12-04-03 10:20	25 mL	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Dissolved	BRL		mg/L	0.01	1	12-09-03 18:09	EPA 6010B[1]
7440-39-3	Barium, Dissolved	BRL		mg/L	0.2	1	12-09-03 18:09	EPA 6010B[1]
7440-43-9	Cadmium, Dissolved	**0.012**		mg/L	0.005	1	12-09-03 18:09	EPA 6010B[1]
7440-47-3	Chromium, Dissolved	BRL		mg/L	0.01	1	12-09-03 18:09	EPA 6010B[1]
7439-92-1	Lead, Dissolved	BRL		mg/L	0.005	1	12-09-03 18:09	EPA 6010B[1]
7439-97-6	Mercury, Dissolved	BRL		mg/L	0.0002	1	12-04-03 14:11	EPA 7470A[2]
7782-49-2	Selenium, Dissolved	BRL		mg/L	0.05	1	12-09-03 18:09	EPA 6010B[1]
7440-22-4	Silver, Dissolved	BRL		mg/L	0.007	1	12-09-03 18:09	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**MW-3**	Matrix:	**Aqueous**
Project:	**Village St./A6560**	Container:	**500 mL Plastic**
Client:	**Resource Control Associates**	Preservation:	**HNO3 / Cool**
Laboratory ID:	**67556-08**	Preserved:	**12-01-03 00:00**
Sampled:	**12-01-03 00:00**	Filtered:	**12-01-03 00:00**
Received:	**12-02-03 16:00**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Volume	Instrument ID	Analyst
EPA 6010B[1]	MB-0923-W	EPA 3010A	12-09-03 10:00	50 mL	ICP-2 PE 3300	MWR
EPA 7470A[2]	MP-1412-W	EPA 7470A	12-04-03 10:20	25 mL	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Dissolved	BRL		mg/L	0.01	1	12-09-03 18:14	EPA 6010B[1]
7440-39-3	Barium, Dissolved	BRL		mg/L	0.2	1	12-09-03 18:14	EPA 6010B[1]
7440-43-9	Cadmium, Dissolved	BRL		mg/L	0.005	1	12-09-03 18:14	EPA 6010B[1]
7440-47-3	Chromium, Dissolved	BRL		mg/L	0.01	1	12-09-03 18:14	EPA 6010B[1]
7439-92-1	Lead, Dissolved	BRL		mg/L	0.005	1	12-09-03 18:14	EPA 6010B[1]
7439-97-6	Mercury, Dissolved	BRL		mg/L	0.0002	1	12-04-03 14:20	EPA 7470A[2]
7782-49-2	Selenium, Dissolved	BRL		mg/L	0.05	1	12-09-03 18:14	EPA 6010B[1]
7440-22-4	Silver, Dissolved	BRL		mg/L	0.007	1	12-09-03 18:14	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	**Village St./A6560**	Lab ID:	**67556**
Client:	**Resource Control Associates**	Received:	**12-02-03 16:00**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. EPA 8260B Non-conformance: Samples 67556-01 through -03. Laboratory control sample (LCS) analytes tert-Butyl Alcohol, 1,4-Dioxane were above recommended recovery limits for QC batch VM8-0114-W.

2. Samples 67556-07 and -08 for Dissolved Metal Analysis were not received filtered. The samples were filtered and preserved with HNO3 by the laboratory upon receipt.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	**Village St./A6560**	Lab ID:	**67556**
Client:	**Resource Control Associates**	Received:	**12-02-03 16:00**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. ~~EPA 6010B Non-conformance: Samples 67556-07,-08. A matrix spike (MS) sample was not performed in accordance with the minimum field QC requirements of the MA DEP CAM.~~
2. ~~EPA 6010B Note: Samples 67556-07,-08. Samples were analyzed for selected target analytes, as requested by client.~~
3. EPA 8260B Non-conformance: Samples 67556-01 through -03. Laboratory control sample (LCS) analytes tert-Butyl Alcohol, 1,4-Dioxane were above recommended recovery limits for QC batch VM8-0114-W.
4. Samples 67556-07 and -08 for Dissolved Metal Analysis were not received filtered. The samples were filtered and preserved with HNO3 by the laboratory upon receipt.

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 082504

Project Name:

Firm:

Project Number:

Address:

Sampler Name:

City / State / Zip:

Project Manager:

Telephone:

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☒ PRIORITY (5 Business Days)
- ☐ RUSH (RAN- _____)
  (Rush requires Rush Authorization Number)
- ☐ Please Email to: _____
- ☐ Please FAX to: _____

BILLING

- ☒ Purchase Order No.: _____
- ☐ Third Party Billing: _____
- ☐ GWA Quote: _____

ANALYSIS REQUEST

Sampling DATE	Sampling TIME	SAMPLE IDENTIFICATION	Matrix: GROUNDWATER	Matrix: DRINKING WATER	Matrix: WASTEWATER	Matrix: SOIL	Matrix: OTHER SOLID	Matrix: OIL/ORGANIC LIQUID	Type: COMPOSITE	Type: GRAB	Container(s): NUMBER	Container(s): 40mL VOA Vial	Container(s): 60mL/2 oz Glass	Container(s): 120mL/4 oz Amber Glass	Container(s): 250mL/8 oz Glass	Container(s): 500mL/16 oz Glass	Container(s): 1L/32 oz Amber Glass	Container(s): 250mL/8 oz Plastic	Container(s): 500mL/16 oz Plastic	Container(s): 1L/32 oz Plastic	Container(s): 120mL Sterile	Preservation: HCl	Preservation: HNO3	Preservation: H_2SO_4	Preservation: NaOH	Preservation: Methanol	Preservation: Sodium Bisulfate	Preservation: ICE	Filtered: YES	Filtered: NO	LABORATORY NUMBER (Lab Use Only)
			X							X		X									X									
			X							X																				
			X							X																				
			X							X		X									X									
			X							X									X											
			X							X																				
			X							X																				
			X							X											X		X							
			X							X											X									

OPTIONS: Volatiles: ☐ 11C Search; Semivolatiles: ☐ Acid Only ☐ B/N Only ☐ 11C Search; Metals: Specify For Water Samples ☐ Total ☐ Dissolved

SDWA: Volatiles: ☐ 524.2+MTBE; Semivolatiles: ☐ 525.2; Pest/Herb/PCBs Extractable: ☐ 505 ☐ 508; Pest/Herb/PCBs Vol.: ☐ 531.1 ☐ 515.1 ☐ 504.1 EDB/DBCP; Metals: ☐ Lead and Copper

NPDES: Volatiles: ☐ 624; ☐ 602+MTBE ☐ 601 ☐ 601/602+MTBE; Semivolatiles: ☐ 625; ☐ 625 PAHs only; Pest/Herb/PCBs Extractable: ☐ 608 Pesticides ☐ 608 PCBs; Pest/Herb/PCBs Vol.: ☐ 615; Metals: ☐ 13 Priority Pollutant

RCRA/21E: Volatiles: ☐ 8260B TCL+MTBE ☐ 8260B NH PETROLEUM ☐ 8260B; ☐ 8021B Aromatics ☐ 8021B Halocarbons ☐ 8021B; Semivolatiles: ☐ 8270C; ☐ 8270C PAHs only; Pest/Herb/PCBs Extractable: ☐ 8081A Pesticides ☐ 8082 PCBs; Pest/Herb/PCBs Vol.: ☐ 8151A Herbicides ☐ 8011 EDB/DBCP; Metals: ☐ 8 RCRA ☐ 5 RCRA ☐ MA List Metals ☐ 23 TAL ☐ Specify:

Petroleum Hydrocarbon: Ext. TPH: ☐ TPH-HR ☐ Diesel Range Organics (DRO) ☐ ME DRO ☐ CT ETPH ☐ MA DEP EPH w/all targets ☐ EPH Carbon Ranges only ☐ EPH w/4 PAHs ☐ Hydrocarbon Fingerprint (GC/FID by ASTM D3328-00 Mod.); Vol. TPH: ☐ TPH by GC/FID (8015B Mod) Quantitative Only ☐ Gasoline Range Organics (GRO) ☐ ME GRO ☐ MA DEP VPH w/all targets ☐ VPH Carbon ranges only

Haz. Waste: ☐ TCLP ☐ SPLP ☐ 13 Metals ☐ Pb only ☐ VOA ☐ Semi VOA ☐ Pesticides ☐ Herbicides; ☐ Corrosivity (as pH) ☐ Reactivity ☐ Ignitability (as Flashpoint) ☐ Paint Filter; ☐ MA Basic Disposal Criteria: 8260B, TPH by GC, PCBs, 5 Metals, Corrosivity, Ignitability, Reactivity

General Chemistry: ☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Fluoride ☐ Sulfate; ☐ Dissolved Phosphorus; ☐ Ammonia ☐ TKN ☐ Total Phosphorus ☐ Total N (as NO2/NO3/TKN); ☐ Oil & Grease; ☐ COD ☐ TOC; ☐ BOD ☐ TDS ☐ TSS ☐ TS ☐ Alkalinity; ☐ Cyanide, Total ☐ Cyanide, Physiologically Available; ☐ pH ☐ Dissolved Oxygen ☐ Turbidity

Other: ☐ Total Coliform ☐ Fecal Coliform ☐ HPC

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

☐ YES ☐ NO MCP Data Certification is required.

☐ YES ☒ NO MCP minimum Field QC requirements have been met for this project.
(Metals, hexavalent chromium and cyanide analyses require one matrix spike per 20 samples)

☐ YES ☐ NO MCP Drinking Water samples required.
(Require collection of contingent duplicate samples. Trip blanks are also required, if VOA samples collected)

Signature: _____

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☒ MCP GW-1/S-1	☐ PWS Form
☐ ME	☐ MCP GW-2/S-2	☐ MWRA
☒ MA	☐ NY STARS	☐ _____
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ _____	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required
- ☐ Sample Duplicate
- ☐ Matrix Spike
- ☐ Matrix Spike Duplicate

Selection of QC Sample
- ☐ Please use sample: _____

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by Sampler:	Date	Time	Received by:	Receipt Temperature:
		11:48		☐ Ice ☒ Refrigerated 2-6°C Recommended 5°C
Relinquished by:	**Date**	**Time**	**Received by:**	**Container Count:**
	12/2/03	1:14		16
Relinquished by:	**Date**	**Time**	**Received by Laboratory:**	**Shipping/Airbill Number:**

Method of Shipment: ☒ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ _____

Custody Seal Number:

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

December 10, 2003

Ms. Maria Meleschnig
Resource Control Associates
474 Broadway
Pawtucket, RI 02860

LABORATORY REPORT

Project: **Village St./A6550**
Lab ID: **67565**
Received: **12-02-03**

Dear Maria:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Eric H. Jensen
Operations Manager

EHJ/smd
Enclosures

GROUNDWATER ANALYTICAL

Sample Receipt Report

Project:	**Village St./A6550**	Delivery:	**GWA Courier**	Temperature:	**5.0'C**
Client:	**Resource Control Associates**	Airbill:	**n/a**	Chain of Custody:	**Present**
Lab ID:	**67565**	Lab Receipt:	**12-02-03**	Custody Seal(s):	**n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67565-1	MW-1 1-2'		Soil	12/1/03 8:45	EPA 8260B Volatile Organics with Oxygenates				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C330782	40 mL VOA Vial	Industrial	BX10041	NaHSO4	R-3849A	11-13-03	n/a		
C330781	40 mL VOA Vial	Industrial	BX10041	NaHSO4	R-3849A	11-13-03	n/a		
C330780	40 mL VOA Vial	Industrial	BX10041	NaHSO4	R-3849A	11-13-03	n/a		
C338393	40 mL VOA Vial	Industrial	BX9969	Methanol	R-3770A	10-22-03	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67565-2	MW-2 5-6'		Soil	12/1/03 9:50	EPA 8260B Volatile Organics with Oxygenates				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C330777	40 mL VOA Vial	Industrial	BX10041	NaHSO4	R-3849A	11-13-03	n/a		
C330779	40 mL VOA Vial	Industrial	BX10041	NaHSO4	R-3849A	11-13-03	n/a		
C330778	40 mL VOA Vial	Industrial	BX10041	NaHSO4	R-3849A	11-13-03	n/a		
C338392	40 mL VOA Vial	Industrial	BX9969	Methanol	R-3770A	10-22-03	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67565-3	MW-1 1-2'		Soil	12/1/03 9:50	EPA 6010B/7471A 8 RCRA Metals SM 5520 EF Total Petroleum Hydrocarbons by IR				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C322469	250 mL Glass	Proline	BX10286	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67565-4	MW-2 5-6'		Soil	12/1/03 9:50	EPA 6010B/7471A 8 RCRA Metals SM 5520 EF Total Petroleum Hydrocarbons by IR				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C321285	250 mL Glass	Proline	BX10126	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67565-5	SB-2 1-2'		Soil	12/1/03 10:30	EPA 6010B/7471A 8 RCRA Metals EPA 9012A Total Cyanide SM 5520 EF Total Petroleum Hydrocarbons by IR				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C321288	250 mL Glass	Proline	BX10126	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67565-6	SB-3 3-4'		Soil	12/1/03 12:00	EPA 6010B Al As Ba Cd Cr Pb Mg Ni Se Ag Zn Total EPA 7471A Hg EPA 8082 PCBs EPA 9012A Total Cyanide				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C368955	250 mL Glass	Proline	BX10399	None	n/a	n/a	n/a		
C368953	250 mL Glass	Proline	BX10399	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
67565-7	SB-4 1-2'		Soil	12/1/03 12:00	EPA 6010B Al As Ba Cd Cr Pb Mg Ni Se Ag Zn Total EPA 7471A Hg EPA 9012A Total Cyanide SM 5520 EF Total Petroleum Hydrocarbons by IR				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C322464	250 mL Glass	Proline	BX10286	None	n/a	n/a	n/a		

GROUNDWATER ANALYTICAL

EPA Method 8260B
Volatile Organics by GC/MS

Field ID:	**MW-1 1-2'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**NaHSO4 / Cool**
Laboratory ID:	**67565-01**	QC Batch ID:	**VM2-2504-S**
Sampled:	**12-01-03 08:45**	Instrument ID:	**MS-2 HP 5890**
Received:	**12-02-03 12:14**	Sample Weight:	**3 g**
Analyzed:	**12-09-03 14:02**	% Solids:	**84**
Analyst:	**CMM**	Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
75-71-8	Dichlorodifluoromethane	BRL		ug/Kg	20
74-87-3	Chloromethane	BRL		ug/Kg	20
75-01-4	Vinyl Chloride	BRL		ug/Kg	20
74-83-9	Bromomethane	BRL		ug/Kg	20
75-00-3	Chloroethane	BRL		ug/Kg	20
75-69-4	Trichlorofluoromethane	BRL		ug/Kg	20
60-29-7	Diethyl Ether	BRL		ug/Kg	20
75-35-4	1,1-Dichloroethene	BRL		ug/Kg	10
76-13-1	1,1,2-Trichlorotrifluoroethane	BRL		ug/Kg	98
67-64-1	Acetone	BRL		ug/Kg	390
75-15-0	Carbon Disulfide	BRL		ug/Kg	98
75-09-2	Methylene Chloride	BRL		ug/Kg	98
156-60-5	*trans*- 1,2-Dichloroethene	BRL		ug/Kg	10
1634-04-4	Methyl *tert*- butyl Ether (MTBE)	BRL		ug/Kg	10
75-34-3	1,1-Dichloroethane	BRL		ug/Kg	10
594-20-7	2,2-Dichloropropane	BRL		ug/Kg	10
156-59-2	*cis*- 1,2-Dichloroethene	BRL		ug/Kg	10
78-93-3	2-Butanone (MEK)	BRL		ug/Kg	98
74-97-5	Bromochloromethane	BRL		ug/Kg	10
109-99-9	Tetrahydrofuran (THF)	BRL		ug/Kg	98
67-66-3	Chloroform	BRL		ug/Kg	10
71-55-6	1,1,1-Trichloroethane	BRL		ug/Kg	10
56-23-5	Carbon Tetrachloride	BRL		ug/Kg	10
563-58-6	1,1-Dichloropropene	BRL		ug/Kg	10
71-43-2	Benzene	BRL		ug/Kg	10
107-06-2	1,2-Dichloroethane	BRL		ug/Kg	10
79-01-6	Trichloroethene	BRL		ug/Kg	10
78-87-5	1,2-Dichloropropane	BRL		ug/Kg	10
74-95-3	Dibromomethane	BRL		ug/Kg	10
75-27-4	Bromodichloromethane	BRL		ug/Kg	10
123-91-1	1,4-Dioxane	BRL		ug/Kg	9,800
10061-01-5	*cis*- 1,3-Dichloropropene	BRL		ug/Kg	10
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/Kg	98
108-88-3	Toluene	BRL		ug/Kg	10
10061-02-6	*trans*- 1,3-Dichloropropene	BRL		ug/Kg	10
79-00-5	1,1,2-Trichloroethane	BRL		ug/Kg	10
127-18-4	Tetrachloroethene	BRL		ug/Kg	10
142-28-9	1,3-Dichloropropane	BRL		ug/Kg	10
591-78-6	2-Hexanone	BRL		ug/Kg	98
124-48-1	Dibromochloromethane	BRL		ug/Kg	10
106-93-4	1,2-Dibromoethane (EDB)	BRL		ug/Kg	10
108-90-7	Chlorobenzene	BRL		ug/Kg	10
630-20-6	1,1,1,2-Tetrachloroethane	BRL		ug/Kg	10
100-41-4	Ethylbenzene	BRL		ug/Kg	10
108-38-3/106-42-3	*meta*- Xylene and *para*- Xylene	BRL		ug/Kg	10
95-47-6	*ortho*- Xylene	BRL		ug/Kg	10

GROUNDWATER ANALYTICAL

EPA Method 8260B (Continued)
Volatile Organics by GC/MS

Field ID:	**MW-1 1-2'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**NaHSO4 / Cool**
Laboratory ID:	**67565-01**	QC Batch ID:	**VM2-2504-S**
Sampled:	**12-01-03 08:45**	Instrument ID:	**MS-2 HP 5890**
Received:	**12-02-03 12:14**	Sample Weight:	**3 g**
Analyzed:	**12-09-03 14:02**	% Solids:	**84**
Analyst:	**CMM**	Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
100-42-5	Styrene	BRL		ug/Kg	10
75-25-2	Bromoform	BRL		ug/Kg	10
98-82-8	Isopropylbenzene	BRL		ug/Kg	10
108-86-1	Bromobenzene	BRL		ug/Kg	10
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/Kg	10
96-18-4	1,2,3-Trichloropropane	BRL		ug/Kg	10
103-65-1	*n*-Propylbenzene	BRL		ug/Kg	10
95-49-8	2-Chlorotoluene	BRL		ug/Kg	10
108-67-8	1,3,5-Trimethylbenzene	BRL		ug/Kg	10
106-43-4	4-Chlorotoluene	BRL		ug/Kg	10
98-06-6	*tert*-Butylbenzene	BRL		ug/Kg	10
95-63-6	1,2,4-Trimethylbenzene	BRL		ug/Kg	10
135-98-8	*sec*-Butylbenzene	BRL		ug/Kg	10
541-73-1	1,3-Dichlorobenzene	BRL		ug/Kg	10
99-87-6	4-Isopropyltoluene	BRL		ug/Kg	10
106-46-7	1,4-Dichlorobenzene	BRL		ug/Kg	10
95-50-1	1,2-Dichlorobenzene	BRL		ug/Kg	10
104-51-8	*n*-Butylbenzene	BRL		ug/Kg	10
96-12-8	1,2-Dibromo-3-chloropropane	BRL		ug/Kg	10
120-82-1	1,2,4-Trichlorobenzene	BRL		ug/Kg	10
87-68-3	Hexachlorobutadiene	BRL		ug/Kg	10
91-20-3	Naphthalene	BRL		ug/Kg	10
87-61-6	1,2,3-Trichlorobenzene	BRL		ug/Kg	10
75-65-0	*tert*-Butyl Alcohol (TBA)	BRL		ug/Kg	390
108-20-3	Di-isopropyl Ether (DIPE)	BRL		ug/Kg	10
637-92-3	Ethyl *tert*-butyl Ether (ETBE)	BRL		ug/Kg	10
994-05-8	*tert*-Amyl Methyl Ether (TAME)	BRL		ug/Kg	10

QC Surrogate Compound	Spiked	Measured	Recovery		QC Limits
Dibromofluoromethane	50	56	**112** %		70 - 130 %
1,2-Dichloroethane-d_4	50	56	**112** %		70 - 130 %
Toluene-d_8	50	54	**109** %		70 - 130 %
4-Bromofluorobenzene	50	69	**137** %	m	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5035A. Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

m Surrogate recovery outside recommended limits due to sample matrix interference.

GROUNDWATER ANALYTICAL

EPA Method 8260B
Volatile Organics by GC/MS

Field ID:	**MW-2 5-6'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**NaHSO4 / Cool**
Laboratory ID:	**67565-02**	QC Batch ID:	**VM2-2504-S**
Sampled:	**12-01-03 09:50**	Instrument ID:	**MS-2 HP 5890**
Received:	**12-02-03 12:14**	Sample Weight:	**2.7 g**
Analyzed:	**12-09-03 14:40**	% Solids:	**83**
Analyst:	**CMM**	Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
75-71-8	Dichlorodifluoromethane	BRL		ug/Kg	22
74-87-3	Chloromethane	BRL		ug/Kg	22
75-01-4	Vinyl Chloride	BRL		ug/Kg	22
74-83-9	Bromomethane	BRL		ug/Kg	22
75-00-3	Chloroethane	BRL		ug/Kg	22
75-69-4	Trichlorofluoromethane	BRL		ug/Kg	22
60-29-7	Diethyl Ether	BRL		ug/Kg	22
75-35-4	1,1-Dichloroethene	BRL		ug/Kg	11
76-13-1	1,1,2-Trichlorotrifluoroethane	BRL		ug/Kg	110
67-64-1	Acetone	BRL		ug/Kg	440
75-15-0	Carbon Disulfide	BRL		ug/Kg	110
75-09-2	Methylene Chloride	BRL		ug/Kg	110
156-60-5	*trans*- 1,2-Dichloroethene	BRL		ug/Kg	11
1634-04-4	Methyl *tert*- butyl Ether (MTBE)	BRL		ug/Kg	11
75-34-3	1,1-Dichloroethane	BRL		ug/Kg	11
594-20-7	2,2-Dichloropropane	BRL		ug/Kg	11
156-59-2	*cis*- 1,2-Dichloroethene	BRL		ug/Kg	11
78-93-3	2-Butanone (MEK)	BRL		ug/Kg	110
74-97-5	Bromochloromethane	BRL		ug/Kg	11
109-99-9	Tetrahydrofuran (THF)	BRL		ug/Kg	110
67-66-3	Chloroform	BRL		ug/Kg	11
71-55-6	1,1,1-Trichloroethane	BRL		ug/Kg	11
56-23-5	Carbon Tetrachloride	BRL		ug/Kg	11
563-58-6	1,1-Dichloropropene	BRL		ug/Kg	11
71-43-2	Benzene	BRL		ug/Kg	11
107-06-2	1,2-Dichloroethane	BRL		ug/Kg	11
79-01-6	Trichloroethene	BRL		ug/Kg	11
78-87-5	1,2-Dichloropropane	BRL		ug/Kg	11
74-95-3	Dibromomethane	BRL		ug/Kg	11
75-27-4	Bromodichloromethane	BRL		ug/Kg	11
123-91-1	1,4-Dioxane	BRL		ug/Kg	11,000
10061-01-5	*cis*- 1,3-Dichloropropene	BRL		ug/Kg	11
108-10-1	4-Methyl-2-Pentanone (MIBK)	BRL		ug/Kg	110
108-88-3	Toluene	BRL		ug/Kg	11
10061-02-6	*trans*- 1,3-Dichloropropene	BRL		ug/Kg	11
79-00-5	1,1,2-Trichloroethane	BRL		ug/Kg	11
127-18-4	Tetrachloroethene	BRL		ug/Kg	11
142-28-9	1,3-Dichloropropane	BRL		ug/Kg	11
591-78-6	2-Hexanone	BRL		ug/Kg	110
124-48-1	Dibromochloromethane	BRL		ug/Kg	11
106-93-4	1,2-Dibromoethane (EDB)	BRL		ug/Kg	11
108-90-7	Chlorobenzene	BRL		ug/Kg	11
630-20-6	1,1,1,2-Tetrachloroethane	BRL		ug/Kg	11
100-41-4	Ethylbenzene	BRL		ug/Kg	11
108-38-3/106-42-3	*meta*- Xylene and *para*- Xylene	BRL		ug/Kg	11
95-47-6	*ortho*- Xylene	BRL		ug/Kg	11

GROUNDWATER ANALYTICAL

EPA Method 8260B (Continued)
Volatile Organics by GC/MS

Field ID:	**MW-2 5-6'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**40 mL VOA Vial**
Client:	**Resource Control Associates**	Preservation:	**NaHSO4 / Cool**
Laboratory ID:	**67565-02**	QC Batch ID:	**VM2-2504-S**
Sampled:	**12-01-03 09:50**	Instrument ID:	**MS-2 HP 5890**
Received:	**12-02-03 12:14**	Sample Weight:	**2.7 g**
Analyzed:	**12-09-03 14:40**	% Solids:	**83**
Analyst:	**CMM**	Dilution Factor:	**1**

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
100-42-5	Styrene	BRL		ug/Kg	11
75-25-2	Bromoform	BRL		ug/Kg	11
98-82-8	Isopropylbenzene	BRL		ug/Kg	11
108-86-1	Bromobenzene	BRL		ug/Kg	11
79-34-5	1,1,2,2-Tetrachloroethane	BRL		ug/Kg	11
96-18-4	1,2,3-Trichloropropane	BRL		ug/Kg	11
103-65-1	*n*-Propylbenzene	BRL		ug/Kg	11
95-49-8	2-Chlorotoluene	BRL		ug/Kg	11
108-67-8	1,3,5-Trimethylbenzene	BRL		ug/Kg	11
106-43-4	4-Chlorotoluene	BRL		ug/Kg	11
98-06-6	*tert*-Butylbenzene	BRL		ug/Kg	11
95-63-6	1,2,4-Trimethylbenzene	BRL		ug/Kg	11
135-98-8	*sec*-Butylbenzene	BRL		ug/Kg	11
541-73-1	1,3-Dichlorobenzene	BRL		ug/Kg	11
99-87-6	4-Isopropyltoluene	BRL		ug/Kg	11
106-46-7	1,4-Dichlorobenzene	BRL		ug/Kg	11
95-50-1	1,2-Dichlorobenzene	BRL		ug/Kg	11
104-51-8	*n*-Butylbenzene	BRL		ug/Kg	11
96-12-8	1,2-Dibromo-3-chloropropane	BRL		ug/Kg	11
120-82-1	1,2,4-Trichlorobenzene	BRL		ug/Kg	11
87-68-3	Hexachlorobutadiene	BRL		ug/Kg	11
91-20-3	Naphthalene	BRL		ug/Kg	11
87-61-6	1,2,3-Trichlorobenzene	BRL		ug/Kg	11
75-65-0	*tert*-Butyl Alcohol (TBA)	BRL		ug/Kg	440
108-20-3	Di-isopropyl Ether (DIPE)	BRL		ug/Kg	11
637-92-3	Ethyl *tert*-butyl Ether (ETBE)	BRL		ug/Kg	11
994-05-8	*tert*-Amyl Methyl Ether (TAME)	BRL		ug/Kg	11

QC Surrogate Compound	Spiked	Measured	Recovery	QC Limits
Dibromofluoromethane	50	53	**107** %	70 - 130 %
1,2-Dichloroethane-d_4	50	50	**99** %	70 - 130 %
Toluene-d_8	50	55	**110** %	70 - 130 %
4-Bromofluorobenzene	50	55	**109** %	70 - 130 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample preparation performed by EPA Method 5035A. Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **MW-1 1-2'** Matrix: **Soil**
Project: **Village St./A6550** Received: **12-02-03 12:14**
Client: **Resource Control Associates**

Lab ID: **67565-03** Sampled: **12-01-03 09:50** % Solids: Container: **250 mL Glass** Preservation: **Cool**

Analyte	Result	Units	RL	DF	Weight	Analyzed	QC Batch	Method	Inst	Analyst
Total Petroleum Hydrocarbons	**470**	mg/Kg	36	1	13 g	12-10-03 09:00	HI-1324-S	SM 5520 EF	1	AAB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: PE 1625 FT-IR

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **MW-2 5-6'** Matrix: **Soil**
Project: **Village St./A6550** Received: **12-02-03 12:14**
Client: **Resource Control Associates**

Lab ID: **67565-04** Sampled: **12-01-03 09:50** % Solids: Container: **250 mL Glass** Preservation: **Cool**

Analyte	Result	Units	RL	DF	Weight	Analyzed	QC Batch	Method	Inst	Analyst
Total Petroleum Hydrocarbons	**70**	mg/Kg	36	1	13 g	12-10-03 09:00	HI-1324-S	SM 5520 EF	1	AAB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: PE 1625 FT-IR

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **SB-2 1-2'** Matrix: **Soil**
Project: **Village St./A6550** Received: **12-02-03 12:14**
Client: **Resource Control Associates**

Lab ID: **67565-05** Sampled: **12-01-03 10:30** % Solids: Container: **250 mL Glass** Preservation: **Cool**

Analyte	Result	Units	RL	DF	Weight	Analyzed	QC Batch	Method	Inst	Analyst
Cyanide, Total	BRL	mg/Kg	1.3	1	0.5 g	12-08-03 14:12	TCN-0932-S	EPA 9012A	1	AVB
Total Petroleum Hydrocarbons	**190**	mg/Kg	38	1	12 g	12-10-03 09:00	HI-1324-S	SM 5520 EF	2	AAB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: Lachat 8000 Autoanalyzer

2 Instrument ID: PE 1625 FT-IR

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **SB-3 3-4'**
Project: **Village St./A6550**
Client: **Resource Control Associates**

Matrix: **Soil**
Received: **12-02-03 12:14**

Lab ID: **67565-06** Sampled: **12-01-03 12:00** % Solids: Container: **250 mL Glass** Preservation: **Cool**

Analyte	Result	Units	RL	DF	Weight	Analyzed	QC Batch	Method	Inst	Analyst
Cyanide, Total	BRL	mg/Kg	1.1	1	0.5 g	12-08-03 14:14	TCN-0932-S	EPA 9012A	1	AVB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: Lachat 8000 Autoanalyzer

GROUNDWATER ANALYTICAL

Inorganic Chemistry

Field ID: **SB-4 1-2'** Matrix: **Soil**
Project: **Village St./A6550** Received: **12-02-03 12:14**
Client: **Resource Control Associates**

Lab ID: **67565-07** Sampled: **12-01-03 12:00** % Solids: Container: **250 mL Glass** Preservation: **Cool**

Analyte	Result	Units	RL	DF	Weight	Analyzed	QC Batch	Method	Inst	Analyst
Cyanide, Total	BRL	mg/Kg	1	1	0.5 g	12-08-03 14:17	TCN-0932-S	EPA 9012A	1	AVB
Total Petroleum Hydrocarbons	**2,600**	mg/Kg	310	11	1.4 g	12-10-03 09:00	HI-1324-S	SM 5520 EF	2	AAB

Method Reference: Methods for Chemical Analysis of Water and Wastes, US EPA, EPA-600/4-790-020 (Revised 1983), and Methods for the Determination of Inorganic Substances in Environmental Samples, US EPA, EPA/600/R-93/100 (1993), and Standard Methods for the Examination of Water and Wastewater, APHA, Twentieth Edition (1998), and Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

RL Reporting Limit.

DF Dilution Factor.

1 Instrument ID: Lachat 8000 Autoanalyzer

2 Instrument ID: PE 1625 FT-IR

GROUNDWATER ANALYTICAL

EPA Method 8082
Polychlorinated Biphenyls (PCBs) by GC/ECD

Field ID:	**SB-3 3-4'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**67565-06**	QC Batch ID:	**PB-1827-P**
Sampled:	**12-01-03 12:00**	Instrument ID:	**GC-6 HP 5890**
Received:	**12-02-03 12:14**	Sample Weight:	**15 g**
Extracted:	**12-04-03 08:00**	Final Volume:	**10 mL**
Cleaned Up:	**12-04-03 13:00**	Percent Solids:	**84**
Analyzed:	**12-05-03 13:16**	Dilution Factor:	**1**
Analyst:	**JJT**		

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
12674-11-2	Aroclor 1016	BRL		ug/Kg	94
11104-28-2	Aroclor 1221	BRL		ug/Kg	94
11141-16-5	Aroclor 1232	BRL		ug/Kg	94
53469-21-9	Aroclor 1242	BRL		ug/Kg	94
12672-29-6	Aroclor 1248	BRL		ug/Kg	94
11097-69-1	Aroclor 1254	BRL		ug/Kg	94
11096-82-5	Aroclor 1260	BRL		ug/Kg	94

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
First	Tetrachloro-*m*-xylene	16	9	**58 %**	30 - 150 %
Column	Decachlorobiphenyl	16	14	**88 %**	30 - 150 %
Second	Tetrachloro-*m*-xylene	16	9	**59 %**	30 - 150 %
Column	Decachlorobiphenyl	16	14	**89 %**	30 - 150 %

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Sample extraction performed by EPA Method 3545. Cleanup performed by EPA Method 3660B and EPA Method 3665A.
Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**MW-1 1-2'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**67565-03**	Percent Solids:	**84**
Sampled:	**12-01-03 09:50**		
Received:	**12-02-03 12:14**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-1989-S	EPA 3051	12-03-03 12:05	0.5 g	ICP-1 PE 3000	CRL
EPA 7471A[2]	MP-1505-S	EPA 7471A	12-03-03 10:30	0.6 g	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**81**		mg/Kg	1.2	1	12-03-03 17:32	EPA 6010B[1]
7440-39-3	Barium, Total	**40**		mg/Kg	24	1	12-03-03 17:31	EPA 6010B[1]
7440-43-9	Cadmium, Total	**26**		mg/Kg	0.60	1	12-03-03 17:31	EPA 6010B[1]
7440-47-3	Chromium, Total	BRL		mg/Kg	12	1	12-03-03 17:31	EPA 6010B[1]
7439-92-1	Lead, Total	**280**		mg/Kg	12	1	12-03-03 17:31	EPA 6010B[1]
7439-97-6	Mercury, Total	**0.22**		mg/Kg	0.039	1	12-03-03 16:09	EPA 7471A[2]
7782-49-2	Selenium, Total	BRL		mg/Kg	24	1	12-03-03 17:32	EPA 6010B[1]
7440-22-4	Silver, Total	BRL		mg/Kg	6.0	1	12-03-03 17:31	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**MW-2 5-6'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**67565-04**	Percent Solids:	**83**
Sampled:	**12-01-03 09:50**		
Received:	**12-02-03 12:14**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-1989-S	EPA 3051	12-03-03 12:05	0.5 g	ICP-1 PE 3000	CRL
EPA 7471A[2]	MP-1505-S	EPA 7471A	12-03-03 10:30	0.6 g	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**3.3**		mg/Kg	1.2	1	12-03-03 17:46	EPA 6010B[1]
7440-39-3	Barium, Total	BRL		mg/Kg	24	1	12-03-03 17:45	EPA 6010B[1]
7440-43-9	Cadmium, Total	BRL		mg/Kg	0.60	1	12-03-03 17:46	EPA 6010B[1]
7440-47-3	Chromium, Total	BRL		mg/Kg	12	1	12-03-03 17:45	EPA 6010B[1]
7439-92-1	Lead, Total	**33**		mg/Kg	12	1	12-03-03 17:46	EPA 6010B[1]
7439-97-6	Mercury, Total	BRL		mg/Kg	0.039	1	12-03-03 16:12	EPA 7471A[2]
7782-49-2	Selenium, Total	BRL		mg/Kg	24	1	12-03-03 17:46	EPA 6010B[1]
7440-22-4	Silver, Total	BRL		mg/Kg	6.0	1	12-03-03 17:45	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-2 1-2'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**67565-05**	Percent Solids:	**79**
Sampled:	**12-01-03 10:30**		
Received:	**12-02-03 12:14**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-1989-S	EPA 3051	12-03-03 12:05	0.5 g	ICP-1 PE 3000	CRL
EPA 7471A[2]	MP-1505-S	EPA 7471A	12-03-03 10:30	0.6 g	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**7.7**		mg/Kg	1.3	1	12-03-03 17:51	EPA 6010B[1]
7440-39-3	Barium, Total	**69**		mg/Kg	25	1	12-03-03 17:50	EPA 6010B[1]
7440-43-9	Cadmium, Total	**25**		mg/Kg	0.63	1	12-03-03 17:50	EPA 6010B[1]
7440-47-3	Chromium, Total	BRL		mg/Kg	13	1	12-03-03 17:50	EPA 6010B[1]
7439-92-1	Lead, Total	**2200**		mg/Kg	13	1	12-03-03 17:50	EPA 6010B[1]
7439-97-6	Mercury, Total	**0.088**		mg/Kg	0.043	1	12-03-03 16:16	EPA 7471A[2]
7782-49-2	Selenium, Total	BRL		mg/Kg	25	1	12-03-03 17:51	EPA 6010B[1]
7440-22-4	Silver, Total	BRL		mg/Kg	6.3	1	12-03-03 17:50	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-3 3-4'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**67565-06**	Percent Solids:	**84**
Sampled:	**12-01-03 12:00**		
Received:	**12-02-03 12:14**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-1989-S	EPA 3051	12-03-03 12:05	0.5 g	ICP-1 PE 3000	CRL
EPA 7471A[2]	MP-1505-S	EPA 7471A	12-03-03 10:30	0.6 g	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7429-90-5	Aluminum, Total	**5,100**		mg/Kg	60	1	12-03-03 17:56	EPA 6010B[1]
7440-38-2	Arsenic, Total	**8.0**		mg/Kg	1.2	1	12-03-03 17:56	EPA 6010B[1]
7440-39-3	Barium, Total	**40**		mg/Kg	24	1	12-03-03 17:56	EPA 6010B[1]
7440-43-9	Cadmium, Total	**20**		mg/Kg	0.60	1	12-03-03 17:56	EPA 6010B[1]
7440-47-3	Chromium, Total	**18**		mg/Kg	12	1	12-03-03 17:56	EPA 6010B[1]
7439-92-1	Lead, Total	**240**		mg/Kg	12	1	12-03-03 17:56	EPA 6010B[1]
7439-95-4	Magnesium, Total	**1,300**		mg/Kg	60	1	12-03-03 17:56	EPA 6010B[1]
7439-97-6	Mercury, Total	**0.39**		mg/Kg	0.040	1	12-03-03 16:19	EPA 7471A[2]
7440-02-0	Nickel, Total	BRL		mg/Kg	12	1	12-03-03 17:56	EPA 6010B[1]
7782-49-2	Selenium, Total	BRL		mg/Kg	24	1	12-03-03 17:56	EPA 6010B[1]
7440-22-4	Silver, Total	BRL		mg/Kg	6.0	1	12-03-03 17:56	EPA 6010B[1]
7440-66-6	Zinc, Total	**2,100**		mg/Kg	60	1	12-04-03 13:05	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-4 1-2'**	Matrix:	**Soil**
Project:	**Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**67565-07**	Percent Solids:	**95**
Sampled:	**12-01-03 12:00**		
Received:	**12-02-03 12:14**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-1989-S	EPA 3051	12-03-03 12:05	0.5 g	ICP-1 PE 3000	CRL
EPA 7471A[2]	MP-1505-S	EPA 7471A	12-03-03 10:30	0.6 g	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7429-90-5	Aluminum, Total	**4,500**		mg/Kg	53	1	12-03-03 18:01	EPA 6010B[1]
7440-38-2	Arsenic, Total	**8.3**		mg/Kg	1.1	1	12-03-03 18:02	EPA 6010B[1]
7440-39-3	Barium, Total	**220**		mg/Kg	21	1	12-03-03 18:01	EPA 6010B[1]
7440-43-9	Cadmium, Total	**4.2**		mg/Kg	0.53	1	12-03-03 18:02	EPA 6010B[1]
7440-47-3	Chromium, Total	**24**		mg/Kg	11	1	12-03-03 18:01	EPA 6010B[1]
7439-92-1	Lead, Total	**1,600**		mg/Kg	11	1	12-03-03 18:01	EPA 6010B[1]
7439-95-4	Magnesium, Total	**1,400**		mg/Kg	53	1	12-03-03 18:01	EPA 6010B[1]
7439-97-6	Mercury, Total	**0.16**		mg/Kg	0.034	1	12-03-03 16:22	EPA 7471A[2]
7440-02-0	Nickel, Total	**230**		mg/Kg	11	1	12-03-03 18:01	EPA 6010B[1]
7782-49-2	Selenium, Total	BRL		mg/Kg	21	1	12-03-03 18:02	EPA 6010B[1]
7440-22-4	Silver, Total	**7.0**		mg/Kg	5.3	1	12-03-03 18:01	EPA 6010B[1]
7440-66-6	Zinc, Total	**3,000**		mg/Kg	530	10	12-05-03 13:56	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	**Village St./A6550**	Lab ID:	**67565**
Client:	**Resource Control Associates**	Received:	**12-02-03 12:14**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

5. EPA 8260B Non-conformance: Samples 67565-01 and -02. Laboratory control sample (LCS) analytes tert-Butyl Alcohol were above recommended recovery limits for QC batch VM2-2504-S.

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 083050

Project Name: Village St	Firm: RCA
Project Number: A0550	Address: 474 Broadway
Sampler Name: T Nevis	City / State / Zip: Pawtucket RI 02860
Project Manager: M Melesdino	Telephone: 401-728-6860

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☒ PRIORITY (5 Business Days)
- ☐ RUSH (RAN- _____)
  (Rush requires Rush Authorization Number)
  - ☐ Please Email to: _____
  - ☐ Please FAX to: _____

BILLING

- ☒ Purchase Order No.: 9018
- ☐ Third Party Billing: _____
- ☐ GWA Quote: _____

ANALYSIS REQUEST

OPTIONS: ☐ TIC Search

Volatiles: SDWA ☐ 524.2+MTBE; NPDES ☐ 624; RCRA/21E ☐ 8260B TCL+MTBE ☐ 8260B NH PETROLEUM ☒ 8260B

Semivolatiles: ☐ Acid Only ☐ B/N Only ☐ TIC Search; SDWA ☐ 525.2; NPDES ☐ 625; RCRA/21E ☐ 8270C; ☐ 8270C PAHs only

Pest/Herb/PCBs Extractable: SDWA ☐ 505 ☐ 508; NPDES ☐ 608 Pesticides; RCRA/21E ☐ 8081A Pesticides

Pest/Herb/PCBs Vol.: SDWA ☐ 531.1 ☐ 515.1 ☐ 504.1 EDB/DBCP; NPDES ☐ 608 PCBs; RCRA/21E ☒ 8082 PCBs; ☐ 8151A Herbicides; ☐ 8011 EDB/DBCP

Metals: Specify For Water Samples ☐ Total ☐ Dissolved; SDWA ☒ Lead and Copper; NPDES ☐ 13 Priority Pollutant; RCRA/21E ☒ 8 RCRA ☐ 5 RCRA ☐ MA List Metals ☐ 23 TAL ☐ Specify: Al, Mn, Fe

Petroleum Hydrocarbon Ext. TPH: ☒ TPH-IR ☐ Diesel Range Organics (DRO) ☐ ME DRO ☐ CT ETPH ☐ MA DEP EPH w/all targets ☐ EPH Carbon Ranges only ☐ EPH w/4 PAHs ☐ Hydrocarbon Fingerprint (GC/FID by ASTM D3328-00-Mod.) ☐ TPH by GC/FID (8015B Mod) Quantitative Only

Petroleum Hydrocarbon Vol.TPH: ☐ TPH by GC/FID (8015B Mod) Qualitative Only ☐ Gasoline Range Organics (GRO) ☐ ME GRO ☐ MA DEP VPH w/all targets ☐ VPH Carbon ranges only

Haz. Waste: ☐ TCLP ☐ SPLP ☐ 8 Metals ☐ Pb only ☐ VOA ☐ Semi VOA ☐ Pesticides ☐ Herbicides ☐ Corrosivity (as pH) ☐ Reactivity ☐ Ignitability (as Flashpoint) ☐ Paint Filter ☐ MA Basic Disposal Criteria: 8260B, TPH by GC, PCBs, 5 Metals, Corrosivity, Ignitability, Reactivity

General Chemistry: ☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Fluoride ☐ Sulfate ☐ Dissolved Phosphorus ☐ Ammonia ☐ TKN ☐ Total Phosphorus ☐ Total N (as N02/N03/TKN) ☐ Oil & Grease ☐ COD ☐ TOC ☐ BOD ☐ TDS ☐ TSS ☐ TS ☐ Alkalinity ☐ Cyanide, Total ☐ Cyanide, Physiologically Available ☐ pH ☐ Dissolved Oxygen ☐ turbidity

Other: ☐ Total Coliform ☐ Fecal Coliform ☐ HPC

Sampling DATE	TIME	SAMPLE IDENTIFICATION	Matrix	Type	Container(s) NUMBER	40mL VOA Vial	60mL/2 oz Glass	120mL/4 oz Amber Glass	250mL/8 oz Glass	500mL/16 oz Glass	1L/32 oz Amber Glass	250mL/8 oz Plastic	500mL/16 oz Plastic	1L/32 oz Plastic	120mL Sterile	Preservation HCl	HNO3	H2SO4	NaOH	Methanol	Sodium Bisulfate	ICE	Filtered YES	NO	LABORATORY NUMBER (Lab Use Only)
12/1	8:45	MW-1 1-2'	SOIL	GRAB	4	X													X	X					1
12/1	8:45	MW-1 1-2	SOIL	GRAB	1				X												X				3
12/1	9:50	MW-2 1-6'	SOIL	GRAB	1				X												X				4
12/1	1:50	MW-[illegible] -6'	SOIL	GRAB	4	X													X	X					2
12/1	10:30	SB-2 1-2'	SOIL	GRAB	1				X												X				5
12/1	12:00	SB-3 3-4'	SOIL	GRAB	1				X												X				6
12/1	12:00	SB-4 1-2'	SOIL	GRAB	1				X												X				7

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

- ☐ YES ☒ NO MCP Data Certification is required.
- ☐ YES ☒ NO MCP minimum Field QC requirements have been met for this project.
  (Metals, hexavalent chromium and cyanide analyses require one matrix spike per 20 samples)
- ☐ YES ☒ NO MCP Drinking Water samples required.
  (Require collection of contingent duplicate samples. Trip blanks are also required, if VOA samples collected)

Signature: _____

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☒ MCP GW-1/S-1	☐ PWS Form
☐ ME	☐ MCP GW-2/S-2	☐ MWRA
☒ MA	☐ NY STARS	☐ _____
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ _____	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required
- ☐ Sample Duplicate
- ☐ Matrix Spike
- ☐ Matrix Spike Duplicate

Selection of QC Sample
- ☐ Please use sample: _____

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by Sampler:	Date / Time: 12/2/03 11:55	Received by:	Receipt Temperature: ☐ Ice ☒ Refrigerated 2-6°C Recommended 5°C
Relinquished by:	Date / Time: 12/2/03 1:14	Received by:	Container Count: 12
Relinquished by:	Date / Time:	Received by Laboratory:	Shipping/Airbill Number:
Method of Shipment: ☒ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ _____			Custody Seal Number:

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

January 19, 2004

Ms. Maria Meleschnig
Resource Control Associates
474 Broadway
Pawtucket, RI 02860

LABORATORY REPORT

Project: **Santos / Village St./A6550**
Lab ID: **68687**
Received: **01-12-04**

Dear Maria:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Eric H. Jensen
Operations Manager

EHJ/smd
Enclosures

GROUNDWATER ANALYTICAL

Sample Receipt Report

Project:	**Santos / Village St./A6550**	Delivery:	**GWA Courier**	Temperature:	**2'C**
Client:	**Resource Control Associates**	Airbill:	**n/a**	Chain of Custody:	**Present**
Lab ID:	**68687**	Lab Receipt:	**01-12-04**	Custody Seal(s):	**n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-1	SB-9 (7-8')		Soil	1/9/04 13:00	MA DEP EPH with PAHs				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C356530	120 mL Amber Glass	Proline	BX10489	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-2	SB-12 (6-7')		Soil	1/9/04 14:30	MA DEP EPH with 4PAHs				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C356529	120 mL Amber Glass	Proline	BX10489	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-3	SB-11 (0-1')		Soil	1/9/04 14:00	MA DEP EPH with 4PAHs				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C356512	120 mL Amber Glass	Proline	BX10489	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-4	SB-6 (1-2')		Soil	1/9/04 10:15	MA DEP EPH with 4PAHs				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C356534	120 mL Amber Glass	Proline	BX10489	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-5	SB-13 (1-2')		Soil	1/9/04 0:00	MA DEP EPH with 4PAHs				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C322760	250 mL Glass	Proline	BX10282	None	n/a	n/a	11-13-03		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-6	SB-9 (7-8')		Soil	1/9/04 13:00	EPA 6010B Pb Zn Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C306123	250 mL Glass	Proline	BX10449	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-7	SB-7 (1-2')		Soil	1/9/04 10:30	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C381124	250 mL Glass	Proline	BX9363	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-8	SB-7(5-6')		Soil	1/9/04 10:35	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368833	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-9	SB-5 (1-2')		Soil	1/9/04 9:50	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368832	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-10	SB-5 (7-8')		Soil	1/9/04 10:00	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368827	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

GROUNDWATER ANALYTICAL

Sample Receipt Report (Continued)

Project:	Santos / Village St./A6550	Delivery:	GWA Courier	Temperature:	2'C
Client:	Resource Control Associates	Airbill:	n/a	Chain of Custody:	Present
Lab ID:	68687	Lab Receipt:	01-12-04	Custody Seal(s):	n/a

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-11	SB-8 (7-8')		Soil	1/9/04 12:00	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368826	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-12	SB-10 (1-2')		Soil	1/9/04 13:30	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368825	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-13	SB-12 (6-7')		Soil	1/9/04 14:30	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368828	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-14	SB-11 (0-1')		Soil	1/9/04 14:00	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368831	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-15	SB-11 (6-7')		Soil	1/9/04 14:10	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368824	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-16	SB-6 (1-2')		Soil	1/9/04 10:15	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368829	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-17	SB-6 (7-8')		Soil	1/9/04 10:20	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C322761	250 mL Glass	Proline	BX10282	None	n/a	n/a	11-13-03		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-18	SB-13 (1-2')		Soil	1/9/04 14:50	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368834	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-19	SB-13 (6-7')		Soil	1/9/04 0:00	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C368830	250 mL Glass	Proline	BX10401	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-20	SB-11 (6-7') MS		Soil	1/9/04 14:10	EPA 6010B As Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C322759	250 mL Glass	Proline	BX10282	None	n/a	n/a	11-13-03		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68687-21	SB-9(7-8') MS		Soil	1/9/04 13:00	EPA 6010B Zn Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C381128	250 mL Glass	Proline	BX9363	None	n/a	n/a	n/a		

GROUNDWATER ANALYTICAL

Data Certification

Project:	**Santos / Village St./A6550**	Lab ID:	**68687**
Client:	**Resource Control Associates**	Received:	**01-12-04 17:15**

MA DEP Compendium of Analytical Methods

Project Location:	n/a	MA DEP RTN:	n/a

This Form provides certifications for the following data set:

MA DEP EPH: 68687-01,-02,-03,-04,-05
EPA 6010B: 68687-06,-07,-08,-09,-10,-11,-12,-13,-14,-15,-16,-17,-18,-19,-20,-21

Sample Matrices:	Groundwater ( )	Soil/Sediment (X)	Drinking Water ( )	Other ( )	
MCP SW-846 Methods Used	8260B ( )	8151A ( )	8330 ( )	6010B (X)	7470A/1A ( )
	8270C ( )	8081A ( )	VPH ( )	6020 ( )	9012A[2] ( )
As specified in MA DEP Compendium of Analytical Methods. (check all that apply)	8082 ( )	8021B ( )	EPH (X)	7000 S[3] ( )	Other ( )

1. List Release Tracking Number (RTN), if known.
2. SW-846 Method 9012A (Equivalent to 9014) or MA DEP Physiologically Available Cyanide (PAC) Method.
3. S - SW-846 Methods 7000 Series. List individual method and analyte.

