REVISED ENVIRONMENTAL MONITORING PLAN
CHARBERT DIVISION OF NFA
RICHMOND, RHODE ISLAND
RIDEM CASE # 99-037

PREPARED FOR:
Rhode Island Department of Environmental Management
Providence, Rhode Island

PREPARED BY:
GZA GeoEnvironmental, Inc.
Providence, Rhode Island

May 2011
File No. 32795.41

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May 16, 2011
File No. 32795.41

Mr. Gary Jablonski
Rhode Island Department of Environmental Management
Office of Waste Management
235 Promenade Street
Providence, Rhode Island 02908

Re: Revised Environmental Monitoring Plan
Charbert Division of NFA
Richmond, Rhode Island
RIDEM Case # 99-037

Dear Mr. Jablonski:

On behalf of Charbert, Division of NFA Corp, GZA GeoEnvironmental, Inc. (GZA) is pleased to provide you with the attached *Environmental Monitoring Plan* (EMP) for the former Charbert Facility in Alton, Rhode Island. The attached EMP was revised, per your May 10, 2011 comments to the EMP submitted by GZA on May 3, 2011, as described below:

1. Page 1, Section 1.00 Monitoring program Overview; 2nd paragraph, last sentence has been changed by remove the Bedrock Site Investigation Report and MNA references;
2. Page 3, Section 1.20 Closure & Post Closure Monitoring Program; 1st paragraph, last sentence has been changed by remove the Bedrock Site Investigation Report and MNA references.

Please feel free to call Ed Summerly or Stephen Andrus at (401) 421-4140 (or via email at *edward.summerly@gza.com* *or* *stephen.andrusz@gza.com*) with any questions or comments regarding this letter or the attached EMP.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Stephen Andrus, P.E.
Assistant Project Manager

Edward A. Summerly, P.G.
Principal

CC: Tracy Nelson Hay, Richmond Town Clerk
Clark Memorial Library – Charbert Repository

Attachments: Environmental Monitoring Plan

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1.00 MONITORING PROGRAM OVERVIEW

This document describes the "Environmental Monitoring Plan" (EMP) for the former Charbert Manufacturing Facility site located at 299 Church Street in Richmond, Rhode Island. This plan describes the performance monitoring for the remedial systems and presents a site-wide long term environmental compliance monitoring program. GZA has developed this EMP to address the requirements established by Section 9.00 of the Rhode Island Department of Environmental Management's (RIDEM) Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases (DEM-DSR-01-93 Remediation Regulations).

This plan was developed based on the results of the Interim Compliance Monitoring Program (ICMP), which was conducted at the Site for the past 12 quarters. The EMP also incorporates monitoring of the bedrock aquifer. This plan includes the location of proposed monitoring points; a sampling schedule; the methods of sample collection, preservation and analysis, data reduction, statistical interpretation, and reporting requirements.

1.10 SITE DESCRIPTION

The ±113.9 acre Charbert property (consisting of Plat 11A, Lot 6) is located at the confluence of the Wood and Pawcatuck Rivers, at 299 Church Street, in the Town of Richmond, in an area referred to as the Village of Alton, Rhode Island (see Figure 1, Site *Locus Map* and Figure 2, *Existing Conditions Site Plan*). The North American Datum (NAD) 1983 Rhode Island State Plane coordinates at the approximate center of the property are 129,015 feet north, and 267,645 feet east (latitude 41° 26'14.0" north, longitude 070° 43' 14.0" west). The facility ceased operations in February 2008. The facility's standard industrial classification (SIC) code was 2259 (Knitting Mills).

The northwestern portion of the Site is currently developed with twelve inter-connected buildings, forming one, 2-story manufacturing facility. The building was originally constructed in approximately 1860 with various renovations occurring throughout the years and the last building was constructed in 1979. The subsequent additions to the main building have resulted in approximately 107,500 square feet of manufacturing, storage, and office space. In addition to the main manufacturing building, the northern portion of the Site is also developed with a wastewater pump house, a potable well pump house, a fire water tower, three bunkered oil storage areas and two outdoor storage areas. There are two paved areas; one is located immediately east of the manufacturing area and was used for employee and visitor parking. The second employee parking lot is located to the east of the manufacturing building, across River Street.

The southern portion of the Site consists of undeveloped wetlands, forested areas, and a gravel burrow area. Three wastewater lagoons and an inactive holding pond were located on the southern portion of the property. The three wastewater lagoons had an approximate total leaching area of 142,835 square feet (3.29 acres), and the holding pond had an approximate leaching area of 22,600 square feet (0.51 acres). The Charbert facility utilized

Lagoons 1, 2 and 3 to dispose of industrial wastewater produced during textile operations formerly conducted at facility.