An affirmative response to questions A, B, C and D is required for "Presumptive Certainty" status.

A.	Were all samples received by the laboratory in a condition consistent with that described on the Chain-of-Custody documentation for the data set?	Yes
B.	Were all QA/QC procedures required for the specified analytical method(s) included in this report followed, including the requirement to note and discuss in a narrative QC data that did not meet appropriate performance standards or guidelines?	Yes
C.	Does the analytical data included in this report meet all the requirements for "Presumptive Certainty," as described in Section 2.0 of the MA DEP document CAM VII A, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data*?	Yes
D.	VPH and EPH methods only: Was the VPH or EPH method run without significant modifications, as specified in Section 11.3?	Yes

A response to questions E and F below is required for "Presumptive Certainty" status.

E.	Were all QC performance standards and recommendations for the specified methods achieved?	No
F.	Were results for all analyte-list compounds/elements for the specified method(s) reported?	No

All No answers are addressed in the attached Project Narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature:		Position:	Operations Manager
Printed Name:	Eric H. Jensen	Date:	01-19-04

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**SB-9 (7-8')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**120 mL Amber Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-01**	QC Batch ID:	**EP-1800-M**
Sampled:	**01-09-04 13:00**	Instrument ID:	**GC-7 HP 5890**
Received:	**01-12-04 17:15**	Sample Weight:	**16 g**
Extracted:	**01-12-03 08:00**	Final Volume:	**1 mL**
Analyzed (AL):	**01-15-04 03:15**	% Solids:	**83**
Analyzed (AR):	**01-15-04 03:58**	Aliphatic Dilution Factor:	**1**
Analyst:	**AG**	Aromatic Dilution Factor:	**1**

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	35
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL		mg/Kg	35
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL		mg/Kg	35
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL		mg/Kg	35

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		mg/Kg	0.58
91-57-6	2-Methylnaphthalene	BRL		mg/Kg	0.58
85-01-8	Phenanthrene	BRL		mg/Kg	0.58
83-32-9	Acenaphthene	BRL		mg/Kg	0.58
208-96-8	Acenaphthylene	BRL		mg/Kg	0.58
86-73-7	Fluorene	BRL		mg/Kg	0.58
120-12-7	Anthracene	BRL		mg/Kg	0.58
206-44-0	Fluoranthene	BRL		mg/Kg	0.58
129-00-0	Pyrene	BRL		mg/Kg	0.58
56-55-3	Benzo[a]anthracene	BRL		mg/Kg	0.58
218-01-9	Chrysene	BRL		mg/Kg	0.58
205-99-2	Benzo[b]fluoranthene	BRL		mg/Kg	0.58
207-08-9	Benzo[k]fluoranthene	BRL		mg/Kg	0.58
50-32-8	Benzo[a]pyrene	BRL		mg/Kg	0.58
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		mg/Kg	0.58
53-70-3	Dibenzo[a,h]anthracene	BRL		mg/Kg	0.58
191-24-2	Benzo[g,h,i]perylene	BRL		mg/Kg	0.58

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	3.1	2.8	**90 %**	40 - 140 %
	2-Bromonaphthalene	3.1	2.8	**90 %**	40 - 140 %
Extraction:	Chloro-octadecane	3.1	2.2	**71 %**	40 - 140 %
	ortho-Terphenyl	3.1	2.5	**80 %**	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.1.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).
Sample extraction performed by microwave accelerated solvent extraction technique. Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	SB-12 (6-7')	Matrix:	Soil
Project:	Santos / Village St./A6550	Container:	120 mL Amber Glass
Client:	Resource Control Associates	Preservation:	Cool
Laboratory ID:	68687-02	QC Batch ID:	EP-1800-M
Sampled:	01-09-04 14:30	Instrument ID:	GC-7 HP 5890
Received:	01-12-04 17:15	Sample Weight:	15 g
Extracted:	01-12-03 08:00	Final Volume:	1 mL
Analyzed (AL):	01-15-04 04:41	% Solids:	84
Analyzed (AR):	01-15-04 05:24	Aliphatic Dilution Factor:	1
Analyst:	AG	Aromatic Dilution Factor:	1

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	35
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL		mg/Kg	35
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL		mg/Kg	35
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL		mg/Kg	35

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		mg/Kg	0.58
91-57-6	2-Methylnaphthalene	BRL		mg/Kg	0.58
85-01-8	Phenanthrene	BRL		mg/Kg	0.58
83-32-9	Acenaphthene	BRL		mg/Kg	0.58

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	3.1	3.1	101 %	40 - 140 %
	2-Bromonaphthalene	3.1	3.2	102 %	40 - 140 %
Extraction:	Chloro-octadecane	3.1	2.3	76 %	40 - 140 %
	ortho-Terphenyl	3.1	2.9	93 %	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed? Yes
2. Were all perfomance/acceptance standards for the required QA/QC procedures achieved? Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.1.1? No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).
Sample extraction performed by microwave accelerated solvent extraction technique. Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	SB-11 (0-1')	Matrix:	Soil
Project:	Santos / Village St./A6550	Container:	120 mL Amber Glass
Client:	Resource Control Associates	Preservation:	Cool
Laboratory ID:	68687-03	QC Batch ID:	EP-1800-M
Sampled:	01-09-04 14:00	Instrument ID:	GC-7 HP 5890
Received:	01-12-04 17:15	Sample Weight:	15 g
Extracted:	01-12-03 08:00	Final Volume:	1 mL
Analyzed (AL):	01-15-04 06:07	% Solids:	83
Analyzed (AR):	01-15-04 06:50	Aliphatic Dilution Factor:	5
Analyst:	AG	Aromatic Dilution Factor:	5

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	180
n-C19 to n-C36 Aliphatic Hydrocarbons †	360		mg/Kg	180
n-C11 to n-C22 Aromatic Hydrocarbons †◊	480		mg/Kg	180
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	640		mg/Kg	180

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		mg/Kg	2.9
91-57-6	2-Methylnaphthalene	BRL		mg/Kg	2.9
85-01-8	Phenanthrene	30		mg/Kg	2.9
83-32-9	Acenaphthene	BRL		mg/Kg	2.9

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	3.1	d	d	40 - 140 %
	2-Bromonaphthalene	3.1	d	d	40 - 140 %
Extraction:	Chloro-octadecane	3.1	d	d	40 - 140 %
	ortho-Terphenyl	3.1	d	d	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	No
3. Were any significant modifications made to the method, as specified in Section 11.3.1.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).
Sample extraction performed by microwave accelerated solvent extraction technique. Results are reported on a dry weight basis.

Report Notations:

- BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.
- † Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.
- ◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.
- d Surrogate recovery not measurable due to required sample dilution.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	SB-6 (1-2')	Matrix:	Soil
Project:	Santos / Village St./A6550	Container:	120 mL Amber Glass
Client:	Resource Control Associates	Preservation:	Cool
Laboratory ID:	68687-04	QC Batch ID:	EP-1800-M
Sampled:	01-09-04 10:15	Instrument ID:	GC-7 HP 5890
Received:	01-12-04 17:15	Sample Weight:	15 g
Extracted:	01-12-03 08:00	Final Volume:	1 mL
Analyzed (AL):	01-15-04 08:17	% Solids:	85
Analyzed (AR):	01-15-04 09:00	Aliphatic Dilution Factor:	1
Analyst:	AG	Aromatic Dilution Factor:	1

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	82		mg/Kg	34
n-C19 to n-C36 Aliphatic Hydrocarbons †	270		mg/Kg	34
n-C11 to n-C22 Aromatic Hydrocarbons †◊	210		mg/Kg	34
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	240		mg/Kg	34

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		mg/Kg	0.57
91-57-6	2-Methylnaphthalene	BRL		mg/Kg	0.57
85-01-8	Phenanthrene	3.8		mg/Kg	0.57
83-32-9	Acenaphthene	BRL		mg/Kg	0.57

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	3.1	2.3	75 %	40 - 140 %
	2-Bromonaphthalene	3.1	2.2	72 %	40 - 140 %
Extraction:	Chloro-octadecane	3.1	1.6	53 %	40 - 140 %
	ortho-Terphenyl	3.1	1.9	61 %	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed?	Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved?	Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.1.1?	No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).
Sample extraction performed by microwave accelerated solvent extraction technique. Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Massachusetts DEP EPH Method
Extractable Petroleum Hydrocarbons by GC/FID

Field ID:	**SB-13 (1-2')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-05**	QC Batch ID:	**EP-1800-M**
Sampled:	**01-09-04 00:00**	Instrument ID:	**GC-7 HP 5890**
Received:	**01-12-04 17:15**	Sample Weight:	**15 g**
Extracted:	**01-12-03 08:00**	Final Volume:	**1 mL**
Analyzed (AL):	**01-15-04 09:43**	% Solids:	**90**
Analyzed (AR):	**01-15-04 10:26**	Aliphatic Dilution Factor:	**1**
Analyst:	**AG**	Aromatic Dilution Factor:	**1**

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	33
n-C19 to n-C36 Aliphatic Hydrocarbons †	**96**		mg/Kg	33
n-C11 to n-C22 Aromatic Hydrocarbons †◊	**71**		mg/Kg	33
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	90		mg/Kg	33

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		mg/Kg	0.55
91-57-6	2-Methylnaphthalene	BRL		mg/Kg	0.55
85-01-8	Phenanthrene	**2.7**		mg/Kg	0.55
83-32-9	Acenaphthene	BRL		mg/Kg	0.55

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	2.9	2.5	**86 %**	40 - 140 %
	2-Bromonaphthalene	2.9	2.7	**92 %**	40 - 140 %
Extraction:	Chloro-octadecane	2.9	2.2	**76 %**	40 - 140 %
	ortho-Terphenyl	2.9	3.0	**104 %**	40 - 140 %

QA/QC Certification

1. Were all QA/QC procedures required by the method followed? Yes
2. Were all performance/acceptance standards for the required QA/QC procedures achieved? Yes
3. Were any significant modifications made to the method, as specified in Section 11.3.1.1? No

Method non-conformances indicated above are detailed below on this data report, or in the accompanying project narrative and project quality control report. Release of this data is authorized by the accompanying signed project cover letter. The accompanying cover letter, project narrative and quality control report are considered part of this data report.

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).
Sample extraction performed by microwave accelerated solvent extraction technique. Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-9 (7-8')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-06**	Percent Solids:	**75**
Sampled:	**01-09-04 13:00**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**19**		mg/Kg	13	1	01-14-04 11:37	EPA 6010B[1]
7440-66-6	Zinc, Total	**160**		mg/Kg	64	1	01-14-04 11:36	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

Groundwater Analytical, Inc., P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Matrix Spike
Trace Metals

			Parent Sample	Matrix Spike
Field ID:	SB-9(7-8')			
Project:	Santos / Village St./A6550	Laboratory ID:	68687-06	68687-21
Client:	Resource Control Associates	Sampled:	01-09-04 13:00	01-09-04 13:00
Matrix:	Soil	Received:	01-12-04 17:15	01-12-04 17:15
Container:	250 mL Glass	% Solids:	75	67
Preservation:	Cool			

Sample Type	Method	QC Batch ID	Prep Method	Prepared	Weight	DF	Analyzed	Instrument ID	Analyst
Matrix Spike	EPA 6010B	MM-0312-S	EPA 3051	01-13-04 10:45	0.5 g	1	01-14-04 11:47	ICP-1 PE 3000	CRL

CAS Number	Analyte	Unspiked Sample (mg/Kg)	MS Spiked (mg/Kg)	MS Measured (mg/Kg)	MS Recovery	QC Limits Spike	Method
7439-92-1	Lead	19	140	140	86 %	75-125%	EPA 6010B
7440-66-6	Zinc	160	140	310	107 %	75-125%	EPA 6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-7 (1-2')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-07**	Percent Solids:	**93**
Sampled:	**01-09-04 10:30**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**570**		mg/Kg	11	1	01-14-04 12:02	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-7(5-6')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-08**	Percent Solids:	**85**
Sampled:	**01-09-04 10:35**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	36		mg/Kg	12	1	01-14-04 12:08	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-5 (1-2')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-09**	Percent Solids:	**92**
Sampled:	**01-09-04 09:50**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**380**		mg/Kg	11	1	01-14-04 12:13	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-5 (7-8')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-10**	Percent Solids:	**82**
Sampled:	**01-09-04 10:00**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	BRL		mg/Kg	12	1	01-14-04 18:02	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	SB-8 (7-8')	Matrix:	Soil
Project:	Santos / Village St./A6550	Container:	250 mL Glass
Client:	Resource Control Associates	Preservation:	Cool
Laboratory ID:	68687-11	Percent Solids:	83
Sampled:	01-09-04 12:00		
Received:	01-12-04 17:15		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	BRL		mg/Kg	12	1	01-14-04 18:07	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-10 (1-2')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-12**	Percent Solids:	**85**
Sampled:	**01-09-04 13:30**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**76**		mg/Kg	11	1	01-14-04 18:13	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations: BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-12 (6-7')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-13**	Percent Solids:	**84**
Sampled:	**01-09-04 14:30**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**1.5**		mg/Kg	1.2	1	01-14-04 12:44	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

Groundwater Analytical, Inc., P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-11 (0-1')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-14**	Percent Solids:	**83**
Sampled:	**01-09-04 14:00**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**10**		mg/Kg	1.2	1	01-14-04 12:49	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-11 (6-7')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-15**	Percent Solids:	**85**
Sampled:	**01-09-04 14:10**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	BRL		mg/Kg	1.1	1	01-14-04 11:52	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Matrix Spike
Trace Metals

			Parent Sample	Matrix Spike
Field ID:	SB-11 (6-7')	Laboratory ID:	68687-15	68687-20
Project:	Santos / Village St./A6550	Sampled:	01-09-04 14:10	01-09-04 14:10
Client:	Resource Control Associates	Received:	01-12-04 17:15	01-12-04 17:15
Matrix:	Soil	% Solids:	85	81
Container:	250 mL Glass			
Preservation:	Cool			

Sample Type	Method	QC Batch ID	Prep Method	Prepared	Weight	DF	Analyzed	Instrument ID	Analyst
Matrix Spike	EPA 6010B	MM-0312-S	EPA 3051	01-13-04 10:45	0.5 g	1	01-14-04 11:58	ICP-1 PE 3000	CRL

CAS Number	Analyte	Unspiked Sample (mg/Kg)	MS Spiked (mg/Kg)	MS Measured (mg/Kg)	MS Recovery	QC Limits Spike	Method
7440-38-2	Arsenic	BRL	130	120	92 %	75-125%	EPA 6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

P.O. Box 1300, 320 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-6 (1-2')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-16**	Percent Solids:	**85**
Sampled:	**01-09-04 10:15**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**12**		mg/Kg	1.1	1	01-14-04 12:55	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

Groundwater Analytical, Inc. P.O. Box 1300, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-6 (7-8')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-17**	Percent Solids:	**66**
Sampled:	**01-09-04 10:20**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	BRL		mg/Kg	1.5	1	01-14-04 13:00	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

Groundwater Analytical, Inc. P.O. Box 1289, 220 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-13 (1-2')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-18**	Percent Solids:	**90**
Sampled:	**01-09-04 14:50**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**4.4**		mg/Kg	1.1	1	01-14-04 13:05	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-13 (6-7')**	Matrix:	**Soil**
Project:	**Santos / Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68687-19**	Percent Solids:	**74**
Sampled:	**01-09-04 00:00**		
Received:	**01-12-04 17:15**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MB-0312-S	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Total	**2.0**		mg/Kg	1.4	1	01-14-04 13:10	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	**Santos / Village St./A6550**	Lab ID:	**68687**
Client:	**Resource Control Associates**	Received:	**01-12-04 17:15**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. The Matrix Spike for Lead was performed on sample 68687-21 as discussed with Tim Nevins, 01-14-04.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. EPA 6010B Note: Samples 68687-06,-07,-08,-09,-10,-11,-12,-13,-14,-15,-16,-17,-18,-19,-20,-21. Samples were analyzed for selected target analytes, as requested by client.
2. MA DEP EPH Non-conformance: Sample 68687-03. Sample had surrogate recoveries outside recommended limits due to required sample dilution.
3. MA DEP EPH Note: Sample 68687-03. Sample was diluted prior to analysis. Dilution was required to keep all target analytes within calibration.
4. MA DEP EPH Note: Samples 68687-02,-03,-04,-05. Samples were analyzed for only carbon range analytes and four Fuel Oil No.2/Diesel Fuel PAH analytes, as requested by client.

Groundwater Analytical, Inc., P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

SB-9 analyze for all 13 PAHs

all other EPH Samples, 4 PAHs

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 080649

Project Name: Center/Village St
Project Number: 6550
Sampler Name: T. Nevins
Project Manager: J. Mulcahy
Firm: RIA
Address: 474 Broadway
City / State / Zip: Pawtucket RI 02860
Telephone: 401-728-6860

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☒ PRIORITY (5 Business Days)
- ☐ RUSH (RAN- _____)
  (Rush requires Rush Authorization Number)
- ☐ Please Email to: _____
- ☐ Please FAX to: _____

BILLING

- ☒ Purchase Order No.: 9070
- ☐ Third Party Billing: _____
- ☐ GWA Quote: _____

ANALYSIS REQUEST

OPTIONS: TIC Search

SW846: 524.2-MTBE; 525.2; 505 ☐ 508; 531.1; 515.1; 504.1 EDB/DBCP; Lead and Copper (Specify For Water Samples ☐ Total ☐ Dissolved)

MPMES: 624; 8260-MTBE; 601; 601/8260-MTBE; 625; 625 PAHs only; 608 Pesticides; 608 PCBs; 615; 13 Priority Pollutant

RCRA/21E: 8260/8 TCL-MTBE; 8260/8 NH PETROLEUM; 8260/8; 8021B Aromatics; 8021B Halocarbons; 8021B; 8270; 8270C PAHs only; 8081A Pesticides; 8082 PCBs; 8151A Herbicides; 8011 EDB/DBCP; 8 RCRA; 5 RCRA; MA List Metals; 23 TAL; Specify:

Volatiles; Semivolatiles; Pest/Herb/PCBs Extractable Vol.; Metals; Petroleum Hydrocarbon Ext. TPH; Vol. TPH; Haz. Waste; General Chemistry; Other

Petroleum Hydrocarbon: TPH-IR; Diesel Range Organics (DRO); ME DRO; 21 ETPH; MA DEP EPH w/all targets; EPH Carbon Ranges only; EPH w/4 PAHs; Hydrocarbon Fingerprint (GC/FID by ASTM D3328-00-Mod.); TPH by (GC/FID (8015B Mod) Quantitative Only; Gasoline Range Organics (GRO); ME GRO; MA DEP VPH w/all targets; VPH Carbon ranges only

Haz. Waste: TCLP; SPLP; 8 Metals; Pb only; VOA; Semi VOA; Pesticides; Herbicides; Corrosivity (as pH); Reactivity; Ignitability (as Flashpoint); Paint Filter; MA Basic Disposal Criteria: 5030B, TPH by GC, PCBs, 5 Metals, Corrosivity, Ignitability, Reactivity

General Chemistry: Nitrate; Nitrite; Chloride; Fluoride; Sulfate; Dissolved Phosphorus; Ammonia; TKN; Total Phosphorus; Total N (as NH3/NO3/TKN); Oil & Grease; COD; TOC; BOD; TDS; TSS; TS; Alkalinity; Cyanide, Total; Cyanide, Physiologically Available; pH; Dissolved Oxygen; Turbidity

Other: Total Coliform; Fecal Coliform; HPC; Total P; Total Zinc; Total Arsenic

Sampling Date	Time	SAMPLE IDENTIFICATION	Matrix: GROUNDWATER	DRINKING WATER	WASTEWATER	SOIL	OTHER SOLID	OIL/ORGANIC LIQUID	Type: COMPOSITE	GRAB	Container(s) NUMBER	40mL VOA Vial	60mL/2 oz Glass	120mL/4 oz Amber Glass	250mL/8 oz Glass	500mL/16 oz Glass	1L/32 oz Amber Glass	250mL/8 oz Plastic	500mL/16 oz Plastic	1L/32 oz Plastic	120mL Sterile	Preservation: HCl	HNO3	H2SO4	NaOH	Methanol	Sodium Bisulfate	ICE	Filtered: YES	NO	LABORATORY NUMBER (Lab Use Only)
4	1:00	SB-9 7-8'				X				X	1			X														X			1 ✓
4	1:00	SB-9 7-8'				X				X	7				X													X			6 ~~5~~ 22 ✓
4	10:20	SB-7 1-2'				X				X	1				X													X			7
	10:35	SB-7 5-6'				X				X	1				X													X			8
4	11:50	SB-5 1-2'				X				X	1				X													X			9
4	10:00	SB-5 7-8'				X				X	1				X													X			10
4	12:00	SB-8 7-8'				X				X	1				X													X			11
4	[illegible]	SB-10 [illegible]				X				X	1				X													X			12
4	2:30	SB-12 0-7				X				X	1			X														X			2
4	2:20	SB-12 0-7				X				X	1				X													X			~~4~~ 13
4	2:00	SB-11 0-1'				X				X	1			X														X			3
4	2:00	SB-11 C-1'				X				X	1				X													X			~~15~~ 14

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

☒ YES ☐ NO MCP Data Certification is required.

☒ YES ☐ NO MCP minimum Field QC requirements have been met for this project.
(Metals, hexavalent chromium and cyanide analyses require one matrix spike per 20 samples)

☐ YES ☒ NO MCP Drinking Water samples required.
(Require collection of contingent duplicate samples. Trip blanks are also required, if VOA samples collected)

Signature: _____

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☒ MCP GW-1/S-1	☐ PWS Form
☐ ME	☐ MCP GW-2/S-2	☐ MWRA
☒ MA	☐ NY STARS	☐ _____
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ _____	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required
- ☐ Sample Duplicate
- ☒ Matrix Spike
- ☐ Matrix Spike Duplicate

Selection of QC Sample
- ☒ Please use sample: SB-9 7-8' (21) SB-7 5-6' (18)

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by Sampler:	Date: 1/9/04	Time:	Received by:	Receipt Temperature: ☐ Ice ☒ Refrigerated 2-6°C Recommended 2
Relinquished by:	Date: 1/12/04	Time: 1:55	Received by:	Container Count: 21
Relinquished by:	Date: 1/12/04	Time: 1:55	Received by Laboratory:	Shipping/Airbill Number:

Method of Shipment: ☒ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ _____

Custody Seal Number:

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 084473

Project Name: Santos/Village St
Project Number: A5550
Sampler Name: T. Nevins
Project Manager: M. Meloschino
Firm: RCA
Address: 474 Broadway
City / State / Zip: Pawtucket RI 02860
Telephone: 401-728-5860

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☒ PRIORITY (5 Business Days)
- ☐ RUSH (RAN- _____)
  (Rush requires Rush Authorization Number)
- ☐ Please Email to: _____
- ☐ Please FAX to: _____

BILLING

- ☒ Purchase Order No.: 9070
- ☐ Third Party Billing: _____
- ☐ GWA Quote: _____

ANALYSIS REQUEST

OPTIONS: ☐ TIC Search

SDWA: ☐ 524.2-MTBE; ☐ 502.2: ☐ Acid Only ☐ SVOA Only ☐ TIC Search; ☐ 505 ☐ 508; ☐ 531.1; ☐ 515.1; ☐ 504.1 EDB/DBCP; ☐ Lead and Copper

NPDES: ☐ 624; ☐ 502-MTBE; ☐ 601; ☐ 601/602-MTBE; ☐ 625; ☐ 625 PAHs only; ☐ 608 Pesticides; ☐ 608 PCBs; ☐ 615; ☐ 13 Priority Pollutant

RCRA/CTE: ☐ 8260B TCL-MTBE; ☐ 8260B MA PETROLEUM; ☐ 8260B; ☐ 8021B Aromatics; ☐ 8021B Halocarbons; ☐ 8021B; ☐ 8270C; ☐ 8270C PAHs only; ☐ 8081A Pesticides; ☐ 8082 PCBs; ☐ 8151A Herbicides; ☐ 8011 EDB/DBCP; ☐ 3 RCRA; ☐ 5 RCRA; ☐ MA List Metals; ☐ 23 TAL; ☐ Specify:

Metals: Specify For Water Samples; ☐ Total; ☐ Dissolved

Petroleum Hydrocarbon Ext. TPH: ☐ TPH-IR; ☐ Diesel Range Organics (DRO); ☐ ME GRO; ☐ CT ETPH; ☐ MA DEP EPH w/all targets; ☐ EPH Carbon Ranges only; ☐ EPH w/4 PAHs; ☐ Hydrocarbon Fingerprint (GC/FID by ASTM D3328-90-Mod.); ☐ TPH by (GC/FID 8015B Mod) Quantitative Only; ☐ Gasoline Range Organics (GRO); ☐ ME GRO; ☐ MA DEP VPH w/all targets; ☐ VPH Carbon ranges only

Vol. TPH

Haz. Waste: ☐ TCLP; ☐ SPLP C & Metals; ☐ Pb only; ☐ VOA; ☐ Semi VOA; ☐ Pesticides; ☐ Herbicides; ☐ Corrosivity (as pH); ☐ Reactivity; ☐ Ignitability (as Flashpoint); ☐ Paint Filter; ☐ MA Basic Disposal Criteria: 8260B, TPH by GC, PCBs, 5 Metals, Corrosivity, Ignitability, Reactivity

General Chemistry: ☐ Nitrate; ☐ Nitrite; ☐ Chloride; ☐ Fluoride; ☐ Sulfate; ☐ Dissolved Phosphorus; ☐ Ammonia; ☐ TKN; ☐ Total Phosphorus; ☐ Total N (as NH3/NO3/TKN); ☐ Oil & Grease; ☐ COD; ☐ TOC; ☐ BOD; ☐ TDS; ☐ TSS; ☐ TS; ☐ Alkalinity; ☐ Cyanide, Total; ☐ Cyanide, Physiologically Available; ☐ pH; ☐ Dissolved Oxygen; ☐ Turbidity

Other: ☐ Total Coliform; ☐ Fecal Coliform; ☐ HPC

Sampling Date	Time	SAMPLE IDENTIFICATION	Matrix: GROUNDWATER	DRINKING WATER	WASTEWATER	SOIL	OTHER SOLID	OIL/ORGANIC LIQUID	Type: COMPOSITE	GRAB	Container(s) NUMBER	40mL VOA Vial	60mL/2 oz Glass	120mL/4 oz Amber Glass	250mL/8 oz Glass	500mL/16 oz Glass	1L/32 oz Amber Glass	250mL/8 oz Plastic	500mL/16 oz Plastic	1L/32 oz Plastic	120mL Sterile	Preservation: HCl	HNO3	H2SO4	NaOH	Methanol	Sodium Bisulfate	ICE	Filtered: YES	NO	LABORATORY NUMBER (Lab Use Only)	Volatiles	Semivolatiles	Pest/Herb/PCBs Extractable	Pest/Herb/PCBs Vol.	Metals	Petroleum Hydrocarbon Ext. TPH	Petroleum Hydrocarbon Vol. TPH	Haz. Waste	General Chemistry	Other
[illegible]		SB-11 6-7'				X				X	1					X												X			#15 #20										
4	10:15	SB-9 1-2'				X				X	1			X														X			4										
4	[illegible]	SB-6 1-2'				X				X	1					X												X			#16										X
4	1020	SB-6 7-8'				X				X	1					X												X			#17										X
4		SB-13 1-2'				X				X	1			X														X			5										X
4		SB-13				X				X	1					X												X			#18										X
		SB-13 6-7'				X				X	1					X												X			#19										X

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

- ☒ YES ☐ NO MCP Data Certification is required.
- ☒ YES ☐ NO MCP minimum Field QC requirements have been met for this project. *(Metals, hexavalent chromium and cyanide analyses require one matrix spike per 20 samples)*
- ☐ YES ☒ NO MCP Drinking Water samples required. *(Require collection of contingent duplicate samples. Trip blank/are also required, if VOA samples collected)*

Signature: _____

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☒ MCP GW-1/S-1	☐ PWS Form
☒ ME	☐ MCP GW-2/S-2	☐ MWRA
☐ MA	☐ NY STARS	☐ _____
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ _____	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required
- ☐ Sample Duplicate
- ☒ Matrix Spike
- ☐ Matrix Spike Duplicate

Selection of QC Sample
- ☒ Please use sample: SB-11 6-7'

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by Sampler:	Date / Time	Received by:	Receipt Temperature:
[signature]	1/12/04		☐ Ice ☒ Refrigerated 2-5°C Recommended
Relinquished by:	**Date / Time**	**Received by:**	**Container Count:**
[signature]	1/12/04 1533	[signature]	21
Relinquished by:	**Date / Time**	**Received by Laboratory:**	**Shipping/Airbill Number:**
[signature]	1/12/04 1715	[signature]	

Method of Shipment: ☐ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ _____

Custody Seal Number:

GROUNDWATER ANALYTICAL

Quality Assurance/Quality Control

A. Program Overview

Groundwater Analytical conducts an active Quality Assurance program to ensure the production of high quality, valid data. This program closely follows the guidance provided by *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,* US EPA QAMS-005/80 (1980), and *Test Methods for Evaluating Solid Waste,* US EPA, SW-846, Update III (1996).

Quality Control protocols include written Standard Operating Procedures (SOPs) developed for each analytical method. SOPs are derived from US EPA methodologies and other established references. Standards are prepared from commercially obtained reference materials of certified purity, and documented for traceability.

Quality Assessment protocols for most organic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. All samples, standards, blanks, laboratory control samples, matrix spikes and sample duplicates are spiked with internal standards and surrogate compounds. All instrument sequences begin with an initial calibration verification standard and a blank; and excepting GC/MS sequences, all sequences close with a continuing calibration standard. GC/MS systems are tuned to appropriate ion abundance criteria daily, or for each 12 hour operating period, whichever is more frequent.

Quality Assessment protocols for most inorganic analyses include a minimum of one laboratory control sample, one method blank, one matrix spike sample, and one sample duplicate for each sample preparation batch. Standard curves are derived from one reagent blank and four concentration levels. Curve validity is verified by standard recoveries within plus or minus ten percent of the curve.

B. Definitions

Batches are used as the basic unit for Quality Assessment. A Batch is defined as twenty or fewer samples of the same matrix which are prepared together for the same analysis, using the same lots of reagents and the same techniques or manipulations, all within the same continuum of time, up to but not exceeding 24 hours.

Laboratory Control Samples are used to assess the accuracy of the analytical method. A Laboratory Control Sample consists of reagent water or sodium sulfate spiked with a group of target analytes representative of the method analytes. Accuracy is defined as the degree of agreement of the measured value with the true or expected value. Perent Recoveries for the Laboratory Control Samples are calculated to assess accuracy.

Method Blanks are used to assess the level of contamination present in the analytical system. Method Blanks consist of reagent water or an aliquot of sodium sulfate. Method Blanks are taken through all the appropriate steps of an analytical method. Sample data reported is not corrected for blank contamination.

Surrogate Compounds are used to assess the effectiveness of an analytical method in dealing with each sample matrix. Surrogate Compounds are organic compounds which are similar to the target analytes of interest in chemical behavior, but which are not normally found in environmental samples. Percent Recoveries are calculated for each Surrogate Compound.

Groundwater Analytical, Inc., P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category:	**MA DEP EPH Method**	Instrument ID:	**GC-7 HP 5890**
QC Batch ID:	**EP-1800-M**	Extracted:	**01-12-04 08:00**
Matrix:	**Soil**	Analyzed (AL):	**01-12-04 17:44**
Units:	**mg/Kg**	Analyzed (AR):	**01-12-04 18:27**
		Analyst:	**AG**

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits
111-84-2	*n*-Nonane (C_9)	3.3	2.4	**73 %**	40 - 140 %
629-59-4	*n*-Tetradecane (C_{14})	3.3	2.6	**78 %**	40 - 140 %
629-92-5	*n*-Nonadecane (C_{19})	3.3	2.7	**82 %**	40 - 140 %
112-95-8	*n*-Eicosane (C_{20})	3.3	2.8	**85 %**	40 - 140 %
630-02-4	*n*-Octacosane (C_{28})	3.3	3.2	**96 %**	40 - 140 %
91-20-3	Naphthalene	3.3	2.5	**74 %**	40 - 140 %
83-32-9	Acenaphthene	3.3	2.7	**82 %**	40 - 140 %
120-12-7	Anthracene	3.3	3.2	**97 %**	40 - 140 %
129-00-0	Pyrene	3.3	3.1	**93 %**	40 - 140 %
218-01-9	Chrysene	3.3	3.2	**95 %**	40 - 140 %

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	2.7	2.6	**97 %**	40 - 140 %
	2-Bromonaphthalene	2.7	2.5	**95 %**	40 - 140 %
Extraction:	Chloro-octadecane	2.7	2.3	**85 %**	40 - 140 %
	ortho-Terphenyl	2.7	2.5	**93 %**	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998). Sample extraction performed by microwave accelerated solvent extraction technique.

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category:	MA DEP EPH	Instrument ID:	GC-7 HP 5890
QC Batch ID:	EP-1800-M	Extracted:	01-12-04 08:00
Matrix:	Soil	Analyzed (AL):	01-12-04 16:21
		Analyzed (AR):	01-12-04 17:00
		Analyst:	AG

EPH Ranges	Concentration	Notes	Units	Reporting Limit
n-C9 to n-C18 Aliphatic Hydrocarbons †	BRL		mg/Kg	30
n-C19 to n-C36 Aliphatic Hydrocarbons †	BRL		mg/Kg	30
n-C11 to n-C22 Aromatic Hydrocarbons †◊	BRL		mg/Kg	30
Unadjusted n-C11 to n-C22 Aromatic Hydrocarbons †	BRL		mg/Kg	30

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit
91-20-3	Naphthalene	BRL		mg/Kg	0.50
91-57-6	2-Methylnaphthalene	BRL		mg/Kg	0.50
85-01-8	Phenanthrene	BRL		mg/Kg	0.50
83-32-9	Acenaphthene	BRL		mg/Kg	0.50
208-96-8	Acenaphthylene	BRL		mg/Kg	0.50
86-73-7	Fluorene	BRL		mg/Kg	0.50
120-12-7	Anthracene	BRL		mg/Kg	0.50
206-44-0	Fluoranthene	BRL		mg/Kg	0.50
129-00-0	Pyrene	BRL		mg/Kg	0.50
56-55-3	Benzo[a]anthracene	BRL		mg/Kg	0.50
218-01-9	Chrysene	BRL		mg/Kg	0.50
205-99-2	Benzo[b]fluoranthene	BRL		mg/Kg	0.50
207-08-9	Benzo[k]fluoranthene	BRL		mg/Kg	0.50
50-32-8	Benzo[a]pyrene	BRL		mg/Kg	0.50
193-39-5	Indeno[1,2,3-c,d]pyrene	BRL		mg/Kg	0.50
53-70-3	Dibenzo[a,h]anthracene	BRL		mg/Kg	0.50
191-24-2	Benzo[g,h,i]perylene	BRL		mg/Kg	0.50

QC Surrogate Compound		Spiked	Measured	Recovery	QC Limits
Fractionation:	2-Fluorobiphenyl	2.7	2.8	**103 %**	40 - 140 %
	2-Bromonaphthalene	2.7	2.7	**101 %**	40 - 140 %
Extraction:	Chloro-octadecane	2.7	2.0	**76 %**	40 - 140 %
	ortho-Terphenyl	2.7	2.6	**98 %**	40 - 140 %

Method Reference: Method for the Determination of Extractable Petroleum Hydrocarbons, MA DEP (1998).
Sample extraction performed by microwave accelerated solvent extraction technique.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

† Hydrocarbon range data excludes concentrations of any surrogate(s) and/or internal standards eluting in that range.

◊ n-C11 to n-C22 Aromatic Hydrocarbons range data excludes the method target analyte concentrations.

GROUNDWATER ANALYTICAL

Quality Control Report
Laboratory Control Sample

Category: **Metals**
Matrix: **Soil**
Units: **mg/Kg**

Analysis Method	QC Batch ID	Prep Method	Prepared	Instrument ID	Analyst
EPA 6010B	MB-0312-SL	EPA 3050B	01-13-04 10:45	ICP-1 PE 3000	CRL

CAS Number	Analyte	Spiked	Measured	Recovery	QC Limits	Analyzed	Method
7440-38-2	Arsenic	110	110	**96 %**	80-120 %	01-14-04 11:32	EPA 6010B
7439-92-1	Lead	100	94	**92 %**	81-120 %	01-14-04 11:32	EPA 6010B
7440-66-6	Zinc	190	170	**90 %**	79-121 %	01-14-04 11:31	EPA 6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations: All calculations performed prior to rounding. Quality Control Limits are defined by the methodology, or alternatively based upon the historical average recovery plus or minus three standard deviation units.

Groundwater Analytical, Inc. P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Quality Control Report
Method Blank

Category: **Metals**
Matrix: **Soil**

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Volume	Instrument ID	Analyst
EPA 6010B	MB-0312-SB	EPA 3050B	01-13-04 10:45	0.5 g	ICP-1 PE 3000	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic	BRL		mg/Kg	5.0	1	01-14-04 11:27	EPA 6010B
7439-92-1	Lead	BRL		mg/Kg	10	1	01-14-04 11:27	EPA 6010B
7440-66-6	Zinc	BRL		mg/Kg	50	1	01-14-04 11:27	EPA 6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:
BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

Groundwater Analytical, Inc. P.O. Box 1300, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Certifications and Approvals

Groundwater Analytical maintains environmental laboratory certification in a variety of states. Copies of our current certificates may be obtained from our website:

http://www.groundwateranalytical.com/qualifications.htm

CONNECTICUT, Department of Health Services, PH-0586

Categories: Potable Water, Wastewater, Solid Waste and Soil
http://www.dph.state.ct.us/BRS/Environmental_Lab/OutStateLabList.htm

FLORIDA, Department of Health, Bureau of Laboratories, E87643

Categories: SDWA, CWA, RCRA/CERCLA
http://www.floridadep.org/labs/qa/dohforms.htm

MAINE, Department of Human Services, MA103

Categories: Drinking Water and Wastewater
http://www.state.me.us/dhs/eng/water/Compliance.htm

MASSACHUSETTS, Department of Environmental Protection, M-MA-103

Categories: Potable Water and Non-Potable Water
http://www.state.ma.us/dep/bspt/wes/files/certlabs.pdf

NEW HAMPSHIRE, Department of Environmental Services, 202703

Categories: Drinking Water and Wastewater
http://www.des.state.nh.us/asp/NHELAP/labsview.asp

NEW YORK, Department of Health, 11754

Categories: Potable Water, Non-Potable Water and Solid Waste
http://www.wadsworth.org/labcert/elap/comm.html

PENNSYLVANIA, Department of Environmental Protection, 68-665

Environmental Laboratory Registration (Non-drinking water and Non-wastewater)
http://www.dep.state.pa.us/Labs/Registered/

RHODE ISLAND, Department of Health, 54

Categories: Surface Water, Air, Wastewater, Potable Water, Sewage
http://www.healthri.org/labs/labsCT_MA.htm

U.S. Department of Agriculture, Soil Permit, S-53921

Foreign soil import permit

VERMONT, Department of Environmental Conservation, Water Supply Division

Category: Drinking Water
http://www.vermontdrinkingwater.org/wsops/labtable.PDF

Groundwater Analytical, Inc., P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

January 22, 2004

Ms. Maria Meleschnig
Resource Control Associates
474 Broadway
Pawtucket, RI 02860

LABORATORY REPORT

Project: **Santos/Village St/A6550**
Lab ID: **68885**
Received: **01-20-04**

Dear Maria:

Enclosed are the analytical results for the above referenced project. The project was processed for Rush 24 Hour turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Eric H. Jensen
Operations Manager

EHJ/smd
Enclosures

GROUNDWATER ANALYTICAL

Sample Receipt Report

Project:	**Santos/Village St/A6550**	Delivery:	**GWA Courier**	Temperature:	**2°C**
Client:	**Resource Control Associates**	Airbill:	**n/a**	Chain of Custody:	**Present**
Lab ID:	**68885**	Lab Receipt:	**01-20-04**	Custody Seal(s):	**n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68885-1	SB-14 1-2'		Soil	1/9/04 0:00	EPA 6010B Pb Total				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C322763	250 mL Glass	Proline	BX10282	None	n/a	n/a	11-13-03		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68885-2	SB-15 1-2'		Soil	1/9/04 0:00	EPA 6010B Pb Total				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C322756	250 mL Glass	Proline	BX10282	None	n/a	n/a	11-13-03		

Groundwater Analytical, Inc., P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-14 1-2'**	Matrix:	**Soil**
Project:	**Santos/Village St/A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68885-01**	Percent Solids:	**87**
Sampled:	**01-09-04 00:00**		
Received:	**01-20-04 17:00**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2013-S	EPA 3051	01-21-04 09:05	0.5 g	ICP-2 PE 3300	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**660**		mg/Kg	11	1	01-21-04 18:02	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-15 1-2'**	Matrix:	**Soil**
Project:	**Santos/Village St/A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**68885-02**	Percent Solids:	**80**
Sampled:	**01-09-04 00:00**		
Received:	**01-20-04 17:00**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2013-S	EPA 3051	01-21-04 09:05	0.5 g	ICP-2 PE 3300	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**1,100**		mg/Kg	13	1	01-21-04 18:14	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996). Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	**Santos/Village St/A6550**	Lab ID:	**68885**
Client:	**Resource Control Associates**	Received:	**01-20-04 17:00**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. No method modifications, non-conformances or analytical issues were noted.

Groundwater Analytical, Inc., P.O. Box 1200, 228 Main Street, Buzzards Bay, MA 02532

GROUNDWATER ANALYTICAL

228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 080647

Project Name: Santos/Village St	Firm: RCA
Project Number: A6550	Address: 474 Broadway
Sampler Name: T. Nevins	City / State / Zip: Pawtucket RI 02860
Project Manager: M. Meleschnik	Telephone: 401-728-6860

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☐ PRIORITY (5 Business Days)
- ☒ RUSH (RAN- 064)
  (Rush requires Rush Authorization Number)
- ☐ Please Email to: _____
- ☐ Please FAX to: _____

BILLING

- ☒ Purchase Order No.: 9093
- ☐ Third Party Billing: _____
- ☐ GWA Quote: _____

ANALYSIS REQUEST

Sampling DATE	Sampling TIME	SAMPLE IDENTIFICATION	Matrix: GROUNDWATER	DRINKING WATER	WASTEWATER	SOIL	OTHER SOLID	OIL/ORGANIC LIQUID	Type: COMPOSITE	GRAB	Container(s) NUMBER	40mL VOA Vial	60mL/4 oz Glass	120mL/4 oz Amber Glass	250mL/8 oz Glass	500mL/16 oz Glass	1L/32 oz Amber Glass	250mL/8 oz Plastic	500mL/16 oz Plastic	1L/32 oz Plastic	120mL Sterile	Preservation: HCl	HNO3	H2SO4	NaOH	Methanol	Sodium Bisulfate	ICE	Filtered: YES	NO	LABORATORY NUMBER (Lab Use Only)
1/9/04		SB-14 12'				X				X	1				X													X			
1/9/04		SB-15 12'				X				X	1				X													X			

OPTIONS: ☐ TIC Search

SOWA: ☐ 524.2-MTBE

NPDES: ☐ 624 ☐ 602-MTBE ☐ 601 ☐ 8021B/602-MTBE ☐ 625 ☐ 625 PAHs only ☐ 608 Pesticides ☐ 608 PCBs ☐ 613 ☐ 13 Priority Pollutant

RCRA/21E: ☐ 8260B TCL-MTBE ☐ 8260B NH PETROLEUM ☐ 8260B ☐ 8021B Aromatics ☐ 8021B Halocarbons ☐ 8021B ☐ 8270C ☐ 8270C PAHs only ☐ 8081A Pesticides ☐ 8082 PCBs ☐ 8151A Herbicides ☐ 8011 EDB/DBCP ☐ 6 RCRA ☐ 5 RCRA ☐ MA List Metals ☐ 13 TPL

Volatiles / Semivolatiles / Pest/Herb/PCBs (Extractable, Vol.) / Metals (Specify For Water Samples ☐ Total ☐ Dissolved) / Petroleum Hydrocarbon (Ext. TPH, Vol. TPH) / Haz. Waste / General Chemistry / Other

Specify: Total Pb

☐ TPH-IR ☐ Diesel Range Organics (DRO) ☐ ME DRO ☐ CT ETPH ☐ MA DEP EPH w/all ranges ☐ EPH Carbon Ranges only ☐ EPH w/ PAHs ☐ Hydrocarbon Fingerprint (GC/FID by ASTM D3328-90 Mod.) ☐ TPH by GC/FID (8015B Mod) Quantitative Only ☐ Gasoline Range Organics (GRO) ☐ ME GRO ☐ MA DEP VPH w/all ranges ☐ VPH Carbon ranges only ☐ TCLP ☐ SPLP ☐ 8 Metals ☐ PH only ☐ VOA ☐ Semi VOA ☐ Pesticides ☐ Herbicides ☐ Corrosivity (as pH) ☐ Reactivity ☐ Ignitability (as Flashpoint) ☐ Paint Filter ☐ MA Solid Disposal Criteria: 8260B, TPH by GC, PCBs, 5 Metals, Corrosivity, Ignitability, Reactivity ☐ Nitrate ☐ Nitrite ☐ Cyanide ☐ Fluoride ☐ Sulfide ☐ Dissolved Phosphorus ☐ Ammonia ☐ TKN ☐ Total Phosphorus ☐ Total N (as N02/N03/TKN) ☐ Oil & Grease ☐ COD ☐ TOC ☐ BOD ☐ TSS ☐ TDS ☐ TS ☐ Alkalinity ☐ Cyanide, Total ☐ Cyanide, Physiologically Available ☐ pH ☐ Dissolved Oxygen ☐ Turbidity ☐ Total Coliform ☐ Fecal Coliform ☐ HPC

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

- ☐YES ☒NO MCP Data Certification is required.
- ☐YES ☒NO MCP minimum Field QC requirements have been met for this project.
  (Metals, hexavalent chromium and cyanide analyses require one matrix spike per 20 samples)
- ☐YES ☒NO MCP Drinking Water samples required.
  (Require collection of contingent duplicate samples. Trip blanks are also required if VOA samples collected)

Signature: _____

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☒ MCP GW-1/S-1	☐ PWS Form
☐ ME	☐ MCP GW-2/S-2	☐ MWRA
☒ MA	☐ NY STARS	☐ _____
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ _____	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required
- ☐ Sample Duplicate
- ☐ Matrix Spike
- ☐ Matrix Spike Duplicate

Selection of QC Sample
- ☐ Please use sample: _____

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by Sampler:	Date / Time: 1/20/04 1530	Received by:	Receipt Temperature: ☐ Ice ☐ Refrigerated 2-8°C Recommended ~2 C
Relinquished by:	Date / Time: 1/20/04 1700	Received by:	Container Count: 2
Relinquished by:	Date / Time:	Received by Laboratory:	Shipping/Airbill Number:
Method of Shipment: ☒ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ _____			Custody Seal Number:

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

January 16, 2004

Ms. Maria Meleschnig
Resource Control Associates
474 Broadway
Pawtucket, RI 02860

LABORATORY REPORT

Project: **Santos/A6550**
Lab ID: **68662**
Received: **01-09-04**

Dear Maria:

Enclosed are the analytical results for the above referenced project. The project was processed for Priority turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Eric H. Jensen
Operations Manager

EHJ/kal
Enclosures

GROUNDWATER ANALYTICAL

Sample Receipt Report

Project:	**Santos/A6550**	Delivery:	**GWA Courier**	Temperature:	**2'C**
Client:	**Resource Control Associates**	Airbill:	**n/a**	Chain of Custody:	**Present**
Lab ID:	**68662**	Lab Receipt:	**01-09-04**	Custody Seal(s):	**n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68662-1	MW-2		Aqueous	1/9/04 0:00	EPA 6010B As Ba Cd Cr Pb Se Ag Zn Dissolved EPA 7470A Hg Dissolved				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C376450	250 mL Plastic	n/a	n/a	HNO3	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
68662-2	MW-2 MS		Aqueous	1/9/04 0:00	EPA 6010B As Ba Cd Cr Pb Se Ag Zn Dissolved EPA 7470A Hg Dissolved				
Con ID	**Container**	**Vendor**	**QC Lot**	**Preserv**	**QC Lot**	**Prep**	**Ship**		
C376449	250 mL Plastic	n/a	n/a	HNO3	n/a	n/a	n/a		

GROUNDWATER ANALYTICAL

Data Certification

Project:	Santos/A6550	Lab ID:	68662
Client:	Resource Control Associates	Received:	01-09-04 12:50

MA DEP Compendium of Analytical Methods

Project Location:	n/a	MA DEP RTN:	n/a

This Form provides certifications for the following data set:

EPA 6010B: 68662-01,-02
EPA 7470A/1A: 68662-01,-02

Sample Matrices:	Groundwater (X)	Soil/Sediment ( )	Drinking Water ( )	Other ( )	
MCP SW-846 Methods Used	8260B ( )	8151A ( )	8330 ( )	6010B (X)	7470A/1A (X)
	8270C ( )	8081A ( )	VPH ( )	6020 ( )	9012A[2] ( )
As specified in MA DEP Compendium of Analytical Methods (check all that apply)	8082 ( )	8021B ( )	EPH ( )	7000 S[3] ( )	Other ( )

1. List Release Tracking Number (RTN), if known.
2. SW-846 Method 9012A (Equivalent to 9014) or MA DEP Physiologically Available Cyanide (PAC) Method
3. S - SW-846 Methods 7000 Series. List individual method and analyte.

An affirmative response to questions A, B, C and D is required for "Presumptive Certainty" status.

A.	Were all samples received by the laboratory in a condition consistent with that described on the Chain-of-Custody documentation for the data set?	Yes
B.	Were all QA/QC procedures required for the specified analytical method(s) included in this report followed, including the requirement to note and discuss in a narrative QC data that did not meet appropriate performance standards or guidelines?	Yes
C.	Does the analytical data included in this report meet all the requirements for "Presumptive Certainty," as described in Section 2.0 of the MA DEP document CAM VII A, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data*?	Yes
D.	VPH and EPH methods only: Was the VPH or EPH method run without significant modifications, as specified in Section 11.3?	n/a

A response to questions E and F below is required for "Presumptive Certainty" status.

E.	Were all QC performance standards and recommendations for the specified methods achieved?	Yes
F.	Were results for all analyte-list compounds/elements for the specified method(s) reported?	No

All No answers are addressed in the attached Project Narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature:		Position:	Operations Manager
Printed Name:	Eric H. Jensen	Date:	01-16-04

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**MW-2**	Matrix:	**Aqueous**
Project:	**Santos/A6550**	Container:	**250 mL Plastic**
Client:	**Resource Control Associates**	Preservation:	**HNO3 / Cool**
Laboratory ID:	**68662-01**	Preserved:	**01-09-04 12:50**
Sampled:	**01-09-04 00:00**	Filtered:	**01-09-04 12:50**
Received:	**01-09-04 12:50**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Volume	Instrument ID	Analyst
EPA 6010B[1]	MB-0955-W	EPA 3010A	01-12-04 08:55	50 mL	ICP-2 PE 3300	MWR
EPA 7470A[2]	MP-1434-W	EPA 7470A	01-13-04 09:00	25 mL	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7440-38-2	Arsenic, Dissolved	BRL		mg/L	0.01	1	01-13-04 10:48	EPA 6010B[1]
7440-39-3	Barium, Dissolved	BRL		mg/L	0.2	1	01-13-04 10:48	EPA 6010B[1]
7440-43-9	Cadmium, Dissolved	BRL		mg/L	0.005	1	01-13-04 10:48	EPA 6010B[1]
7440-47-3	Chromium, Dissolved	BRL		mg/L	0.01	1	01-13-04 10:48	EPA 6010B[1]
7439-92-1	Lead, Dissolved	BRL		mg/L	0.005	1	01-13-04 10:48	EPA 6010B[1]
7439-97-6	Mercury, Dissolved	BRL		mg/L	0.0002	1	01-13-04 13:58	EPA 7470A[2]
7782-49-2	Selenium, Dissolved	BRL		mg/L	0.05	1	01-13-04 10:48	EPA 6010B[1]
7440-22-4	Silver, Dissolved	BRL		mg/L	0.007	1	01-13-04 10:47	EPA 6010B[1]
7440-66-6	Zinc, Dissolved	BRL		mg/L	0.2	1	01-13-04 10:48	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Matrix Spike
Trace Metals

			Parent Sample	Matrix Spike
Field ID:	MW-2			
Project:	Santos/A6550	Laboratory ID:	68662-01	68662-02
Client:	Resource Control Associates	Sampled:	1-09-04	1-09-04
Matrix:	Aqueous	Received:	1-09-04 12:50	1-09-04 12:50
Container:	250 mL Plastic			
Preservation:	HNO3 / Cool			

Sample Type	Method	QC Batch ID	Prep Method	Prepared	Volume	DF	Analyzed	Instrument ID	Analyst
Matrix Spike	EPA 6010B	MB-0955-W	EPA 3010A	01-12-04 08:55	50 mL	1	01-13-04 10:52	ICP-2 PE 3300	MWR
Matrix Spike	EPA 7470A	MP-1434-W	EPA 7470A	01 13-04 09:00	25 mL	1	01-13-04 14:01	CVAA-1 PE FIMS	CRL

CAS Number	Analyte	Unspiked Sample (mg/L)	MS Spiked (mg/L)	MS Measured (mg/L)	MS Recovery	QC Limits Spike	Method
7440-38-2	Arsenic	BRL	1.0	0.98	98 %	75-125%	EPA 6010B
7440-39-3	Barium	BRL	1.0	0.91	91 %	75-125%	EPA 6010B
7440-43-9	Cadmium	BRL	1.0	0.93	93 %	75-125%	EPA 6010B
7440-47-3	Chromium	BRL	1.0	0.92	92 %	75-125%	EPA 6010B
7439-92-1	Lead	BRL	1.0	0.92	92 %	75-125%	EPA 6010B
7439-97-6	Mercury	BRL	0.0010	0.00098	98 %	75-125%	EPA 7470A
7782-49-2	Selenium	BRL	1.0	0.94	94 %	75-125%	EPA 6010B
7440-22-4	Silver	BRL	1.0	0.91	91 %	75-125%	EPA 6010B
7440-66-6	Zinc	BRL	1.0	0.90	90 %	75-125%	EPA 6010B

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	Santos/A6550	Lab ID:	68662
Client:	Resource Control Associates	Received:	01-09-04 12:50

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. EPA 6010B Note: Samples 68662-01,-02. Samples were analyzed for selected target analytes, as requested by client.
2. Samples 68662-01 and -02 for Dissolved Metal Analysis were not received filtered. The samples were filtered and preserved with HNO3 by the laboratory upon receipt.

GROUNDWATER ANALYTICAL

226 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 084472

Project Name:	Firm:
Project Number:	Address:
Sampler Name:	City / State / Zip:
Project Manager:	Telephone:

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☒ PRIORITY (5 Business Days)
- ☐ RUSH (RAN- _____)
  (Rush requires Rush Authorization Number)
- ☐ Please Email to: _____
- ☒ Please FAX to: _____

BILLING

- ☒ Purchase Order No.: 90770
- ☐ Third Party Billing: _____
- ☐ GWA Quote: _____

ANALYSIS REQUEST

OPTIONS: ☐ TIC Search

Volatiles: ☐ 524.2-MTBE

Semivolatiles: ☐ Acid Only ☐ BN Only ☐ TIC Search; ☐ 525.2

Pest/Herb/PCBs Extractable Vol.: ☐ 505 ☐ 508; ☐ 531.1; ☐ 515.1; ☐ 504.1 EDB/DBCP

Metals: Specify For Water Samples ☐ Total ☐ Dissolved; ☐ Lead and Copper

SDWA: ☐ 524.2-MTBE; ☐ 525.2; ☐ 505 ☐ 508; ☐ 531.1; ☐ 515.1; ☐ 504.1 EDB/DBCP; ☐ Lead and Copper

NPDES: ☐ 624; ☐ 601 - MTBE; ☐ 601; ☐ 601/602-MTBE; ☐ 625; ☐ 625 PAHs only; ☐ 608 Pesticides; ☐ 608 PCBs; ☐ 615; ☐ 13 Priority Pollutant

RCRA/21E: ☐ 8260B TCL-MTBE; ☐ 8260B MI PETROLEUM; ☐ 8260B; ☐ 8021B Aromatics; ☐ 8021B Halocarbons; ☐ 8021B; ☐ 8270C; ☐ 8270C PAHs only; ☐ 8081A Pesticides; ☐ 8082 PCBs; ☐ 8151A Herbicides; ☐ 8011 EDB/DBCP; ☐ 8 RCRA; ☐ 5 RCRA; ☐ MA List Metals; ☐ 23 TAL; ☒ Specify: [illegible]

Petroleum Hydrocarbon Ext. TPH / Vol. TPH: ☐ TPH-IR; ☐ Diesel Range Organics (DRO); ☐ MF (TPH); ☐ GRO (TPH); ☐ EPH Carbon Ranges only; ☐ EPH w/4 PAHs; ☐ Hydrocarbon Fingerprint (GC/FID) by ASTM D3328-78-Mod.); ☐ TPH by GC/FID (8015B Mod) Quantitative Only; ☐ Gasoline Range Organics (GRO); ☐ MF 540; ☐ MA EEP VPH w/all targets; ☐ VPH Carbon ranges only

Haz. Waste: ☐ TCLP ☐ SPLP ☐ 8 Metals ☐ Pb only ☐ VOA ☐ Semi VOA ☐ Pesticides ☐ Herbicides; ☐ Corrosivity (as pH) ☐ Reactivity ☐ Ignitability (as Flashpoint) ☐ Paint Filter; ☐ MA Toxic Diagnost Criteria: 8260B, TPH by GC, PCBs, 3 Metals, Corrosivity, Ignitability, Reactivity

General Chemistry: ☐ Alkalinity ☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Fluoride ☐ Sulfate; ☐ Dissolved Phosphorus; ☐ Ammonia ☐ TKN ☐ Total Phosphorus ☐ Total N (as NO2/NO3/TKN); ☐ Oil & Grease; ☐ COD ☐ TOC; ☐ BOD ☐ TDS ☐ TSS ☐ TS ☐ Alkalinity; ☐ Cyanide, Total ☐ Cyanide, Physiologically Available; ☐ pH ☐ Dissolved Oxygen ☐ Turbidity

Other: ☐ Total Coliform ☐ Fecal Coliform ☐ HPC

Sampling DATE	Sampling TIME	SAMPLE IDENTIFICATION	Matrix: GROUNDWATER	DRINKING WATER	WASTEWATER	SOIL	OTHER SOLID	DILUTE ORGANIC LIQUID	Type: COMPOSITE	GRAB	Container(s) NUMBER	40mL VOA Vial	60mL/2 oz Glass	120mL/4 oz Amber Glass	250mL/8 oz Glass	500mL/16 oz Glass	1L/32 oz Amber Glass	250mL/8 oz Plastic	500mL/16 oz Plastic	1L/32 oz Plastic	120mL Sterile	Preservation: HCl	HNO3	H2SO4	NaOH	Methanol	Sodium Bisulfate	ICE	Filtered: YES	NO	LABORATORY NUMBER (Lab Use Only)
1/3/04		MW-2	X							X	2							X	X									X		X	
1/3/04		MW-2	X							X	2							X	X									X		X	

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

- ☐ YES ☐ NO MCP Data Certification is required.
- ☐ YES ☐ NO MCP minimum Field QC requirements have been met for this project. *(Metals, hexavalent chromium and cyanide analyses require one matrix spike per 20 samples)*
- ☐ YES ☒ NO MCP Drinking Water samples required. *(Require collection of contingent duplicate samples. Trip blanks are also required, if VOA samples collected)*

Signature: _____

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☒ MCP GW-1/S-1	☐ PWS Form
☐ ME	☐ MCP GW-2/S-2	☐ MWRA
☒ MA	☐ NY STARS	☐ _____
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ _____	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required	Selection of QC Sample
☐ Sample Duplicate	☒ Please use sample:
☒ Matrix Spike	[illegible]
☐ Matrix Spike Duplicate	

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by Sampler:	Date	Time	Received by:	Receipt Temperature:
[illegible]	1/3/04	1145	[illegible]	☒ Ice ☐ Refrigerated 2-6°C Recommended 2
Relinquished by:	**Date**	**Time**	**Received by:**	**Container Count:**
[illegible]	1/3/04	1700	[illegible]	4
Relinquished by:	**Date**	**Time**	**Received by Laboratory:**	**Shipping/Airbill Number:**

Method of Shipment: ☐ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ _____

Custody Seal Number:

GROUNDWATER ANALYTICAL

Groundwater Analytical, Inc.
P.O. Box 1200
228 Main Street
Buzzards Bay, MA 02532

Telephone (508) 759-4441
FAX (508) 759-4475
www.groundwateranalytical.com

March 3, 2004

Ms. Maria Meleschnig
Resource Control Associates
474 Broadway
Pawtucket, RI 02860

LABORATORY REPORT

Project: **Santos/Village St./A6550**
Lab ID: **70078**
Received: **03-02-04**

Dear Maria:

Enclosed are the analytical results for the above referenced project. The project was processed for Rush 24 Hour turnaround.

This letter authorizes the release of the analytical results, and should be considered a part of this report. This report contains a sample receipt report detailing the samples received, a project narrative indicating project changes and non-conformances, a quality control report, and a statement of our state certifications.

The analytical results contained in this report meet all applicable NELAC standards, except as may be specifically noted, or described in the project narrative. This report may only be used or reproduced in its entirety.

I attest under the pains and penalties of perjury that, based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Should you have any questions concerning this report, please do not hesitate to contact me.

Sincerely,

Jonathan R. Sanford
President

JRS/kh
Enclosures

GROUNDWATER ANALYTICAL

Sample Receipt Report

Project:	**Santos/Village St./A6550**	Delivery:	**GWA Courier**	Temperature:	**2.0'C**
Client:	**Resource Control Associates**	Airbill:	**n/a**	Chain of Custody:	**Present**
Lab ID:	**70078**	Lab Receipt:	**03-02-04**	Custody Seal(s):	**n/a**

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-1	SB-16		Soil	3/1/04 9:20	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313283	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-2	SB-17		Soil	3/1/04 10:00	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313280	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-3	SB-18		Soil	3/1/04 10:20	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313281	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-4	SB-19		Soil	3/1/04 10:30	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313282	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-5	SB-20		Soil	3/1/04 11:00	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313287	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-6	SB-21		Soil	3/1/04 11:30	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313286	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-7	SB-22		Soil	3/1/04 11:45	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313285	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

Lab ID	Field ID		Matrix	Sampled	Method				Notes
70078-8	SB-23		Soil	3/1/04 12:30	EPA 6010B Pb Total				
Con ID	Container	Vendor	QC Lot	Preserv	QC Lot	Prep	Ship		
C313284	250 mL Glass	Proline	BX10877	None	n/a	n/a	n/a		

GROUNDWATER ANALYTICAL

Data Certification

Project:	**Santos/Village St./A6550**	Lab ID:	**70078**
Client:	**Resource Control Associates**	Received:	**03-02-04 11:10**

MA DEP Compendium of Analytical Methods

Project Location: **n/a** MA DEP RTN: **n/a**

This Form provides certifications for the following data set:

EPA 6010B: 70078-01,-02,-03,-04,-05,-06,-07,-08

Sample Matrices:	Groundwater ( )	Soil/Sediment (X)	Drinking Water ( )	Other ( )	
MCP SW-846	8260B ( )	8151A ( )	8330 ( )	6010B (X)	7470A/1A ( )
Methods Used	8270C ( )	8081A ( )	VPH ( )	6020 ( )	9012A[2] ( )
As specified in MA DEP Compendium of Analytical Methods.	8082 ( )	8021B ( )	EPH ( )	7000 S[3] ( )	Other ( )

(check all that apply)

1. List Release Tracking Number (RTN), if known.
2. SW-846 Method 9012A (Equivalent to 9014) or MA DEP Physiologically Available Cyanide (PAC) Method
3. S - SW-846 Methods 7000 Series. List individual method and analyte.

An affirmative response to questions A, B, C and D is required for "Presumptive Certainty" status.

A.	Were all samples received by the laboratory in a condition consistent with that described on the Chain-of-Custody documentation for the data set?	Yes
B.	Were all QA/QC procedures required for the specified analytical method(s) included in this report followed, including the requirement to note and discuss in a narrative QC data that did not meet appropriate performance standards or guidelines?	Yes
C.	Does the analytical data included in this report meet all the requirements for "Presumptive Certainty," as described in Section 2.0 of the MA DEP document CAM VII A, *Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data*?	No
D.	VPH and EPH methods only: Was the VPH or EPH method run without significant modifications, as specified in Section 11.3?	n/a

A response to questions E and F below is required for "Presumptive Certainty" status.

E.	Were all QC performance standards and recommendations for the specified methods achieved?	Yes
F.	Were results for all analyte-list compounds/elements for the specified method(s) reported?	No

All No answers are addressed in the attached Project Narrative.

I, the undersigned, attest under the pains and penalties of perjury that, based upon my personal inquiry of those responsible for obtaining the information, the material contained in this analytical report is, to the best of my knowledge and belief, accurate and complete.

Signature: Position: President

Printed Name: Jonathan R. Sanford Date: 03-03-04

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-16**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-01**	Percent Solids:	**86**
Sampled:	**03-01-04 09:20**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**590**		mg/Kg	12	1	03-02-04 17:40	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-17**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-02**	Percent Solids:	**84**
Sampled:	**03-01-04 10:00**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**61**		mg/Kg	12	1	03-02-04 17:53	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-18**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-03**	Percent Solids:	**71**
Sampled:	**03-01-04 10:20**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**380**		mg/Kg	14	1	03-02-04 17:57	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-19**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-04**	Percent Solids:	**83**
Sampled:	**03-01-04 10:30**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**620**		mg/Kg	12	1	03-02-04 18:01	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-20**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-05**	Percent Solids:	**76**
Sampled:	**03-01-04 11:00**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**230**		mg/Kg	13	1	03-02-04 18:06	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-21**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-06**	Percent Solids:	**66**
Sampled:	**03-01-04 11:30**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**210**		mg/Kg	15	1	03-02-04 18:11	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-22**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-07**	Percent Solids:	**85**
Sampled:	**03-01-04 11:45**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**64**		mg/Kg	12	1	03-02-04 18:25	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Trace Metals

Field ID:	**SB-23**	Matrix:	**Soil**
Project:	**Santos/Village St./A6550**	Container:	**250 mL Glass**
Client:	**Resource Control Associates**	Preservation:	**Cool**
Laboratory ID:	**70078-08**	Percent Solids:	**80**
Sampled:	**03-01-04 12:30**		
Received:	**03-02-04 11:10**		

Analysis Method	QC Batch ID	Prep Method	Prepared	Sample Weight	Instrument ID	Analyst
EPA 6010B[1]	MM-2030-S	EPA 3051	03-02-04 15:00	0.5 g	ICP-2 PE 3300	MWR

CAS Number	Analyte	Concentration	Notes	Units	Reporting Limit	DF	Analyzed	Method
7439-92-1	Lead, Total	**170**		mg/Kg	12	1	03-02-04 18:29	EPA 6010B[1]

Method Reference: Test Methods for Evaluating Solid Waste, US EPA, SW-846, Third Edition, Update III (1996).
Results are reported on a dry weight basis.

Report Notations:

BRL Indicates concentration, if any, is below reporting limit for analyte. Reporting limit is the lowest concentration that can be reliably quantified under routine laboratory operating conditions. Reporting limits are adjusted for sample size and dilution.

DF Dilution Factor.

GROUNDWATER ANALYTICAL

Project Narrative

Project:	**Santos/Village St./A6550**	Lab ID:	**70078**
Client:	**Resource Control Associates**	Received:	**03-02-04 11:10**

A. Documentation and Client Communication

The following documentation discrepancies, and client changes or amendments were noted for this project:

1. No documentation discrepancies, changes, or amendments were noted.

B. Method Modifications, Non-Conformances and Observations

The sample(s) in this project were analyzed by the references analytical method(s), and no method modifications, non-conformances or analytical issues were noted, except as indicated below:

1. EPA 6010B Non-conformance: Samples 70078-01,-02,-03,-04,-05,-06,-07,-08. A matrix spike (MS) sample was not performed in accordance with the minimum field QC requirements of the MA DEP CAM.

2. EPA 6010B Note: Samples 70078-01,-02,-03,-04,-05,-06,-07,-08. Samples were analyzed for selected target analytes, as requested by client.

GROUNDWATER ANALYTICAL
228 Main Street, P.O. Box 1200
Buzzards Bay, MA 02532
Telephone (508) 759-4441 • FAX (508) 759-4475
www.groundwateranalytical.com

CHAIN-OF-CUSTODY RECORD AND WORK ORDER

№ 085579

Project Name: Santos / Village St
Firm: RCA
Project Number: A 6550
Address: 474 Broadway
Sampler Name: Jack Potter
City / State / Zip: Pawtucket, RI 02860
Project Manager: Maria Melaschnig
Telephone: 401-728-6860

INSTRUCTIONS: Use separate line for each container (except replicates).

TURNAROUND

- ☐ STANDARD (10 Business Days)
- ☐ PRIORITY (5 Business Days)
- ☒ RUSH (RAN- 107) 24 Hour (Rush requires Rush Authorization Number)
- ☐ Please Email to:
- ☒ Please FAX to:

BILLING

- ☒ Purchase Order No.: 9165
- ☐ Third Party Billing:
- ☐ GWA Quote:

ANALYSIS REQUEST

Metals: Specify For Water Samples ☒ Total ☐ Dissolved; ☐ Specify: Total Lead

Date	Time	Sample Identification	Matrix	Type	Container(s)	Preservation	Filtered	Laboratory Number (Lab Use Only)	Metals – Specify: Total Lead
3-1-04	9:20	SB-16	Soil	Grab	250mL/8 oz Glass	Ice	No	1	X
↓	10:00	SB-17	Soil	Grab	250mL/8 oz Glass	Ice	No	2	X
	10:20	SB-18	Soil	Grab	250mL/8 oz Glass	Ice	No	3	X
	10:50	SB-19	Soil	Grab	250mL/8 oz Glass	Ice	No	4	X
	11:00	SB-20	Soil	Grab	250mL/8 oz Glass	Ice	No	5	X
	11:30	SB-21	Soil	Grab	250mL/8 oz Glass	Ice	No	6	X
	11:45	SB-22	Soil	Grab	250mL/8 oz Glass	Ice	No	7	X
↓	12:30	SB-23	Soil	Grab	250mL/8 oz Glass	Ice	No	8	X

Column options printed on the form: Matrix: Groundwater, Drinking Water, Wastewater, Soil, Other Solid, Oil/Organic Liquid. Type: Composite, Grab. Container(s): Number, 40mL VOA Vial, 60mL/2 oz Glass, 120mL/4 oz Amber Glass, 250mL/8 oz Glass, 500mL/16 oz Glass, 1L/32 oz Amber Glass, 250mL/8 oz Plastic, 500mL/16 oz Plastic, 1L/32 oz Plastic, 120mL Sterile. Preservation: HCl, HNO_3, H_2SO_4, NaOH, Methanol, Sodium Bisulfate, Ice. Filtered: Yes, No.

Analysis Request options printed on the form:

- Options: ☐ TIC Search; ☐ Acid Only ☐ B/N Only ☐ TIC Search; Metals: Specify For Water Samples ☐ Total ☐ Dissolved
- SDWA: ☐ 524.2+MTBE; ☐ 525.2; ☐ 505 ☐ 508; ☐ 531.1; ☐ 515.1; ☐ 504.1 EDB/DBCP; ☐ Lead and Copper
- NPDES: ☐ 624; ☐ 602+MTBE; ☐ 601; ☐ 601/602+MTBE; ☐ 625; ☐ 625 PAHs only; ☐ 608 Pesticides; ☐ 608 PCBs; ☐ 615; ☐ 13 Priority Pollutant
- RCRA/21E: ☐ 8260B TCL+MTBE; ☐ 8260B NH PETROLEUM; ☐ 8260B; ☐ 8021B Aromatics; ☐ 8021B Halocarbons; ☐ 8021B; ☐ 8270C; ☐ 8270C PAHs only; ☐ 8081A Pesticides; ☐ 8082 PCBs; ☐ 8151A Herbicides; ☐ 8011 EDB/DBCP; ☐ 8 RCRA; ☐ 5 RCRA; ☐ MA List Metals; ☐ 23 TAL
- Petroleum Hydrocarbon (Ext. TPH / Vol. TPH): ☐ TPH-IR; ☐ Diesel Range Organics (DRO) ☐ ME DRO; ☐ CT ETPH; ☐ MA DEP EPH w/all targets ☐ EPH Carbon Ranges only ☐ EPH w/4 PAHs; ☐ Hydrocarbon Fingerprint (GC/FID by ASTM D3328-00-Mod.); ☐ TPH by GC/FID (8015B Mod) Quantitative Only; ☐ Gasoline Range Organics (GRO) ☐ ME GRO; ☐ MA DEP VPH w/all targets ☐ VPH Carbon ranges only
- Haz. Waste: ☐ TCLP ☐ SPLP ☐ 8 Metals ☐ Pb only ☐ VOA ☐ Semi VOA ☐ Pesticides ☐ Herbicides; ☐ Corrosivity (as pH) ☐ Reactivity ☐ Ignitability (as Flashpoint) ☐ Paint Filter; ☐ MA Basic Disposal Criteria, 8260B, TPH by GC, PCBs, 5 Metals, Corrosivity, Ignitability, Reactivity
- General Chemistry: ☐ Nitrate ☐ Nitrite ☐ Chloride ☐ Fluoride ☐ Sulfate; ☐ Dissolved Phosphorus; ☐ Ammonia ☐ TKN ☐ Total Phosphorus ☐ Total N (as NO2/NO3/TKN); ☐ Oil & Grease; ☐ COD ☐ TOC; ☐ BOD ☐ TDS ☐ TSS ☐ TS ☐ Alkalinity; ☐ Cyanide, Total ☐ Cyanide, Physiologically Available; ☐ pH ☐ Dissolved Oxygen ☐ Turbidity
- Other: ☐ Total Coliform ☐ Fecal Coliform ☐ HPC

REMARKS / SPECIAL INSTRUCTIONS

MA DEP MCP Data Enhancement Affirmation

☐ YES ☐ NO MCP Data Certification is required.

☐ YES ☐ NO MCP minimum Field QC requirements have been met for this project. *(Metals, hexavalent chromium and cyanide analyses require one matrix spike per 20 samples)*

☐ YES ☐ NO MCP Drinking Water samples required. *(Require collection of contingent duplicate samples. Trip blanks are also required, if VOA samples collected)*

Signature: ____________

DATA QUALITY OBJECTIVES

Regulatory Program

State	Standard	Deliverables
☐ CT	☐ MCP GW-1/S-1	☐ PWS Form
☐ ME	☐ MCP GW-2/S-2	☐ MWRA
☐ MA	☐ NY STARS	☐ ______
☐ NH	☐ Drinking Water	
☐ NY	☐ Wastewater	
☐ RI	☐ Waste Disposal	
☐ VT	☐ Dredge Material	
☐ ___	☐ ______	

Project Specific QC

Many regulatory programs and EPA methods require project specific QC. Project specific QC includes Sample Duplicates, Matrix Spikes, and/or Matrix Spike Duplicates. Laboratory QC is not project specific unless prearranged. Project specific QC samples are charged on a per sample basis. **Each MS, MSD and Sample Duplicate requires an additional sample aliquot.**

Project Specific QC Required: ☐ Sample Duplicate ☐ Matrix Spike ☐ Matrix Spike Duplicate

Selection of QC Sample: ☐ Please use sample: ______

CHAIN-OF-CUSTODY RECORD

NOTE: All samples submitted subject to Standard Terms and Conditions on reverse hereof.

Relinquished by	Date	Time	Received by	
Relinquished by Sampler: [signature]	3-1-04	1017	Received by: [signature] 3/2/04	Receipt Temperature: 2.0 ☐ Ice ☐ Refrigerated 2-6°C Recommended
Relinquished by: [signature]	3/2/04	1110	Received by:	Container Count: 8
Relinquished by:			Received by Laboratory: [signature]	Shipping/Airbill Number:

Method of Shipment: ☐ GWA Courier ☐ Express Mail ☐ Federal Express ☐ UPS ☐ Hand ☐ ______

Custody Seal Number:

APPENDIX G

Method 3 Risk Characterization

MCP Method 3 Risk Characterization

Of

27 Village Street
Somerville, Massachusetts

Prepared by:

OAK CREEK, Inc.
60 Oak Creek
Buxton, Maine

Prepared for:

Resource Control Associates, Inc.
474 Broadway

Pawtucket, RI 02860

March 11, 2004

TABLE OF CONTENTS

EXECUTIVE SUMMARY 4
SUMMARY OF FINDINGS 4
MCP METHOD 3 RISK CHARACTERIZATION....6
1.0 Site Characterization 6
1.1 Conceptual Model....6
2.0 Risk to Human Health....7
2.1 Preliminary Steps....8
2.1.1 ..... Current and Foreseeable Site Activities and Uses 8
2.1.2 ..... Soil Categorization 8
2.1.3 ..... Groundwater Categorization 8
2.1.4 ..... Established Background 9
2.1.5 ..... Assumptions Concerning Activity and Use Limitations 9
2.2 Hazard Identification 9
2.2.1 ..... Identification of CoPC....10
2.2.2 ..... Elimination of CoPC 10
2.3 Dose-Response or Toxicity Assessment....11
2.3.1 ..... Receptor- and Pathway-Specific Adjustments to Toxicity Values....12
2.3.2 ..... Source of Toxicity Values 12
2.3.2.1 .... Toxicity Values for Lead....13
2.3.2.2 .... Toxicity Values for PAHs 13
2.4 Exposure Assessment....14
2.4.1 ..... Exposure Profiles 15
2.4.2 ..... Exposure Parameters 15
2.4.3 ..... Exposure Points....22
2.4.4 ..... Exposure Media....22
2.4.5 ..... Exposure Point Concentrations 22
2.4.5.1 EPC in Soil 23
2.4.5.2 EPC in Groundwater 24
2.4.5.3 EPC in Air 24
2.4.5.3.1 EPC in Outdoor Air Particulate 24
2.4.6 ..... Quantification of Exposure....24
2.4.6.1 Calculation of an Average and Lifetime Average Daily Dose....24
2.5 Risk Characterization....26
2.5.1 ..... Cancer Risk 26
2.5.2 ..... Non-Cancer Risk 27
2.6 Applicable or Suitably Analogous Public Health Standards 28
2.7 Uncertainty Analysis....28
2.7 Conclusion 29
3.0 Risk to Public Welfare 29
4.0 Risk to Safety....30
5.0 Risk to the Environment 30
6.0 Conclusions....31
7.0 References....32
APPENDIX A – RISK CHARACTERIZATION TABLES 36

List of Tables in Appendix A

Table 1. Soil Laboratory Analytical Results
Table 2. Compounds of Potential Concern Identified in Soil
Table 3. Receptor Exposure Profiles
Table 4. Quantitative Exposure Estimates
- Table 4.1. Incidental Soil Ingestion – Adult Resident
- Table 4.2. Inhalation & Ingestion of Dust – Adult Resident
- Table 4.3. Dermal Contact with Soil – Adult Resident
- Table 4.4. Ingestion of Homegrown Produce – Adult Resident
- Table 4.5. Incidental Soil Ingestion – Child Resident
- Table 4.6. Inhalation & Ingestion of Dust – Child Resident
- Table 4.7. Dermal Contact with Soil – Child Resident
- Table 4.8. Ingestion of Homegrown Produce – Child Resident
- Table 4.9. Incidental Soil Ingestion – Construction/Utility Worker
- Table 4.10. Inhalation & Ingestion of Dust – Construction/Utility Worker
- Table 4.11. Dermal Contact with Soil – Construction/Utility Worker
- Table 4.12. Inhalation & Ingestion of Dust – Maintenance Worker
- Table 4.13. Incidental Soil Ingestion – Maintenance Worker
- Table 4.14. Dermal Contact with Soil – Maintenance Worker
- Table 4.15. Residential Scenario FIs.

Table 5. CoPC Toxicity Values
Table 6. Chemical-Specific Relative Absorption Factors & Table 6. RAF References
Table 7. Exposure Point Concentrations
Table 8. Ingestion of Homegrown Produce
Table 9. Incidental Ingestion of Soil – Adult Resident
Table 10. Dermal Contact with Soil – Adult Resident
Table 11. Inhalation & Ingestion of Dusts – Adult Resident (Inhalation)
Table 12. Inhalation & Ingestion of Dusts – Adult Resident (Ingestion)
Table 13. Incidental Ingestion of Soil – Child Resident
Table 14. Dermal Contact with Soil – Child Resident
Table 15. Inhalation & Ingestion of Dusts – Child Resident (Inhalation)
Table 16. Inhalation & Ingestion of Dusts – Child Resident (Ingestion)
Table 17. Ingestion of Contaminates in Homegrown Produce – Adult and Child Resident
Table 18. Incidental Ingestion of Soil – Construction/Utility Worker
Table 19. Dermal Contact with Soil – Construction/Utility Worker
Table 20. Inhalation& Ingestion of Dusts – Construction/Utility Worker (Inhalation)
Table 21. Inhalation& Ingestion of Dusts – Construction/Utility Worker (Ingestion)
Table 22. Incidental Ingestion of Soil – Maintenance Worker
Table 23. Dermal Contact with Soil – Maintenance Worker
Table 24. Inhalation& Ingestion of Dusts – Maintenance Worker (Inhalation)
Table 25. Inhalation& Ingestion of Dusts – Maintenance Worker (Ingestion)
Table 26. Summary of Chemical-Specific Upper-Bound Excess Lifetime Carcinogenic Risks and Noncarcinogenic Hazard Indices for Each Receptor Scenario
Table 27. Summary of Upper-Bound Excess Lifetime Carcinogenic Risks and Noncarcinogenic Hazard Indices for Each Pathway and Scenario

EXECUTIVE SUMMARY

Resource Control Associates, Inc. (“RCA”) retained OAK CREEK, Inc. ("OCI") to conduct a risk characterization of the residential property located at 27 Village Street, Somerville, Massachusetts (“site”). OCI conducted a baseline Massachusetts Contingency Plan (“MCP”) Method 3 risk characterization to establish whether a condition of "No Significant Risk" exists, or has been established at the site for all current and reasonably foreseeable land uses and activities, or whether further remedial action or an Activity and Use Limitation (“AUL”) is required at the site. This report presents the findings of that effort.

SUMMARY OF FINDINGS

OCI conducted a baseline risk characterization of the site in accordance with the MCP [310 CMR 40.0900-40.0960] and risk assessment guidance provided by MADEP (MADEP 1994, 1995, 1996a,b, 1999, 2002a,b,c,d,f) and the U.S. Environmental Protection Agency (“U.S. EPA”) (U.S. EPA 1989, 1991, 1992a,b, 1996, 1997, 2000, 2004a,b). The risk characterization was performed assuming unrestricted residential land uses and activities for the site. OCI obtained chemical-specific toxicity values from MADEP (MADEP 1995), MCP [310 CMR 40.1513(2)], and the U.S. EPA (U.S. EPA 2004c,d). OCI obtained exposure factors for residential receptors, consistent with unrestricted land uses and activities, from MADEP (1994, 1995) and the U.S. EPA (1989, 1991, 1992b, 1996, 1997, 2000, 2004c,d). OCI obtained exposure factors for construction/utility, and maintenance, workers from "*DRAFT Commercial/Industrial ShortForm Exposure Scenarios, Human Exposures at Industrial/Commercial Properties*" (MADEP 1996a), MADEP guidance (MADEP 1994, 1995, 2002b,c,d), and where appropriate U.S. EPA guidance (U.S. EPA 1989, 1991, 1992b, 1996, 1997, 2000, 2004c,d). OCI obtained chemical-specific relative absorption factors (“RAFs”) from the Risk Assessment Information Service (RAIS 2004) and U.S. EPA (1992, 2004c,d). Where absent from RAIS and U.S. EPA, OCI determined chemical-specific RAF from the information presented in Appendix B, “*Suggested Default Exposure Assumptions*,” of MADEP risk characterization guidance (MADEP 1995). The result of this risk characterization demonstrates that a condition of "No Significant Risk" (“NSR”) of harm to human health, safety, public welfare, and the environment exists at the site now and foreseeable future, without restriction.

No Significant Risk of Harm to Human Health, Safety, Public Welfare, and the Environment, without Restriction.

No activity and use limitation (“AUL”) or other deeded encumbrance on the property is required. A summary of the conclusions of this risk characterization is provided below, but should be read in conjunction with the entire risk characterization report.

Human Health: OCI performed a MCP Method 3 baseline characterization of human health risk for the residential property, located on 27 Village Street in Somerville, Massachusetts, ("site"). OCI identified volatile, semi-volatile organic compounds ("VOC" and "SVOC," respectively), and various metals as compounds of potential concern ("CoPC") in site soils. Significant concentrations of CoPC were not identified in site groundwater samples (RCA 2003). Consequently, this risk characterization is limited to the potential exposure of receptors through ingestion of surface soil, dermal contact with surface soils, inhalation and ingestion of inhaled airborne particulates. OCI characterized risk to current and potential future residential receptors, as well as construction/utility and maintenance workers. OCI quantified cumulative cancer and non-cancer health risks and compared them to MADEP risk management criteria of 1×10^{-5} [310 CMR 40.0960(6)] for cumulative CoPC cancer effects and a hazard index ("HI") of 1 for cumulative CoPC non-cancer effects (MADEP 1995). Excess lifetime cancer risks ("ELCR") for residential adults and children do not exceed the MADEP target cancer risk of 1×10^{-5} or the MADEP target non-cancer HI of 1. Additionally, the ELCR for construction/utility and maintenance workers does not exceed the MADEP target cancer risk of 1×10^{-5} or the MADEP target non-cancer HI of 1. Based on these results, OCI finds that a condition of "No Significant Risk" of harm to human health currently exists at the site and will exist in the foreseeable future, without restriction.

Safety: As required under the MCP [310 CMR 40.0941(2)], a qualitative characterization of risk to safety was conducted at the site. An evaluation of CoPC flammability and ignitability, corrosivity, and reactivity did not identify conditions at the site that currently pose, or will pose in the foreseeable future, a threat of physical harm or bodily injury to people. Therefore, a condition of "No Significant Risk" of harm to safety exists at the site now and in the foreseeable future, without restriction.

Public Welfare: The risk to public welfare was assessed in a manner consistent with MADEP guidance (MADEP 1995), and as stipulated under the revised MCP [310 CMR 40.0994]. There is no apparent nuisance conditions, loss of property value, unilateral restriction of property use, or any monetary or nonphysical costs associated with historical contaminant release at the site. Relevant site, receptor, and exposure information suggests that there is no adverse impact to public welfare. Contaminant concentrations in media from the site do not exceed their relevant upper concentration limit ("UCL"). Furthermore, there is no information to suggest that a community in the vicinity of the site currently experiences or will in the future experience any adverse impact to public welfare as a result of the subject hazardous material release. Therefore, a condition of "No Significant Risk" to public welfare exists at the site, now and in the foreseeable future.

Environment: OCI conducted a MCP Method 3 environmental risk characterization in a manner consistent with MADEP guidance (MADEP 1995,

1996b). A Stage I risk characterization determined that site-related contamination does not migrate to environmentally sensitive habitats or receptors. Therefore, a Stage II risk characterization is not warranted and a condition of "No Significant Risk" of harm to the environment exists at the site now and in the foreseeable future, without restriction.

This baseline risk characterization finds that a condition of "No Significant Risk" of harm to health, safety, public welfare and the environment currently exists at the site, and will exist at the site into the foreseeable future, without restriction.

MCP METHOD 3 RISK CHARACTERIZATION

A complete Method 3 risk characterization consists of assessments of four distinct types of risk: 1) risk to human health; 2) risk to safety; 3) risk to the public welfare; and 4) risk to the environment. The purpose of risk characterization is to establish whether a condition of "No Significant Risk" exists at the site or whether response actions are required to protect human health, environmental health, safety, and/or public welfare.

1.0 SITE CHARACTERIZATION

A complete description of the site, its historical use, and previous site investigations is described in the *"ASTM Phase I & II Environmental Site Assessment Report, 27 Village Street, Somerville, Massachusetts,"* dated December 19, 2003 (RCA 2003). A detailed summary of analytical data obtained for site soils is provided in Table 1 of Appendix A. Analytical groundwater data from three (3) monitoring wells at the site is unremarkable, with only small concentrations of acetone (19 ug/l), methyl tert-Butyl Ether ("MtBE") (0.6 ug/L), and cadmium (12 ug/l) identified in groundwater. Acetone and MtBE were detected in MW-2, while cadmium was detected in MW-1.

According to information reported by RCA, the site is comprised of one, rectangular shaped parcel with a total area of approximately 15,150 square feet (RCA 2003). The site is improved by two structures. The larger structure (Building 1), located along the western edge of the site, is constructed of brick and is currently utilized as a residence and children's theatre. The smaller structure (Building 2), located along the eastern border of the site, is constructed of concrete block with a flat roof and is currently utilized for custom letter-press printing operations. The southern portion of the site, located between the fence/gate and adjacent to Village Street, is paved. The remaining area of the site, not covered by building footprint or pavement, is used for gardening.

1.1 Conceptual Model

A conceptual model is important in defining the potential for exposure (U.S. EPA 1989). A conceptual model identifies all potential or suspected sources of release; types and concentrations of contaminants detected in media, all potentially impacted media,

potential exposure pathways, and potentially exposed receptors. A site conceptual model provides a systematic way to identify and summarize this information based on current and potential future site-specific land use considerations.

OCI provides a list of contaminants of potential concern ("CoPC") detected at the site (Appendix A; Table 2) and their concentrations in site media (Appendix A; Table 1) for use in this risk characterization. OCI identifies contaminated site media as limited to soils. Exposure pathways through which receptors are potentially exposed include the ingestion of soil, dermal contact with soil, as well as, the inhalation and ingestion of inhaled airborne soil particulate.

Table 4 (Appendix A) describes exposure profiles for all current and potential future receptors using the site. Consistent with potential future residential activities and uses, OCI assumed that residential adult and child receptors have direct contact with CoPC in soils on playgrounds, yards, and gardens, and indirect contact with CoPC through the inhalation and ingestion of airborne particulate generated from exposed soils. OCI does not evaluate residential receptor inhalation exposure of VOC vapors infiltrating indoor air or the consumption and use of groundwater since significant concentrations of CoPC were not identified in groundwater sampled from beneath the site. Consistent with the potential for the site to be developed for industrial/commercial uses, OCI evaluated construction/utility workers for exposure to soil CoPC through direct contact with soils (0 to 15 ft bgs) and indirect contact with CoPC in soil through the inhalation and ingestion of inhaled particulates generated from exposed soils. Also consistent with current and potential future use of the site for industrial/commercial uses, OCI evaluated maintenance worker exposure to CoPC through direct contact with soils during routine facility maintenance operations (e.g. landscaping and grounds maintenance), and indirect exposure to CoPC in soil particulate through the inhalation and ingestion of inhaled particulates generated from exposed soils.

The characterization of human and environmental health risk uses site-specific information and, where such information is absent, conservative default information to estimate receptor exposure to contaminants in site media. OCI integrates receptor exposures and contaminant toxicity to generate quantitative estimates of health risk for each receptor group.

2.0 RISK TO HUMAN HEALTH

A baseline MCP Method 3 human health risk characterization was performed in a manner consistent with risk assessment guidance from MADEP (MADEP 1994, 1995, 1996a,b, 1999, 2002b,c,d,f) and the U.S. Environmental Protection Agency ("U.S. EPA") (U.S. EPA 1989, 1991, 1992a,b, 1996, 1997, 2000, 2004a,b).

Human health risk characterization integrates five separate components: hazard identification, dose-response assessment, exposure assessment, risk characterization, and

uncertainty analysis. OCI considers several preliminary steps prior to characterizing health risk at the site.

2.1 Preliminary Steps

Preliminary steps required in a MCP Method 3 characterization of human health risk include the determination of current and foreseeable site land uses, categorization of site soil and groundwater, determination of background concentrations, and defining any assumptions or limitations regarding allowable site activities and uses. OCI addresses these preliminary steps and each of the major components of a human health risk characterization in the following appropriately labeled sections.

2.1.1 Current and Foreseeable Site Activities and Uses

This risk characterization evaluates current and potential future use of the site for both current and potential future residential and industrial/commercial uses.

2.1.2 Soil Categorization

Soil at the site is categorized S-1 and S-3. This soil categorization is consistent with current and potential future residential use of the site. S-1 categorized soils at the site include surface and subsurface soils with which residential receptors are likely to have high intensity and high frequency contact, such as those which may be used in children's play areas, yards, and gardens (MADEP 1995) and within which children may frequently play. S-2 categorized soils include those contacted with less frequently and intensity such as those under pavement or at a depth where receptors are unlikely to have frequent or high intensity contact (MADEP 1995). Soils more than 15 ft bgs are relatively inaccessible and are categorized S-3. Because development of a future residential structure may bring S-2 and perhaps even S-3 categorized soils to the surface, however, all soils at all depths are conservatively categorized S-1. This soil categorization is conservative in that it categorizes soils, even those beneath the footprint of Building 1 as S-1, implying that these soils may eventually become available for high intensity and high frequency receptor contact.

2.1.3 Groundwater Categorization

Groundwater at the site is categorized GW-2 and GW-3. A groundwater categorization of GW-1 is not appropriate since groundwater at this site does not meet any of the six (6) criteria as defined under the MCP [310 CMR 40.0932]. According to RCA, there are no public or private drinking water supply wells within 0.5 miles of the site (RCA 2003). Furthermore, the site is not located within Zone II Interim Wellhead Protection Areas, Zone A areas, and Potentially Productive Aquifers are not found within 0.5 miles of the site (RCA 2003). Consequently, groundwater is not categorized GW-1. A GW-2 categorization is appropriate since previous site characterization shows the average

annual depth to groundwater is less than 15 feet below the ground surface ("bgs") (RCA 2003). The GW-3 categorization is also appropriate since groundwater at all sites is categorized GW-3 (MADEP 1995). Therefore, groundwater at the site is categorized GW-2 and GW-3. According to RCA, groundwater flows to the south and the nearest surface water body is the Charles River, located just over 1 mile distant from the site.

2.1.4 Established Background

OCI compared the mean and maximum detected concentrations of CoPC identified in site soils to available MADEP "Natural" and "Fill Material" background concentrations (MADEP 2002a) (Table 1; Appendix A). MADEP identified "Natural" background concentrations as generally representing the high end (i.e., 90th percentile) of the concentration range observed for individual compounds in Massachusetts's soil. OCI compared the maximum CoPC soil concentration detected at the site to MADEP "Natural" and "Fill Material" background concentrations (Table 1; Appendix A). OCI determined that of the polycyclic aromatic hydrocarbon ("PAH") compounds detected in site soils, only two (2); acenaphthene and phenanthrene exceeded their applicable "Natural" background concentration. Two (2) volatile organic compounds ("VOCs"), naphthalene and 2-methylnaphthalene exceed their applicable "Natural" background concentration. OCI found that nine (9) of the metals detected in site soils (i.e., arsenic, barium, cadmium, lead, mercury, nickel, selenium, silver, and zinc) exceeded their "Natural" background concentration, while several others did not (i.e., aluminum and chromium). There is no "Natural" background concentration identified by MADEP for magnesium.

2.1.5 Assumptions Concerning Activity and Use Limitations

Specific land uses and activities, which are reasonably foreseeable, may be eliminated from further consideration in risk characterization through the implementation of an Activity and Use Limitation ("AUL"). An AUL is a declaration of the acceptable and unacceptable future land uses and activities at the site. An AUL is not required if the site is suitable for unrestricted land use in the future (i.e., all activities and land uses are permitted and consistent with a level of "No Significant Risk"). This risk characterization assumes unrestricted land uses and activities, consistent with potential future residential use of the site and therefore, assumes that an AUL is not required.

2.2 Hazard Identification

Hazard identification describes the nature of a substance that causes it to be of regulatory concern and identifies the effects of substances determined to cause adverse effects in humans. The U.S. EPA has characterized substances, commonly encountered at hazardous waste sites, as to whether they are likely to have carcinogenic and non-carcinogenic effects in humans. The relative hazard of each CoPC is fully discussed by the U.S. EPA (2004c,d) and MADEP (1995) will not be further addressed within this risk

characterization. The following sections identify CoPC that are carried through risk characterization.

2.2.1 Identification of CoPC

OCI tentatively identifies CoPC at the site as all compounds detected at least once in laboratory analytical analyses of site soils (Appendix A; Tables 1). OCI lists all of these CoPC in Table 2 (Appendix A).

2.2.2 Elimination of CoPC

OCI may eliminate CoPC from consideration in the risk characterization if they meet one of the following three criteria (MADEP 1995).

- Present at low frequency of detection and in low concentration;
- Present at a concentration which is consistent with "background" concentrations for the area and there is no evidence that their presence is related to present or past activities at the site;
- Present as a field or laboratory contaminant, subject to criteria provided by the U.S. EPA (1992a).

OCI eliminated several soil metals (i.e., aluminum, chromium, and magnesium) from further consideration in this risk characterization. These metals were detected in soils at concentrations below their respective MADEP identified "Natural" or "Fill Material" background concentrations (MADEP 2002a). OCI also eliminated several PAH compounds from further consideration in this risk characterization (i.e., acenaphthylene, anthracene, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, fluorene, indeno[1,2,3-cd]pyrene, and pyrene). These compounds were eliminated from further consideration based on the fact that they did not exceed their respective MADEP "Natural" background concentrations in soil (MADEP 2002a).

OCI eliminated all CoPC detected in groundwater samples collected from site monitoring wells (i.e., acetone, MtBE, and cadmium) from further consideration in this risk characterization. OCI eliminated acetone from further consideration in this risk characterization because it is a common laboratory contaminant. Because acetone is a common solvent in laboratories, it can contaminate laboratory samples, producing "false positive" analytical results. Specific U.S. EPA guidance suggests that concentrations of acetone that are "less than 10 times that detected in method blanks will be reported as undetected (or flagged B)." The laboratory (Groundwater Analytical Buzzards Bay, MA) reported acetone detected in one of two samples at a concentration of 19 ug/L, with a method detection limit ("MDL") of 10 ug/L. Even if undetected, the U.S. EPA typically assumes that acetone may be present in groundwater at a concentration that is half its MDL. Because the detected concentration of acetone (19 ug/L) is less than 10 times, one-half (½) the MDL (5 ug/L), it may be eliminated from further consideration in this risk characterization as a common laboratory contaminant.

OCI eliminated MtBE from further consideration in this risk characterization based on low frequency of detection and low concentration. There is no historical information or nearby release suggesting that MtBE would be detected at the site. MtBE is a ubiquitous contaminant of groundwater, detected in MW-2, but not MW-1 or MW-3. MtBE was only detected at the very low concentration of 0.6 ug/L, a concentration that is without significant risk of harm to human and/or environmental receptors. Therefore, OCI eliminated MtBE as a CoPC in this risk characterization.

OCI eliminated cadmium from further consideration in this risk characterization based on low frequency of detection and low concentration. Although historical operations at the site suggest a potential for metals to impact groundwater, no metal other than cadmium is detected in groundwater. Analytical analyses of groundwater detected cadmium at a concentration of 12 ug/L in one of two wells sampled (MW-1). Although this groundwater concentration exceeds MADEP Drinking Water Standard (Massachusetts Maximum Contaminant Level; "MMCL") for cadmium (5 ug/L), it can not pose a potential human health risk, since groundwater at the site is not considered to be suitable for consumption of use (i.e., groundwater is categorized GW-2 and GW-3, not GW-1). In contrast, the detected concentration of cadmium in MW-1 exceeds the MADEP GW-3 standard of 4 ug/L. The concentration of cadmium in groundwater of MW-1, however, is unlikely to impact nearby surface waters or environmental receptors since, this concentration is localized to MW-1, not detected in MW-2 (MDL = 5 ug/L), and therefore is likely bound to particulate collected with groundwater from MW-1. Therefore, OCI eliminated cadmium in groundwater as a CoPC in this risk characterization.

2.3 Dose-Response or Toxicity Assessment

Dose-response assessment describes the observed effects in humans and/or laboratory animals that are associated with particular exposure to CoPC (U.S. EPA 1989). U.S. EPA obtained this information from published literature describing epidemiological or toxicological studies involving CoPC. U.S. EPA used this information to quantitatively characterize the relationship between the dose of the compound and the incidence of adverse effects in an exposed population.

MADEP (1995) guidance suggests that in the absence of MADEP-derived toxicity values, U.S. EPA's toxicity values should be used to assess the relative hazard posed by site CoPC. MADEP and the U.S. EPA indicate the carcinogenic potency of a compound by the oral- and inhalation-specific cancer slope factor (CSF_o and CSF_i, respectively) expressed as the reciprocal of standard intake units (i.e., milligrams per kilogram body weight per day or mg/kg-bw/day). For non-carcinogenic effects, the highest dose that is deemed unlikely to cause adverse effects when administered over a lifetime is termed the chronic oral reference dose ("RfD") or, for inhalation exposure, the chronic inhalation reference concentration ("RfC"). The units for the RfD and RfC are milligrams per kilogram body weight per day (mg/kg-bw/day) and milligrams per cubic meter (mg/m^3), respectively. For comparison purposes, however, chemical-specific RfC values in Table

5 (Appendix A) are converted to RfD_I, in units of mg/kg-bw/day. The U.S. EPA RfC (mg/m^3) is converted to units of mg/kg/day by multiplying by the average adult breathing rate of 20 m^3/day, dividing by the average adult body weight of 70 kg, and multiplying by an appropriate unit conversion factor (U.S. EPA 1996, 1997, 2004a,b). This conversion also assists in the appropriate scaling of dose between receptors of different inhalation rates, such as between children and adult receptors.

2.3.1 Receptor- and Pathway-Specific Adjustments to Toxicity Values

U.S. EPA derives CSF and RfC using default adult exposure parameters. Consequently, U.S. EPA guidance (Appendix 1A; U.S. EPA 1996) suggests that CSF and RfC values should be corrected to reflect the characteristics of the exposed population. The conversion of the RfC units to RfD_I units makes such a correction unnecessary for non-cancer toxicity values used to assess inhalation exposures, since the RfD_I is used to estimate risk considering receptor body weight and breathing rate. For the CSF, however, the correction takes the form of an exposure adjustment factor, which for a child is equivalent to the cube root of the child's body weight over the adult's body weight (approximately 0.6). Table 5 in Appendix A lists U.S. EPA's un-adjusted toxicity values for site-related contaminants (MADEP 1995, 2002e, RAIS 2004, and U.S. EPA 2004c,d). Prior to use in this risk characterization, the CSF is adjusted per U.S. EPA guidance to reflect an exposed child's lower mean age-specific body weight (15 kg) using this correction factor. A similar correction factor (0.56), estimated from a child's age-specific (2 year old) mean body weight (12.075 kg), is used when evaluating cancer risk posed by the consumption of homegrown produce.

OCI also adjusts non-cancer toxicity values to reflect adult receptor-specific subchronic exposures (i.e., construction/utility workers). These adjustments are consistent with U.S. EPA and MADEP guidance in which the non-cancer toxicity values used to characterize subchronic exposure construction/utility workers are multiplied by a factor of 10 to reflect the lower toxicity of the compound over this shorter exposure period.

2.3.2 Source of Toxicity Values

In order of preference, OCI obtained cancer and non-cancer toxicity values (Appendix A; Table 5) from MADEP (MADEP 1995, 2002f), the MCP [310 CMR 40.1513(2)], U.S. EPA's Integrated Risk Information System ("IRIS") (U.S. EPA 2004d), and where absent, the U.S. EPA Region III Risk-Based Concentration Table (U.S. EPA 2004c) and the Risk Assessment Information System ("RAIS") (RAIS 2004). This later two (2) sources includes toxicity values published in the U.S. EPA's Health and Environmental Assessment Summary Table ("HEAST") and provisional toxicity values determined by U.S. EPA program offices. Where toxicity values were not available, OCI assigned surrogate toxicity values to CoPC based on structural similarity to other CoPC for which toxicity values are available. In this risk characterization, OCI used recently up-dated toxicity values for VPH and EPH fractions (MADEP 2002e).

2.3.2.1 Toxicity Values for Lead

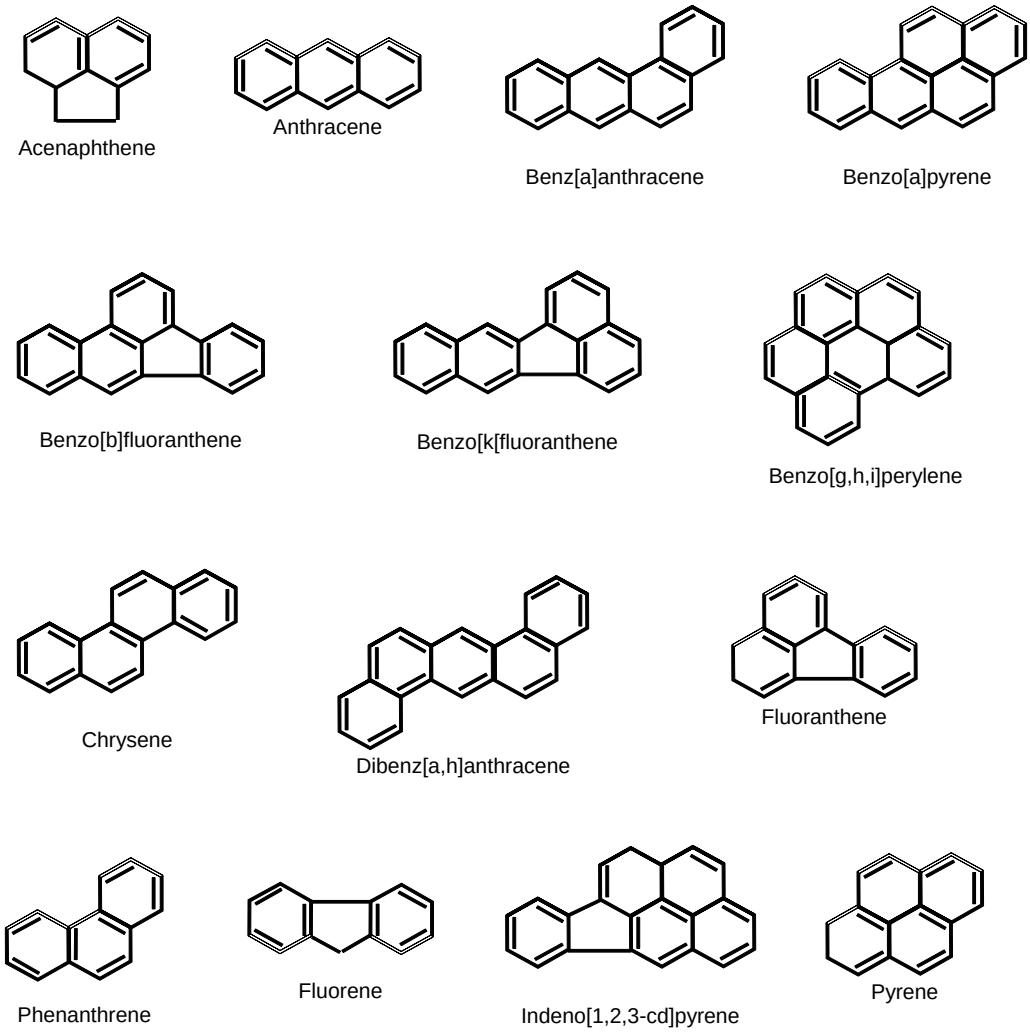
Although considered inappropriate (ATSDR 1992, TRW 1999, U.S.EPA 1994a,b), OCI uses the MADEP identified RfD for lead in assessing human health risk resulting from exposure to this element. MADEP uses this RfD for the purpose of assigning a human health-based toxicity score in tier classification [310 CMR 40.1513(2)].

2.3.2.2 Toxicity Values for PAHs

Consistent with MADEP guidance (MADEP 1995), OCI assigns non-cancer toxicity and cancer toxicity values to several PAH target compounds. Individual CSF values for seven (7) potentially carcinogenic PAHs are based on their relative potency to induce skin cancer in rodent bioassays relative to benzo[a]pyrene ("BaP") (U.S. EPA 1993, 2004c,d, MADEP 1995). This relative CSF is expressed in terms of a BaP equivalent dose (U.S. EPA 1993, MADEP 1995). This assignment of relative CSF values to PAHs is termed the estimated order of potency ("EOP") approach (U.S. EPA 1993). The rationale for this approach is based on evidence that all carcinogenic PAHs have a cancer-causing mechanism similar to BaP (U.S. EPA 1993). MADEP (1995) and U.S. EPA (1993) both define the relative CSF values for seven (7) PAH compounds. Between these two agencies, the assigned CSF values are equivalent (i.e., the same), except for chrysene. MADEP's carcinogenic potency estimate for chrysene is 10-fold higher (i.e., higher carcinogenic potency) than that estimated by U.S. EPA (U.S. EPA 1993, 2004c,d). Regardless, OCI exclusively uses the MADEP assigned relative CSF values for all 7 carcinogenic PAHs in this risk characterization.

Consistent with MADEP guidance (MADEP 1995), OCI assigns surrogate non-cancer toxicity values to PAH compounds for which there are no verified U.S. EPA non-cancer toxicity values (i.e., an RfD). MADEP recommends assigning non-cancer toxicity values based on similarity in molecular structure (MADEP 1995). U.S. EPA has derived and verified a non-cancer RfD for anthracene, acenaphthene, fluoranthene, fluorene, and pyrene (U.S. EPA 2004a,b). Consistent with MADEP's guidance, OCI assigns indeno[1,2,3-c,d]pyrene, benzo[k]fluoranthene and benzo[b]fluoranthene non-cancer toxicity values equivalent to structurally similar fluoranthene. OCI assigns benzo[a]anthracene, dibenz[a,h]anthracene, chrysene, and phenanthrene non-cancer toxicity values equivalent to structurally similar anthracene. OCI assigned benzo[a]pyrene and benzo[g,h,i]perylene a non-cancer toxicity value equivalent to that of structurally similar pyrene. The molecular structure of these compounds is presented in FIGURE 1.

FIGURE 1. Molecular Structure of Certain PAH Compounds.



2.4 Exposure Assessment

Exposure assessment involves identifying potential routes of exposure; characterizing the populations exposed; and determining the frequency, duration, and extent of exposure to site-related contaminants (MADEP 1995, 1996a, 2002b,c,d, and U.S. EPA 1989, 1991, 1996, 1997, 2000 2004a,b). OCI divides this exposure assessment into several sections, which include discussion of exposure profiles and scenarios, assumptions relating to the selection of exposure parameters, selection of exposure points, determination of exposure point concentrations ("EPC"), and the calculation of quantitative estimates of exposure.

2.4.1 Exposure Profiles

An exposure profile is a narrative description of the assumed potential for receptor exposure at the site (MADEP 1995). OCI developed an exposure profile for each receptor and for all current and foreseeable uses of the site. Table 3 (Appendix A) presents the exposure profiles for human receptors at the site. In addition to current residential and industrial/commercial uses, in which OCI estimates the health risk to current residents, construction/utility, and maintenance workers, OCI also estimates health risk to potential future residential receptors following redevelopment of the site for unrestricted use. Current and potential future residential receptor exposure represents high intensity and high frequency contact with site soils that is consistent with unrestricted future land use, including use of the site as a child daycare, playground, and/or as an elementary school. An additional description of each receptor group and the exposure parameters employed to reflect their relative exposure to site-related contamination is provided in the following section.

2.4.2 Exposure Parameters

OCI obtained default exposure parameters for residential adults and children and construction/utility and maintenance worker receptors from MADEP (1994, 1995, 1996a, 2002c,d,e) and U.S. EPA (1989, 1991, 1992b, 1996, 1997, 2000, 2004a,b). Specifically for construction/utility workers, OCI relied on information contained within recent MADEP guidance (MADEP 2002b,c,d) in preference to previous MADEP guidance (MADEP 1996a) or U.S. EPA sources of information relating to construction/utility worker exposure (U.S. EPA 1997).

OCI evaluated residential children and adults for exposure to CoPC in soil and in soil particulate. OCI evaluated residential receptor exposure pathways that include ingestion of soil and homegrown produce, dermal contact with soils, and inhalation and ingestion of inhaled airborne particulate. OCI did not evaluate residential receptor exposure to VOC vapors in indoor building air since significant VOC contamination of groundwater and soils is not apparent at the site. OCI evaluated construction/utility workers for exposure to site CoPC through the incidental ingestion of soil, dermal contact with soil, and inhalation and ingestion of inhaled airborne particulate. The construction/utility worker scenario is protective of other less intense (i.e., reduced physical contact with site media) and less frequent contact with soils. For example, the default MADEP exposure frequency for a utility worker is one day per year (MADEP 1995). This is much less than the 130 day per year default exposure frequency assumed for construction workers (MADEP 1996a, 2002b). As such, an evaluation of the construction worker exposure is protective of utility workers less intense and less frequent contact with soils at the site. Because of this, OCI combines construction and utility worker receptors into one group, i.e., construction/utility worker. OCI evaluated maintenance workers for exposure to site CoPC through the incidental ingestion of soils, dermal contact with soil, and inhalation and ingestion of airborne particulate.

OCI does not evaluate health risk resulting form exposure through the ingestion and use of groundwater since groundwater is categorized GW-2 and GW-3, and therefore is not suitable for consumption or use. OCI describes exposure parameters used to estimate receptor exposure (i.e., intake) below and within Tables 3 and 4.

2.4.2.1 Exposure Times:

Residential Adult & Child Receptors: According to the background documentation for the development of Method S-1 soil standards (MADEP 1994), adults (i.e., receptors from 7 to 31 years of age) are assumed to come into contact with soil five (5) days each week from May through September, a total of 153 days. In contrast, children from one to six (6) years of age are assumed have skin contact with soil and dust five (5) days each week for 153 days between May and September and to have skin contact with dust five (5) days each week for 212 days between October and April. OCI used these exposure times to formulate fractional intake ("FI") values to adjust exposure to CoPC in these media. The use of FI values necessitates leaving the exposure time ("ET") unchanged at 24 hours/day, exposure frequency ("EF") unchanged at 350 days/year, and the exposure duration ("ED") unchanged at six (6) years for children and 24 years for adults. In short, the following exposure time parameters were used in the risk characterization. OCI derived fractional intake values in a later section of this report.

Residential Adult & Child Receptors

- ET = 24 hours/day
- EF = 350 days/year
- ED = 6 years for a child (1-6 years)
- ED = 24 years for an adult (7-31 years)

Construction/Utility Workers: Consistent with the "*Draft Commercial/Industrial ShortForm Exposure Scenarios*" (MADEP 1996a), construction workers are assumed to come into direct contact with soil throughout the excavation/subsurface construction stage of site development. MADEP indicates that this stage of construction lasts six (6) months, with exposure occurring during an eight-hour workday, 5-days each week for a total of 120 days (MADEP 1996a). Recent guidance (MADEP 2002b), however, suggests slightly different exposure time parameters be used to assess construction worker exposure. In this new guidance, MADEP indicates that construction workers have direct contact with soil for 182 days, with exposure occurring during an 8-hour workday, 5-days each week for a total of 130 days.

Construction/Utility Workers:

- ET = 8 hours/day
- EF = 130 days/year
- ED = 0.50 years (182 days/365 days per year)

Maintenance Workers: Maintenance workers have direct contact with soil in the performance of outdoor activities involved in property maintenance and landscaping. In

this context, exposure to outdoor soils is assumed to occur continuously over an 8-hour workday, 5 days a week, 173 days each year (i.e., length of seasonal access to outside soils), over a 27-year period of employment (MADEP 1996a, U.S. EPA 1996a, 1997).

Maintenance Workers:

- ET = 8 hours/day
- EF = 173 days/year
- ED = 27 years

2.4.2.2 Ages: OCI evaluated child residents for exposure between the ages of one (1) and six (6) years, inclusive. OCI evaluated adult residents for exposure between the ages of seven (7) and 31 years, inclusive. OCI evaluated construction/utility, and maintenance workers for exposure between the ages of 18 and 45, inclusive.

2.4.2.3 Body Weights ("BW"): OCI assumed child residents have a body weight of 15 kg representing the mean of the age-specific male and female body weights (MADEP 1995). OCI assumed that adult residents and construction/utility, and maintenance workers have a mean default body weight of 70 kg, (MADEP 1995, U.S. EPA 1996, 1997).

2.4.2.4 Ventilation Rates ("VR"): OCI estimated time- and age-specific ventilation rates for use in this risk characterization. OCI assumed both adult and child residents are awake and performing activities consistent with the MADEP activity category, "*light exertion*," for 4-hours a day, with the remaining waking and sleeping hours at "*low activity*," 20-hours of each day (MADEP 1995). MADEP provides descriptive and quantitative age-specific ventilation rates for these receptors. OCI calculated activity- and mean age- specific ventilation rates for residential adults (7- to 30-years of age) and children (1- to 6-years of age) using Equation 1.

Equation 1.

$$VR = \frac{(VR_{LE} \times 4\ hr) + (VR_{LA} \times 20\ hr)}{24\ hr}$$

Where:

VR = age-specific mean Ventilation Rate (m^3/hr);
VR_{LE} = age-specific mean light exertion Ventilation Rate (m^3/hr); and
VR_{LE} = age-specific mean light activity Ventilation Rate (m^3/hr).

OCI uses Equation 1 to estimate an activity- and age-specific mean ventilation rate for residential receptors. According to MADEP, a 1- to 6-year old child has an age-specific *low activity* ventilation rate of 2.48 L/min and an age-specific *light exertion* ventilation rate of 4.94 L/min (MADEP 1995). In contrast, MADEP indicates that an adult, over 18 years in age (7- to 30-years of age), has an age-specific *low activity* ventilation rate of 10 L/min and an age-specific *light exertion* ventilation rate of 20 L/min (MADEP 1995). Using Equation 1 above, OCI estimates a mean daily ventilation rate for residential children of 2.89 L/min or 0.174 m^3/hr and a mean daily ventilation rate for residential adults of 11.67 L/min or 0.70 m^3/hr (Table 3 and 4).

Consistent with MADEP guidance, OCI estimated inhalation exposure of construction/utility and maintenance workers using a "*heavy exertion*" ventilation rate of 3.6 m^3/hour or 60 L/min for the entire 8-hour workday, each work day (MADEP 1995, 1996a, 2002b).

2.4.2.5 Dermal Contact Surface Area ("SA"): Background documentation for the development of Method S-1 soil standards identifies the child and adult body parts available for dermal contact (MADEP 1994). MADEP determines the mean age-specific sum of exposed skin area from the age-specific surface areas of each body part (Appendix B of MADEP 1995). Recent guidance (U.S. EPA 2000, MADEP 2002c), however, update these receptor-specific estimates of the total surface area of skin available for contact with soil. OCI describes these below and uses them in this risk characterization.

Child Residents: For the child resident 1- to 6-years in age, early MADEP guidance indicated that the surface area available for contact with soil during summer months (i.e., May through September, inclusive) is equivalent to the surface area of the hands, arms, legs, and feet (i.e., 3,420 cm^2) (MADEP 1994, 1995). During the winter months (i.e., October through April, inclusive), when dermal absorption of CoPC is primarily through contact with indoor dusts, the surface area available for contact is equivalent to the hands only (i.e., 370.4 cm^2) (MADEP 1994, 1995). OCI uses these seasonal differences in contact surface areas and length of exposure over the year to adjust the average daily intake by a fractional intake ("FI") factor. OCI describes the derivation of this FI in a later section of this report. This risk characterization, however, uses recent MADEP guidance (MADEP 2002c) indicating that the total skin surface area available for contact with soil on a 1- to 6-year old child is 2,434 cm^2. This is close to U.S. EPA guidance that suggests an appropriate default dermal contact surface area for a residential child is 2,900 cm^2 (U.S. EPA 2000). OCI uses this surface area, identified in recent MADEP guidance, in this risk characterization.

Adult Residents: For adult residents, early MADEP guidance indicated the surface area available for contact with soil is equivalent to the surface area of the hands, forearms, lower legs, and feet (MADEP 1994). Adult residents, however, are only evaluated for dermal contact with soil during the summer months (i.e., May through September, inclusive), with the adult skin surface area available for contact with soil equivalent to 5,123 cm^2 (MADEP 1994, 1995). This seasonal difference in exposure is used to adjust the average daily intake by an appropriate FI, the development of which is discussed in a later section of this report. In contrast, U.S. EPA guidance suggested a default dermal contact surface area of 5,700 cm^2 for residential adults (U.S. EPA 2000), which is not substantially different from the earlier MADEP value of 5,123 cm^2. Recent MADEP guidance, however, suggested an appropriate default dermal surface area available for contact with soil is 5,657 cm^2 (MADEP 2002c). OCI uses this value in this risk characterization.

Construction, Utility, and Maintenance Workers: For adult residents, U.S. EPA guidance suggests a default dermal contact surface area of 5,700 cm^2 (U.S. EPA 2000). This value is not substantially different from the 5,834 cm^2 suggested by MADEP for construction workers in their "*Draft Commercial/Industrial ShortForm Exposure Scenarios*" (MADEP 1996a). MADEP based this contact surface area on the surface area of the construction workers face, neck, hands, forearms, lower legs, and feet. The actual surface area available for contact with soil, however, may be lower given the industry standard for acceptable work attire during surface and subsurface activities. This is seen in recent MADEP guidance (MADEP 2002c), which reports actual skin surface areas available for contact with soils for "heavy construction/utility workers" is equivalent to 3,477 cm^2. This value is the exposed surface areas of the face, hands, forearms, lower legs, and feet. OCI uses this value in this risk characterization for the evaluation of both construction/utility and maintenance worker receptor exposures.

2.4.2.6 Adherence Factor ("AF"): U.S. EPA (1989, 1991) indicated that very few adherence factors ("AF") are available for soil types and body parts. This is still true. However, U.S. EPA recently released new guidance concerning the use of standardized default exposure assumptions used to estimate dermal exposure (U.S. EPA 2000). This guidance includes AF values for residential adults and children of 0.07 mg/cm^2 and 0.2 mg/cm^2, respectively (U.S. EPA 2000). These AF values stand in stark contrast to the previous U.S. EPA (1989, 1991) and MADEP (1995) default AF values of 0.51 mg/cm^2. Recent MADEP guidance (MADEP 2002c) takes the U.S. EPA methodology for determining an appropriate AF value still further, suggesting AF values for various receptor classes. MADEP (2002c) suggests an AF for "*heavy construction/utility workers*" of 0.29 mg/cm^2. OCI uses this AF values in this risk characterization instead of the previous default AF value of 0.51 mg/cm^2. Similarly, MADEP (2002c) indicates that maintenance workers involved in landscaping and keeping the grounds (i.e., "*Landscaper/Groundskeeper*") have an AF of 0.19. OCI uses this value to evaluate maintenance worker uptake of CoPC from dermal contact with soils. OCI uses this same MADEP guidance to assign adult and child residential receptors AF values of 0.13 and 0.35, respectively (MADEP 2002c).

2.4.2.7 Ingestion Rates ("IR"): Risk characterization guidance indicates that adult residents ingest 50 mg of soil each day (MADEP 1995, U.S. EPA 1989, 1991). MADEP guidance indicates that child residents ingest 100 mg of soil and dust each day during the summer months and from 2 to 31 mg of dust each day during the winter months (MADEP 1994, 1995). In this risk characterization, OCI assumes that child residents ingest 100 mg/day of soil and dust during the summer months and 17 mg/day during the winter months (median amount of dust ingested during this season). Additionally, because a major component of house dust is exfoliated skin cells and hair, OCI adjusts the total amount of CoPC in ingested dust downward by 50 percent to reflect the fraction of house dust that comes from contaminated out door soils and that which comes from exfoliated skin cells. This is a reasonable estimate of the amount of contaminated soil in house dust given published reports that indicate house dust from residences near a highly contaminated smelter site have concentrations of CoPC that are less than one-half (50%)

that of the exterior residential soils (Freeman et al. 1995a). The ingestion rate of homegrown vegetables/produce for residential adult (26 to 30 years of age) and child (1-2 years old) receptors is determined by MADEP (Appendix B; MADEP 1995). MADEP assumes that consumption of homegrown produce occurs only during that portion of the year during which receptors have access to exterior soils (Appendix A; Table 8).

Previous MADEP guidance suggested an enhanced soil consumption rate of 500 mg/day for construction workers and other receptors with high intensity and high frequency contact with soils (MADEP 1995, 1996a). Recent MADEP guidance, however, suggests that construction/utility and maintenance workers only consume 100 mg soil each day (MADEP 2002d). In this risk characterization, OCI uses this later enhanced soil consumption rate (100 mg/day) to evaluate construction/utility and maintenance worker exposure to CoPC in soils.

2.4.2.8 Fractional Intake ("FI"): OCI uses Unit-less fractional intake values to adjust receptor CoPC intake from soils, and homegrown produce. FI values reflect seasonal differences in soil ingestion rates, surface areas available for dermal contact, accessibility of homegrown produce, and availability or airborne dusts for inhalation and ingestion. The FI value is calculated as a dimensionless fraction of the exposure parameter considered. FI values used in this risk characterization are presented in Table 4.15 (Appendix A).

Soil Ingestion:

FI (child) = 0.47: OCI uses this FI to adjust the child soil and dust intake rate to reflect seasonal soil accessibility. Specifically, the fractional intake value considers a 100 mg/day ingestion rate over 153 days (i.e. summer months) and a 17 mg/day ingestion rate over 212 days (i.e., winter months), with only half of this later winter ingestion rate attributed to exterior soil.

FI (child) = ((100 mg/day × 153 d) + (17 mg/day × 212 d) × 0.5) / 365 d) / 100 mg/d.

FI (adult) = 0.42. OCI uses this FI to adjust the adult soil intake to reflect a seasonal soil exposure period of 153 days each year.

FI (adult) = (153 days / 365 days).

FI (construction/utility & maintenance worker) = 1.0. OCI does not adjust construction/utility or maintenance worker exposure via soil ingestion by an FI.

Surface Area Available for Dermal Contact with Soil:

FI (child) = 0.45. OCI uses this FI to adjust dermal intake of residential children to reflect seasonal exposure via the hands, arms, legs, and feet over the summer months, 153 days a year, and exposure via the hands over the winter months, 212 days a year.

FI (child) = (((3,420 cm^2 × 153 days)+(370.4 cm^2 × 212 days)) / 365 days) / 3,420 cm^2.

FI (adult)= 0.42. OCI uses this FI to adjust dermal intake of the residential adult to reflect exposure via the hands, forearms, lower legs and feet over the summer months, 153 days each year.

FI (adult) = 153 days) / 365 days

FI (construction/utility & maintenance worker) = 1.0. OCI does not adjust construction/utility or maintenance worker dermal exposure by an FI.

Inhalation of Dusts (Residential Receptors):

FI = 0.35. OCI uses this FI to adjust both residential child and adult inhalation intake estimates. This FI reflects seasonal exposure to dusts and fractional contribution of source soils to household dusts. During the summer, OCI assumes that site soils contribute half of the total of inhaled dusts (i.e., half of all inhaled dusts come from the site). During winter months, however, OCI assumes that one quarter (¼) of all interior dusts come from contaminated soils at the site, half of all exterior dusts coming from the site and half of all interior dust comes from an non-contaminated source (i.e., half of interior dusts are exfoliated skin cells).

FI = 0.5 × (153 days + (212 days × 0.5 fraction contaminated soil in dust)) / 365 days

OCI does not adjust the FI to reflect differences in airborne particulate ability to enter into a residence. Generally, airborne particulates smaller than 2.5 microns ("$PM_{2.5}$") have no difficulty entering interior spaces (Ozkaynak and Spengler 1996). In contrast, the doors and windows in typical homes offer some resistance to the entry of larger particles (e.g., PM_5 to PM_{10}).

Inhalation of Dusts (Worker Receptors):

MADEP guidance (MADEP 2002b) estimates effective exposure concentrations based on PM_{10}. These concentrations reflect exposure to particulates through the accidental ingestion of inhaled particulates and inhalation of particulates into the lungs. The effective exposure concentration of respirable airborne particulates for accidental ingestion is equivalent to 2 times the concentration of PM_{10}, while that for the lungs is 0.5 times the PM_{10}. The FI above adjusts these exposures to reflect the relative abundance of contaminated soil in respirable dusts and the seasonal availability of soils contributing to airborne particulate.

$FI_{INHALATION}$ (construction/utility & maintenance worker) = 0.5. OCI uses this FI to adjust the construction worker's airborne particulate lung intake to reflect the MADEP assumption that only half of the particulate concentration in air is absorbed through the lungs (MADEP 2002b).

$FI_{INGESTION}$ (construction/utility & maintenance worker) = 2.0. OCI uses this FI to adjust the construction worker's airborne particulate gastrointestinal intake to reflect the MADEP assumption that 2 times the particulate concentration in air, swallowed after inhalation (MADEP 2002b).

2.4.2.9 Particulate Emission Factor ("PEF"): For the adult and child resident, OCI uses the MADEP (1995) open field MADEP default particulate emission factor ("PEF") of 32 ug/m^3 in the evaluation of inhalation exposure to airborne soil particulate. For the construction/utility and maintenance worker, OCI uses the construction site MADEP default particulate emission factor ("PEF") of 60 ug/m^3 (MADEP 1995, 1996a).

2.4.2.10 Averaging Time ("AT"): OCI uses the averaging time ("ATn") to determine an average daily dose ("ADD") for non-carcinogenic CoPC; equivalent to the exposure duration ("ED") in days (MADEP 1995, U.S. EPA 1989, 1991, 1996, 1997). The averaging time ("ATc"), used to determine the lifetime average daily dose ("LADD") for the evaluation of carcinogenic CoPC, is equivalent to 75 years or 27,375 days, which is the average life span of humans (MADEP 1995, U.S. EPA 1996, 1997).

2.4.3 Exposure Points

Exposure points are physical locations where exposure to potential receptors is evaluated (MADEP 1995, U.S. EPA 1989). Exposure points for current and potential future residential receptors include surface soils in children's outdoor play areas, soils used in vegetable and flower gardens, yards, dusts inside the home and interior air spaces within the home (i.e., living spaces). Exposure points for construction/utility workers include soils to a depth of 15 ft bgs. Exposure points for maintenance workers are limited to surface soils in landscaped areas of the site.

2.4.4 Exposure Media

Exposure media refer to the variety of contaminated environmental material with which receptors may come into contact (MADEP 1995, U.S. EPA 1989). Exposure media to which residential receptors may have contact include site soils, vegetables/produce grown in site soils and airborne particulate. Exposure media to which construction/utility workers are exposed include soils (including airborne particulate). Exposure media to which maintenance workers are exposed is limited to soils and airborne soil particulate.

2.4.5 Exposure Point Concentrations

OCI provides chemical- and media-specific exposure point concentrations ("EPC") in Table 7 (Appendix A). These EPC are determined from the available analytical data in Table 1 (Appendix A).

For residential receptors, OCI calculates EPC in homegrown vegetables, airborne soil particulate, and soils from the average CoPC concentration in soil, except where a CoPC is identified as having a hotspot soil concentration. EPC in homegrown produce is determined using guidance, age-specific vegetable consumption information, and methodology provided in MADEP guidance (Appendix B; MADEP 1995). OCI estimated a residential EPC for airborne soil particulate as the product of particulate emission factor ("PEF"), an appropriate conversion factor, and the soil EPC for individual CoPC in soil (Appendix A; Table 7). Because residential and worker receptors receive exposure in different environments with different MADEP PEF values, OCI calculated two different airborne particulate EPC. One EPC is for evaluating residential receptor exposure, while the other is for use in evaluating construction/utility and maintenance worker exposure. For residential receptors, OCI used MADEP (1995) default PEF for an open field (32 $\mu g/m^3$) for estimating exposure to airborne particulate EPC.

For construction/utility and maintenance workers, OCI calculated the EPC for CoPC in soil as the mean of all soil analytical data, except where a CoPC is identified as having a hotspot soil concentration. OCI calculated the EPC for CoPC in airborne particulates as the product of the soil EPC, the default PEF for a construction site (60 $\mu g/m^3$), and an appropriate unit conversion factor. OCI describes the derivation of each EPC in detail in the following sections.

2.4.5.1 EPC in Soil

Analytical soil results (Appendix A; Table 1) include data from soil samples obtained from between 0 to 8 feet ("ft") in depth below the ground surface ("bgs") from 27 soil borings. OCI used the mean of soil CoPC concentration data as the EPC (Table 7; Appendix A). The mean of soil analytical data is calculated as the mean of both detected and one-half (½) the MDL for non-detected soil CoPC concentrations. OCI only calculated EPC for CoPC with at least one detection above their respective MDL in site soils.

OCI did not identify any CoPC as having a "hot spot" soil concentration under the MCP [310 CMR 40.0924(2)] (MADEP 1995). Where identified, OCI must evaluate hot spots as additional, individual exposure points within the risk characterization. Hot spots are relatively small areas with relatively high contaminant concentrations. The MCP defines a hot spot by the concentration of the individual CoPC in relation to its spatial distribution. Specifically, a "hot spot" is where the CoPC concentration is greater than ten times the concentration of the surrounding area. This is always true unless there is evidence that the area of higher concentration is not associated with a greater exposure potential <u>and</u> a site-specific evaluation indicates that the area of higher contamination should not be considered a hot spot (MADEP 1995). In any case, a soil area with a CoPC concentration that is 100-fold greater than the surrounding area is always considered a "hot spot," while a CoPC concentration less than MADEP's Method 1 S-1 Soil Standard should never be considered a hot spot.

Consistent with the MCP, OCI defines a hot spot simply as the ratio of the maximum concentration at a sampling location and arithmetic mean concentration of the same CoPC in all site soils. OCI defined ratios exceeding ten (10) as having a hot spot concentration in soil. OCI describes these CoPC-specific hot spot ratios ("HSR") within Table 1 (Appendix A). Using this approach, OCI did not identify any CoPC as having a hot spot ratio.

2.4.5.2 EPC in Groundwater

According to RCA, groundwater samples collected from three newly installed groundwater monitoring wells (i.e., MW-1, MW-2, and MW-3; sampled in December, 2003), failed to detect significant concentrations of CoPC in groundwater (RCA 2003). Consequently, OCI did not evaluate the ingestion and/or use of groundwater in this risk characterization.

2.4.5.3 EPC in Air

OCI estimated inhalation exposure of various receptors to CoPC in airborne particulate from disturbed soils.

2.4.5.3.1 EPC in Outdoor Air Particulate

OCI estimates EPC for airborne particulates as the product of the MADEP default respirable particulate emission factor ("PEF"), a unit conversion factor, and the EPC for CoPC in soil. Use of MADEP's default open field and construction site PEF value (32 and 60 ug/m^3, respectively) assume that the contaminant concentration in the respirable airborne particulate fraction is equivalent to the contaminant concentration in soil (i.e., that airborne particulate and soil contain the same amount of each CoPC).

OCI accepts without question MADEP default conditions relating to truck traffic, vegetative cover, wind speed, and soil composition/type used to derive default PEF values. Realistically, maintenance workers involved in landscaping activities at the site over a 27-year employment period are unlikely to have exposure to this high level of particulate in out door air, 8-hours of every work day.

2.4.6 Quantification of Exposure

OCI determined quantitative exposure estimates in accordance with the MCP (MADEP 1995, 2002b) and where applicable, U.S. EPA (1989, 1991, 1992b, 1996, 1997, 2000, 2004a,b) guidance.

2.4.6.1 Calculation of an Average and Lifetime Average Daily Dose

OCI calculates quantitative estimates of exposure using the equations provided in MADEP (1994, 1995, 1996a, 2002b) and U.S. EPA guidance (1989, 1991, 1992b, 1996a,

1997, 2000, 2004a,b). OCI provides exposure parameters used in the calculation of quantitative exposure estimates for each individual exposure pathway in Tables 3 and 4. OCI estimated exposure to soils and sediments separately using the same equations, but with different exposure parameters. In accordance with applicable risk assessment guidance and consistent with the approach used within the attached risk characterization spreadsheets, quantitative estimates of the Average Daily Dose ("ADD") for non-carcinogens and Lifetime Average Daily Dose ("LADD") for carcinogens are calculated using the following equations and parameters:

Ingestion of Soil:

Equation 2

$$\text{ADD (mg/kg-day)} = \frac{C_S \times RAF \times IR \times FI \times EF \times ED \times CF}{BW \times AT}$$

Ingestion of Homegrown Vegetables:

Equation 3

$$\text{ADD (mg/kg-day)} = \frac{C_F \times RAF \times IR \times FI \times EF \times ED \times CF}{BW \times AT}$$

Intake of CoPC in homegrown vegetables is estimated as per MADEP guidance (Appendix B; MADEP 1995). The ingestion of homegrown produce relies on MADEP estimates of the proportion of homegrown vegetables consumed, and the relative accumulation (i.e., uptake) of CoPC by plants to determine the intake of CoPC from homegrown vegetables. The RAF for the absorption of CoPC from food is 1, or nearly 1, for all CoPC, except those for which RAIS provides a gastrointestinal absorption factor. Consideration of metabolic detoxification of CoPC in first pass metabolism might reasonably result in lower CoPC-specific RAF to the target organ where the CoPC has its toxic effect. Regardless, no further adjustment for bioavailability from food is made in this risk characterization.

Dermal Contact with Soil:

Equation 4

$$\text{ADD (mg/kg-day)} = \frac{C_S \times ABS \times SA \times AF \times EF \times ED \times CF}{BW \times AT}$$

Inhalation and Ingestion of Inhaled Airborne Particulate:

Equation 5

$$ADD_{INHALED}\ \text{(mg/kg-day)} = \frac{C_S \times 0.5 \times PEF \times VR \times P \times EF \times ED \times CF}{BW \times AT}$$

Equation 6

$$ADD_{INGESTED}\ \text{(mg/kg-day)} = \frac{C_S \times 2 \times PEF \times VR \times P \times EF \times ED \times CF}{BW \times AT}$$

The ADD and LADD (not shown) are calculated similarly, but utilize different exposure parameters relating to the averaging time over which the health effect is expected to occur. The ADD or LADD for each equation above was calculated in two parts. A chemical independent uptake ("CIU") was first calculated using all of the non-chemical-specific exposure factors (Appendix A; Tables 6). OCI then used the CIU to calculate a chemical-specific ADD for each exposure profile and receptor evaluated using chemical- and pathway-specific parameters (Appendix A; Tables 9 through 25). Specific exposure parameter values used in each equation for each exposure profile evaluated are presented in Tables 3 and 4 (Appendix A).

The calculation of a CIU allows for a streamlined quantification of exposure and risk for each receptor class (i.e., residential child or adult, construction/utility, and maintenance workers), media, and exposure pathway (i.e., ingestion, dermal contact, and inhalation). In order of preference, OCI determined relative absorption factors ("RAF") for CoPC using MADEP and U.S. EPA CoPC-specific information, the online Risk Assessment Information System ("RAIS") (RAIS 2004), and default RAF determined as per MADEP guidance (MADEP 1995; Appendix B). These values are presented in Table 6 (Appendix A) and used to adjust route-specific intake estimates of CoPC in various media. In Tables 9 through 25 (Appendix A), OCI provides detail in the calculation of CoPC-specific non-cancer and cancer risk for each compound, receptor, and completed exposure pathway.

OCI determines a CIU for dermal exposure using guidance from U.S. EPA (1989, 1992, 2000) and MADEP (2002c). OCI used newly developed and conservative adherence factors and skin surface areas available for contact with soil for the various receptor classes within this risk characterization. OCI calculated the intake through inhalation of dusts using revised MADEP guidance (MADEP 2002b), which considers the inhalation of volatiles and the inhalation and ingestion of inhaled particulate.

2.5 Risk Characterization

The final step in the process, risk characterization integrates hazard identification, dose-response assessment, and exposure assessment information to quantify the potential carcinogenic and non-carcinogenic human health risk at the site. OCI provides quantified risk estimates for each receptor class, exposure pathway, and receptor in Tables 9 through 25 (Appendix A). OCI provides a summary of risks posed by CoPC in Table 26 and summarizes risk for each exposure pathway in Table 27.

2.5.1 Cancer Risk

The overall excess lifetime cancer risk ("ELCR") to residential receptors (sum of adult and child carcinogenic risks; 2×10^{-6}) is below 1×10^{-5} the MADEP target carcinogenic risk (MADEP 1995). Separately, residential adults had an ELCR of 9×10^{-7}, while

residential children had an ELCR of 1×10^{-6}. Exposure pathways contributing most to the ELCR for residential adults (Appendix A; Table 27) include the incidental ingestion of soil (70%), ingestion of homegrown produce (23%), dermal contact with soils (2%), and the inhalation of airborne particulate (4%). The CoPC contributing most to the ELCR of residential adults is arsenic (99%), with the remaining risk coming from cadmium (1%). No other CoPC accounts for more than 1% of the remaining ELCR (Appendix A; Table 26).

In order, the exposure pathways contributing most to the ELCR for residential children (Appendix A; Table 27) include the incidental ingestion of soil (92%), the ingestion of homegrown produce (6%), dermal contact with soils (2%), and the inhalation of airborne particulate (1%). Arsenic contributes most all of the ELCR for residential children (100%). No other CoPC accounts for more than 1% of the remaining ELCR (Appendix A; Table 26).

The overall ELCR to construction/utility workers is less than 3×10^{-8} (Appendix A; Table 27). This is also below the MADEP target carcinogenic risk of 1×10^{-5} (MADEP 1995). The exposure pathways contributing most to the construction/utility worker ELCR is incidental ingestion of soil (83%), the inhalation of airborne particulate (14%), dermal contact with soils (2%), and ingestion of inhaled airborne particulate (1%). In order, the CoPC contributing most to the ELCR of construction/utility workers is arsenic (95%) and cadmium (54%). No other CoPC accounts for more than 1% of the remaining ELCR (Appendix A; Table 26).

The overall ELCR to maintenance workers is approximately 1×10^{-6} (Appendix A; Table 27). This is also below the MADEP target carcinogenic risk of 1×10^{-5} (MADEP 1995). The exposure pathways contributing most to the maintenance worker ELCR include the incidental ingestion of soil (72%), inhalation of airborne particulate (23%), dermal contact with soil (2%), and ingestion of inhaled airborne particulate (2%). The compounds contributing the majority of the ELCR to maintenance workers include arsenic (92%) and cadmium (8%). No other CoPC accounts for more than 1% of the remaining ELCR (Appendix A; Table 26).

Overall, the risk characterization demonstrates that "No Significant Excess Lifetime Cancer Risk" exists at the site, without restriction.

2.5.2 Non-Cancer Risk

The overall non-cancer hazard index ("HI") for the potential future adult and child residents is 2×10^{-1} and 1, respectively. These HI meet the MADEP target HI of 1 (MADEP 1995). The exposure pathways contributing to adult resident HI includes dermal contact with soil (83%),and the incidental ingestion of soils (17%), (Appendix A; Table 27). CoPC contributing most to the adult HI are lead (95%), and the C_{11}-C_{22} aromatic fraction of EPH (3%) (Appendix A; Table 26). No other CoPC accounts for more than 1% of the remaining HI (Appendix A; Table 26).

Exposure pathways contributing most to child resident HI include dermal contact with soil (73%) and the incidental ingestion of soil (26%) (Appendix A; Table 27). CoPC contributing most to the child HI are lead (95%), and the C_{11}-C_{22} aromatic fraction of EPH (3%) (Appendix A; Table 26). No other CoPC account for more than 1% of the remaining HI (Appendix A; Table 26).

The overall HI to construction/utility workers is approximately 2×10^{-2} (Appendix A; Table 27). This is below the MADEP target HI of 1 (MADEP 1995). The two exposure pathways contributing most to the HI for construction/utility workers include dermal contact with soil (77%) and the incidental ingestion of soil (22%). (Appendix A, Table 26). The two CoPC contributing most to construction/utility worker HI is lead (95%) and the C_{11}-C_{22} aromatic fraction of EPH (3%) (Appendix A; Table 26). No other CoPC accounts for more than 1% of the remaining HI (Appendix A; Table 26).

The overall HI to maintenance workers is less than 2×10^{-1} (Appendix A; Table 27). This is also below the MADEP target HI of 1 (MADEP 1995). Most of this HI comes from dermal contact with soil (81%), with the remaining risk coming from incidental ingestion of soil (18%), ingestion of inhaled particulate (1%), and inhalation of airborne particulate (1%). The two CoPC contributing most to maintenance worker HI are lead (95%) and the C_{11}-C_{22} aromatic fraction of EPH (3%) (Appendix A; Table 26). No other CoPC accounts for more than 1% of the remaining HI (Appendix A; Table 26).

This risk characterization demonstrates that there is “No Significant Non-Cancer Risk” associated with exposure CoPC in site soils, without restriction. Overall, this risk characterization demonstrates that a condition of “No Significant Risk” exists at the site, now and into the foreseeable future, without restriction.

2.6 Applicable or Suitably Analogous Public Health Standards

No Applicable or Suitably Analogous Public Health Standards ("ASAPHS") were identified for comparison with soil EPC at the site.

2.7 Uncertainty Analysis

OCI performed this baseline risk characterization in accordance with the MCP [310 CMR 40.0900-40.0960] and risk assessment guidance provided by the MADEP (MADEP 1994, 1995, 1996a,b, 1999, 2002b,c,d,f) and the U.S. EPA (U.S. EPA 1989, 1991, 1992a,b, 1993, 1996, 1997, 2000, 2002a,b). Exclusive use of conservative MADEP and U.S. EPA default exposure factors ensures that this risk characterization provides a conservative estimate of site-related human health risks. The use of additional site- and chemical-specific information would likely reduce the magnitude of the human health risk estimated for receptors using this site.

Three areas of uncertainty in risk characterization are media concentrations, exposure assumptions, and toxicity factors. Media concentrations were assessed by a certified

laboratory using existing guidance, appropriate analytical protocols, and reported using appropriate quality assurance and quality control measures. Although such measures cannot guarantee good quality data, there is no reason to believe that data accuracy, bias, and veracity are suspect.

OCI used default exposure assumptions, guidance, and toxicity values provided by MADEP and U.S. EPA in the conduct of this risk characterization. Each provides an additional layer of conservatism to the characterization of health risk. U.S. EPA alone stipulates that the toxicity values likely over estimate toxicity by an order of magnitude. The use of uncertainty factors ("UF") totaling several orders of magnitude in the derivation of RfD may increase their conservative nature by the same amount. U.S. EPA indicates that CSF values also over estimate cancer potency for compounds that may have no cancer causing potential at all. This conservatism is a part of this risk characterization.

OCI also used the newly proposed and conservative non-cancer toxicity values for VPH and EPH fractions. These proposed toxicity values are in most cases more conservative than those currently adopted by MADEP and those proposed by the TPH Work Group (MADEP 2002e). Use of MADEP and U.S. EPA default exposure parameters, conservative approximation methods, and toxicity values likely over states risk and minimizes the potential of this risk characterization to under estimate health risk posed by site-related contamination.

2.7 Conclusion

This baseline risk characterization demonstrates that a condition of "No Significant Risk" of harm to human health exists at the site now and into the foreseeable future, without restriction.

3.0 RISK TO PUBLIC WELFARE

OCI performed a MCP Method 3 characterization of the risk to public welfare as described in MADEP guidance (MADEP 1995). OCI considered the following factors in the characterization of public health risk:

- Site, receptor, and exposure information;
- Existence of nuisance conditions;
- Loss of property value;
- Unilateral restriction of another's property use;
- Monetary or non-physical costs which may accrue from the degradation of the public or private resources due to material release; and
- Comparison of contaminant concentrations to upper concentration limit ("UCL") values listed in the MCP [310 CMR 40.0996].

No nuisance conditions were identified at the site as a result of a release or threat of release of hazardous materials to the subject site. Ambient and indoor air is currently and will, in the reasonably foreseeable future, remain free from persistent and noxious odors. Because site groundwater may not be used for drinking water purposes (i.e., GW-2 and GW-3, but not GW-1), it can be considered inaccessible. Therefore, there is no accessible drinking water from which to evaluate site-related noxious tastes and odors. There are no apparent nuisance conditions, impact to livestock, loss of property value, unilateral restriction of property use, or any monetary or nonphysical costs associated with historical contaminant release at the site. No EPC exceeds the relevant upper concentration limits (“UCL”) in soil. There is no information to suggest that any community near the site experiences any adverse impacts to public welfare resulting from the subject hazardous material release. Therefore, this risk characterization finds that a condition of "No Significant Risk" to public welfare exists at the site now and in the foreseeable future without restriction.

4.0 RISK TO SAFETY

As required under Subpart I of the MCP [310 CMR 40.0941(2)] a qualitative characterization of risk to safety was conducted for the site. The purpose of evaluating the risk of harm to safety is to identify conditions, which have resulted or may result in a release of oil and/or hazardous material currently or in the foreseeable future that will pose a threat of physical harm of bodily injury to people.

The risk to safety relies on the characterization of hazardous material flammability and ignitability, corrosivity, reactivity, and infectious materials related to the release of hazardous materials at the site. Site contaminants are not present in sufficient concentrations to present a significant risk for flammability and ignitability, corrosivity, and reactivity. Furthermore, OCI does not consider contaminants identified at the site as “infectious” materials. Based on these considerations, there exists a condition of "No Significant Risk" to safety now and into the foreseeable future.

5.0 RISK TO THE ENVIRONMENT

OCI conducted a MCP Method 3 environmental risk characterization in a manner consistent with MADEP Guidance (MADEP 1995, 1996b). In such a characterization, the MCP stipulates that the risk of harm to biota and habitats shall be characterized by evaluating ecological parameters using a two-stage approach. The objective of Stage I is to identify and document whether conditions warrant a Stage II risk characterization, either because of significant exposure pathways or because environmental harm is readily apparent. If required, additional assessment takes the form of a Stage II risk characterization, which focuses on an assessment of the potential ecological effects of site contaminants.

The initial task in the Stage I characterization of environmental risks is to identify exposure pathways through which CoPC may migrate to sensitive habitat or receptors. A

secondary task in a Stage I characterization of environmental risks is to identify any readily apparent harm to the environment. A third task in a Stage I characterization of environmental risks is to identify site conditions that exceed, or may exceed effects-based screening criteria. With the exception of cadmium, CoPC detected in groundwater do not exceed their applicable GW-3 standards. Regarding the concentration of cadmium detected in groundwater from MW-1 (12 ug/L), its migration in groundwater appears to be limited to the location of that monitoring well since it is not detected in MW-2 (MDL = 5 ug/L). Finally, it is unlikely that a significant concentration of cadmium in groundwater from MW-1 will migrate more than 1 mile and discharge into the Charles River. Therefore, OCI concludes that there is no potential for CoPC at the site to migrate to or impact nearby surface waters or any area of environmental concern. Therefore OCI concludes that there is “No Significant Risk” of harm to environmental health and there is no need to perform a Stage II characterization of environmental risk.

6.0 CONCLUSIONS

This MCP Method 3 baseline risk characterization of the risk of harm to human health, safety, public welfare, and the environment finds that a condition of "No Significant Risk” exists at the site now and will exist in the foreseeable future, without restriction.

7.0 REFERENCES

ATSDR. 1992. Toxicological Profile for Lead. PB 93182475. Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services. Springfield, VA.

Freeman G.B., R.A. Schoof, M.V. Ruby, A.O. Davis, J.A. Dill, S.C. Liao, C.A. Lapin, and P.D. Bergstrom. 1995. Bioavailability of Arsenic in Soil and House Dusts Impacted by Smelter Activities Following Oral Administration in Cynomolgus Monkeys. *Fund. Appl. Toxicol*. 28:215-222.

MADEP. 1994. Background Documentation for the Development of the MCP Numerical Standards. Massachusetts Department of Environmental Protection. Bureau of Waste Site Cleanup and Office of Research and Standards.

MADEP. 1995. Guidance for disposal site risk characterization. Interim Final Policy, WSC/ORS-95-141. Massachusetts Department of Environmental Protection, Boston, MA.

MADEP. 1996a. DRAFT Commercial/Industrial ShortForm Exposure Scenarios, Human Exposures at Industrial/Commercial Properties. Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup.

MADEP. 1996b. Environmental Risk Characterization Guidance, Chapter 9 of the Guidance for Disposal Site Risk Characterization. Available Online at: http://www.state.ma.us/dep/ors/orspubs.htm.

MADEP. 1999. Summer 1999, Changes to the MCP Risk Characterization Regulations. Available Online at: http://www.magnet.state.ma.us/dep/bwsc/files/risk899.html.

MADEP. 2002a. Anthropogenic Background Levels of Polycyclic Aromatic Hydrocarbons and Metals in Soil. Updates: Section 2.3 Guidance for Disposal Site Risk Characterization – In Support of the Massachusetts Contingency Plan (1992). DRAFT technical update. Massachusetts Department of Environmental Protection, Office of Research & Standards. February.

MADEP. 2002b. Characterization of Risks Due to Inhalation of Particulates by Construction Workers. Updates: Section 7.3 and Appendix A of the MA DEP Guidance for Disposal Site Risk Characterization – In Support of the Massachusetts Contingency Plan (1995a). DRAFT technical update. Massachusetts Department of Environmental Protection, Office of Research & Standards. February.

MADEP. 2002c. Weighted Skin-Soil Adherence Factors. Updates: Appendix A of Guidance for Disposal Site Risk Characterization – In Support of the Massachusetts Contingency Plan (1995a). DRAFT technical update. Massachusetts Department of Environmental Protection, Office of Research & Standards. February.

MADEP. 2002d. Calculation of an Enhanced Soil Ingestion Rate. Updates: Appendix A of Guidance for Disposal Site Risk Characterization – In Support of the Massachusetts Contingency Plan (1995a). DRAFT technical update. Massachusetts Department of Environmental Protection, Office of Research & Standards. February.

MADEP. 2002e. DRAFT Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology. Prepared for: Bureau of Waste Site Cleanup, Prepared by: Office of Research and Standards, Massachusetts Department of Environmental Protection. May 2002.

MADEP. 2002f. Characterizing Risks posed by Petroleum Contaminated Sites: Implementation of the MADEP VPH/EPH Approach. FINAL POLICY. Massachusetts Department of Environmental Protection. Bureau of Waste Site Cleanup. October 31, 2002.

Ozkaynak H., and J. Spengler. 1996. The Role of Outdoor Particulate Matter in Assessing Total Human Exposure. Chapter 4. In; Particles in Our Air. Eds. R. Wilson and J. Spengler. Harvard University Press. Pp. 64-84.

RAIS. 2004. Toxicity and Chemical Specific Factors, Risk Assessment Information System. Oak Ridge National Laboratory (ORNL), a U.S. Department of Energy multi-program laboratory managed by Lockheed Martin Energy Research (LMER) Corporation in Oak Ridge, Tennessee. Available Online at: http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=nrad.

RCA. 2003. "*ASTM Phase I & II Environmental Site Assessment Report, 27 Village Street, Somerville, Massachusetts*," Resource Control Associates Inc.. dated December 19, 2003

TRW. 1999. Memorandum dated April 7, 1999. Subject: Use of the TRW Interim Adult Lead Methodology in Risk Assessment. Addressed to: Mark Maddaloni, Chair, TRW Adult Lead Subgroup, From: Pat Van Leeuwen, Region 5 Superfund Program and Paul White, ORD/NCEA.

U.S. EPA. 1989. Risk assessment guidance for Superfund: Volume I – Human health evaluation manual (Part A). EPA 540/1-89/002. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington DC.

U.S. EPA. 1991. OSWER Directive 9285.6-03. Memorandum: Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors" From: Timothy Fields, Jr. Acting Director, Office of Emergency and Remedial Response. and Bruce Diamond, Director, Office of Waste Programs Enforcement. To: Director, Waste Management Division, Regions I, IV, V, & VII; Director, Emergency & Remedial Response Division, Region II; Director, Hazardous Waste Management Division, Regions III, VI, VIII, & IX; Director, Hazardous Waste Division, Region X.

U.S. EPA. 1992a. Guidance for Data Useability in Risk Assessment (Part A), Final. Publication 9285.7-09A, PB92-963356, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC., April.

U.S. EPA. 1992b. Dermal Exposure Assessment: Principles and Applications. Interim Report. EPA/600/8-91/011B, U.S. Environmental Protection Agency, Office of Research and Development, Washington, D.C.

U.S. EPA. 1993. Provisional guidance for quantitative risk assessment of polycyclic aromatic hydrocarbons. PB94-116571. EPA/600/R-93/089. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC.

U.S. EPA. 1994a. Technical Support Document: Parameters and Equations Used in Integrated Exposure Uptake Biokinetic Model for Lead in Children (v 0.99d). PB94-963505, EPA/540/R-94/040. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC.

U.S. EPA. 1994b. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. PB93-963510. EPA/540/R-93/081. U.S. Environmental Protection Agency, Office of Emergency Response, Washington, DC.

U.S. EPA. 1996. Appendix A, Exposure Factors Handbook. Volumes I - III. SAB Review Draft. EPA/600/P-95/002Ba. U.S. Environmental Protection Agency, National Center for Environmental Assessment, Office of Research and Development, Washington, DC.

U.S. EPA. 1997. Exposure Factors Handbook. Volumes I, II, and III. SAB Review Draft. EPA/600/P-95/002Ba. U.S. Environmental Protection Agency, National Center for Environmental Assessment, Office of Research and Development, Washington, DC.

U.S. EPA. 2000. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance Dermal Risk Assessment, Interim Guidance.* EPA/540/R-99/005. Office of Solid Waste and Emergency Response, Washington, D.C. PB99-963312.

U.S. EPA 2004a. Assessing Dermal Exposure from Soil. Region III, Technical Guidance Manual Risk Assessment. EPA/903-K-95-003. U.S. Environmental Protection Agency, Region III. Office of Superfund Programs, Philadelphia, PA.

U.S. EPA. 2004b. Volatile Organic Compounds, Assessing Dermal Contact with Soil; Existing Guidance. Risk Assessment Technical Guidance Manual, Region 3: Mid-Atlantic Region, Hazardous Site Cleanup Division. U.S. Environmental Protection Agency. Available Online at: http://www.epa.gov/reg3hwmd/risk/solabsg2.htm

U.S. EPA. 2004c. Risk-based concentration table, June-December 1999. Online at: http://www.epa.gov/reg3hwmd/risk/riskmenu.html. U.S. Environmental Protection Agency, Region III, Philadelphia, PA.

U.S. EPA. 2004d. Integrated Risk Information System (IRIS), Online at: http://www.epa.gov/ngispgm3/iris/index.html. U.S. Environmental Protection Agency, National Center for Environmental Assessment, Cincinnati, OH.

U.S. EPA 2004c. Phys-Chem. Data, Preliminary Remediation Goals. U.S. Environmental Protection Agency. Region IX, Waste Programs. Available Online at: http://www.epa.gov/region09/waste/sfund/prg/index.htm

APPENDIX A – RISK CHARACTERIZATION TABLES

List of Tables in Appendix A

Table 1. Soil Laboratory Analytical Results
Table 2. Compounds of Potential Concern Identified in Soil
Table 3. Receptor Exposure Profiles
Table 4. Quantitative Exposure Estimates
- Table 4.1. Incidental Soil Ingestion – Adult Resident
- Table 4.2. Inhalation & Ingestion of Dust – Adult Resident
- Table 4.3. Dermal Contact with Soil – Adult Resident
- Table 4.4. Ingestion of Homegrown Produce – Adult Resident
- Table 4.5. Incidental Soil Ingestion – Child Resident
- Table 4.6. Inhalation & Ingestion of Dust – Child Resident
- Table 4.7. Dermal Contact with Soil – Child Resident
- Table 4.8. Ingestion of Homegrown Produce – Child Resident
- Table 4.9. Incidental Soil Ingestion – Construction/Utility Worker
- Table 4.10. Inhalation & Ingestion of Dust – Construction/Utility Worker
- Table 4.11. Dermal Contact with Soil – Construction/Utility Worker
- Table 4.12. Inhalation & Ingestion of Dust – Maintenance Worker
- Table 4.13. Incidental Soil Ingestion – Maintenance Worker
- Table 4.14. Dermal Contact with Soil – Maintenance Worker
- Table 4.15. Residential Scenario FIs.

Table 5. CoPC Toxicity Values
Table 6. Chemical-Specific Relative Absorption Factors & Table 6. RAF References
Table 7. Exposure Point Concentrations
Table 8. Ingestion of Homegrown Produce
Table 9. Incidental Ingestion of Soil – Adult Resident
Table 10. Dermal Contact with Soil – Adult Resident
Table 11. Inhalation & Ingestion of Dusts – Adult Resident (Inhalation)
Table 12. Inhalation & Ingestion of Dusts – Adult Resident (Ingestion)
Table 13. Incidental Ingestion of Soil – Child Resident
Table 14. Dermal Contact with Soil – Child Resident
Table 15. Inhalation & Ingestion of Dusts – Child Resident (Inhalation)
Table 16. Inhalation & Ingestion of Dusts – Child Resident (Ingestion)
Table 17. Ingestion of Contaminates in Homegrown Produce – Adult and Child Resident
Table 18. Incidental Ingestion of Soil – Construction/Utility Worker
Table 19. Dermal Contact with Soil – Construction/Utility Worker
Table 20. Inhalation& Ingestion of Dusts – Construction/Utility Worker (Inhalation)
Table 21. Inhalation& Ingestion of Dusts – Construction/Utility Worker (Ingestion)
Table 22. Incidental Ingestion of Soil – Maintenance Worker
Table 23. Dermal Contact with Soil – Maintenance Worker
Table 24. Inhalation& Ingestion of Dusts – Maintenance Worker (Inhalation)
Table 25. Inhalation& Ingestion of Dusts – Maintenance Worker (Ingestion)
Table 26. Summary of Chemical-Specific Upper-Bound Excess Lifetime Carcinogenic Risks and Noncarcinogenic Hazard Indices for Each Receptor Scenario
Table 27. Summary of Upper-Bound Excess Lifetime Carcinogenic Risks and Noncarcinogenic Hazard Indices for Each Pathway and Scenario

TABLE 1: SOIL ANALYTICAL RESULTS

Sample Identification	MW-1	MW-2	SB-2	SB-3	SB-4	SB-5	SB-5	SB-6	SB-6	SB-7	SB-7	SB-8	SB-9	SB-10	SB-11
Depth Sampled (feet)	1-2	1-2	1-2	3-4	1-2	1-2	7-8	1-2	7-8	1-2	5-6	7-8	7-8	1-2	0-1
Date Sampled			12/1/2003			1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004
Total Petroleum Hydrocarbons (mg/kg)															
Total Petroleum Hydrocarbons	470	70	190	NA	2,600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide (mg/kg)															
Cyanide	NA	NA	0.65	0.55	0.50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organic Compounds (mg/kg)															
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA	NA	NA	0.29	NA	1.45
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Benzo[a]anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Benzo[a]pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Benzo[b]fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Benzo[g,h,I]perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Benzo[k]fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Dibenzo[a,h]anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Ideno[1,2,3-c,d]pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	3.8	NA	NA	NA	NA	0.29	NA	30
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA
EPH (mg/kg)															
C_9-C_{18} Aliphatic Hydrocarbons	NA	NA	NA	NA	NA	NA	NA	82	NA	NA	NA	NA	17.5	NA	90
C_{19}-C_{36} Aliphatic Hydrocarbons	NA	NA	NA	NA	NA	NA	NA	270	NA	NA	NA	NA	17.5	NA	360
C_{11}-C_{22} Aromatic Hydrocarbons	NA	NA	NA	NA	NA	NA	NA	210	NA	NA	NA	NA	17.5	NA	480
Volatile Organic Compounds (mg/kg)															
Naphthalene	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA	NA	NA	0.29	NA	1.45
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	0.29	NA	NA	NA	NA	0.29	NA	1.45
Metals (mg/kg)															
Aluminum	NA	NA	NA	5,100	4,500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	81	3.3	7.7	8.0	8.3	NA	NA	12	0.75	NA	NA	NA	NA	NA	10
Barium	40	12	69	40	220	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	26	0.3	25	20	4.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	6	6	6.5	18	24	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	280	33	2,200	240	1,600	380	6	NA	NA	570	36	6	19	76	NA
Magnesium	NA	NA	NA	1,300	1,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	0.22	0.020	0.09	0.39	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	6	230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	12	12	12.5	12	10.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	3	3	3.15	3	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	2,100	3,000	NA	NA	NA	NA	NA	NA	NA	160	NA	NA

NOTES:

mg/kg = milligrams per kilogram (parts per million).

NA= Not analyzed.

NS = No standard.

Soil samples from MW-1 and MW-2 were analyzed for volatile organic compounds using EPA method 8260B. Reported concentrations were below method detection limitsand MCP Reportable Concentration for RCS-1.

BOLD = Exceeds MCP Method 1 S-1 GW-2/GW-3 Soil Standards.

TABLE 1: SOIL ANALYTICAL RESULTS

Sample Ide	SB-11	SB-12	SB-13	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19	SB-20	SB-21	SB-22	SB-23
Depth Samp	6-7	6-7	1-2	6'-7'	1-2	1-2	1-3	1-3	1-2	1-2	0.5-1.5	1-2	1-3	0.5-2
Date	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	1/9/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004	3/1/2004
Total Petroleum Hydrocarbons														
Total Petroleum Hydrocarbons	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide														
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Semi-Volatile Organic Compounds														
Acenaphthene	NA	0.29	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[b]fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[g,h,I]perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[k]fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo[a,h]anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ideno[1,2,3-c,d]pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	0.29	2.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
EPH														
C_9-C_{18} Aliphatic Hydrocarbons	NA	17.5	16.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C_{19}-C_{36} Aliphatic Hydrocarbons	NA	17.5	96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C_{11}-C_{22} Aromatic Hydrocarbons	NA	17.5	71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds														
Naphthalene	NA	0.29	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	0.29	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals														
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.55	1.5	4.4	2.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	660	1,100	590	61	380	620	230	210	64	170
Magnesium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:
mg/kg = milligrams per kilogram (parts per million).
NA= Not analyzed.
NS = No standard.
Soil samples from MW-1 and MW-2 were analyzed for volatile organic cor
BOLD = Exceeds MCP Method 1 S-1 GW-2/GW-3 Soil Standards.

TABLE 1: SOIL ANALYTICAL RESULTS

Sample Ide Depth Sam Date	Summary Statistics samples n	detect d	MEAN	SD	75% S-1 Rule	95% CI	MAX	Hot Spot Ratio	MADEP Background "Natural" (mg/kg)	"Fill"	MADEP Standards S-1/GW-2	UCL
Total Petroleum Hydrocarbons												
Total Petroleum Hydrocarbons	4	4	833	1,190	1	2,166	2,600	3.1	NA	NA	**800**	10,000
Cyanide												
Cyanide	3	3	0.57	0	0	1	1	1.1	NA	NA	100	3000
Semi-Volatile Organic Compounds												
Acenaphthene	5	5	0.52	1	0	1	1	2.8	**0.5**	**2**	1,000	10,000
Acenaphthylene	1	1	0.29	NA	0	NA	0.29	1.0	0.5	1	60	600
Anthracene	1	1	0.29	NA	0	NA	0.29	1.0	1	4	1,000	10,000
Benzo[a]anthracene	1	1	0.29	NA	0	NA	0.29	1.0	2	9	7	3000
Benzo[a]pyrene	1	1	0.29	NA	0	NA	0.29	1.0	2	7	2	300
Benzo[b]fluoranthene	1	1	0.29	NA	0	NA	0.29	1.0	2	8	7	3000
Benzo[g,h,I]perylene	1	1	0.29	NA	0	NA	0.29	1.0	1	3	2	100
Benzo[k]fluoranthene	1	1	0.29	NA	0	NA	0.29	1.0	1	4	70	10000
Chrysene	1	1	0.29	NA	0	NA	0.29	1.0	2	7	70	10000
Dibenzo[a,h]anthracene	1	1	0.29	NA	0	NA	0.29	1.0	0.5	1	0.7	300
Fluoranthene	1	1	0.29	NA	0	NA	0.29	1.0	4	10	1,000	10,000
Fluorene	1	1	0.29	NA	0	NA	0.29	1.0	1	2	1,000	10,000
Ideno[1,2,3-c,d]pyrene	1	1	0.29	NA	0	NA	0.29	1.0	1	3	7	3000
Phenanthrene	5	5	7.42	13	0	20	30	4.0	**3**	**20**	70	700
Pyrene	1	1	0.29	NA	0	NA	0.29	1.0	4	20	2	10,000
EPH												
C_9-C_{18} Aliphatic Hydrocarbons	5	5	44.7	38	1	83	90	2.0	NA	NA	1,000	10,000
C_{19}-C_{36} Aliphatic Hydrocarbons	5	5	152.2	155	1	308	360	2.4	NA	NA	3,000	10,000
C_{11}-C_{22} Aromatic Hydrocarbons	5	5	159.2	196	1	356	480	3.0	NA	NA	1000	10,000
Volatile Organic Compounds												
Naphthalene	5	5	0.52	1	0	1	1.45	2.8	**0.5**	**1**	500	4,000
2-Methylnaphthalene	5	5	0.52	1	0	1	1.45	2.8	**0.5**	**1**	200	3,000
Metals												
Aluminum	2	2	4,800	424	1	5,472	5,100	1.1	10,000	10,000	NS	NS
Arsenic	12	12	11.6	22	0	26	81	7.0	**20**	**20**	20	200
Barium	5	5	76	83	1	159	220	2.9	**50**	**50**	1,000	10,000
Cadmium	5	5	15.1	12	0	27	26	1.7	**2**	**3**	**3**	200
Chromium	5	5	12.1	8	1	21	24	2.0	30	40	1,000	2,000
Lead	22	22	433	558	1	700	2,200	5.1	**100**	600	**300**	6000
Magnesium	2	2	1,350	71	1	1,462	1,400	1.0	5,000	5,000	NS	NS
Mercury	5	5	0.18	0	0	0	0.39	2.2	**0.3**	1.00	1	10
Nickel	2	2	118	158	1	369	230	1.9	**20**	**30**	**30**	5000
Selenium	5	5	11.8	1	1	13	13	1.1	**0.5**	**1**	400	8,000
Silver	5	5	3.83	2	0	6	7	1.8	**0.6**	**1.0**	100	2,000
Zinc	3	3	1,753	1,451	1	3,632	3,000	1.7	**100**	**300**	2,500	10,000

NOTES:
mg/kg = milligrams per kilogram (parts per million).
NA= Not analyzed.
NS = No standard.
Soil samples from MW-1 and MW-2 were analyzed for volatile organic cor
BOLD = Exceeds MCP Method 1 S-1 GW-2/GW-3 Soil Standards.

TABLE 2. COMPOUNDS OF POTENTIAL CONCERN IDENTIFIED IN SOIL

Total Petroleum Hydrocarbons	**CASRN**
TPH	NA
Cyanide	
Cyanide (free)	57-12-5
Semi-Volatile Organic Compounds	
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo[a]anthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[g,h,i]perylene	191-24-2
Benzo[k]fluoranthene	207-08-9
Chrysene	218-01-9
Dibenz[a,h]anthracene	53-70-3
Fluoranthene	206-44-0
Fluorene	86-73-7
Indeno[1,2,3,-cd]pyrene	193-39-5
Phenanthrene	85-01-8
Pyrene	129-00-0
Extractable Petroleum Hydrocarbons	
C_9-C_{18} Aliphatic	NA
C_{19}-C_{36} Aliphatic	NA
C_{11}-C_{22} Aromatic	NA
Volatile Organic Compounds	
Naphthalene	91-20-3
2-Methylnaphthalene	91-57-6
Metals	
Aluminum	7429-90-5
Arsenic	7440-38-2
Barium	7440-39-3
Cadmium	7440-43-9
Chromium (total)	16065-83-1 & 18540-29-9
Lead	7439-92-1
Magnesium	7439-95-4
Mercury	7487-94-7
Nickel	7440-02-0
Selenium	7783-00-8
Silver	7440-22-4
Zinc	7440-66-6

TABLE 6. CHEMICAL-SPECIFIC RELATIVE ABSORPTION FACTORS

Class Compound	Study Media	RAF_{SI}	RAF_{SD}	RAF_{WI}	RAF_{IP}	RAF_{IA}
Total Petroleum Hydrocarbons						
TPH	NA	0.91 [12]	0.010 [2]	1.00 [12]	0.91 [12]	1.00 [2]
Cyanide						
Cyanide (free)	food	0.17 [4]	0.01 [2]	1.00	1.00	1.00
Semi-Volatile Organic Compounds						
Acenaphthene	gavage	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Acenaphthylene	gavage	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Anthracene	gavage	0.76 [16]	0.010 [2]	1.00	0.76 [16]	1.00
Benzo[a]anthracene	gavage[S]	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Benzo[a]pyrene	gavage[A]	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Benzo[b]fluoranthene	gavage[S]	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Benzo[g,h,i]perylene	gavage[A]	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Benzo[k]fluoranthene	gavage[S]	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Chrysene	gavage[S]	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Dibenz[a,h]anthracene	gavage[S]	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Fluoranthene	gavage	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Fluorene	gavage	0.50 [2]	0.010 [2]	1.00	0.50 [2]	1.00
Indeno[1,2,3,-cd]pyrene	gavage	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Phenanthrene	gavage[S]	0.73 [16]	0.010 [2]	1.00	0.73 [16]	1.00
Pyrene	gavage	0.31 [16]	0.010 [2]	1.00	0.31 [16]	1.00
Extractable Petroleum Hydrocarbons						
C9-C18 Aliphatic	gavage[M]	0.91 [12]	0.20 [12]	1.00	0.91 [12]	1.00
C19-C36 Aliphatic	gavage[M]	0.91 [12]	0.10 [12]	1.00	0.91 [12]	1.00
C11-C22 Aromatic	gavage[M]	0.91 [12]	0.18 [12]	1.00	0.91 [12]	1.00
Volatile Organic Compounds						
Naphthalene	gavage[S]	0.80 [5]	0.010 [2]	1.00	0.99	1.00
2-Methylnaphthalene	gavage[A]	0.80 [5]	0.010 [2]	1.00	0.80 [5]	1.00
Metals						
Aluminum	unknown	0.10 [8,9]	0.00 [2]	1.00	1.00	1.00
Arsenic	drinking water	0.41 [13]	0.001 [2]	0.73	0.71	1.00
Barium	drinking water	0.07 [1]	0.001 [2]	0.73	0.71	0.71
Cadmium	food/drinking water	0.025 [19]	0.010 [2]	0.05 [3,19]	0.025 [19]	1.00
Chromium (total)	food	0.01 [14]	0.001 [2]	1.00	1.00	1.00
Lead	multipathway	0.15 [6,10]	0.055 [6,10]	1.00 [6,10]	0.50 [6,10]	1.00
Magnesium	unknown	0.20 [11]	0.001 [2]	1.00	1.00	1.00
Mercury	food	0.07 [15]	0.001 [2]	1.00	1.00	1.00
Nickel	gavage	0.27 [7]	0.001 [2]	1.00	1.00	1.00
Selenium	injection	0.44 [18]	0.001 [2]	0.40	0.39	0.39
Silver	injection	0.18 [17]	0.001 [2]	0.40	0.39	0.39
Zinc	food	0.20 [18]	0.001 [2]	1.00	1.00	1.00

KEY:

[A] = Assumed route of administration based on other compounds in class.

[S] = Surrogate toxicity value and route of administration (See footnotes for Table 5).

[M] = Based on specific compound surrogate toxicity value and route of administration (MADEP 2002f).

NA = Not Available

RAF_{SI} = RAF Soil Ingestion

RAF_{SD} = RAF Soil Dermal Contact

RAF_{WI} = RAF Water Ingestion

RAF_{IP} = RAF Ingestion of Produce

RAF_{IA} = RAF Inhalation of Indoor Air

NOTE: - Relative absorption was determined using the toxicological studies relating to the derivation of the RfD, and if necessary studies used in the derivation of CSF. The use of inhalation studies for RAF determination was avoided whenever possible.

- For all non-referenced relative absorption factors, OCI determined the RAF using default MADEP (1995a) guidance (Appendix B).

TABLE 6. RAF REFERENCES

RAIS. 2004. Toxicity and Chemical Specific Factors, Risk Assessment Information System. Oak Ridge National Laboratory (ORNL), a U.S. Department of Energy multi-program laboratory managed by Lockheed Martin Energy Research (LMEF
Corporation in Oak Ridge, Tennessee. Available Online at: http://risk.lsd.ornl.gov/cgi-bin/tox/TOX_select?select=csf.

[1] ATSDR (Agency for Toxic Substances and Disease Registry). 1992. Toxicological Profile for Barium. ATSDR/U.S. Public Health Service
[2] U.S.EPA. 1995. Supplemental Guidance to RAGS: Region 4 Bulletins, Human Health Risk Assessment (Interim Guidance). Waste Management Division, Office of Health Assessmen
[3] Foulkes, E.C. 1986. Absorption of cadmium. In: Handbook of Experimental Pharmacology. Vol. 80, E.C. Foulkes, ed., Springer-Verlag, Berlin, pp. 75-10
[4] U.S. EPA. 1984. Health Effects Assessment for Cyanides. Prepared by the Environmental Criteria and Assessment Office, Cincinnati, OH for the Emergency and Remedial Response Office, Washington, DC. EPA/540/1-86-011.
[5] ATSDR. 1993. Toxicological Profile for Naphthalene. Agency for Toxic Substances and Disease Registry. U.S. Public Health Servic
[6] U.S. EPA. 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children. PB93-963510. EPA/540/R-93/081. U.S. Environmental Protection Agency, Office of Emergency Response, Washington, D
[7] ATSDR (Agency for Toxic Substances and Disease Registry). 1993. Toxicological Profile for Nickel. ATSDR/U.S. Public Health Service.
[8] Venugopal, B. and T.D. Luckey. 1978. Metal Toxicity in Mammals-2. Chemical Toxicity of Metals and Metalloids. Plenum Press. pp. 104-112
[9] Kortus, J. 1967. The carbohydrate metabolism accompanying intoxication by aluminum salts in the rat. Experientia 23:912-913
[10] U.S. EPA. 1994. Technical Support Document: Parameters and Equations Used in Integrated Exposure Uptake Biokinetic Model for Lead in Children (v 0.99d). PB94-963505, EPA/540/R-94/040. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, DC
[11] Goyer, R.A. 1991. Toxic Effects of Metals. In: Casarett and Doull's Toxicology: The Basic Science of Poisons, fourth edition. M. O. Ammdur, J. Doull, and C.D. Klaassen, eds. pp. 623-680.
[12] MADEP. 2002. Characterizing Risks posed by Petroleum Contaminanted Sites: Implementation of the MADEP VPH/EPH Approach. FINAL POLICY. Available Online at: http://www.state.ma.us/dep/bwsc/vph_eph.htm.
[13] Bettley, F.R., O'Shea, J.A. 1975. The absorption of arsenic and its relation to carcinoma. Br. J. Dermatology. 92:563. (Cited in Hindmarsh and McCurdy, 1986
[14] ATSDR. 1993. Toxicological Profile for Chromium. Agency for Toxic Substances and Disease Registry. U.S. Public Health Service
and Development.
[16] Rahman, A., J.A. Barrowman and A. Rahimtula. 1986. The influence of bile on the bioavailability of polynuclear aromatic hydrocarbons from the rat intestine. Can. J. Physiol. Pharmacol. 64:1214-1218
[17] East, B.W., K. Boddy, E.D. Williams, et al. 1980. Silver retention, total body silver and tissue silver concentrations in argyria associated with exposure to an anti-smoking remedy containing silver acetate. Clin. Exp. Dermatol. 5:305-311.
[18] U.S. EPA. 1984. Health Effects Assessment for Zinc and Compounds. U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. EPA/540/1-86-048.
[19] U.S. EPA. 2004. Cadmium (CASRN 7440-43-9). Integrated Risk Information System (IRIS). U.S. Environmental Protection Agency. Available Online at: http://www.epa.gov/iris/subst/0141.htm.

TABLE 3. RECEPTOR EXPOSURE PROFILES

Receptor	Source Medium	Route		Age	CF Varies	Effect	IR mg/day	VR m^3/hr	FI unitless	ET hours/day	EF days/year	ED Year	SA cm^2/day	AF mg/cm^2	PEF mg/m^3	BW kg	AT.n days	AT.c days	CDI[a] VARIABLE
Resident	*Soil*	Ingestion		Child (1-6)	1.E-06	Carc	100	--	0.47	--	350	6	--	--	--	15	--	27375	2.40E-07
					1.E-06	Nonc	100	--	0.47	--	350	6	--	--	--	15	2190	--	3.00E-06
				Adult (7-31)	1.E-06	Carc	50	--	0.42	--	350	24	--	--	--	70	--	27375	9.19E-08
					1.E-06	Nonc	50	--	0.42	--	350	24	--	--	--	70	8760	--	2.87E-07
		Inhalation	inhale	Child (1-6)	1.E-03	Carc	--	0.17	0.35	8	350	6	--	--	32	15	--	27375	1.26E-06
			swallowed		1.E-03		--	0.17	0.35	8	350	6	--	--	32	15	--	27375	5.05E-06
			inhaled		1.E-03	Nonc	--	0.17	0.35	8	350	6	--	--	32	15	2190	--	1.58E-05
			swallowed		1.E-03		--	0.17	0.35	8	350	6	--	--	32	15	2190	--	6.31E-05
			inhaled	Adult (7-31)	1.E-03	Carc	--	0.70	0.35	8	350	24	--	--	32	70	--	27375	4.35E-06
			swallowed		1.E-03		--	0.70	0.35	8	350	24	--	--	32	70	--	27375	1.74E-05
			inhaled		1.E-03	Nonc	--	0.70	0.35	8	350	24	--	--	32	70	8760	--	1.36E-05
			swallowed		1.E-03		--	0.70	0.35	8	350	24	--	--	32	70	8760	--	5.44E-05
		Dermal		Child (1-6)	1.E-06	Carc	--	--	0.45	--	350	6	2,434	0.35	--	15	--	27375	1.96E-06
					1.E-06	Nonc	--	--	0.45	--	350	6	2,434	0.35	--	15	2190	--	2.45E-05
				Adult (7-31)	1.E-06	Carc	--	--	0.42	--	350	24	5,657	0.13	--	70	--	27375	1.35E-06
					1.E-06	Nonc	--	--	0.42	--	350	24	5,657	0.13	--	70	8760	--	4.22E-06
	Homegrown Produce	Consumption		Child (1-6)	--	Carc	A&PS	--	0.47	--	350	6	--	--	--	12.075	--	27375	2.98E-03
					--	Nonc	A&PS	--	0.47	--	350	6	--	--	--	12.075	2190	--	3.72E-02
				Adult (7-31)	--	Carc	A&PS	--	0.42	--	350	24	--	--	--	70	--	27375	1.84E-03
					--	Nonc	A&PS	--	0.42	--	350	24	--	--	--	70	8760	--	5.74E-03
Construction/Utility Worker	*Soil*	Ingestion		Adult (18-45)	1.E-06	Carc	100	--	--	--	130	0.50	--	--	--	70	--	27375	3.38E-09
					1.E-06	NonC	100	--	--	--	130	0.50	--	--	--	70	182	--	5.09E-07
		Inhalation	inhale	Adult (18-45)	1.E-03	Carc	--	3.6	0.50	8	130	0.50	--	--	60	70	--	27375	2.44E-07
			swallowed		1.E-03		--	3.6	0.50	8	130	0.50	--	--	60	70	--	27375	9.74E-07
			inhaled		1.E-03	NonC	--	3.6	0.50	8	130	0.50	--	--	60	70	182	--	3.66E-05
			swallowed		1.E-03		--	3.6	0.50	8	130	0.50	--	--	60	70	182	--	1.47E-04
		Dermal		Adult (18-45)	1.E-06	Carc	--	--	1.00	--	130	0.50	3,477	0.29	--	70	--	27375	3.41E-08
					1.E-06	NonC	--	--	1.00	--	130	0.50	3,477	0.29	--	70	182	--	5.13E-06
Maintenance Worker	*Soil*	Ingestion		Adult (18-45)	1.E-06	Carc	100	--	0.50	--	173	27	--	--	--	70	--	27375	1.22E-07
					1.E-06	Nonc	100	--	0.50	--	173	27	--	--	--	70	9855	--	3.39E-07
		Inhalation	inhale	Adult (18-45)	1.E-03	Carc	--	3.6	0.50			27	--	--	60	70	--	27375	1.76E-05
			swallowed		1.E-03		--	3.6	0.50	8	173	27	--	--	60	70	--	27375	7.02E-05
			inhaled		1.E-03	Nonc	--	3.6	0.50	8	173	27	--	--	60	70	9855	--	4.88E-05
			swallowed		1.E-03		--	3.6	0.50	8	173	27	--	--	60	70	9855	--	1.95E-04
		Dermal		Adult (18-45)	1.E-06	Carc	--	--	0.50	--	173	27	3,477	0.19	--	70	--	27375	1.61E-06
					1.E-06	Nonc	--	--	0.50	--	173	27	3,477	0.19	--	70	9855	--	4.47E-06

NOTES:

AF - Soil adherence factor
BW - Body weight
Carc - Carcinogenic effect
CF - Conversion Factor
ED - Exposure Duration
EF - Exposure Frequency
ET - ExposureTime
IR - Ingestion Rate
VR - Ventilation Rate
FI - Fraction Intake
Nonc - Non-carcinogenic effect
PEF - Particulate Emission Factor or PM_{10}, Respirable particulate concentration in air.
SA - Contact Surface Area
A&PS - Age- and Produce-Specific Ingestion Rates.

[a] Chemical independent uptake (CIU) values are exclusive of chemical concentration, K_p, and relative absorption factor (RAF).
Multiply CIU value by chemical-specific concentration in media, chemical specific factors (K_p), and pathway specific RAF.

[b] CIU for the Food Ingestion pathway is estimated in Table 4.2 for food and age specific consumption (MADEP 1995a).

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.1 Incidental Soil Ingestion - Adult Resident			
Exposure Assumptions:			
Chemical Concentration in Soil	C_S	mg/kg	
Conversion Factor	CF	kg/mg	1E-06
Relative Absorption Factor (default=1; or chemical-specific)	RAF	--	--
Ingestion Rate	IR	mg/day	50
Fractional Ingestion (seasonal outdoor soil & indoor dusts)	FI	unitless	0.42
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	24
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	8760
CIU.c =(CF*IR*FI*EF*ED)/(BW*AT.c)	CIU.c	$(day)^{-1}$	9.2E-8
CIU.n =(CF*IR*FI*EF*ED)/(BW*AT.n)	CIU.n	$(day)^{-1}$	2.9E-7

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.5 Incidental Soil Ingestion - Child Resident			
Exposure Assumptions:			
Chemical Concentration in Soil	C_S	mg/kg	
Conversion Factor	CF	kg/mg	1E-06
Relative Absorption Factor (default=1; or chemical-specific)	RAF	--	--
Ingestion Rate (default)	IR	mg/day	100
Fractional Ingestion (seasonal outdoor soil & indoor dusts)	FI	unitless	0.47
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	6
Body Weight - Child (mean age-specific)	BW	kg	15
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	2190
CIU.c =(CF*IR*FI*EF*ED)/(BW*AT.c)	CIU.c	$(day)^{-1}$	2.4E-7
CIU.n =(CF*IR*FI*EF*ED)/(BW*AT.n)	CIU.n	$(day)^{-1}$	3.0E-6

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.9 Incidental Soil Ingestion - Construction/Utility Worker			
Exposure Assumptions:			
Chemical Concentration in Soil	C_S	mg/kg	--
Conversion Factor	CF	kg/mg	1E-06
Relative Absorption Factor (default=1; or chemical-specific)	RAF	--	--
Ingestion Rate	IR	mg/day	100
Fractional Ingestion	FI	unitless	1
Exposure Frequency	EF	days/year	130
Exposure Duration	ED	years	0.50
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	182
CIU.c =(CF*IR*FI*EF*ED)/(BW*AT.c)	CIU.c	$(day)^{-1}$	3.4E-9
CIU.n =(CF*IR*FI*EF*ED)/(BW*AT.n)	CIU.n	$(day)^{-1}$	5.1E-7

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 5.18 Inhalation of Volatiles Infiltrating Indoor Air - Office Worker			
Exposure Assumptions:			
Chemical Concentration in Air	C_A	ug/m^3	--
Conversion Factor	CF	mg/ug	1E-03
Inhalation Rate (light exertion rate - 20 Liters/minute)	VR	m^3/hour	1.2
Fraction inhaled from contaminated source (P)	FI	unitless	1
Exposure Time	ET	hours/day	8
Exposure Frequency	EF	days/year	250
Exposure Duration	ED	years	27
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	9855
CIU.c =(CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	mg-m^3/ug-kg-day	3.4E-05
CIU.n =(CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	mg-m^3/ug-kg-day	9.4E-05

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.2 Inhalation & Ingestion of Dust - Adult Resident			
Exposure Assumptions:			
Chemical Concentration in Air	$OHM_{particulate}$	ug/m^3	= (OHM_{soil}*CFa*PM_{10})
Chemical Concentration in Soil	OHM_{soil}	mg/kg	--
Respirable particulate fraction	PM_{10}	ug/m^3	32
Conversion factor to calculate OHM_{air} from OHM_{soil} (Table 8)	CFa	kg/mg	1.E-06
Conversion Factor	CF	mg/ug	1.E-03
Inhalation Rate (light exertion = 13.49 liters/minute)	VR	m^3/hr	0.70
Xylenes	FI	--	0.35
Exposure Time	ET	hours/day	8
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	24
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	8760
Inhalation			
CIU.c =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	mg-m^3/ug-kg-day	4.4E-06
CIU.n =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	mg-m^3/ug-kg-day	1.4E-05
Ingestion			
CIU.c =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	mg-m^3/ug-kg-day	1.7E-05
CIU.n =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	mg-m^3/ug-kg-day	5.4E-05

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.6 Inhalation & Ingestion of Dust - Child Resident			
Exposure Assumptions:			
Chemical Concentration in Air	$OHM_{particulate}$	ug/m^3	= (OHM_{soil}*CFa*PM_{10})
Chemical Concentration in Soil	OHM_{soil}	mg/kg	--
Respirable particulate fraction	PM_{10}	ug/m^3	32
Conversion factor to calculate OHM_{air} from OHM_{soil} (Table 8)	CFa	kg/mg	1.E-06
Conversion Factor	CF	mg/ug	1.E-03
Inhalation Rate (light exertion = 5.74 liters/minute) (age-specific)	VR	m^3/hr	0.174
Fraction Inhaled (seasonal outdoor soil & indoor dusts)	FI	--	0.35
Exposure Time	ET	hours/day	8
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	6
Body Weight - Child (mean age-specific)	BW	kg	15
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	2190
Inhalation			
CIU.c =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	1.3E-06
CIU.n =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	1.6E-05
Ingestion			
CIU.c =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	5.1E-06
CIU.n =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	6.3E-05

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.10 Inhalation & Ingestion of Dust - Construction/Utility Worker			
Exposure Assumptions:			
Chemical Concentration in Air	$OHM_{particulate}$	ug/m^3	= (OHM_{soil}*CFa*PM_{10})
Chemical Concentration in Soil	OHM_{soil}	mg/kg	--
Respirable particulate fraction	PM_{10}	ug/m^3	60
Conversion factor to calculate OHM_{air} from OHM_{soil} (Table 8)	CFa	kg/mg	1.E-06
Conversion Factor	CF	mg/ug	1.E-03
Inhalation Rate (heavy exertion = 60 liters/minute)	VR	m^3/hr	3.6
Fraction Inhaled from Contamination Source (P)	FI	--	0.5
Exposure Time	ET	hours/day	8
Exposure Frequency	EF	days/year	130
Exposure Duration	ED	years	0.50
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	182
Inhalation			
CIU.c =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	2.4E-07
CIU.n =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	3.7E-05
Ingestion			
CIU.c =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	9.7E-07
CIU.n =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	1.5E-04

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value

TABLE 4.12 Inhalation and Ingestion of Dust - Maintenance Worker

Exposure Assumptions:

Chemical Concentration in Air	$OHM_{particulate}$	ug/m^3	= (OHM_{soil}*CFa*PM_{10})
Chemical Concentration in Soil	OHM_{soil}	mg/kg	--
Respirable particulate fraction	PM_{10}	ug/m^3	60
Conversion factor to calculate OHM_{air} from OHM_{soil} (Table 8)	CFa	kg/mg	1.E-06
Conversion Factor	CF	mg/ug	1.E-03
Inhalation Rate (heavy exertion = 60 liters/minute)	VR	m^3/hr	3.6
Fraction Inhaled from Contamination Source (P)	FI	--	0.5
Exposure Time	ET	hours/day	8
Exposure Frequency	EF	days/year	173
Exposure Duration	ED	years	27
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	9855
Inhalation			
CIU.c =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	1.8E-05
CIU.n =(0.5*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	4.9E-05
Ingestion			
CIU.c =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	7.0E-05
CIU.n =(2*CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	$mg\text{-}m^3/ug\text{-}kg\text{-}day$	2.0E-04

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.3 Dermal Contact with Soil - Adult Resident			
Exposure Assumptions:			
Chemical Concentration in Soil	C_S	mg/kg	
Conversion Factor	CF	kg/mg	1E-06
Skin Surface Area Available for Contact	SA	cm^2/day	5657
Soil-to-Skin Adherence Factor	AF	mg/cm^2	0.13
Relative Absorption Factor (default=1: or chemical specific)	RAF	unitless	--
Fractional Exposure (seasonal outdoor soil & indoor dusts)	FI	unitless	0.42
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	24
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	8760
CIU.c =(CF*SA*AF*FI*EF*ED)/(BW*AT.c)	CIU.c	$(day)^{-1}$	1.4E-06
CIU.n =(CF*SA*AF*FI*EF*ED)/(BW.AT.n)	CIU.n	$(day)^{-1}$	4.2E-06

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.7 Dermal Contact with Soil - Child Resident			
Exposure Assumptions:			
Chemical Concentration in Soil	C_S	mg/kg	
Conversion Factor	CF	kg/mg	1E-06
Skin Surface Area Available for Contact (mean age-specific)	SA	cm^2/day	2434
Soil-to-Skin Adherence Factor	AF	mg/cm^2	0.35
Relative Absorption Factor (default=1: or chemical specific)	RAF	unitless	--
Fractional Exposure (seasonal outdoor soil & indoor dusts)	FI	unitless	0.45
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	6
Body Weight - Child (mean age-specific)	BW	kg	15
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	2190
CIU.c =(CF*SA*AF*FI*EF*ED)/(BW*AT.c)	CIU.c	$(day)^{-1}$	2.0E-06
CIU.n =(CF*SA*AF*FI*EF*ED)/(BW.AT.n)	CIU.n	$(day)^{-1}$	2.5E-05

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.11 Dermal Contact with Soil - Construction/Utility Worker			
Exposure Assumptions:			
Chemical Concentration in Soil	CS	mg/kg	--
Conversion Factor	CF	kg/mg	1E-06
Skin Surface Area Available for Contact (1 event/day)	SA	cm^2/day	3477
Soil-to-Skin Adherence Factor	AF	mg/cm^2	0.29
Relative Absorption Factor (default=1: or chemical specific)	RAF	unitless	--
Fractional Exposure (seasonal outdoor soil & indoor dusts)	FI	unitless	1
Exposure Frequency	EF	days/year	130
Exposure Duration	ED	years	0.50
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	182
CIU.c =(CF*SA*AF*FI*EF*ED)/(BW*AT.c)	CIU.c	$(day)^{-1}$	3.4E-08
CIU.n =(CF*SA*AF*FI*EF*ED)/(BW.AT.n)	CIU.n	$(day)^{-1}$	5.1E-06

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.13 Incidental Soil Ingestion - Maintenance Worker			
Exposure Assumptions:			
Chemical Concentration in Soil	C_S	mg/kg	--
Conversion Factor	CF	kg/mg	1E-06
Relative Absorption Factor (default=1; or chemical-specific)	RAF	--	--
Ingestion Rate	IR	mg/day	100
Fractional Ingestion	FI	unitless	0.50
Exposure Frequency	EF	days/year	173
Exposure Duration	ED	years	27
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	9855
CIU.c =(CF*IR*FI*EF*ED)/(BW*AT.c)	CIU.c	$(day)^{-1}$	1.2E-7
CIU.n =(CF*IR*FI*EF*ED)/(BW*AT.n)	CIU.n	$(day)^{-1}$	3.4E-7

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.4 Inhalation of Volatiles in Indoor Air - Adult Resident			
Exposure Assumptions:			
Chemical Concentration in Air	C_A	ug/m^3	
Conversion Factor	CF	mg/ug	1E-03
Ventilation Rate (mean age-specific)	VR	m^3/hour	0.70
Fractional exposure to source	FI	unitless	1.0
Exposure Time	ET	hours/day	24
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	24
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	8760
CIU.c =(CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	mg-m^3/ug-kg-day	7.4E-05
CIU.n =(CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	mg-m^3/ug-kg-day	2.3E-04

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.9 Inhalation of Indoor Air - Child Resident			
Exposure Assumptions:			
Chemical Concentration in Air	C_A	ug/m^3	
Conversion Factor	CF	mg/ug	1E-03
Ventilation Rate (mean age-specific)	VR	m^3/hour	0.174
Fraction inhaled from contaminated source	FI	unitless	1.0
Exposure Time	ET	hours/day	24
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	6
Body Weight - Child (mean age-specific)	BW	kg	15
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	2190
CIU.c =(CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CIU.c	mg-m^3/ug-kg-day	2.1E-05
CIU.n =(CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CIU.n	mg-m^3/ug-kg-day	2.7E-04

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 6.10 Dermal Contact With Groundwater - Construction/Utility Worker			
Exposure Assumptions:			
DA_{EVENT}	DA_{EVENT}	mg/cm^2-event	--
Chemical Concentration in Water	C_W	ug/L	--
Conversion Factor	CF	$mg\text{-}L/ug\text{-}cm^3$	1E-06
Skin Surface Area Available for Contact	SA	cm^2	3477
Exposure Time	ET	event/day	1
Exposure Frequency	EF	days/year	130
Exposure Duration	ED	years	0.50
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	182
CDI.c =(SA*ET*EF*ED)/(BW*AT.c)	CDI.c	cm^2-event/kg-day	1.2E-01
CDI.n =(SA*ET*EF*ED)/(BW*AT.n)	CDI.n	cm^2-event/kg-day	1.8E+01

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.15 SUMMARY OF RESIDENTIAL SCENARIO FI VALUES			**FI Value**
Soil Ingestion (mg/day)			
Child (100mg/d) - Fractional Intake ((100mg/d x 153d)+(0.5 x (17mg/d x 212d)))/365d =			0.47
Adult (50 mg/d) - Fractional Intake (50mg/d x 153d)/365d =			0.42
Soil Contact (cm^2/day)			
Child (2434 cm^2/d) - Fractional Intake ((2434cm2/d x 153d)+(0.5 x (370.4cm2/d x 212d)))/365d =			0.45
Adult (5657 cm^2/d) - Fractional Intake (5657cm2/d x 153d)/365d =			0.42
Inhalation for Adult and Child (unitless)			
Particulate Fractional Intake 0.5x((153d)+(0.5 x 212d))/365d =			0.35

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.4 Ingestion of Homegrown Produce - Adult Resident			
Exposure Assumptions:			
Chemical Concentration Ingested per Day for BW (70 kg)	C_F	mg/day	
Relative Absorption Factor (default=1: or chemical specific)	RAF	unitless	--
Fractional Source	FI	unitless	0.42
Exposure Time	ET	meal/day	1
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	24
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	8760
CIU.c =(FI*ET*EF*ED)/(BW*AT.c)	CIU.c	meal/kg-day	1.8E-03
CIU.n =(FI*ET*EF*ED)/(BW*AT.n)	CIU.n	meal/kg-day	5.7E-03

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.8 Ingestion of Homegrown Produce - Child Resident			
Exposure Assumptions:			
Chemical Concentration Ingested per Day for BW (12.075 kg)	C_F	mg/meal	
Relative Absorption Factor (default=1: or chemical specific)	RAF	unitless	--
Fractional Source	FI	unitless	0.47
Exposure Time	ET	meal/day	1
Exposure Frequency	EF	days/year	350
Exposure Duration	ED	years	6
Body Weight - Child (mean age-specific for a 2 year old)	BW	kg	12.075
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	2190
CIU.c =(FI*ET*EF*ED)/(BW*AT.c)	CIU.c	meal/kg-day	3.0E-03
CIU.n =(FI*ET*EF*ED)/(BW*AT.n)	CIU.n	meal/kg-day	3.7E-02

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 6.11 Inhalation of Volatiles from Groundwater - Construction/Utility Worker			
Exposure Assumptions:			
Chemical Concentration in Air	C_A	ug/m^3	--
Conversion Factor	CF	mg/ug	1E-03
Inhalation Rate (heavy exertion = 60 liters/minute)	VR	m^3/hour	3.6
Fraction inhaled from contaminated source (P)	FI	unitless	0.5
Exposure Time	ET	hours/day	8
Exposure Frequency	EF	days/year	130
Exposure Duration	ED	years	0.50
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	182
CDI.c =(CF*VR*FI*ET*EF*ED)/(BW*AT.c)	CDI.c	mg-m^3/ug-kg-day	4.9E-07
CDI.n =(CF*VR*FI*ET*EF*ED)/(BW*AT.n)	CDI.n	mg-m^3/ug-kg-day	7.3E-05

TABLE 4. QUANTITATIVE EXPOSURE ESTIMATES

Scenario:	Variable	Units	Value
TABLE 4.14 Dermal Contact with Soil - Maintenance Worker			
Exposure Assumptions:			
Chemical Concentration in Soil	C_S	mg/kg	--
Conversion Factor	CF	kg/mg	1E-06
Skin Surface Area Available for Contact (1 event/day)	SA	cm^2/day	3477
Soil-to-Skin Adherence Factor	AF	mg/cm^2	0.19
Relative Absorption Factor (default=1: or chemical specific)	RAF	unitless	--
Fractional Exposure (seasonal outdoor soil & indoor dusts)	FI	unitless	1
Exposure Frequency	EF	days/year	173
Exposure Duration	ED	years	27
Body Weight - Adult	BW	kg	70
Averaging Time - Carcinogenic	AT.c	days	27375
Averaging Time - Noncarcinogenic - Adult	AT.n	days	9855
CDI.c =(CF*SA*AF*FI*EF*ED)/(BW*AT.c)	CDI.c	$(day)^{-1}$	1.6E-06
CDI.n =(CF*SA*AF*FI*EF*ED)/(BW.AT.n)	CDI.n	$(day)^{-1}$	4.5E-06

TABLE 5. CoPC TOXICITY VALUES

Compounds	CASRN		CSF_{oral} $(mg/kg/day)^{-1}$		$CSF_{inhalation}$ $(mg/kg/day)^{-1}$		RfD_O (mg/kg/day)		RfD_I (mg/kg/day)		Comment
Total Petroleum Hydrocarbons											
TPH	NA		NA		NA		NA		NA		
Cyanide											
Cyanide (free)	57-12-5		NA		NA		2.00E-02	I	NA		
Semi-Volatile Organic Compounds											
Acenaphthene	83-32-9		NA	M,I	NA		6.00E-02	I	NA		
Acenaphthylene	208-96-8		NA	M,I	NA		6.00E-02	H	NA		Non-cancer toxicity values assumed to be the same as acenaphthene.
Anthracene	120-12-7		NA	M,I	NA		3.00E-01	I	NA		
Benzo[a]anthracene	56-55-3		7.30E-01	M,I	NA		3.00E-01	M,J	NA		Non-cancer toxicity values assumed to be the same as anthracene.
Benzo[a]pyrene	50-32-8		7.30E+00	M,I	NA		3.00E-02	M,K	NA		Non-cancer toxicity values assumed to be the same as pyrene.
Benzo[b]fluoranthene	205-99-2		7.30E-01	M,I	NA		4.00E-02	M,L	NA		Non-cancer toxicity values assumed to be the same as fluoranthene.
Benzo[g,h,i]perylene	191-24-2		NA	M,I	NA		3.00E-01	M,K	NA		Non-cancer toxicity values assumed to be the same as pyrene.
Benzo[k]fluoranthene	207-08-9		7.30E-02	M,I	NA		4.00E-02	M,L	NA		Non-cancer toxicity values assumed to be the same as fluoranthene.
Chrysene	218-01-9		7.30E-02	M	NA		3.00E-01	M,J	NA		Non-cancer toxicity values assumed to be the same as anthracene.
Dibenz[a,h]anthracene	53-70-3		7.30E+00	M,I	NA		3.00E-01	M,J	NA		Non-cancer toxicity values assumed to be the same as anthracene.
Fluoranthene	206-44-0		NA	M,I	NA		4.00E-02	I	NA		
Fluorene	86-73-7		NA	M,I	NA		4.00E-02	I	NA		
Indeno[1,2,3,-cd]pyrene	193-39-5		7.30E-01	M,I	NA		4.00E-02	M,L	NA		Non-cancer toxicity values assumed to be the same as fluoranthene.
Phenanthrene	85-01-8		NA	M,I	NA		3.00E-01	M,J	NA		Non-cancer toxicity values assumed to be the same as anthracene.
Pyrene	129-00-0		NA	M,I	NA		3.00E-01	I	NA		
Extractable Petroleum Hydrocarbons											
C_9-C_{18} Aliphatic	NA		NA	M,I	NA		1.00E-01	A,E	5.71E+01	A,C,E	RfC = 200mg/m^3
C_{19}-C_{36} Aliphatic	NA		NA	M,I	NA		2.00E+00	A,E	NA	A,C,E	NA
C_{11}-C_{22} Aromatic	NA		NA	M,I	NA		3.00E-02	A,E	5.71E+00	A,C,E	RfC = 20 mg/m^3
Volatile Organic Compounds											
Naphthalene	91-20-3		NA		NA		2.00E-02	I	8.57E-04	I,C	RfC = 3E-03 mg/m^3.
2-Methylnaphthalene	91-57-6		NA	M,I	NA		4.00E-03	I	4.00E-03	F	RfC = 1.14E-03 mg/m^3.
Metals											
Aluminum	7429-90-5		NA		NA		1.00E+00	I	NA		
Arsenic	7440-38-2		1.50E+00	I	1.50E+01	I	NA		3.00E-04	I	
Barium	7440-39-3		NA		NA		7.00E-02	I	1.40E-04	A	
Cadmium	7440-43-9	(food)	NA		6.30E+00	I	1.00E-03	I	NA		
Chromium (total)	16065-83-1 & 18540-29-9		NA		NA		1.50E+00	I	NA		Chromium III (predoninate reduced form of Chromium in soils).
Lead	7439-92-1		NA		NA		7.50E-04	M	NA		
Magnesium	7439-95-4		NA		NA		NA		NA		No applicable toxicity value was found for magnesium.
Mercury	7487-94-7		NA		NA		NA		8.60E-05	I	Elemental Mercury RfC = 3.0E-04 mg/m^3.
Nickel	7440-02-0		NA		NA		2.00E-02	I	NA		
Selenium	7783-00-8		NA		NA		5.00E-03	I	NA		
Silver	7440-22-4		NA		NA		5.00E-03	I	NA		
Zinc	7440-66-6		NA		NA		3.00E-01	I	NA		

NOTES:

CSF = Chronic cancer slope factor.
RfC = Chronic inhalation reference concentration.
RfD_o = Chronic oral reference dose.
NA = Not available

[A] MADEP. 2002. VPH/EPH MCP Policy #WSC-02-411.
[C] RfC converted to an RfD_I by multiplying by 20 m^3/day and dividing by 70 kg-bw.
[E] MADEP. 2002. #2 Fuel/Diesel *Residential ShortForm* . August
[F] Estimated route-to-route extrapolation (RfC = RfD_O x 20m^3/d x 1/70 kg-bw).
[H] Non-cancer toxicity assumed to be the same as structurally similar acenaphthene.
[I] U.S. EPA. 2004. Integrated Risk Information System (IRIS).
[J] Non-cancer toxicity assumed to be the same as structurally similar anthracene.
[M] MADEP. 1995a.Guidance for Disposal Site Risk Characterization.

Table 7.
Exposure Point Concentrations

COMPOUND	Mean Soil (mg/kg)	Residential Airborne Particulate (ug/m^3)	Work Site Airborne Particulate (ug/m^3)
Total Petroleum Hydrocarbons			
TPH	833	2.7E-02	5.0E-02
Cyanide			
Cyanide (free)	0.57	1.8E-05	3.4E-05
Semi-Volatile Organic Compounds			
Acenaphthene	0.52	1.7E-05	3.1E-05
Acenaphthylene	BB	NA	NA
Anthracene	BB	NA	NA
Benzo[a]anthracene	BB	NA	NA
Benzo[a]pyrene	BB	NA	NA
Benzo[b]fluoranthene	BB	NA	NA
Benzo[g,h,i]perylene	BB	NA	NA
Benzo[k]fluoranthene	BB	NA	NA
Chrysene	BB	NA	NA
Dibenz[a,h]anthracene	BB	NA	NA
Fluoranthene	BB	NA	NA
Fluorene	BB	NA	NA
Indeno[1,2,3,-cd]pyrene	BB	NA	NA
Phenanthrene	7.42	2.4E-04	4.4E-04
Pyrene	BB	NA	NA
Extractable Petroleum Hydrocarbons			
C9-C18 Aliphatic	44.7	1.4E-03	2.7E-03
C19-C36 Aliphatic	152.2	4.9E-03	9.1E-03
C11-C22 Aromatic	159.2	5.1E-03	9.6E-03
Volatile Organic Compounds			
Naphthalene	0.52	1.7E-05	3.1E-05
2-Methylnaphthalene	0.52	1.7E-05	3.1E-05
Metals			
Aluminum	BB	NA	NA
Arsenic	11.6	3.7E-04	7.0E-04
Barium	76	2.4E-03	4.6E-03
Cadmium	15.1	4.8E-04	9.1E-04
Chromium (total)	BB	NA	NA
Lead	433	1.4E-02	2.6E-02
Magnesium	BB	NA	NA
Mercury	0.18	5.6E-06	1.1E-05
Nickel	118	3.8E-03	7.1E-03
Selenium	11.8	3.8E-04	7.1E-04
Silver	3.83	1.2E-04	2.3E-04
Zinc	1753	5.6E-02	1.1E-01

NOTES:

[HS]Denotes "hot spots" where the maximum concentration in soil is greater than 10-fold the avergae site-wide concentration in soil. Here the maximum value in soil is used.

- Concentrations in soils represent a site-wide average as suggested by MADEP (1995a).

- Concentrations of fugitive dusts in air are calculated as the product of the average soil concentration, a unit conversion factor and the default MADEP particulate emission factor (PEF) (MADEP 2002b).

ND - Not Detected

HS = Hot Spot

BB - Below MADEP identified "Natural" and "Fill Material" background concentrations (MADEP 2002a).

TABLE 8. INGESTION OF HOMEGROWN PRODUCE

Compounds	Intake by Receptor Age (mg/kg/day)			
	2 yr.		*26<30 yr.*	
	Non-Cancer	Cancer	Non-Cancer	Cancer
Total Petroleum Hydrocarbons				
TPH	NA	NA	NA	NA
Cyanide				
Cyanide (free)	NA	NA	NA	NA
Semi-Volatile Organic Compounds				
Acenaphthene	4.7E-06	3.8E-07	7.7E-07	2.5E-07
Acenaphthylene	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA
Benzo[a]anthracene	NA	NA	NA	NA
Benzo[a]pyrene	NA	NA	NA	NA
Benzo[b]fluoranthene	NA	NA	NA	NA
Benzo[g,h,i]perylene	NA	NA	NA	NA
Benzo[k]fluoranthene	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA
Dibenz[a,h]anthracene	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA
Indeno[1,2,3,-cd]pyrene	NA	NA	NA	NA
Phenanthrene	1.6E-04	1.3E-05	2.6E-05	8.3E-06
Pyrene	NA	NA	NA	NA
Extractable Petroleum Hydrocarbons				
C9-C18 Aliphatic	NA	NA	NA	NA
C19-C36 Aliphatic	NA	NA	NA	NA
C11-C22 Aromatic	NA	NA	NA	NA
Volatile Organic Compounds				
Naphthalene	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA
Metals				
Aluminum	NA	NA	NA	NA
Arsenic	9.9E-07	7.9E-08	4.6E-07	1.5E-07
Barium	NA	NA	NA	NA
Cadmium	3.5E-08	2.8E-09	3.2E-07	1.0E-07
Chromium (total)	NA	NA	NA	NA
Lead	1.1E-04	9.1E-06	9.6E-06	3.1E-06
Magnesium	NA	NA	NA	NA
Mercury	4.6E-08	3.7E-09	8.7E-09	2.8E-09
Nickel	1.1E-03	8.8E-05	1.7E-04	5.3E-05
Selenium	9.8E-06	7.9E-07	1.8E-06	5.7E-07
Silver	8.3E-05	6.6E-06	1.3E-05	4.2E-06
Zinc	5.9E-03	4.7E-04	1.6E-03	5.1E-04

NA = Not Analyzed or Not Applicable.

-- = Not Detected.

NOTE: Two (2) year old intake adjusted to reflect a 12.075 kg body weight. Two year old consumption used to assess the 1 to 6 year old child exposure. The 26 to 30 year old consumption rate was used to assess the 6 to 30 year adult exposure.
Total intake from plants includes target PAH analytes but not EPH and VPH.

TABLE 16. INHALATION OF INDOOR AIR - ADULT RESIDENT

Organic Chemical	Indoor Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects CIU[b] (mg-m^3/ug-kg-day)	Carcinogenic Effects Inhalation CSF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CIU[b] (mg-m^3/ug-kg-day)	Noncarcinogenic Effects Inhalation RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Cyanide								
#REF!	0.0E+00	#REF!	7.4E-5	NA	0.0E+00	2.3E-4	4.00E-03	0.0E+00
Acenaphthene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Acenaphthylene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Anthracene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Benzo[a]anthracene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Benzo[a]pyrene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Benzo[b]fluoranthene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Benzo[g,h,i]perylene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Benzo[k]fluoranthene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Chrysene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Dibenz[a,h]anthracene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Fluoranthene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Fluorene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Indeno[1,2,3,-cd]pyrene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
#REF!	#REF!	#REF!	7.4E-5	#REF!	0.0E+00	2.3E-4	#REF!	0.0E+00
Phenanthrene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Volatile Organic Compounds								
Naphthalene	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	8.57E-04	0.0E+00
#REF!	#REF!	#REF!	7.4E-5	#REF!	0.0E+00	2.3E-4	#REF!	0.0E+00
Metals								
Arsenic	#REF!	1.00	7.4E-5	1.50E+01	0.0E+00	2.3E-4	3.00E-04	0.0E+00
Cadmium	#REF!	1.00	7.4E-5	6.30E+00	0.0E+00	2.3E-4	NA	0.0E+00
Chromium (total)	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Lead	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	NA	0.0E+00
Mercury	#REF!	1.00	7.4E-5	NA	0.0E+00	2.3E-4	8.60E-05	0.0E+00
Inhalation	Total Cancer Risk:				0.0E+00			
	Total Hazard Index:							0.0E+00
Total Inhalation Cancer Risk:					3.8E-08			
Total Inhalation Hazard Index:								1.9E-04

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 21. INHALATION OF INDOOR AIR - CHILD RESIDENT

Organic Chemical	Indoor Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects: CIU[b] (mg-m^3/ug-kg-day)	Carcinogenic Effects: Inhalation CSF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects: Excess Risk	Noncarcinogenic Effects: CIU[b] (mg-m^3/ug-kg-day)	Noncarcinogenic Effects: Inhalation RfD[a] (mg/kg-day)	Noncarcinogenic Effects: Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Cyanide								
#REF!	0.0E+00	#REF!	2.1E-5	NA	0.0E+00	2.7E-4	4.00E-03	0.0E+00
Acenaphthene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Acenaphthylene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Anthracene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Benzo[a]anthracene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Benzo[a]pyrene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Benzo[b]fluoranthene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Benzo[g,h,i]perylene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Benzo[k]fluoranthene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Chrysene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Dibenz[a,h]anthracene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Fluoranthene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Fluorene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Indeno[1,2,3,-cd]pyrene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
#REF!	#REF!	#REF!	2.1E-5	#REF!	0.0E+00	2.7E-4	#REF!	0.0E+00
Phenanthrene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Volatile Organic Compounds								
Naphthalene	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	8.57E-04	0.0E+00
#REF!	#REF!	#REF!	2.1E-5	#REF!	0.0E+00	2.7E-4	#REF!	0.0E+00
Metals								
Arsenic	#REF!	1.00	2.1E-5	1.50E+01	0.0E+00	2.7E-4	3.00E-04	0.0E+00
Cadmium	#REF!	1.00	2.1E-5	6.30E+00	0.0E+00	2.7E-4	NA	0.0E+00
Chromium (total)	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Lead	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	NA	0.0E+00
Mercury	#REF!	1.00	2.1E-5	NA	0.0E+00	2.7E-4	8.60E-05	0.0E+00
Inhalation	Total Cancer Risk:				0.0E+00			
	Total Hazard Index:							0.0E+00
Total Inhalation Cancer Risk:					6.5E-09			
Total Inhalation Hazard Index:								2.2E-04

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 17. INGESTION OF CONTAMINATES IN HOMEGROWN PRODUCE - ADULT AND CHILD RESIDENT

	Concentration Ingested[b]		Carcinogenic Effects			Concentration Ingested[b]		Noncarcinogenic Effects		
Organic Chemical	Adult (7-30 yrs) (mg/kg/day)	Child (1-6 yrs) (mg/kg/day)	Oral SF[a] $(mg/kg\text{-}day)^{-1}$	Excess Adult Risk	Excess Child Risk	Adult (7-30 yrs) (mg/kg/day)	Child (1-6 yrs) (mg/kg/day)	Oral RfD[a] (mg/kg-day)	Adult Hazard Quotient	Child Hazard Quotient
Total Petroleum Hydrocarbons										
TPH	NA	NA	NA	--	--	NA	NA	NA	--	--
Cyanide										
Cyanide (free)	NA	NA	NA	--	--	NA	NA	2.0E-02	--	--
Semi-Volatile Organic Compounds										
Acenaphthene	2.5E-07	3.8E-07	NA	--	--	7.7E-07	4.7E-06	6.0E-02	4.6E-08	2.8E-07
Acenaphthylene	NA	NA	NA	--	--	NA	NA	6.0E-02	--	--
Anthracene	NA	NA	NA	--	--	NA	NA	3.0E-01	--	--
Benzo[a]anthracene	NA	NA	7.30E-01	--	--	NA	NA	3.0E-01	--	--
Benzo[a]pyrene	NA	NA	7.30E+00	--	--	NA	NA	3.0E-02	--	--
Benzo[b]fluoranthene	NA	NA	7.30E-01	--	--	NA	NA	4.0E-02	--	--
Benzo[g,h,i]perylene	NA	NA	NA	--	--	NA	NA	3.0E-01	--	--
Benzo[k]fluoranthene	NA	NA	7.30E-02	--	--	NA	NA	4.0E-02	--	--
Chrysene	NA	NA	7.30E-02	--	--	NA	NA	3.0E-01	--	--
Dibenz[a,h]anthracene	NA	NA	7.30E+00	--	--	NA	NA	3.0E-01	--	--
Fluoranthene	NA	NA	NA	--	--	NA	NA	4.0E-02	--	--
Fluorene	NA	NA	NA	--	--	NA	NA	4.0E-02	--	--
Indeno[1,2,3,-cd]pyrene	NA	NA	7.30E-01	--	--	NA	NA	4.0E-02	--	--
Phenanthrene	8.3E-06	1.3E-05	NA	--	--	2.6E-05	1.6E-04	3.0E-01	7.8E-06	4.8E-05
Pyrene	NA	NA	NA	--	--	NA	NA	3.0E-01	--	--
Extractable Petroleum Hydrocarbons										
C9-C18 Aliphatic	NA	NA	NA	--	--	NA	NA	1.0E-01	--	--
C19-C36 Aliphatic	NA	NA	NA	--	--	NA	NA	2.0E+00	--	--
C11-C22 Aromatic	NA	NA	NA	--	--	NA	NA	3.0E-02	--	--
Volatile Organic Compounds										
Naphthalene	NA	NA	NA	--	--	NA	NA	2.0E-02	--	--
2-Methylnaphthalene	NA	NA	NA	--	--	NA	NA	4.0E-03	--	--
Metals										
Aluminum	NA	NA	NA	--	--	NA	NA	1.0E+00	--	--
Arsenic	1.5E-07	7.9E-08	1.50E+00	2.2E-07	6.6E-08	4.6E-07	9.9E-07	NA	--	--
Barium	NA	NA	NA	--	--	NA	NA	7.0E-02	--	--
Cadmium	1.0E-07	2.8E-09	NA	--	--	3.2E-07	3.5E-08	1.0E-03	3.2E-10	3.5E-11
Chromium (total)	NA	NA	NA	--	--	NA	NA	1.5E+00	--	--
Lead	3.1E-06	9.1E-06	NA	--	--	9.6E-06	1.1E-04	7.5E-04	7.2E-09	8.5E-08
Magnesium	NA	NA	NA	--	--	NA	NA	NA	--	--
Mercury	2.8E-09	3.7E-09	NA	--	--	8.7E-09	4.6E-08	NA	--	--
Nickel	5.3E-05	8.8E-05	NA	--	--	1.7E-04	1.1E-03	2.0E-02	3.3E-06	2.2E-05
Selenium	5.7E-07	7.9E-07	NA	--	--	1.8E-06	9.8E-06	5.0E-03	8.8E-09	4.9E-08
Silver	4.2E-06	6.6E-06	NA	--	--	1.3E-05	8.3E-05	5.0E-03	6.6E-08	4.1E-07
Zinc	5.1E-04	4.7E-04	NA	--	--	1.6E-03	5.9E-03	3.0E-01	4.8E-04	1.8E-03
Ingestion	Total Cancer Risk:			2.2E-07	6.6E-08					
	Total Hazard Index:								4.9E-04	1.8E-03
Total Ingestion Cancer Risk:				8.8E-07	1.1E-06					
Total Ingestion Hazard Index:									2.8E-02	2.9E-01

NOTES:

-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 9. INCIDENTAL INGESTION OF SOIL - ADULT RESIDENT

Organic Chemical	Soil Concentration (mg/kg)	Compound RAF	Carcinogenic Effects: CIU[b] $(day)^{-1}$	Carcinogenic Effects: Oral CSF[a] $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Risk	Noncarcinogenic Effects: CIU[b] $(day)^{-1}$	Noncarcinogenic Effects: Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects: Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.91	9.2E-8	NA	--	2.9E-7	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.17	9.2E-8	NA	--	2.9E-7	2.00E-02	1.4E-06
Acenaphthene	5.2E-01	0.31	9.2E-8	NA	--	2.9E-7	6.00E-02	7.7E-07
Acenaphthylene	BB	0.31	9.2E-8	NA	--	2.9E-7	6.00E-02	--
Anthracene	BB	0.76	9.2E-8	NA	--	2.9E-7	3.00E-01	--
Benzo[a]anthracene	BB	0.31	9.2E-8	7.30E-01	--	2.9E-7	3.00E-01	--
Benzo[a]pyrene	BB	0.31	9.2E-8	7.30E+00	--	2.9E-7	3.00E-02	--
Benzo[b]fluoranthene	BB	0.31	9.2E-8	7.30E-01	--	2.9E-7	4.00E-02	--
Benzo[g,h,i]perylene	BB	0.31	9.2E-8	NA	--	2.9E-7	3.00E-01	--
Benzo[k]fluoranthene	BB	0.31	9.2E-8	7.30E-02	--	2.9E-7	4.00E-02	--
Chrysene	BB	0.31	9.2E-8	7.30E-02	--	2.9E-7	3.00E-01	--
Dibenz[a,h]anthracene	BB	0.31	9.2E-8	7.30E+00	--	2.9E-7	3.00E-01	--
Fluoranthene	BB	0.31	9.2E-8	NA	--	2.9E-7	4.00E-02	--
Fluorene	BB	0.50	9.2E-8	NA	--	2.9E-7	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	BB	0.31	9.2E-8	7.30E-01	--	2.9E-7	4.00E-02	--
Phenanthrene	7.4E+00	0.73	9.2E-8	NA	--	2.9E-7	3.00E-01	5.2E-06
Pyrene	BB	0.31	9.2E-8	NA	--	2.9E-7	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.91	9.2E-8	NA	--	2.9E-7	1.00E-01	1.2E-04
C19-C36 Aliphatic	1.5E+02	0.91	9.2E-8	NA	--	2.9E-7	2.00E+00	2.0E-05
C11-C22 Aromatic	1.6E+02	0.91	9.2E-8	NA	--	2.9E-7	3.00E-02	1.4E-03
Volatile Organic Compounds								
Naphthalene	5.2E-01	0.80	9.2E-8	NA	--	2.9E-7	2.00E-02	5.9E-06
2-Methylnaphthalene	5.2E-01	0.80	9.2E-8	NA	--	2.9E-7	4.00E-03	3.0E-05
Metals								
Aluminum	BB	0.10	9.2E-8	NA	--	2.9E-7	1.00E+00	--
Arsenic	1.2E+01	0.41	9.2E-8	1.50E+00	6.6E-07	2.9E-7	NA	--
Barium	7.6E+01	0.07	9.2E-8	NA	--	2.9E-7	7.00E-02	2.2E-05
Cadmium	1.5E+01	0.03	9.2E-8	NA	--	2.9E-7	1.00E-03	1.1E-04
Chromium (total)	BB	0.01	9.2E-8	NA	--	2.9E-7	1.50E+00	--
Lead	4.3E+02	0.15	9.2E-8	NA	--	2.9E-7	7.50E-04	2.5E-02
Magnesium	BB	0.20	9.2E-8	NA	--	2.9E-7	NA	--
Mercury	1.8E-01	0.07	9.2E-8	NA	--	2.9E-7	NA	--
Nickel	1.2E+02	0.27	9.2E-8	NA	--	2.9E-7	2.00E-02	4.6E-04
Selenium	1.2E+01	0.44	9.2E-8	NA	--	2.9E-7	5.00E-03	3.0E-04
Silver	3.8E+00	0.18	9.2E-8	NA	--	2.9E-7	5.00E-03	4.0E-05
Zinc	1.8E+03	0.20	9.2E-8	NA	--	2.9E-7	3.00E-01	3.4E-04

Ingestion	Total Cancer Risk:	6.6E-07	
	Total Hazard Index:		2.8E-02
Total Ingestion Cancer Risk:		8.8E-07	
Total Ingestion Hazard Index:			2.8E-02

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 13. INCIDENTAL INGESTION OF SOIL - CHILD RESIDENT

Organic Chemical	Soil Concentration (mg/kg)	Compound RAF	Carcinogenic Effects: CIU[b] (day)$^{-1}$	Carcinogenic Effects: Oral SF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects: Excess Risk	Noncarcinogenic Effects: CIU[b] (day)$^{-1}$	Noncarcinogenic Effects: Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects: Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.91	2.4E-7	NA	--	3.0E-6	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.17	2.4E-7	NA	--	3.0E-6	2.00E-02	1.4E-05
Acenaphthene	5.2E-01	0.31	2.4E-7	NA	--	3.0E-6	6.00E-02	8.0E-06
Acenaphthylene	BB	0.31	2.4E-7	NA	--	3.0E-6	6.00E-02	--
Anthracene	BB	0.76	2.4E-7	NA	--	3.0E-6	3.00E-01	--
Benzo[a]anthracene	BB	0.31	2.4E-7	7.30E-01	--	3.0E-6	3.00E-01	--
Benzo[a]pyrene	BB	0.31	2.4E-7	7.30E+00	--	3.0E-6	3.00E-02	--
Benzo[b]fluoranthene	BB	0.31	2.4E-7	7.30E-01	--	3.0E-6	4.00E-02	--
Benzo[g,h,i]perylene	BB	0.31	2.4E-7	NA	--	3.0E-6	3.00E-01	--
Benzo[k]fluoranthene	BB	0.31	2.4E-7	7.30E-02	--	3.0E-6	4.00E-02	--
Chrysene	BB	0.31	2.4E-7	7.30E-02	--	3.0E-6	3.00E-01	--
Dibenz[a,h]anthracene	BB	0.31	2.4E-7	7.30E+00	--	3.0E-6	3.00E-01	--
Fluoranthene	BB	0.31	2.4E-7	NA	--	3.0E-6	4.00E-02	--
Fluorene	BB	0.50	2.4E-7	NA	--	3.0E-6	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	BB	0.31	2.4E-7	7.30E-01	--	3.0E-6	4.00E-02	--
Phenanthrene	7.4E+00	0.73	2.4E-7	NA	--	3.0E-6	3.00E-01	5.4E-05
Pyrene	BB	0.31	2.4E-7	NA	--	3.0E-6	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.91	2.4E-7	NA	--	3.0E-6	1.00E-01	1.2E-03
C19-C36 Aliphatic	1.5E+02	0.91	2.4E-7	NA	--	3.0E-6	2.00E+00	2.1E-04
C11-C22 Aromatic	1.6E+02	0.91	2.4E-7	NA	--	3.0E-6	3.00E-02	1.4E-02
Volatile Organic Compounds								
Naphthalene	5.2E-01	0.80	2.4E-7	NA	--	3.0E-6	2.00E-02	6.2E-05
2-Methylnaphthalene	5.2E-01	0.80	2.4E-7	NA	--	3.0E-6	4.00E-03	3.1E-04
Metals								
Aluminum	BB	0.10	2.4E-7	NA	--	3.0E-6	1.00E+00	--
Arsenic	1.2E+01	0.41	2.4E-7	1.50E+00	1.0E-06	3.0E-6	NA	--
Barium	7.6E+01	0.07	2.4E-7	NA	--	3.0E-6	7.00E-02	2.3E-04
Cadmium	1.5E+01	0.03	2.4E-7	NA	--	3.0E-6	1.00E-03	1.1E-03
Chromium (total)	BB	0.01	2.4E-7	NA	--	3.0E-6	1.50E+00	--
Lead	4.3E+02	0.15	2.4E-7	NA	--	3.0E-6	7.50E-04	2.6E-01
Magnesium	BB	0.20	2.4E-7	NA	--	3.0E-6	NA	--
Mercury	1.8E-01	0.07	2.4E-7	NA	--	3.0E-6	NA	--
Nickel	1.2E+02	0.27	2.4E-7	NA	--	3.0E-6	2.00E-02	4.8E-03
Selenium	1.2E+01	0.44	2.4E-7	NA	--	3.0E-6	5.00E-03	3.1E-03
Silver	3.8E+00	0.18	2.4E-7	NA	--	3.0E-6	5.00E-03	4.1E-04
Zinc	1.8E+03	0.20	2.4E-7	NA	--	3.0E-6	3.00E-01	3.5E-03
Ingestion	Total Cancer Risk:				1.0E-06			
	Total Hazard Index:							2.9E-01
Total Ingestion Cancer Risk:					1.1E-06			
Total Ingestion Hazard Index:								2.9E-01

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 24. DERMAL CONTACT WITH SEDIMENT - ADULT RESIDENT

Organic Chemical	Mean Sediment Concentration (mg/kg)	Compound RAF	Carcinogenic Effects CIU[b] (mg/kg-day)	Carcinogenic Effects Oral SF[a] $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CIU[b] (mg/kg-day)	Noncarcinogenic Effects Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cyanide								
Acenaphthene								
Acenaphthylene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Anthracene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benzo[a]anthracene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benzo[a]pyrene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benzo[b]fluoranthene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benzo[g,h,i]perylene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Benzo[k]fluoranthene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Chrysene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Dibenz[a,h]anthracene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Fluoranthene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Fluorene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Indeno[1,2,3,-cd]pyrene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Phenanthrene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Pyrene	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C19-C36 Aliphatic	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
C11-C22 Aromatic	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Volatile Organic Compounds								
Naphthalene								
#REF!								
Metals								
Arsenic	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Cadmium	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Chromium (total)	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Lead	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

Dermal Contact	Total Cancer Risk:	0.0E+00	
	Total Hazard Index:		0.0E+00
Total Dermal Contact Cancer Risk:		#VALUE!	
Total Dermal Contact Hazard Index:			2.5E-05

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 10. DERMAL CONTACT WITH SOIL - ADULT RESIDENT

Organic Chemical	Soil Concentration (mg/kg)	Compound RAF	Carcinogenic Effects CIU[b] (day)$^{-1}$	Carcinogenic Effects Oral SF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CIU[b] (day)$^{-1}$	Noncarcinogenic Effects Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.01	1.4E-6	NA	--	4.2E-6	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.01	1.4E-6	NA	--	4.2E-6	2.00E-02	1.2E-06
Semi-Volatile Organic Compounds								
Acenaphthene	5.2E-01	0.01	1.4E-6	NA	--	4.2E-6	6.00E-02	3.6E-07
Acenaphthylene	BB	0.01	1.4E-6	NA	--	4.2E-6	6.00E-02	--
Anthracene	BB	0.01	1.4E-6	NA	--	4.2E-6	3.00E-01	--
Benzo[a]anthracene	BB	0.01	1.4E-6	7.30E-01	--	4.2E-6	3.00E-01	--
Benzo[a]pyrene	BB	0.01	1.4E-6	7.30E+00	--	4.2E-6	3.00E-02	--
Benzo[b]fluoranthene	BB	0.01	1.4E-6	7.30E-01	--	4.2E-6	4.00E-02	--
Benzo[g,h,i]perylene	BB	0.01	1.4E-6	NA	--	4.2E-6	3.00E-01	--
Benzo[k]fluoranthene	BB	0.01	1.4E-6	7.30E-02	--	4.2E-6	4.00E-02	--
Chrysene	BB	0.01	1.4E-6	7.30E-02	--	4.2E-6	3.00E-01	--
Dibenz[a,h]anthracene	BB	0.01	1.4E-6	7.30E+00	--	4.2E-6	3.00E-01	--
Fluoranthene	BB	0.01	1.4E-6	NA	--	4.2E-6	4.00E-02	--
Fluorene	BB	0.01	1.4E-6	NA	--	4.2E-6	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	BB	0.01	1.4E-6	7.30E-01	--	4.2E-6	4.00E-02	--
Phenanthrene	7.4E+00	0.01	1.4E-6	NA	--	4.2E-6	3.00E-01	1.0E-06
Pyrene	BB	0.01	1.4E-6	NA	--	4.2E-6	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.20	1.4E-6	NA	--	4.2E-6	1.00E-01	3.8E-04
C19-C36 Aliphatic	1.5E+02	0.10	1.4E-6	NA	--	4.2E-6	2.00E+00	3.2E-05
C11-C22 Aromatic	1.6E+02	0.18	1.4E-6	NA	--	4.2E-6	3.00E-02	4.0E-03
Volatile Organic Compounds								
Naphthalene	5.2E-01	0.01	1.4E-6	NA	--	4.2E-6	2.00E-02	1.1E-06
2-Methylnaphthalene	5.2E-01	0.01	1.4E-6	NA	--	4.2E-6	4.00E-03	5.5E-06
Metals								
Aluminum	BB	0.00	1.4E-6	NA	--	4.2E-6	1.00E+00	--
Arsenic	1.2E+01	0.00	1.4E-6	1.50E+00	2.4E-08	4.2E-6	NA	--
Barium	7.6E+01	0.00	1.4E-6	NA	--	4.2E-6	7.00E-02	4.6E-06
Cadmium	1.5E+01	0.01	1.4E-6	NA	--	4.2E-6	1.00E-03	6.4E-04
Chromium (total)	BB	0.00	1.4E-6	NA	--	4.2E-6	1.50E+00	--
Lead	4.3E+02	0.05	1.4E-6	NA	--	4.2E-6	7.50E-04	1.3E-01
Magnesium	BB	0.00	1.4E-6	NA	--	4.2E-6	NA	--
Mercury	1.8E-01	0.00	1.4E-6	NA	--	4.2E-6	NA	--
Nickel	1.2E+02	0.00	1.4E-6	NA	--	4.2E-6	2.00E-02	2.5E-05
Selenium	1.2E+01	0.00	1.4E-6	NA	--	4.2E-6	5.00E-03	1.0E-05
Silver	3.8E+00	0.00	1.4E-6	NA	--	4.2E-6	5.00E-03	3.2E-06
Zinc	1.8E+03	0.00	1.4E-6	NA	--	4.2E-6	3.00E-01	2.5E-05
Dermal Contact	Total Cancer Risk:				2.4E-08			
	Total Hazard Index:							1.4E-01
Total Dermal Contact Cancer Risk:					2.4E-08			
Total Dermal Contact Hazard Index:								1.4E-01

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor

TABLE 14. DERMAL CONTACT WITH SOIL - CHILD RESIDENT

Organic Chemical	Soil Concentration (mg/kg)	Compound RAF	Carcinogenic Effects: CIU[b] (day)$^{-1}$	Carcinogenic Effects: Oral SF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects: Excess Risk	Noncarcinogenic Effects: CIU[b] (day)$^{-1}$	Noncarcinogenic Effects: Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects: Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.01	2.0E-6	NA	--	2.5E-5	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.01	2.0E-6	NA	--	2.5E-5	2.00E-02	7.0E-06
Semi-Volatile Organic Compounds								
Acenaphthene	5.2E-01	0.01	2.0E-6	NA	--	2.5E-5	6.00E-02	2.1E-06
Acenaphthylene	BB	0.01	2.0E-6	NA	--	2.5E-5	6.00E-02	--
Anthracene	BB	0.01	2.0E-6	NA	--	2.5E-5	3.00E-01	--
Benzo[a]anthracene	BB	0.01	2.0E-6	7.30E-01	--	2.5E-5	3.00E-01	--
Benzo[a]pyrene	BB	0.01	2.0E-6	7.30E+00	--	2.5E-5	3.00E-02	--
Benzo[b]fluoranthene	BB	0.01	2.0E-6	7.30E-01	--	2.5E-5	4.00E-02	--
Benzo[g,h,i]perylene	BB	0.01	2.0E-6	NA	--	2.5E-5	3.00E-01	--
Benzo[k]fluoranthene	BB	0.01	2.0E-6	7.30E-02	--	2.5E-5	4.00E-02	--
Chrysene	BB	0.01	2.0E-6	7.30E-02	--	2.5E-5	3.00E-01	--
Dibenz[a,h]anthracene	BB	0.01	2.0E-6	7.30E+00	--	2.5E-5	3.00E-01	--
Fluoranthene	BB	0.01	2.0E-6	NA	--	2.5E-5	4.00E-02	--
Fluorene	BB	0.01	2.0E-6	NA	--	2.5E-5	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	BB	0.01	2.0E-6	7.30E-01	--	2.5E-5	4.00E-02	--
Phenanthrene	7.4E+00	0.01	2.0E-6	NA	--	2.5E-5	3.00E-01	6.1E-06
Pyrene	BB	0.01	2.0E-6	NA	--	2.5E-5	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.20	2.0E-6	NA	--	2.5E-5	1.00E-01	2.2E-03
C19-C36 Aliphatic	1.5E+02	0.10	2.0E-6	NA	--	2.5E-5	2.00E+00	1.9E-04
C11-C22 Aromatic	1.6E+02	0.18	2.0E-6	NA	--	2.5E-5	3.00E-02	2.3E-02
Volatile Organic Compounds								
Naphthalene	5.2E-01	0.01	2.0E-6	NA	--	2.5E-5	2.00E-02	6.4E-06
2-Methylnaphthalene	5.2E-01	0.01	2.0E-6	NA	--	2.5E-5	4.00E-03	3.2E-05
Metals								
Aluminum	BB	0.00	2.0E-6	NA	--	2.5E-5	1.00E+00	--
Arsenic	1.2E+01	0.00	2.0E-6	1.50E+00	2.0E-08	2.5E-5	NA	--
Barium	7.6E+01	0.00	2.0E-6	NA	--	2.5E-5	7.00E-02	2.7E-05
Cadmium	1.5E+01	0.01	2.0E-6	NA	--	2.5E-5	1.00E-03	3.7E-03
Chromium (total)	BB	0.00	2.0E-6	NA	--	2.5E-5	1.50E+00	--
Lead	4.3E+02	0.05	2.0E-6	NA	--	2.5E-5	7.50E-04	7.7E-01
Magnesium	BB	0.00	2.0E-6	NA	--	2.5E-5	NA	--
Mercury	1.8E-01	0.00	2.0E-6	NA	--	2.5E-5	NA	--
Nickel	1.2E+02	0.00	2.0E-6	NA	--	2.5E-5	2.00E-02	1.4E-04
Selenium	1.2E+01	0.00	2.0E-6	NA	--	2.5E-5	5.00E-03	5.8E-05
Silver	3.8E+00	0.00	2.0E-6	NA	--	2.5E-5	5.00E-03	1.9E-05
Zinc	1.8E+03	0.00	2.0E-6	NA	--	2.5E-5	3.00E-01	1.4E-04
Dermal Contact	Total Cancer Risk:				2.0E-08			
	Total Hazard Index:							8.0E-01
Total Dermal Contact Cancer Risk:					2.0E-08			
Total Dermal Contact Hazard Index:								8.0E-01

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor

TABLE 12. INHALATION & INGESTION OF DUSTS - ADULT RESIDENT (INGESTION)

Organic Chemical	Airborne Particulate Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects: CIU[b] (mg/kg-day)	Carcinogenic Effects: Oral CSF[a] $(mg/kg\text{-}day)^{-1}$	Carcinogenic Effects: Excess Risk	Noncarcinogenic Effects: CIU[b] (mg/kg-day)	Noncarcinogenic Effects: Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects: Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	2.7E-02	0.91	1.7E-5	NA	--	5.4E-05	NA	--
Cyanide								
Cyanide (free)	1.8E-05	0.17	1.7E-5	NA	--	5.4E-05	2.00E-02	8.4E-09
Semi-Volatile Organic Compounds								
Acenaphthene	1.7E-05	0.31	1.7E-5	NA	--	5.4E-05	6.00E-02	4.7E-09
Acenaphthylene	NA	0.31	1.7E-5	NA	--	5.4E-05	6.00E-02	--
Anthracene	NA	0.76	1.7E-5	NA	--	5.4E-05	3.00E-01	--
Benzo[a]anthracene	NA	0.31	1.7E-5	7.30E-01	--	5.4E-05	3.00E-01	--
Benzo[a]pyrene	NA	0.31	1.7E-5	7.30E+00	--	5.4E-05	3.00E-02	--
Benzo[b]fluoranthene	NA	0.31	1.7E-5	7.30E-01	--	5.4E-05	4.00E-02	--
Benzo[g,h,i]perylene	NA	0.31	1.7E-5	NA	--	5.4E-05	3.00E-01	--
Benzo[k]fluoranthene	NA	0.31	1.7E-5	7.30E-02	--	5.4E-05	4.00E-02	--
Chrysene	NA	0.31	1.7E-5	7.30E-02	--	5.4E-05	3.00E-01	--
Dibenz[a,h]anthracene	NA	0.31	1.7E-5	7.30E+00	--	5.4E-05	3.00E-01	--
Fluoranthene	NA	0.31	1.7E-5	NA	--	5.4E-05	4.00E-02	--
Fluorene	NA	0.5	1.7E-5	NA	--	5.4E-05	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	NA	0.31	1.7E-5	7.30E-01	--	5.4E-05	4.00E-02	--
Phenanthrene	2.4E-04	0.73	1.7E-5	NA	--	5.4E-05	3.00E-01	3.1E-08
Pyrene	NA	0.31	1.7E-5	NA	--	5.4E-05	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	1.4E-03	0.91	1.7E-5	NA	--	5.4E-05	1.00E-01	7.1E-07
C19-C36 Aliphatic	4.9E-03	0.91	1.7E-5	NA	--	5.4E-05	2.00E+00	1.2E-07
C11-C22 Aromatic	5.1E-03	0.91	1.7E-5	NA	--	5.4E-05	3.00E-02	8.4E-06
Volatile Organic Compounds								
Naphthalene	1.7E-05	0.8	1.7E-5	NA	--	5.4E-05	2.00E-02	3.6E-08
2-Methylnaphthalene	1.7E-05	0.8	1.7E-5	NA	--	5.4E-05	4.00E-03	1.8E-07
Metals								
Aluminum	NA	0.1	1.7E-5	NA	--	5.4E-05	1.00E+00	--
Arsenic	3.7E-04	0.41	1.7E-5	1.50E+00	4.0E-09	5.4E-05	NA	--
Barium	2.4E-03	0.07	1.7E-5	NA	--	5.4E-05	7.00E-02	1.3E-07
Cadmium	4.8E-04	0.025	1.7E-5	NA	--	5.4E-05	1.00E-03	6.6E-07
Chromium (total)	NA	0.005	1.7E-5	NA	--	5.4E-05	1.50E+00	--
Lead	1.4E-02	0.15	1.7E-5	NA	--	5.4E-05	7.50E-04	1.5E-04
Magnesium	NA	0.2	1.7E-5	NA	--	5.4E-05	NA	--
Mercury	5.6E-06	0.07	1.7E-5	NA	--	5.4E-05	NA	--
Nickel	3.8E-03	0.27	1.7E-5	NA	--	5.4E-05	2.00E-02	2.8E-06
Selenium	3.8E-04	0.44	1.7E-5	NA	--	5.4E-05	5.00E-03	1.8E-06
Silver	1.2E-04	0.18	1.7E-5	NA	--	5.4E-05	5.00E-03	2.4E-07
Zinc	5.6E-02	0.2	1.7E-5	NA	--	5.4E-05	3.00E-01	2.0E-06
Ingestion of Particulate	Total Cancer Risk:				4.0E-09			
	Total Hazard Index:							1.7E-04
Total Ingestion Cancer Risk:					8.8E-07			
Total Ingestion Hazard Index:								2.8E-02

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor

RAF - Relative absorption factor (default absorption efficiency, MADP 1995)

[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.

[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 11. INHALATION & INGESTION OF DUSTS - ADULT RESIDENT (INHALATION)

			Carcinogenic Effects			Noncarcinogenic Effects		
Organic Chemical	Particulate Air Concentration (ug/m^3)	Compound RAF	CIU[b] (mg/kg-day)	Inhalation CSF[a] (mg/kg-day)$^{-1}$	Excess Risk	CIU[b] (mg/kg-day)	Inhalation RfD[a] (mg/kg-day)	Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	2.7E-02	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Cyanide								
Cyanide (free)	1.8E-05	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Semi-Volatile Organic Compounds								
Acenaphthene	1.7E-05	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Acenaphthylene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Anthracene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Benzo[a]anthracene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Benzo[a]pyrene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Benzo[b]fluoranthene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Benzo[g,h,i]perylene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Benzo[k]fluoranthene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Chrysene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Dibenz[a,h]anthracene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Fluoranthene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Fluorene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Indeno[1,2,3,-cd]pyrene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Phenanthrene	2.4E-04	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Pyrene	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	1.4E-03	1.0	4.4E-6	NA	--	1.4E-5	5.71E+01	3.4E-10
C19-C36 Aliphatic	4.9E-03	1.0	4.4E-6	NA	--	1.4E-5	NA	--
C11-C22 Aromatic	5.1E-03	1.0	4.4E-6	NA	--	1.4E-5	5.71E+00	1.2E-08
Volatile Organic Compounds								
Naphthalene	1.7E-05	1.0	4.4E-6	NA	--	1.4E-5	8.57E-04	2.6E-07
2-Methylnaphthalene	1.7E-05	1.0	4.4E-6	NA	--	1.4E-5	4.00E-03	5.6E-08
Metals								
Aluminum	v	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Arsenic	3.7E-04	1.0	4.4E-6	1.50E+01	2.4E-08	1.4E-5	3.00E-04	1.7E-05
Barium	2.4E-03	0.7	4.4E-6	NA	--	1.4E-5	1.40E-04	1.7E-04
Cadmium	4.8E-04	1.0	4.4E-6	6.30E+00	1.3E-08	1.4E-5	NA	--
Chromium (total)	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Lead	1.4E-02	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Magnesium	NA	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Mercury	5.6E-06	1.0	4.4E-6	NA	--	1.4E-5	8.60E-05	8.9E-07
Nickel	3.8E-03	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Selenium	3.8E-04	0.4	4.4E-6	NA	--	1.4E-5	NA	--
Silver	1.2E-04	0.4	4.4E-6	NA	--	1.4E-5	NA	--
Zinc	5.6E-02	1.0	4.4E-6	NA	--	1.4E-5	NA	--
Inhalation	Total Cancer Risk:				3.8E-08			
	Total Hazard Index:							1.9E-04
Total Inhalation Cancer Risk:					3.8E-08			
Total Inhalation Hazard Index:								1.9E-04

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor

RAF - Relative absorption factor (default absorption efficiency, MADP 1995)

[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.

[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 15. INHALATION & INGESTION OF DUSTS - CHILD RESIDENT (INHALATION)

			Carcinogenic Effects			Noncarcinogenic Effects		
Organic Chemical	Particulate Air Concentration (ug/m^3)	Compound RAF	CIU[b] (mg/kg-day)	Inhalation CSF[a] $(mg/kg\text{-}day)^{-1}$	Excess Risk	CIU[b] (mg/kg-day)	Inhalation RfD[a] (mg/kg-day)	Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	2.7E-02	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Cyanide								
Cyanide (free)	1.8E-05	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Semi-Volatile Organic Compounds								
Acenaphthene	1.7E-05	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Acenaphthylene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Anthracene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Benzo[a]anthracene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Benzo[a]pyrene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Benzo[b]fluoranthene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Benzo[g,h,i]perylene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Benzo[k]fluoranthene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Chrysene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Dibenz[a,h]anthracene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Fluoranthene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Fluorene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Indeno[1,2,3,-cd]pyrene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Phenanthrene	2.4E-04	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Pyrene	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	1.4E-03	1.0	1.3E-6	NA	--	1.6E-5	5.71E+01	4.0E-10
C19-C36 Aliphatic	4.9E-03	1.0	1.3E-6	NA	--	1.6E-5	NA	--
C11-C22 Aromatic	5.1E-03	1.0	1.3E-6	NA	--	1.6E-5	5.71E+00	1.4E-08
Volatile Organic Compounds								
Naphthalene	1.7E-05	1.0	1.3E-6	NA	--	1.6E-5	8.57E-04	3.1E-07
2-Methylnaphthalene	1.7E-05	1.0	1.3E-6	NA	--	1.6E-5	4.00E-03	6.5E-08
Metals								
Aluminum	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Arsenic	3.7E-04	1.0	1.3E-6	1.50E+01	4.2E-09	1.6E-5	3.00E-04	2.0E-05
Barium	2.4E-03	0.7	1.3E-6	NA	--	1.6E-5	1.40E-04	1.9E-04
Cadmium	4.8E-04	1.0	1.3E-6	6.30E+00	2.3E-09	1.6E-5	NA	--
Chromium (total)	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Lead	1.4E-02	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Magnesium	NA	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Mercury	5.6E-06	1.0	1.3E-6	NA	--	1.6E-5	8.60E-05	1.0E-06
Nickel	3.8E-03	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Selenium	3.8E-04	0.4	1.3E-6	NA	--	1.6E-5	NA	--
Silver	1.2E-04	0.4	1.3E-6	NA	--	1.6E-5	NA	--
Zinc	5.6E-02	1.0	1.3E-6	NA	--	1.6E-5	NA	--
Inhalation	Total Cancer Risk:				6.5E-09			
	Total Hazard Index:							2.2E-04
Total Inhalation Cancer Risk:					6.5E-09			
Total Inhalation Hazard Index:								2.2E-04

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor

RAF - Relative absorption factor (default absorption efficiency, MADP 1995)

[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.

[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 16. INHALATION & INGESTION OF DUSTS - CHILD RESIDENT (INGESTION)

			Carcinogenic Effects			Noncarcinogenic Effects		
Organic Chemical	Particulate Air Concentration (ug/m^3)	Compound RAF	CIU[b] (mg/kg-day)	Oral CSF[a] $(mg/kg\text{-}day)^{-1}$	Excess Risk	CIU[b] (mg/kg-day)	Oral RfD[a] (mg/kg-day)	Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	2.7E-02	0.91	5.1E-6	NA	--	6.3E-05	NA	--
Cyanide								
Cyanide (free)	1.8E-05	0.17	5.1E-6	NA	--	6.3E-05	2.00E-02	9.7E-09
Semi-Volatile Organic Compounds								
Acenaphthene	1.7E-05	0.31	5.1E-6	NA	--	6.3E-05	6.00E-02	5.4E-09
Acenaphthylene	NA	0.31	5.1E-6	NA	--	6.3E-05	6.00E-02	--
Anthracene	NA	0.76	5.1E-6	NA	--	6.3E-05	3.00E-01	--
Benzo[a]anthracene	NA	0.31	5.1E-6	7.30E-01	--	6.3E-05	3.00E-01	--
Benzo[a]pyrene	NA	0.31	5.1E-6	7.30E+00	--	6.3E-05	3.00E-02	--
Benzo[b]fluoranthene	NA	0.31	5.1E-6	7.30E-01	--	6.3E-05	4.00E-02	--
Benzo[g,h,i]perylene	NA	0.31	5.1E-6	NA	--	6.3E-05	3.00E-01	--
Benzo[k]fluoranthene	NA	0.31	5.1E-6	7.30E-02	--	6.3E-05	4.00E-02	--
Chrysene	NA	0.31	5.1E-6	7.30E-02	--	6.3E-05	3.00E-01	--
Dibenz[a,h]anthracene	NA	0.31	5.1E-6	7.30E+00	--	6.3E-05	3.00E-01	--
Fluoranthene	NA	0.31	5.1E-6	NA	--	6.3E-05	4.00E-02	--
Fluorene	NA	0.5	5.1E-6	NA	--	6.3E-05	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	NA	0.31	5.1E-6	7.30E-01	--	6.3E-05	4.00E-02	--
Phenanthrene	2.4E-04	0.73	5.1E-6	NA	--	6.3E-05	3.00E-01	3.6E-08
Pyrene	NA	0.31	5.1E-6	NA	--	6.3E-05	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	1.4E-03	0.91	5.1E-6	NA	--	6.3E-05	1.00E-01	8.2E-07
C19-C36 Aliphatic	4.9E-03	0.91	5.1E-6	NA	--	6.3E-05	2.00E+00	1.4E-07
C11-C22 Aromatic	5.1E-03	0.91	5.1E-6	NA	--	6.3E-05	3.00E-02	9.8E-06
Volatile Organic Compounds								
Naphthalene	1.7E-05	0.8	5.1E-6	NA	--	6.3E-05	2.00E-02	4.2E-08
2-Methylnaphthalene	1.7E-05	0.8	5.1E-6	NA	--	6.3E-05	4.00E-03	2.1E-07
Metals								
Aluminum	NA	0.1	5.1E-6	NA	--	6.3E-05	1.00E+00	--
Arsenic	3.7E-04	0.41	5.1E-6	1.50E+00	6.9E-10	6.3E-05	NA	--
Barium	2.4E-03	0.07	5.1E-6	NA	--	6.3E-05	7.00E-02	1.5E-07
Cadmium	4.8E-04	0.025	5.1E-6	NA	--	6.3E-05	1.00E-03	7.6E-07
Chromium (total)	NA	0.005	5.1E-6	NA	--	6.3E-05	1.50E+00	--
Lead	1.4E-02	0.15	5.1E-6	NA	--	6.3E-05	7.50E-04	1.8E-04
Magnesium	NA	0.2	5.1E-6	NA	--	6.3E-05	NA	--
Mercury	5.6E-06	0.07	5.1E-6	NA	--	6.3E-05	NA	--
Nickel	3.8E-03	0.27	5.1E-6	NA	--	6.3E-05	2.00E-02	3.2E-06
Selenium	3.8E-04	0.44	5.1E-6	NA	--	6.3E-05	5.00E-03	2.1E-06
Silver	1.2E-04	0.18	5.1E-6	NA	--	6.3E-05	5.00E-03	2.8E-07
Zinc	5.6E-02	0.2	5.1E-6	NA	--	6.3E-05	3.00E-01	2.4E-06
Ingestion of Particulate	Total Cancer Risk:				6.9E-10			
	Total Hazard Index:							2.0E-04
Total Ingestion Cancer Risk:					1.1E-06			
Total Ingestion Hazard Index:								2.9E-01

NOTES:

-- = Not Detected

NA = Not Available

NE = Not Evaluated

RfD - Reference dose

SF - Cancer slope factor

RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 23. INCIDENTAL INGESTION OF SEDIMENTS - ADULT RESIDENT

			Carcinogenic Effects			Noncarcinogenic Effects		
Organic Chemical	Mean Sediment Concentration (mg/kg)	Compound RAF	CIU[b] (mg/kg-day)	Oral SF[a] (mg/kg-day)$^{-1}$	Excess Risk	CIU[b] (mg/kg-day)	Oral RfD[a] (mg/kg-day)	Hazard Quotient
Semi-Volatile Organic Compounds								
Total Petroleum Hydrocarbons								
TPH	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
EPH Target Compounds								
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Acenaphthene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Acenaphthylene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Anthracene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Benzo[a]anthracene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Benzo[a]pyrene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Benzo[b]fluoranthene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Benzo[g,h,i]perylene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Benzo[k]fluoranthene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Chrysene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Dibenz[a,h]anthracene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Fluoranthene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Fluorene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Indeno[1,2,3,-cd]pyrene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Phenanthrene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Pyrene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
C19-C36 Aliphatic	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
C11-C22 Aromatic	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Volatile Organic Compounds								
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Naphthalene	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
####								
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
#REF!	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Metals								
Arsenic	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Cadmium	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Chromium (total)	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Lead	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Mercury	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Ingestion	Total Cancer Risk:				0.0E+00			
	Total Hazard Index:							0.0E+00
Total Ingestion Cancer Risk:					#VALUE!			
Total Ingestion Hazard Index:								#REF!

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 16. INCIDENTAL INGESTION OF SEDIMENTS - CHILD RESIDENT

			Carcinogenic Effects			Noncarcinogenic Effects		
Organic Chemical	Mean Sediment Concentration (mg/kg)	Compound RAF	CIU[b] (mg/kg-day)	Oral SF[a] (mg/kg-day)$^{-1}$	Excess Risk	CIU[b] (mg/kg-day)	Oral RfD[a] (mg/kg-day)	Hazard Quotient
Semi-Volatile Organic Compounds								
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
0.00	0.0E+00	0.00	0.0E+0	0.00E+00	0.0E+00	0.0E+0	0.00E+00	0.0E+00
Ingestion	Total Cancer Risk:				0.0E+00			
	Total Hazard Index:							0.0E+00
Ingestion Total Cancer Risk:					#REF!			
Ingestion Total Hazard Index:								4.8E-01

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 17. DERMAL CONTACT WITH SEDIMENTS - CHILD RESIDENT

			Carcinogenic Effects			Noncarcinogenic Effects		
Organic Chemical	Mean Sediment Concentration (mg/kg)	Compound RAF	CIU[b] (mg/kg-day)	Oral SF[a] (mg/kg-day)$^{-1}$	Excess Risk	CIU[b] (mg/kg-day)	Oral RfD[a] (mg/kg-day)	Hazard Quotient
Semi-Volatile Organic Compounds								
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
0.00	0.0E+00	0.0E+00	0.0E+0	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Dermal Contact	Total Cancer Risk:				0.0E+00			
	Total Hazard Index:							0.0E+00
Total Dermal Contact Cancer Risk:					#REF!			
Total Dermal Contact Hazard Index:								#REF!

NOTES:
-- = Not Detected
NA = Not Available
NE = Not Evaluated
RfD - Reference dose
SF - Cancer slope factor
RAF - Relative absorption factor (default absorption efficiency, MADP 1995)
[a] Toxicity values obtained from U.S. EPA Integrated Risk Information System (IRIS) files (U.S. EPA 1999a), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 18. INCIDENTAL INGESTION OF SOIL - CONSTRUCTION/UTILITY WORKER

Chemical	Soil Concentration (mg/kg)	Compound RAF	Carcinogenic Effects CDI[b] (mg/kg-day)	Carcinogenic Effects Oral CSF[a] (mg/kg-day)[-1]	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CDI[b] (mg/kg-day)	Noncarcinogenic Effects Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.91	3.4E-9	NA	--	5.1E-7	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.17	3.4E-9	NA	--	5.1E-7	2.00E-01	2.5E-07
Semi-Volatile Organic Compounds								
Acenaphthene	5.2E-01	0.31	3.4E-9	NA	--	5.1E-7	6.00E-01	1.4E-07
Acenaphthylene	BB	0.31	3.4E-9	NA	--	5.1E-7	6.00E-01	--
Anthracene	BB	0.76	3.4E-9	NA	--	5.1E-7	3.00E+00	--
Benzo[a]anthracene	BB	0.31	3.4E-9	7.30E-01	--	5.1E-7	3.00E+00	--
Benzo[a]pyrene	BB	0.31	3.4E-9	7.30E+00	--	5.1E-7	3.00E-01	--
Benzo[b]fluoranthene	BB	0.31	3.4E-9	7.30E-01	--	5.1E-7	4.00E-01	--
Benzo[g,h,i]perylene	BB	0.31	3.4E-9	NA	--	5.1E-7	3.00E+00	--
Benzo[k]fluoranthene	BB	0.31	3.4E-9	7.30E-02	--	5.1E-7	4.00E-01	--
Chrysene	BB	0.31	3.4E-9	7.30E-02	--	5.1E-7	3.00E+00	--
Dibenz[a,h]anthracene	BB	0.31	3.4E-9	7.30E+00	--	5.1E-7	3.00E+00	--
Fluoranthene	BB	0.31	3.4E-9	NA	--	5.1E-7	4.00E-01	--
Fluorene	BB	0.50	3.4E-9	NA	--	5.1E-7	4.00E-01	--
Indeno[1,2,3,-cd]pyrene	BB	0.31	3.4E-9	7.30E-01	--	5.1E-7	4.00E-01	--
Phenanthrene	7.4E+00	0.73	3.4E-9	NA	--	5.1E-7	3.00E+00	9.2E-07
Pyrene	BB	0.31	3.4E-9	NA	--	5.1E-7	3.00E+00	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.91	3.4E-9	NA	--	5.1E-7	1.00E+00	2.1E-05
C19-C36 Aliphatic	1.5E+02	0.91	3.4E-9	NA	--	5.1E-7	2.00E+01	3.5E-06
C11-C22 Aromatic	1.6E+02	0.91	3.4E-9	NA	--	5.1E-7	3.00E-01	2.5E-04
Naphthalene	5.2E-01	0.80	3.4E-9	NA	--	5.1E-7	2.00E-01	1.1E-06
2-Methylnaphthalene	5.2E-01	0.80	3.4E-9	NA	--	5.1E-7	4.00E-02	5.3E-06
Metals								
Aluminum	BB	0.10	3.4E-9	NA	--	5.1E-7	1.00E+01	--
Arsenic	1.2E+01	0.41	3.4E-9	1.50E+00	2.4E-08	5.1E-7	NA	--
Barium	7.6E+01	0.07	3.4E-9	NA	--	5.1E-7	7.00E-01	3.9E-06
Cadmium	1.5E+01	0.03	3.4E-9	NA	--	5.1E-7	1.00E-02	1.9E-05
Chromium (total)	BB	0.01	3.4E-9	NA	--	5.1E-7	1.50E+01	--
Lead	4.3E+02	0.15	3.4E-9	NA	--	5.1E-7	7.50E-03	4.4E-03
Magnesium	BB	0.20	3.4E-9	NA	--	5.1E-7	NA	--
Mercury	1.8E-01	0.07	3.4E-9	NA	--	5.1E-7	NA	--
Nickel	1.2E+02	0.27	3.4E-9	NA	--	5.1E-7	2.00E-01	8.1E-05
Selenium	1.2E+01	0.44	3.4E-9	NA	--	5.1E-7	5.00E-02	5.3E-05
Silver	3.8E+00	0.18	3.4E-9	NA	--	5.1E-7	5.00E-02	7.0E-06
Zinc	1.8E+03	0.20	3.4E-9	NA	--	5.1E-7	3.00E+00	5.9E-05
Ingestion	Total Cancer Risk:				2.4E-08			
	Total Hazard Index:							4.9E-03
Ingestion Total Cancer Risk:					2.5E-08			
Ingestion Total Hazard Index								5.0E-03

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 22. INCIDENTAL INGESTION OF SOIL - MAINTENANCE WORKER

Chemical	Soil Concentration (mg/kg)	Compound RAF	Carcinogenic Effects CDI[b] (mg/kg-day)	Oral CSF[a] (mg/kg-day)$^{-1}$	Excess Risk	Noncarcinogenic Effects CDI[b] (mg/kg-day)	Oral RfD[a] (mg/kg-day)	Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.91	1.2E-7	NA	--	3.4E-7	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.17	1.2E-7	NA	--	3.4E-7	2.00E-02	1.6E-06
Acenaphthene	5.2E-01	0.31	1.2E-7	NA	--	3.4E-7	6.00E-02	9.1E-07
Acenaphthylene	BB	0.31	1.2E-7	NA	--	3.4E-7	6.00E-02	--
Anthracene	BB	0.76	1.2E-7	NA	--	3.4E-7	3.00E-01	--
Benzo[a]anthracene	BB	0.31	1.2E-7	7.30E-01	--	3.4E-7	3.00E-01	--
Benzo[a]pyrene	BB	0.31	1.2E-7	7.30E+00	--	3.4E-7	3.00E-02	--
Benzo[b]fluoranthene	BB	0.31	1.2E-7	7.30E-01	--	3.4E-7	4.00E-02	--
Benzo[g,h,i]perylene	BB	0.31	1.2E-7	NA	--	3.4E-7	3.00E-01	--
Benzo[k]fluoranthene	BB	0.31	1.2E-7	7.30E-02	--	3.4E-7	4.00E-02	--
Chrysene	BB	0.31	1.2E-7	7.30E-02	--	3.4E-7	3.00E-01	--
Dibenz[a,h]anthracene	BB	0.31	1.2E-7	7.30E+00	--	3.4E-7	3.00E-01	--
Fluoranthene	BB	0.31	1.2E-7	NA	--	3.4E-7	4.00E-02	--
Fluorene	BB	0.50	1.2E-7	NA	--	3.4E-7	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	BB	0.31	1.2E-7	7.30E-01	--	3.4E-7	4.00E-02	--
Phenanthrene	7.4E+00	0.73	1.2E-7	NA	--	3.4E-7	3.00E-01	6.1E-06
Pyrene	BB	0.31	1.2E-7	NA	--	3.4E-7	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.91	1.2E-7	NA	--	3.4E-7	1.00E-01	1.4E-04
C19-C36 Aliphatic	1.5E+02	0.91	1.2E-7	NA	--	3.4E-7	2.00E+00	2.3E-05
C11-C22 Aromatic	1.6E+02	0.91	1.2E-7	NA	--	3.4E-7	3.00E-02	1.6E-03
Volatile Organic Compounds								
Naphthalene	5.2E-01	0.80	1.2E-7	NA	--	3.4E-7	2.00E-02	7.0E-06
2-Methylnaphthalene	5.2E-01	0.80	1.2E-7	NA	--	3.4E-7	4.00E-03	3.5E-05
Metals								
Aluminum	BB	0.10	1.2E-7	NA	--	3.4E-7	1.00E+00	--
Arsenic	1.2E+01	0.41	1.2E-7	1.50E+00	8.7E-07	3.4E-7	NA	--
Barium	7.6E+01	0.07	1.2E-7	NA	--	3.4E-7	7.00E-02	2.6E-05
Cadmium	1.5E+01	0.03	1.2E-7	NA	--	3.4E-7	1.00E-03	1.3E-04
Chromium (total)	BB	0.01	1.2E-7	NA	--	3.4E-7	1.50E+00	--
Lead	4.3E+02	0.15	1.2E-7	NA	--	3.4E-7	7.50E-04	2.9E-02
Magnesium	BB	0.20	1.2E-7	NA	--	3.4E-7	NA	--
Mercury	1.8E-01	0.07	1.2E-7	NA	--	3.4E-7	NA	--
Nickel	1.2E+02	0.27	1.2E-7	NA	--	3.4E-7	2.00E-02	5.4E-04
Selenium	1.2E+01	0.44	1.2E-7	NA	--	3.4E-7	5.00E-03	3.5E-04
Silver	3.8E+00	0.18	1.2E-7	NA	--	3.4E-7	5.00E-03	4.7E-05
Zinc	1.8E+03	0.20	1.2E-7	NA	--	3.4E-7	3.00E-01	4.0E-04
Ingestion	Total Cancer Risk:				8.7E-07			
	Total Hazard Index:							3.3E-02
Ingestion Total Cancer Risk:					9.0E-07			
Ingestion Total Hazard Index								3.4E-02

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 20. INHALATION & INGESTION OF DUSTS - CONSTRUCTION/UTILITY WORKER (INHALATION)

Organic Chemical	Particulate Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects CDI[b] (mg/kg-day)	Inhalation CSF[a] (mg/kg-day)$^{-1}$	Excess Risk	Noncarcinogenic Effects CDI[b] (mg/kg-day)	Inhalation RfD[a] (mg/kg-day)	Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	5.0E-02	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Cyanide								
Cyanide (free)	3.4E-05	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Semi-Volatile Organic Compounds								
Acenaphthene	3.1E-05	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Acenaphthylene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Anthracene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Benzo[a]anthracene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Benzo[a]pyrene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Benzo[b]fluoranthene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Benzo[g,h,i]perylene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Benzo[k]fluoranthene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Chrysene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Dibenz[a,h]anthracene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Fluoranthene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Fluorene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Indeno[1,2,3,-cd]pyrene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Phenanthrene	4.4E-04	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Pyrene	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	2.7E-03	1.00	2.4E-7	NA	--	3.7E-5	5.71E+02	1.7E-10
C19-C36 Aliphatic	9.1E-03	1.00	2.4E-7	NA	--	3.7E-5	NA	--
C11-C22 Aromatic	9.6E-03	1.00	2.4E-7	NA	--	3.7E-5	5.71E+01	6.1E-09
Volatile Organic Compounds								
Naphthalene	3.1E-05	1.00	2.4E-7	NA	--	3.7E-5	8.57E-03	1.3E-07
2-Methylnaphthalene	3.1E-05	1.00	2.4E-7	NA	--	3.7E-5	4.00E-02	2.8E-08
Metals								
Aluminum	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Arsenic	7.0E-04	1.00	2.4E-7	1.50E+01	2.5E-09	3.7E-5	3.00E-03	8.5E-06
Barium	4.6E-03	0.71	2.4E-7	NA	--	3.7E-5	1.40E-03	8.5E-05
Cadmium	9.1E-04	1.00	2.4E-7	6.30E+00	1.4E-09	3.7E-5	NA	--
Chromium (total)	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Lead	2.6E-02	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Magnesium	NA	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Mercury	1.1E-05	1.00	2.4E-7	NA	--	3.7E-5	8.60E-04	4.5E-07
Nickel	7.1E-03	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Selenium	7.1E-04	0.39	2.4E-7	NA	--	3.7E-5	NA	--
Silver	2.3E-04	0.39	2.4E-7	NA	--	3.7E-5	NA	--
Zinc	1.1E-01	1.00	2.4E-7	NA	--	3.7E-5	NA	--
Inhalation	Total Cancer Risk:				3.9E-09			
	Total Hazard Index:							9.4E-05
Total InhalationCancer Risk					3.9E-09			
Total Inhalation Hazard Index								9.4E-05

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 24. INHALATION & INGESTION OF DUSTS - MAINTENANCE WORKER (INHALATION)

Organic Chemical	Particulate Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects CDI[b] (mg/kg-day)	Carcinogenic Effects Inhalation CSF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CDI[b] (mg/kg-day)	Noncarcinogenic Effects Inhalation RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	5.0E-02	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Cyanide								
Cyanide (free)	3.4E-05	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Semi-Volatile Organic Compounds								
Acenaphthene	3.1E-05	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Acenaphthylene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Anthracene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Benzo[a]anthracene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Benzo[a]pyrene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Benzo[b]fluoranthene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Benzo[g,h,i]perylene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Benzo[k]fluoranthene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Chrysene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Dibenz[a,h]anthracene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Fluoranthene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Fluorene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Indeno[1,2,3,-cd]pyrene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Phenanthrene	4.4E-04	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Pyrene	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	2.7E-03	1.00	1.8E-5	NA	--	4.9E-5	5.71E+01	2.3E-09
C19-C36 Aliphatic	9.1E-03	1.00	1.8E-5	NA	--	4.9E-5	NA	--
C11-C22 Aromatic	9.6E-03	1.00	1.8E-5	NA	--	4.9E-5	5.71E+00	8.1E-08
Volatile Organic Compounds								
Naphthalene	3.1E-05	1.00	1.8E-5	NA	--	4.9E-5	8.57E-04	1.8E-06
2-Methylnaphthalene	3.1E-05	1.00	1.8E-5	NA	--	4.9E-5	4.00E-03	3.8E-07
Metals								
Aluminum	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Arsenic	7.0E-04	1.00	1.8E-5	1.50E+01	1.8E-07	4.9E-5	3.00E-04	1.1E-04
Barium	4.6E-03	0.71	1.8E-5	NA	--	4.9E-5	1.40E-04	1.1E-03
Cadmium	9.1E-04	1.00	1.8E-5	6.30E+00	1.0E-07	4.9E-5	NA	--
Chromium (total)	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Lead	2.6E-02	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Magnesium	NA	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Mercury	1.1E-05	1.00	1.8E-5	NA	--	4.9E-5	8.60E-05	6.0E-06
Nickel	7.1E-03	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Selenium	7.1E-04	0.39	1.8E-5	NA	--	4.9E-5	NA	--
Silver	2.3E-04	0.39	1.8E-5	NA	--	4.9E-5	NA	--
Zinc	1.1E-01	1.00	1.8E-5	NA	--	4.9E-5	NA	--
Inhalation	Total Cancer Risk:				2.8E-07			
	Total Hazard Index							1.3E-03
Total InhalationCancer Risk					2.8E-07			
Total Inhalation Hazard Index								1.3E-03

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 21. INHALATION & INGESTION OF DUSTS - CONSTRUCTION/UTILITY WORKER (INGESTION)

Organic Chemical	Particulate Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects CDI[b] (mg/kg-day)	Carcinogenic Effects Oral CSF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CDI[b] (mg/kg-day)	Noncarcinogenic Effects Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	5.0E-02	0.91	9.7E-7	NA	--	1.5E-4	NA	--
Cyanide								
Cyanide (free)	3.4E-05	0.17	9.7E-7	NA	--	1.5E-4	2.00E-01	4.2E-09
Semi-Volatile Organic Compounds								
Acenaphthene	3.1E-05	0.31	9.7E-7	NA	--	1.5E-4	6.00E-01	2.4E-09
Acenaphthylene	NA	0.31	9.7E-7	NA	--	1.5E-4	6.00E-01	--
Anthracene	NA	0.76	9.7E-7	NA	--	1.5E-4	3.00E+00	--
Benzo[a]anthracene	NA	0.31	9.7E-7	7.30E-01	--	1.5E-4	3.00E+00	--
Benzo[a]pyrene	NA	0.31	9.7E-7	7.30E+00	--	1.5E-4	3.00E-01	--
Benzo[b]fluoranthene	NA	0.31	9.7E-7	7.30E-01	--	1.5E-4	4.00E-01	--
Benzo[g,h,i]perylene	NA	0.31	9.7E-7	NA	--	1.5E-4	3.00E+00	--
Benzo[k]fluoranthene	NA	0.31	9.7E-7	7.30E-02	--	1.5E-4	4.00E-01	--
Chrysene	NA	0.31	9.7E-7	7.30E-02	--	1.5E-4	3.00E+00	--
Dibenz[a,h]anthracene	NA	0.31	9.7E-7	7.30E+00	--	1.5E-4	3.00E+00	--
Fluoranthene	NA	0.31	9.7E-7	NA	--	1.5E-4	4.00E-01	--
Fluorene	NA	0.50	9.7E-7	NA	--	1.5E-4	4.00E-01	--
Indeno[1,2,3,-cd]pyrene	NA	0.31	9.7E-7	7.30E-01	--	1.5E-4	4.00E-01	--
Phenanthrene	4.4E-04	0.73	9.7E-7	NA	--	1.5E-4	3.00E+00	1.6E-08
Pyrene	NA	0.31	9.7E-7	NA	--	1.5E-4	3.00E+00	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	2.7E-03	0.91	9.7E-7	NA	--	1.5E-4	1.00E+00	3.6E-07
C19-C36 Aliphatic	9.1E-03	0.91	9.7E-7	NA	--	1.5E-4	2.00E+01	6.1E-08
C11-C22 Aromatic	9.6E-03	0.91	9.7E-7	NA	--	1.5E-4	3.00E-01	4.2E-06
Volatile Organic Compounds								
Naphthalene	3.1E-05	0.80	9.7E-7	NA	--	1.5E-4	2.00E-01	1.8E-08
2-Methylnaphthalene	3.1E-05	0.80	9.7E-7	NA	--	1.5E-4	4.00E-02	9.1E-08
Metals								
Aluminum	NA	0.10	9.7E-7	NA	--	1.5E-4	1.00E+01	--
Arsenic	7.0E-04	0.41	9.7E-7	1.50E+00	4.2E-10	1.5E-4	NA	--
Barium	4.6E-03	0.07	9.7E-7	NA	--	1.5E-4	7.00E-01	6.7E-08
Cadmium	9.1E-04	0.03	9.7E-7	NA	--	1.5E-4	1.00E-02	3.3E-07
Chromium (total)	NA	0.01	9.7E-7	NA	--	1.5E-4	1.50E+01	--
Lead	2.6E-02	0.15	9.7E-7	NA	--	1.5E-4	7.50E-03	7.6E-05
Magnesium	NA	0.20	9.7E-7	NA	--	1.5E-4	NA	--
Mercury	1.1E-05	0.07	9.7E-7	NA	--	1.5E-4	NA	--
Nickel	7.1E-03	0.27	9.7E-7	NA	--	1.5E-4	2.00E-01	1.4E-06
Selenium	7.1E-04	0.44	9.7E-7	NA	--	1.5E-4	5.00E-02	9.1E-07
Silver	2.3E-04	0.18	9.7E-7	NA	--	1.5E-4	5.00E-02	1.2E-07
Zinc	1.1E-01	0.20	9.7E-7	NA	--	1.5E-4	3.00E+00	1.0E-06
Ingestion Total Cancer Risk:					4.2E-10			
Total Hazard Index:								8.5E-05
Ingestion Total Cancer Risk:					2.5E-08			
Ingestion Total Hazard Index								5.0E-03

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 25. INHALATION & INGESTION OF DUSTS - MAINTENANCE WORKER (INGESTION)

Organic Chemical	Particulate Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects CDI[a] (mg/kg-day)	Oral CSF[a] (mg/kg-day)$^{-1}$	Excess Risk	Noncarcinogenic Effects CDI[a] (mg/kg-day)	Oral RfD[a] (mg/kg-day)	Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	5.0E-02	0.91	7.0E-5	NA	--	2.0E-4	NA	--
Cyanide								
Cyanide (free)	3.4E-05	0.17	7.0E-5	NA	--	2.0E-4	2.00E-02	5.6E-08
Semi-Volatile Organic Compounds								
Acenaphthene	3.1E-05	0.31	7.0E-5	NA	--	2.0E-4	6.00E-02	3.1E-08
Acenaphthylene	NA	0.31	7.0E-5	NA	--	2.0E-4	6.00E-02	--
Anthracene	NA	0.76	7.0E-5	NA	--	2.0E-4	3.00E-01	--
Benzo[a]anthracene	NA	0.31	7.0E-5	7.30E-01	--	2.0E-4	3.00E-01	--
Benzo[a]pyrene	NA	0.31	7.0E-5	7.30E+00	--	2.0E-4	3.00E-02	--
Benzo[b]fluoranthene	NA	0.31	7.0E-5	7.30E-01	--	2.0E-4	4.00E-02	--
Benzo[g,h,i]perylene	NA	0.31	7.0E-5	NA	--	2.0E-4	3.00E-01	--
Benzo[k]fluoranthene	NA	0.31	7.0E-5	7.30E-02	--	2.0E-4	4.00E-02	--
Chrysene	NA	0.31	7.0E-5	7.30E-02	--	2.0E-4	3.00E-01	--
Dibenz[a,h]anthracene	NA	0.31	7.0E-5	7.30E+00	--	2.0E-4	3.00E-01	--
Fluoranthene	NA	0.31	7.0E-5	NA	--	2.0E-4	4.00E-02	--
Fluorene	NA	0.50	7.0E-5	NA	--	2.0E-4	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	NA	0.31	7.0E-5	7.30E-01	--	2.0E-4	4.00E-02	--
Phenanthrene	4.4E-04	0.73	7.0E-5	NA	--	2.0E-4	3.00E-01	2.1E-07
Pyrene	NA	0.31	7.0E-5	NA	--	2.0E-4	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	2.7E-03	0.91	7.0E-5	NA	--	2.0E-4	1.00E-01	4.8E-06
C19-C36 Aliphatic	9.1E-03	0.91	7.0E-5	NA	--	2.0E-4	2.00E+00	8.1E-07
C11-C22 Aromatic	9.6E-03	0.91	7.0E-5	NA	--	2.0E-4	3.00E-02	5.7E-05
Volatile Organic Compounds								
Naphthalene	3.1E-05	0.80	7.0E-5	NA	--	2.0E-4	2.00E-02	2.4E-07
2-Methylnaphthalene	3.1E-05	0.80	7.0E-5	NA	--	2.0E-4	4.00E-03	1.2E-06
Metals								
Aluminum	NA	0.10	7.0E-5	NA	--	2.0E-4	1.00E+00	--
Arsenic	7.0E-04	0.41	7.0E-5	1.50E+00	3.0E-08	2.0E-4	NA	--
Barium	4.6E-03	0.07	7.0E-5	NA	--	2.0E-4	7.00E-02	8.9E-07
Cadmium	9.1E-04	0.03	7.0E-5	NA	--	2.0E-4	1.00E-03	4.4E-06
Chromium (total)	NA	0.01	7.0E-5	NA	--	2.0E-4	1.50E+00	--
Lead	2.6E-02	0.15	7.0E-5	NA	--	2.0E-4	7.50E-04	1.0E-03
Magnesium	NA	0.20	7.0E-5	NA	--	2.0E-4	NA	--
Mercury	1.1E-05	0.07	7.0E-5	NA	--	2.0E-4	NA	--
Nickel	7.1E-03	0.27	7.0E-5	NA	--	2.0E-4	2.00E-02	1.9E-05
Selenium	7.1E-04	0.44	7.0E-5	NA	--	2.0E-4	5.00E-03	1.2E-05
Silver	2.3E-04	0.18	7.0E-5	NA	--	2.0E-4	5.00E-03	1.6E-06
Zinc	1.1E-01	0.20	7.0E-5	NA	--	2.0E-4	3.00E-01	1.4E-05
Ingestion	Total Cancer Risk:				3.0E-08			
	Total Hazard Index:							1.1E-03
Ingestion Total Cancer Risk:					9.0E-07			
Ingestion Total Hazard Index								3.4E-02

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[a] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 19. DERMAL CONTACT WITH SOIL - CONSTRUCTION/UTILITY WORKER

Organic Chemical	Soil Concentration (mg/kg)	Compound ABS	Carcinogenic Effects CDI[b] (mg/kg-day)	Carcinogenic Effects Oral CSF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CDI[b] (mg/kg-day)	Noncarcinogenic Effects Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.01	3.4E-8	NA	--	5.1E-6	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.01	3.4E-8	NA	--	5.1E-6	2.00E-01	1.5E-07
Semi-Volatile Organic Compounds								
Acenaphthene	5.2E-01	0.01	3.4E-8	NA	--	5.1E-6	6.00E-01	4.4E-08
Acenaphthylene	BB	0.01	3.4E-8	NA	--	5.1E-6	6.00E-01	--
Anthracene	BB	0.01	3.4E-8	NA	--	5.1E-6	3.00E+00	--
Benzo[a]anthracene	BB	0.01	3.4E-8	7.30E-01	--	5.1E-6	3.00E+00	--
Benzo[a]pyrene	BB	0.01	3.4E-8	7.30E+00	--	5.1E-6	3.00E-01	--
Benzo[b]fluoranthene	BB	0.01	3.4E-8	7.30E-01	--	5.1E-6	4.00E-01	--
Benzo[g,h,i]perylene	BB	0.01	3.4E-8	NA	--	5.1E-6	3.00E+00	--
Benzo[k]fluoranthene	BB	0.01	3.4E-8	7.30E-02	--	5.1E-6	4.00E-01	--
Chrysene	BB	0.01	3.4E-8	7.30E-02	--	5.1E-6	3.00E+00	--
Dibenz[a,h]anthracene	BB	0.01	3.4E-8	7.30E+00	--	5.1E-6	3.00E+00	--
Fluoranthene	BB	0.01	3.4E-8	NA	--	5.1E-6	4.00E-01	--
Fluorene	BB	0.01	3.4E-8	NA	--	5.1E-6	4.00E-01	--
Indeno[1,2,3,-cd]pyrene	BB	0.01	3.4E-8	7.30E-01	--	5.1E-6	4.00E-01	--
Phenanthrene	7.4E+00	0.01	3.4E-8	NA	--	5.1E-6	3.00E+00	1.3E-07
Pyrene	BB	0.01	3.4E-8	NA	--	5.1E-6	3.00E+00	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.20	3.4E-8	NA	--	5.1E-6	1.00E+00	4.6E-05
C19-C36 Aliphatic	1.5E+02	0.10	3.4E-8	NA	--	5.1E-6	2.00E+01	3.9E-06
C11-C22 Aromatic	1.6E+02	0.18	3.4E-8	NA	--	5.1E-6	3.00E-01	4.9E-04
Volatile Organic Compounds								
Naphthalene	5.2E-01	0.01	3.4E-8	NA	--	5.1E-6	2.00E-01	1.3E-07
2-Methylnaphthalene	5.2E-01	0.01	3.4E-8	NA	--	5.1E-6	4.00E-02	6.6E-07
Metals								
Aluminum	BB	0.00	3.4E-8	NA	--	5.1E-6	1.00E+01	--
Arsenic	1.2E+01	0.00	3.4E-8	1.50E+00	5.9E-10	5.1E-6	NA	--
Barium	7.6E+01	0.00	3.4E-8	NA	--	5.1E-6	7.00E-01	5.6E-07
Cadmium	1.5E+01	0.01	3.4E-8	NA	--	5.1E-6	1.00E-02	7.7E-05
Chromium (total)	BB	0.00	3.4E-8	NA	--	5.1E-6	1.50E+01	--
Lead	4.3E+02	0.05	3.4E-8	NA	--	5.1E-6	7.50E-03	1.6E-02
Magnesium	BB	0.00	3.4E-8	NA	--	5.1E-6	NA	--
Mercury	1.8E-01	0.00	3.4E-8	NA	--	5.1E-6	NA	--
Nickel	1.2E+02	0.00	3.4E-8	NA	--	5.1E-6	2.00E-01	3.0E-06
Selenium	1.2E+01	0.00	3.4E-8	NA	--	5.1E-6	5.00E-02	1.2E-06
Silver	3.8E+00	0.00	3.4E-8	NA	--	5.1E-6	5.00E-02	3.9E-07
Zinc	1.8E+03	0.00	3.4E-8	NA	--	5.1E-6	3.00E+00	3.0E-06
Ingestion	Total Cancer Risk:				5.9E-10			
	Total Hazard Index:							1.7E-02
Dermal Contact Pathway Total Cancer Risk					5.9E-10			
Dermal Contact Pathway Total Hazard Index								1.7E-02

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 23. DERMAL CONTACT WITH SOIL - MAINTENANCE WORKER

Organic Chemical	Soil Concentration (mg/kg)	Compound ABS	Carcinogenic Effects CDI[b] (mg/kg-day)	Carcinogenic Effects Oral CSF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects Excess Risk	Noncarcinogenic Effects CDI[b] (mg/kg-day)	Noncarcinogenic Effects Oral RfD[a] (mg/kg-day)	Noncarcinogenic Effects Hazard Quotient
Total Petroleum Hydrocarbons								
TPH	8.3E+02	0.01	1.6E-6	NA	--	4.5E-6	NA	--
Cyanide								
Cyanide (free)	5.7E-01	0.01	1.6E-6	NA	--	4.5E-6	2.00E-02	1.3E-06
Semi-Volatile Organic Compounds								
Acenaphthene	5.2E-01	0.01	1.6E-6	NA	--	4.5E-6	6.00E-02	3.9E-07
Acenaphthylene	BB	0.01	1.6E-6	NA	--	4.5E-6	6.00E-02	--
Anthracene	BB	0.01	1.6E-6	NA	--	4.5E-6	3.00E-01	--
Benzo[a]anthracene	BB	0.01	1.6E-6	7.30E-01	--	4.5E-6	3.00E-01	--
Benzo[a]pyrene	BB	0.01	1.6E-6	7.30E+00	--	4.5E-6	3.00E-02	--
Benzo[b]fluoranthene	BB	0.01	1.6E-6	7.30E-01	--	4.5E-6	4.00E-02	--
Benzo[g,h,i]perylene	BB	0.01	1.6E-6	NA	--	4.5E-6	3.00E-01	--
Benzo[k]fluoranthene	BB	0.01	1.6E-6	7.30E-02	--	4.5E-6	4.00E-02	--
Chrysene	BB	0.01	1.6E-6	7.30E-02	--	4.5E-6	3.00E-01	--
Dibenz[a,h]anthracene	BB	0.01	1.6E-6	7.30E+00	--	4.5E-6	3.00E-01	--
Fluoranthene	BB	0.01	1.6E-6	NA	--	4.5E-6	4.00E-02	--
Fluorene	BB	0.01	1.6E-6	NA	--	4.5E-6	4.00E-02	--
Indeno[1,2,3,-cd]pyrene	BB	0.01	1.6E-6	7.30E-01	--	4.5E-6	4.00E-02	--
Phenanthrene	7.4E+00	0.01	1.6E-6	NA	--	4.5E-6	3.00E-01	1.1E-06
Pyrene	BB	0.01	1.6E-6	NA	--	4.5E-6	3.00E-01	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	4.5E+01	0.20	1.6E-6	NA	--	4.5E-6	1.00E-01	4.0E-04
C19-C36 Aliphatic	1.5E+02	0.10	1.6E-6	NA	--	4.5E-6	2.00E+00	3.4E-05
C11-C22 Aromatic	1.6E+02	0.18	1.6E-6	NA	--	4.5E-6	3.00E-02	4.3E-03
Volatile Organic Compounds								
Naphthalene	5.2E-01	0.01	1.6E-6	NA	--	4.5E-6	2.00E-02	1.2E-06
2-Methylnaphthalene	5.2E-01	0.01	1.6E-6	NA	--	4.5E-6	4.00E-03	5.8E-06
Metals								
Aluminum	BB	0.00	1.6E-6	NA	--	4.5E-6	1.00E+00	--
Arsenic	1.2E+01	0.00	1.6E-6	1.50E+00	2.8E-08	4.5E-6	NA	--
Barium	7.6E+01	0.00	1.6E-6	NA	--	4.5E-6	7.00E-02	4.9E-06
Cadmium	1.5E+01	0.01	1.6E-6	NA	--	4.5E-6	1.00E-03	6.8E-04
Chromium (total)	BB	0.00	1.6E-6	NA	--	4.5E-6	1.50E+00	--
Lead	4.3E+02	0.05	1.6E-6	NA	--	4.5E-6	7.50E-04	1.4E-01
Magnesium	BB	0.00	1.6E-6	NA	--	4.5E-6	NA	--
Mercury	1.8E-01	0.00	1.6E-6	NA	--	4.5E-6	NA	--
Nickel	1.2E+02	0.00	1.6E-6	NA	--	4.5E-6	2.00E-02	2.6E-05
Selenium	1.2E+01	0.00	1.6E-6	NA	--	4.5E-6	5.00E-03	1.1E-05
Silver	3.8E+00	0.00	1.6E-6	NA	--	4.5E-6	5.00E-03	3.4E-06
Zinc	1.8E+03	0.00	1.6E-6	NA	--	4.5E-6	3.00E-01	2.6E-05

Ingestion	Total Cancer Risk:	2.8E-08	
	Total Hazard Index		1.5E-01
Dermal Contact Pathway Total Cancer Risk		2.8E-08	
Dermal Contact Pathway Total Hazard Index			1.5E-01

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 22. DERMAL CONTACT WITH GROUNDWATER - CONSTRUCTION/UTILITY WORKER

Organic Chemical	Mean Groundwater Concentration (ug/L)	DA_{EVENT} (mg/cm^2-event)		Carcinogenic Effects: CDI[B] (mg/kg-day)	Oral CSF[A] $(mg/kg\text{-}day)^{-1}$	Excess Risk	Noncarcinogenic Effects: CDI[B] (mg/kg-day)	Oral RfD[A] (mg/kg-day)	Hazard Quotient
0									
Total Petroleum Hydrocarbons									
TPH	#REF!	#REF!	D	1.2E-1	NA	#REF!	1.8E+1	NA	#REF!
Cyanide									
#REF!	0.0E+00	0.00E+00	C	1.2E-1	NA	--	1.8E+1	4.00E-02	0.0E+00
Acenaphthene	#REF!	#REF!	D	1.2E-1	NA	#REF!	1.8E+1	6.00E-01	#REF!
Acenaphthylene	#REF!	#REF!	C	1.2E-1	NA	#REF!	1.8E+1	6.00E-01	#REF!
Anthracene	#REF!	#REF!	C	1.2E-1	NA	#REF!	1.8E+1	3.00E+00	#REF!
Benzo[a]anthracene	#REF!	#REF!	C	1.2E-1	7.30E-01	#REF!	1.8E+1	3.00E+00	#REF!
Benzo[a]pyrene	#REF!	#REF!	C	1.2E-1	7.30E+00	#REF!	1.8E+1	3.00E-01	#REF!
Benzo[b]fluoranthene	#REF!	#REF!	C	1.2E-1	7.30E-01	#REF!	1.8E+1	4.00E-01	#REF!
Benzo[g,h,i]perylene	#REF!	#REF!	C	1.2E-1	NA	#REF!	1.8E+1	3.00E+00	#REF!
Benzo[k]fluoranthene	#REF!	#REF!	C	1.2E-1	7.30E-02	#REF!	1.8E+1	4.00E-01	#REF!
Chrysene	#REF!	#REF!	C	1.2E-1	7.30E-02	#REF!	1.8E+1	3.00E+00	#REF!
Dibenz[a,h]anthracene	#REF!	#REF!	C	1.2E-1	7.30E+00	#REF!	1.8E+1	3.00E+00	#REF!
Fluoranthene	#REF!	#REF!	C	1.2E-1	NA	#REF!	1.8E+1	4.00E-01	#REF!
Fluorene	#REF!	#REF!	C	1.2E-1	NA	#REF!	1.8E+1	4.00E-01	#REF!
Indeno[1,2,3,-cd]pyrene	#REF!	#REF!	C	1.2E-1	7.30E-01	#REF!	1.8E+1	4.00E-01	#REF!
#REF!	#REF!	NA	C	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	--
Phenanthrene	#REF!	#REF!	C	1.2E-1	NA	#REF!	1.8E+1	3.00E+00	#REF!
Pyrene	#REF!	#REF!	##	1.2E-1	NA	#REF!	1.8E+1	3.00E+00	#REF!
Extractable Petroleum Hydrocarbons									
C9-C18 Aliphatic	#REF!	#REF!	D	1.2E-1	NA	#REF!	1.8E+1	1.00E+00	#REF!
C19-C36 Aliphatic	#REF!	#REF!	D	1.2E-1	NA	#REF!	1.8E+1	2.00E+01	#REF!
C11-C22 Aromatic	#REF!	#REF!	C	1.2E-1	NA	#REF!	1.8E+1	3.00E-01	#REF!
Volatile Organic Compounds									
#REF!	#REF!	#REF!	D	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	D	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
Naphthalene	#REF!	#REF!	##	1.2E-1	NA	#REF!	1.8E+1	2.00E-01	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
####									
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
#REF!	#REF!	#REF!	##	1.2E-1	#REF!	#REF!	1.8E+1	#REF!	#REF!
Metals									
Arsenic	#REF!	#REF!	E	1.2E-1	1.50E+00	#REF!	1.8E+1	NA	#REF!
Cadmium	#REF!	#REF!	E	1.2E-1	NA	#REF!	1.8E+1	1.00E-02	#REF!
Chromium (total)	#REF!	#REF!	E	1.2E-1	NA	#REF!	1.8E+1	1.50E+01	#REF!
Lead	#REF!	#REF!	E	1.2E-1	NA	#REF!	1.8E+1	7.50E-03	#REF!
Mercury	#REF!	#REF!	E	1.2E-1	NA	#REF!	1.8E+1	NA	#REF!
Dermal Contact	Total Cancer Risk:					#REF!			
	Total Hazard Index:								#REF!
Total Dermal Contact Cancer Risk:						#REF!			
Total Dermal Contact Hazard Index									#REF!

NOTES:

RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[A] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[B] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

C= DA_{EVENT} Calculated as: $2 \times K_p \times C_w \times ((6 \times Tau \times t^*)/Pie)^{0.5}) \times 0.000001$ (mg-L/ug-cm^2)

D= DA_{EVENT} Calculated as: $K_p \times C_w \times t^*((t^*/(1+B))+(2 \times Tau \times ((1+3 \times B)/(1+B)))) \times 0.000001$ (mg-L/ug-cm^2)

E= DA_{EVENT} Calculated as: $K_p \times C_w \times t^* \times 0.000001$ (mg-L/ug-cm^2)

TABLE 25. INHALATION OF VAPORS - CONSTRUCTION/UTILITY WORKER

Organic Chemical	Outdoor Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects CDI[a] (mg/kg-day)	Inhalation CSF[b] (mg/kg-day)$^{-1}$	Excess Risk	Noncarcinogenic Effects CDI[a] (mg/kg-day)	Inhalation RfD[b] (mg/kg-day)	Hazard Quotient
0								
Total Petroleum Hydrocarbons								
TPH		1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Cyanide					0.0E+00			0.0E+00
#REF!	0.0E+00	#REF!	4.9E-7	NA	0.0E+00	7.3E-5	4.00E-02	0.0E+00
Acenaphthene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Acenaphthylene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Anthracene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Benzo[a]anthracene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Benzo[a]pyrene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Benzo[b]fluoranthene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Benzo[g,h,i]perylene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Benzo[k]fluoranthene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Chrysene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Dibenz[a,h]anthracene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Fluoranthene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Fluorene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Indeno[1,2,3,-cd]pyrene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
Phenanthrene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Pyrene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Extractable Petroleum Hydrocarbons					0.0E+00			0.0E+00
C9-C18 Aliphatic	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	5.71E+02	0.0E+00
C19-C36 Aliphatic	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
C11-C22 Aromatic	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	5.71E+01	0.0E+00
Volatile Organic Compounds					0.0E+00			0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
Naphthalene	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	8.57E-03	0.0E+00
#REF!	0.0E+00	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
###					0.0E+00			0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	4.9E-7	#REF!	0.0E+00	7.3E-5	#REF!	0.0E+00
Metals					0.0E+00			0.0E+00
Arsenic	0.0E+00	1.00	4.9E-7	1.50E+01	0.0E+00	7.3E-5	3.00E-03	0.0E+00
Cadmium	0.0E+00	1.00	4.9E-7	6.30E+00	0.0E+00	7.3E-5	NA	0.0E+00
Chromium (total)	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Lead	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	NA	0.0E+00
Mercury	0.0E+00	1.00	4.9E-7	NA	0.0E+00	7.3E-5	8.60E-04	0.0E+00
					0.0E+00			0.0E+00
Dermal Contact	Total Cancer Risk:				0.0E+00			0.0E+00
	Total Hazard Index:							0.0E+00
Total Dermal Contact Cancer Risk:					0.0E+00			0.0E+00
Total Dermal Contact Hazard Index								0.0E+00

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 35. INHALATION OF VAPORS - OFFICE WORKER

Organic Chemical	Indoor Air Concentration (ug/m^3)	Compound RAF	Carcinogenic Effects: CIU[b] (m^3/kg-day)	Carcinogenic Effects: Inhalation CSF[a] (mg/kg-day)$^{-1}$	Carcinogenic Effects: Excess Risk	Noncarcinogenic Effects: CIU[b] (m^3/kg-day)	Noncarcinogenic Effects: Inhalation RfD[a] (mg/kg-day)	Noncarcinogenic Effects: Hazard Quotient
0								
Total Petroleum Hydrocarbons								
TPH	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Cyanide								0.0E+00
#REF!	0.0E+00	#REF!	3.4E-5	NA	0.0E+00	9.4E-5	4.00E-03	0.0E+00
Acenaphthene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Acenaphthylene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Anthracene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Benzo[a]anthracene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Benzo[a]pyrene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Benzo[b]fluoranthene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Benzo[g,h,i]perylene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Benzo[k]fluoranthene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Chrysene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Dibenz[a,h]anthracene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Fluoranthene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Fluorene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Indeno[1,2,3,-cd]pyrene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
Phenanthrene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Pyrene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Extractable Petroleum Hydrocarbons								0.0E+00
C9-C18 Aliphatic	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	5.71E+01	0.0E+00
C19-C36 Aliphatic	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
C11-C22 Aromatic	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	5.71E+00	0.0E+00
Volatile Organic Compounds								0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
Naphthalene	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	8.57E-04	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
####								0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
#REF!	#REF!	#REF!	3.4E-5	#REF!	0.0E+00	9.4E-5	#REF!	0.0E+00
Metals					0.0E+00			0.0E+00
Arsenic	#REF!	1.00	3.4E-5	1.50E+01	0.0E+00	9.4E-5	3.00E-04	0.0E+00
Cadmium	#REF!	1.00	3.4E-5	6.30E+00	0.0E+00	9.4E-5	NA	0.0E+00
Chromium (total)	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Lead	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	NA	0.0E+00
Mercury	#REF!	1.00	3.4E-5	NA	0.0E+00	9.4E-5	8.60E-05	0.0E+00
					0.0E+00			
Ingestion	Total Cancer Risk:				0.0E+00			
	Total Hazard Index:				0.0E+00			0.0E+00
Inhalation Pathway Total Cancer Risk					0.0E+00			
Inhalation Pathway Total Hazard Index								0.0E+00

NOTES:
RfD - Chronic oral reference dose
CSF - Cancer slope factor
-- - Not applicable
ND - Not Detected
NA - Not Available
RAF - Relative absorption factor (default absorption efficiency, MADP 1995
[a] Toxicity values obtained from EPA Integrated Risk Information System (IRIS) files (April 1996), unless otherwise noted.
[b] Chemical dependent intake (CDI) values are exclusive of chemical concentrations and RAF values.

TABLE 26. SUMMARY OF CHEMICAL-SPECIFIC UPPER-BOUND EXCESS LIFETIME CARCINOGENIC RISKS AND NONCARCINOGENIC HAZARD INDICES FOR EACH RECEPTOR SCENARIO

	RESIDENTS				*WORKERS*			
Receptors	**Adult**		**Child**		**Construction/Utility**		**Maintenance**	
Risk Estimates / **Compounds**	Upper-Bound Lifetime Excess Carcinogenic Risk Estimate	Upper-Bound Total Noncarcinogenic Hazard Index	Upper-Bound Lifetime Excess Carcinogenic Risk Estimate	Upper-Bound Total Noncarcinogenic Hazard Index	Upper-Bound Lifetime Excess Carcinogenic Risk Estimate	Upper-Bound Total Noncarcinogenic Hazard Index	Upper-Bound Lifetime Excess Carcinogenic Risk Estimate	Upper-Bound Total Noncarcinogenic Hazard Index
Total Petroleum Hydrocarbons								
TPH	--	--	--	--	--	--	--	--
Cyanide								
Cyanide (free)	--	2.6E-06	--	2.1E-05	--	3.9E-07	--	1.3E-06
Semi-Volatile Organic Compounds								
Acenaphthene	--	1.2E-06	--	1.0E-05	--	1.8E-07	--	1.3E-06
Acenaphthylene	--	--	--	--	--	--	--	--
Anthracene	--	--	--	--	--	--	--	--
Benzo[a]anthracene	--	--	--	--	--	--	--	--
Benzo[a]pyrene	--	--	--	--	--	--	--	--
Benzo[b]fluoranthene	--	--	--	--	--	--	--	--
Benzo[g,h,i]perylene	--	--	--	--	--	--	--	--
Benzo[k]fluoranthene	--	--	--	--	--	--	--	--
Chrysene	--	--	--	--	--	--	--	--
Dibenz[a,h]anthracene	--	--	--	--	--	--	--	--
Fluoranthene	--	--	--	--	--	--	--	--
Fluorene	--	--	--	--	--	--	--	--
Indeno[1,2,3,-cd]pyrene	--	--	--	--	--	--	--	--
Phenanthrene	--	1.4E-05	--	1.1E-04	--	1.1E-06	--	7.4E-06
Pyrene	--	--	--	--	--	--	--	--
Extractable Petroleum Hydrocarbons								
C9-C18 Aliphatic	--	5.0E-04	--	3.4E-03	--	6.7E-05	--	5.4E-04
C19-C36 Aliphatic	--	5.2E-05	--	3.9E-04	--	7.5E-06	--	5.8E-05
C11-C22 Aromatic	--	5.4E-03	--	3.8E-02	--	7.4E-04	--	6.0E-03
Volatile Organic Compounds								
Naphthalene	--	7.3E-06	--	6.9E-05	--	1.3E-06	--	1.0E-05
2-Methylnaphthalene	--	3.5E-05	--	3.4E-04	--	6.1E-06	--	4.2E-05
Metals								
Aluminum	--	--	--	--	--	--	--	--
Arsenic	9.3E-07	1.7E-05	1.1E-06	2.0E-05	2.8E-08	8.5E-06	1.1E-06	1.1E-04
Barium	--	1.9E-04	--	4.5E-04	--	8.9E-05	--	1.2E-03
Cadmium	1.3E-08	7.5E-04	2.3E-09	4.8E-03	1.4E-09	9.7E-05	1.0E-07	8.1E-04
Chromium (total)	--	--	--	--	--	--	--	--
Lead	--	1.6E-01	--	1.0E+00	--	2.1E-02	--	1.7E-01
Magnesium	--	--	--	--	--	--	--	--
Mercury	--	8.9E-07	--	1.0E-06	--	4.5E-07	--	6.0E-06
Nickel	--	4.9E-04	--	4.9E-03	--	8.5E-05	--	5.8E-04
Selenium	--	3.1E-04	--	3.2E-03	--	5.5E-05	--	3.7E-04
Silver	--	4.3E-05	--	4.3E-04	--	7.5E-06	--	5.2E-05
Zinc	--	8.4E-04	--	5.4E-03	--	6.3E-05	--	4.4E-04
TOTAL SITE RISK	**9.E-07**	**2.E-01**	**1.E-06**	**1.E+00**	**3.E-08**	**2.E-02**	**1.E-06**	**2.E-01**
TOTAL RESIDENTIAL ELCR	**2E-06**							

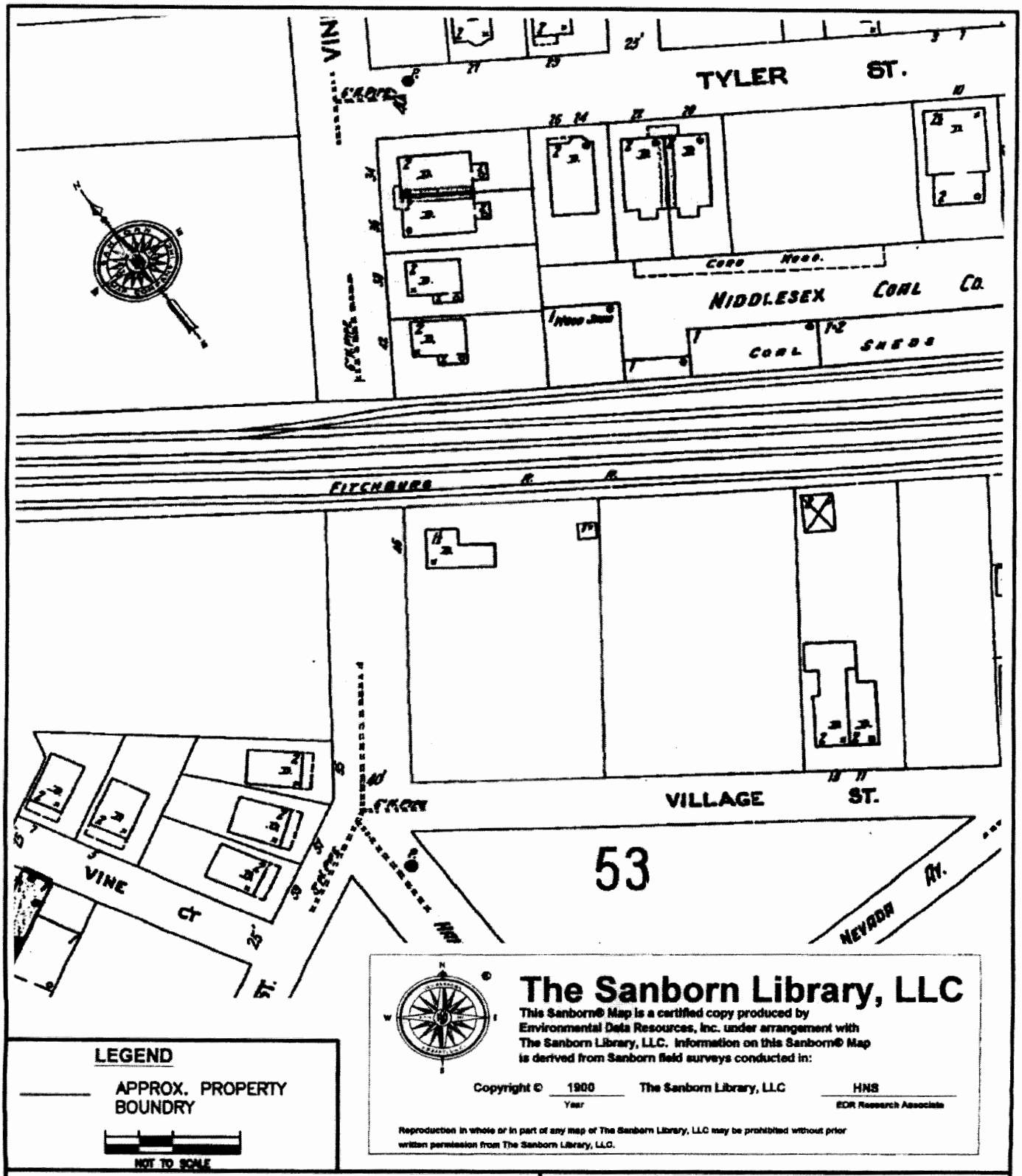
NOTES:
-- - Not applicable

TABLE 27. SUMMARY OF UPPER-BOUND EXCESS LIFETIME CARCINOGENIC RISKS AND NONCARCINOGENIC HAZARD INDICES FOR EACH PATHWAY AND SCENARIO

Exposure Pathway *Route* Media	Upper-Bound Lifetime Excess Carcinogenic Risk Estimate	Upper-Bound Total Non-Carcinogenic Hazard Index
Adult Resident		
Ingestion		
Soil	7.E-07	3.E-02
Inhaled-Particulate	4.E-09	2.E-04
Homegrown Produce	2.E-07	5.E-04
Ingestion Total	**9.E-07**	**3.E-02**
Dermal Contact		
Soil	**2.E-08**	**1.E-01**
Inhalation		
Particulate	4.E-08	2.E-04
Vapors (Indoor Air)	0.E+00	0.E+00
Inhalation Total	**4.E-08**	**2.E-04**
Total Adult Risk	**9.E-07**	**2.E-01**
Child Resident		
Ingestion		
Soil	1.E-06	3.E-01
Inhaled-Particulate	7.E-10	2.E-04
Homegrown Produce	7.E-08	2.E-03
Ingestion Total	**1.E-06**	**3.E-01**
Dermal Contact		
Soil	**2.E-08**	**8.E-01**
Inhalation		
Particulate	7.E-09	2.E-04
Vapors (Indoor Air)	0.E+00	0.E+00
Inhalation Total	**7.E-09**	**2.E-04**
Total Child Risk	**1.E-06**	**1.E+00**
Residential Receptor		
Total Receptor Cancer Risk	**2.E-06**	
Construction Worker		
Ingestion		
Soil	2.E-08	5.E-03
Inhaled-Particulate	4.E-10	8.E-05
Ingestion Total	**2.E-08**	**5.E-03**
Dermal Contact		
Soil	6.E-10	2.E-02
Dermal Contact Total	**6.E-10**	**2.E-02**
Inhalation		
Particulate	4.E-09	9.E-05
Vapor (Outdoor Air)	0.E+00	0.E+00
Inhalation Total	**4.E-09**	**9.E-05**
Total Risk	**3.E-08**	**2.E-02**
Maintenance Worker		
Ingestion		
Soil	9.E-07	3.E-02
Inhaled-Particulate	3.E-08	1.E-03
Total	**9.E-07**	**3.E-02**
Dermal Contact		
Soil	**3.E-08**	**1.E-01**
Inhalation		
Particulate	**3.E-07**	**1.E-03**
Total Risk	**1.E-06**	**2.E-01**

APPENDIX H

Copies of Sanborn® Maps



The Sanborn Library, LLC

This Sanborn® Map is a certified copy produced by Environmental Data Resources, Inc. under arrangement with The Sanborn Library, LLC. Information on this Sanborn® Map is derived from Sanborn field surveys conducted in:

Copyright © 1900 (Year) The Sanborn Library, LLC HNS (EDR Research Associate)

Reproduction in whole or in part of any map of The Sanborn Library, LLC may be prohibited without prior written permission from The Sanborn Library, LLC.

LEGEND

APPROX. PROPERTY BOUNDRY

NOT TO SCALE

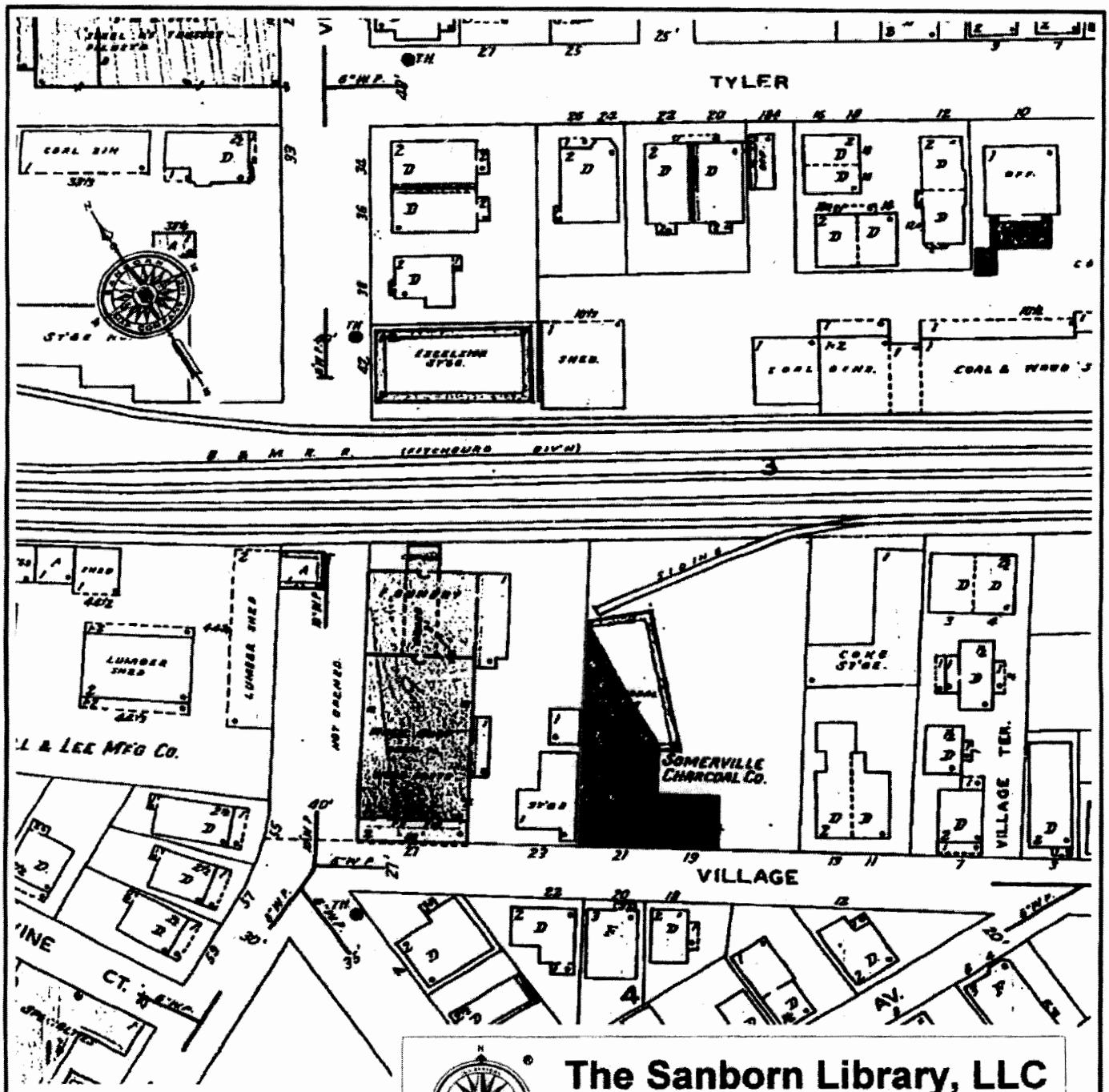
RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

SANBORN MAP 1900

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY:	PROJECT	PRINT DATE	FIGURE
SJS	A6550	12/11/2003	5A

P:\6000\A6550\GRAPHICS\CAD\SANBORN_1900.DWG



The Sanborn Library, LLC

This Sanborn® Map is a certified copy produced by Environmental Data Resources, Inc. under arrangement with The Sanborn Library, LLC. Information on this Sanborn® Map is derived from Sanborn field surveys conducted in:

Copyright © 1933 (Year) The Sanborn Library, LLC HNS (EDR Research Associate)

Reproduction in whole or in part of any map of The Sanborn Library, LLC may be prohibited without prior written permission from The Sanborn Library, LLC.

LEGEND

APPROX. PROPERTY BOUNDRY

NOT TO SCALE

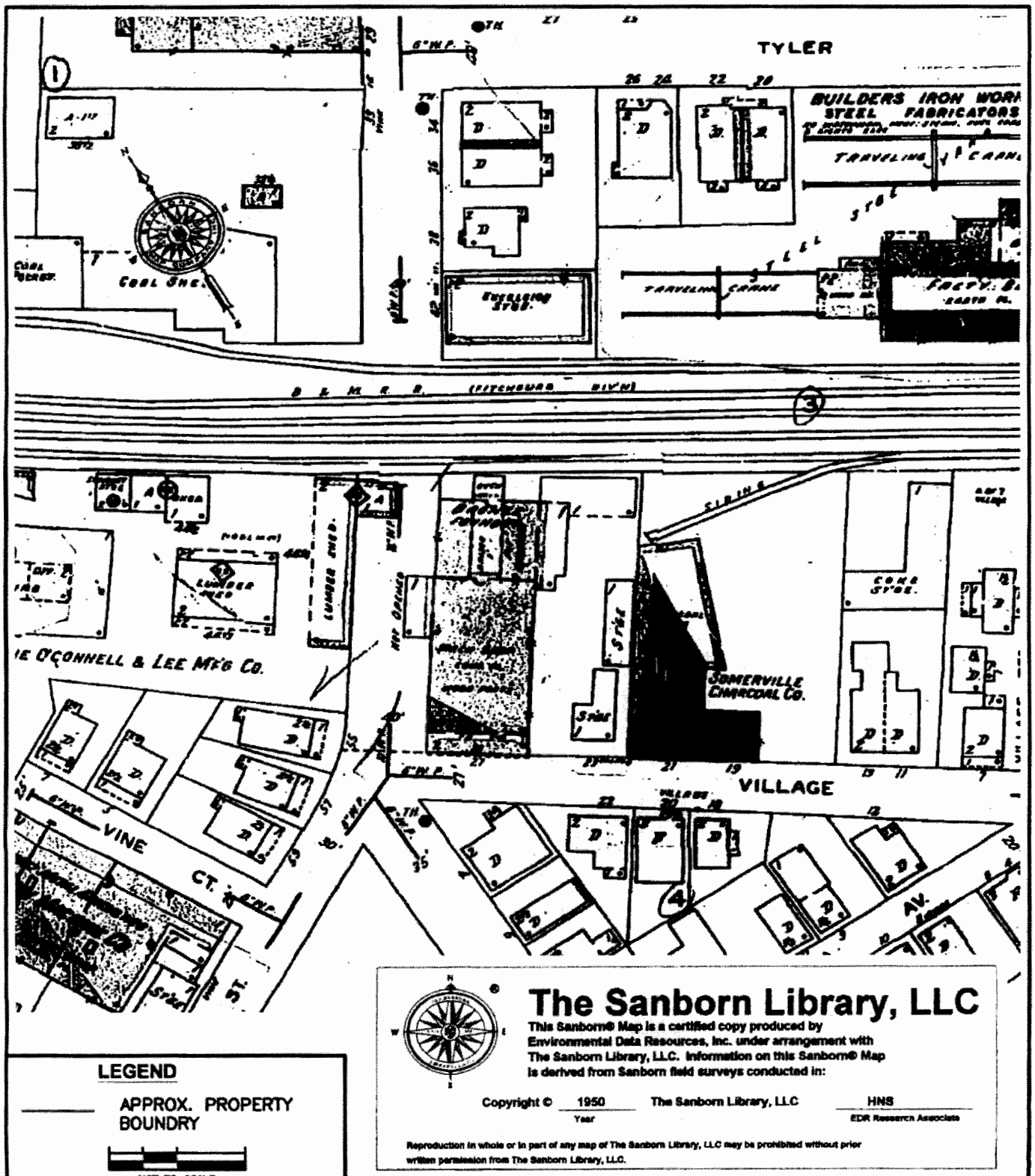
RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

SANBORN MAP 1933

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY:	PROJECT	PRINT DATE	FIGURE
SJS	A6550	12/11/2003	5B

P:\6000\A6550\GRAPHICS\CAD\SANBORN_1933.DWG



LEGEND

APPROX. PROPERTY BOUNDRY

NOT TO SCALE

The Sanborn Library, LLC

This Sanborn® Map is a certified copy produced by Environmental Data Resources, Inc. under arrangement with The Sanborn Library, LLC. Information on this Sanborn® Map is derived from Sanborn field surveys conducted in:

Copyright © 1950 (Year) The Sanborn Library, LLC HNS (EDR Research Associate)

Reproduction in whole or in part of any map of The Sanborn Library, LLC may be prohibited without prior written permission from The Sanborn Library, LLC.

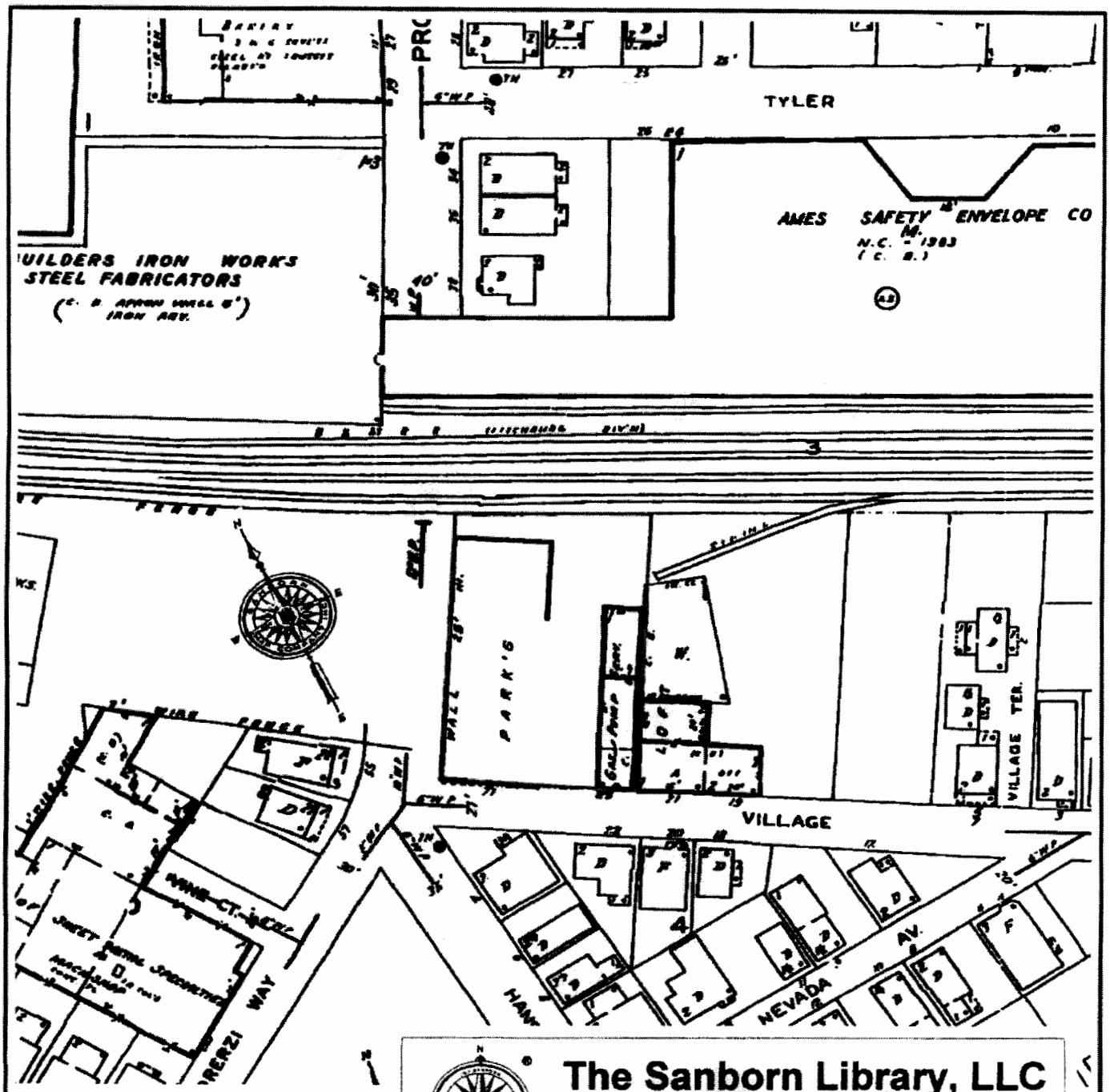
RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

SANBORN MAP 1950

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY:	PROJECT	PRINT DATE	FIGURE
SJS	A6550	12/11/2003	5C

P:\6000\A6550\GRAPHICS\CAD\SANBORN_1950.DWG



The Sanborn Library, LLC

This Sanborn® Map is a certified copy produced by Environmental Data Resources, Inc. under arrangement with The Sanborn Library, LLC. Information on this Sanborn® Map is derived from Sanborn field surveys conducted in:

Copyright © 1989 (Year) The Sanborn Library, LLC HNS (EDR Research Associate)

Reproduction in whole or in part of any map of The Sanborn Library, LLC may be prohibited without prior written permission from The Sanborn Library, LLC.

LEGEND

APPROX. PROPERTY BOUNDRY

NOT TO SCALE

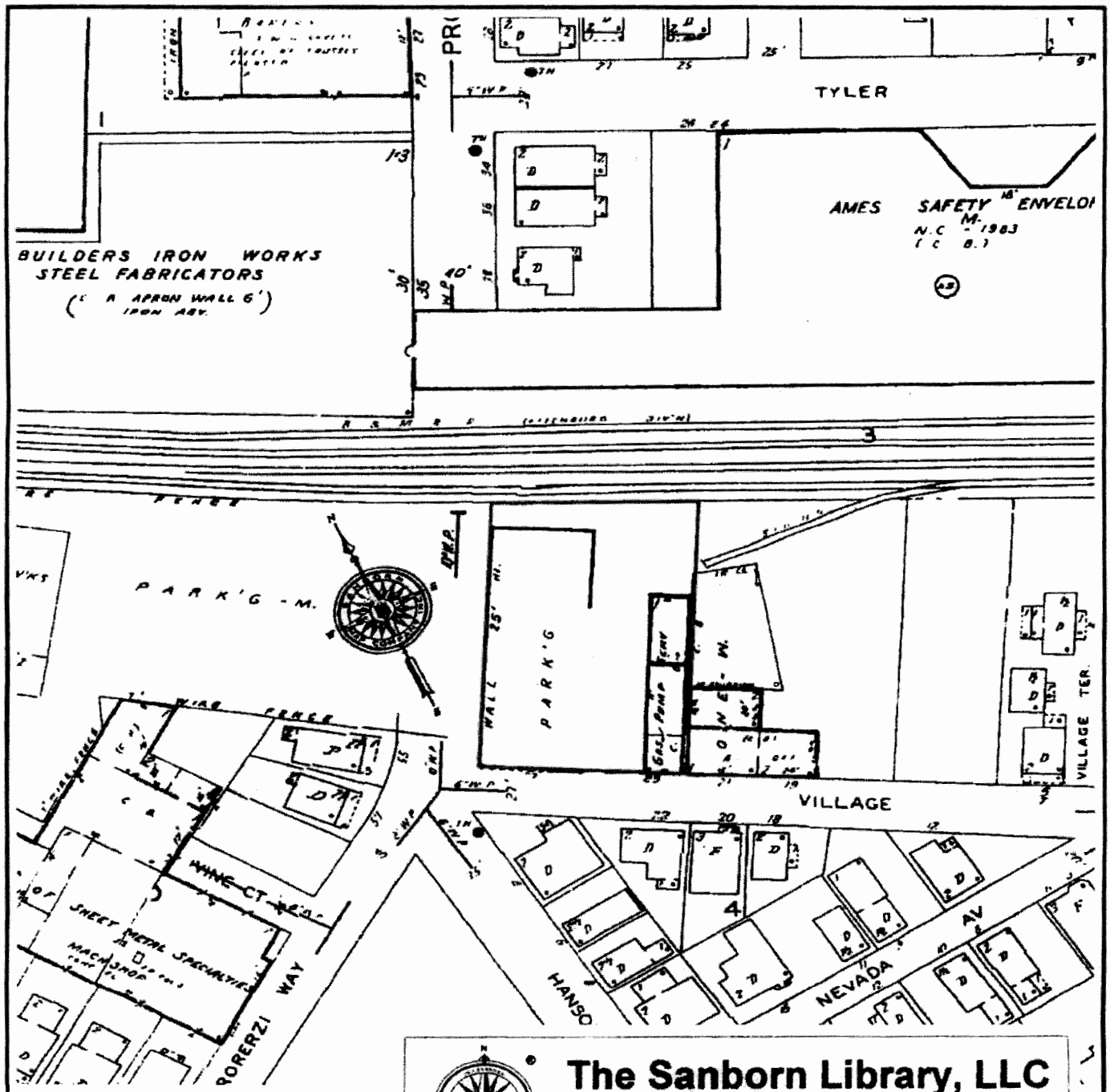
RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

SANBORN MAP 1989

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY:	PROJECT	PRINT DATE	FIGURE
SJS	A6550	12/11/2003	5D

P:\6000\A6550\GRAPHICS\CAD\SANBORN_1989.DWG



LEGEND

APPROX. PROPERTY BOUNDRY

NOT TO SCALE

The Sanborn Library, LLC

This Sanborn® Map is a certified copy produced by Environmental Data Resources, Inc. under arrangement with The Sanborn Library, LLC. Information on this Sanborn® Map is derived from Sanborn field surveys conducted in:

Copyright © 1991 (Year) The Sanborn Library, LLC HNS (EDR Research Associate)

Reproduction in whole or in part of any map of The Sanborn Library, LLC may be prohibited without prior written permission from The Sanborn Library, LLC.

RESOURCE CONTROLS
474 Broadway • Pawtucket, RI 02860

SANBORN MAP 1991

27 VILLAGE STREET
SOMERVILLE, MASSACHUSETTS

DRAWN BY:	PROJECT	PRINT DATE	FIGURE
SJS	A6550	12/11/2003	5E

P:\6000\A6550\GRAPHICS\CAD\SANBORN_1991.DWG

APPENDIX I

Additional Limitations

ADDITIONAL LIMITATIONS

1. The observations described in this Report were made under the conditions stated herein. The conclusions presented in the Report are based solely upon the services described therein and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by Client. The work described in the Report was carried out in accordance with our Proposal and Associated Statement of Standard Terms and Conditions.

2. In preparing the Report, Resource Controls has relied on certain information provided by state and local officials and other parties referenced therein and on information contained in the files of state and/or local agencies available to Resource Controls at the time of the site evaluation. Although there may have been some degree of overlap in the information provided by the various sources, Resource Controls did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this site assessment.

3. Observations and explorations were made of the site as indicated within the Report. Where access to portions of the site were unavailable or limited, Resource Controls renders no opinion as to the presence of hazardous materials, asbestos, lead paint or oil, or to the presence of indirect evidence relating to the same, in that portion of the site or structure. In addition, Resource Controls renders no opinion as to the presence of hazardous materials, lead paint, oil or asbestos or to the presence of indirect evidence relating to hazardous materials, oil, lead paint or asbestos, where direct observation of the interior walls, floor, or ceiling of a structure on a site was obstructed by objects or coverings on or over these structures.

4. The purpose of this Report was to assess the physical and chemical characteristics of the subject site with respect to the presence in the environment of hazardous materials, lead paint, asbestos or oil. No specific attempt was made to check the regulatory compliance of present or past owners or operators of the site with federal, state or local laws and regulations, environmental or otherwise.

5. Except as noted within the text of this Report, no quantitative laboratory testing was performed as part of this evaluation. Where such analyses have been conducted by an outside laboratory, Resource Controls has relied upon the data provided and has not conducted an independent third party evaluation of the reliability of this data.

6. Chemical analyses performed for specific parameters during the course of studies have been used, in part, as a basis for determining the areas of environmental concern. Additional chemical constituents not searched for may be present at the site. Defined areas of environmental concern do not cover the potential additional constituents.

7. Governmental agencies' interpretations, requirements and enforcement policies may impact the type and scope of any site remediation required for a site. In addition, statutes, rules and regulations may be legislatively changed and inter-agency and intra-agency policies may be changed from present practice. If such changes occur, it may be necessary to re-evaluate their impact on the scope of any site remediation required.

8. Any water level readings made in the test pits, borings and/or wells and were made under the conditions stated on the logs. This data may have been reviewed and interpretations have been made in the text of this Report. However, it must be noted that fluctuations in the level of groundwater may occur due to variations in rainfall, temperature and other factors different from those prevailing at the time measurements were made.