On October 29, 2008 GZA certified that the closure of the former holding pond was conducted in accordance with the RIDEM approved *Underground Injection Control (UIC) Closure Assessment Report* prepared by GZA, dated February 8, 2008 and met the wetland restoration requirements in Section C(4)(0) of the Consent Agreement. On behalf of Charbert, GZA submitted a UIC Closure Application for the former industrial wastewater lagoons and associated collection piping to the RIDEM on December 15, 2008. GZA submitted the UIC Closure Assessment Report to RIDEM on August 13, 2010.

At this time an air sparge and soil vapor extraction remedial system is operating at the former Charbert Manufacturing Facility. The system was designed and installed by GZA between December of 2007 and January of 2008 and issued an Order of Approval (OA) from RIDEM on December 18, 2007. The system began full scale operation on January 24, 2008 and is currently monitored on a bi-monthly basis. Air sparge and soil vapor extraction locations are shown on Figure 3, attached.

On September 17, 2009 RIDEM issued an Order of Approval Modification to include additional air sparge and soil vapor extraction wells proposed to address oily soils associated with the oil line leak in the boiler room as reported in GZA's March 20, 2009 *Boiler Room Oil Line Leak.* The September 17, 2009, OA modification also approved additional air sparge and soil vapor extraction wells for an area of contaminated soils associated with the oil line leak and the chlorinated solvents reported in GZA's January 9, 2006 *Supplemental Site Investigation Report*, and petroleum impacted soils reported in GZA's May 12, 2009 *Technical Memorandum #2*. On February 17, 2010 RIDEM issued a second Order of Approval Modification to include three additional air sparge wells along the bank of the Wood River to address the chlorinated solvents reported in GZA's January 15, 2010 *Lagoon 5 Remediation Technical Memorandum #3.*

The air sparge system (AS) is designed to inject air into the soil aquifer and groundwater using a grid pattern of 1-inch diameter sparge wells. The purpose of the air injection is to introduce oxygen to enhance bioremediation and expedite the volatization of contaminants. The soil vapor extraction (SVE) system currently uses two blowers to apply vacuum to a series of 2-inch wells and/or trenches installed primarily above the groundwater table. The system collects the vapors from the natural breakdown and volatization of the contaminants generated by the air sparge system and also helps circulate oxygen rich air through unsaturated contaminated soils stimulating bioremediation of contaminants (bioventing). The air collected by the SVE system is then filtered through activated carbon to collect the contaminants. The treated air is then discharged to the atmosphere.

The remedial system consists of an interior AS/SVE system located under the concrete floor in the approximate center of the mill building and an exterior AS/SVE system, primarily located under the rear maintenance area parking lot on the west side of the mill building. The system controls, SVE blowers, and carbon filters are located in the west end of the facility, near the boiler room. The air is supplied by a central air compressor system located in the eastern side of the mill building (see Figure 3).

1.20 CLOSURE & POST-CLOSURE MONITORING PROGRAM

This EMP provides written guidelines to facilitate the assessment of the effectiveness of the air sparge and soil vapor extraction systems as well as any significant changes in groundwater and soil conditions in the vicinity of the former Charbert Manufacturing Facility. The EMP also incorporates monitoring of the bedrock aquifer.

1.21 Groundwater Monitoring

Groundwater monitoring well locations were selected based on our review of historical groundwater sampling results, piezometric monitoring of the Site and adjacent area to provide both upgradient and downgradient groundwater monitoring in the uppermost groundwater aquifer, lower overburden aquifer and bedrock aquifer. Monitoring well spacing and screen depths were selected, within physical site constraints, to detect groundwater contamination, if present.

Based on review of the current Interim Compliance Monitoring Program (ICMP), past analytical data and site hydrogeology, we propose the following monitoring locations which consist of two existing upgradient monitoring wells, 17 existing ICMP monitoring Wells, 3 existing Perimeter Monitoring Wells, 1 former UIC Monitoring Well and 5 bedrock wells. Qualified environmental personnel will visit the site on approximately a semiannual basis to conduct field screening and sampling activities. The proposed sampling locations are shown on Figure 2, attached, and are summarized in the table below:

TABLE 1 SUMMARY OF GROUNDWATER WATER MONITORING LOCATIONS		
Monitoring Location ID	**Rational**	**Screened Interval (ft bgs)**
GZ-ML-1-Z-1	Bedrock Well Zone-MNA	122 to 132
GZ-ML-1-Z-3	Bedrock Well Zone-MNA	170 to 182
GZ-ML-2-Z-1	Bedrock Well Zone-MNA	98 to 110
GZ-ML-2-Z-3	Bedrock Well Zone-MNA	191 to 201
GZ-ML-3-Z-1	Bedrock Well Zone-MNA	49 to 65
GZ-ML-3-Z-3	Bedrock Well Zone-MNA	97 to 115
GZ-ML-4-Z-1	Bedrock Well Zone-MNA	45 to 62
GZ-ML-4-Z-3	Bedrock Well Zone-MNA	187 to 200
GZ-ML-5-Z-2	Bedrock Well Zone-MNA	80 to 95
GZ-ML-5-Z-3	Bedrock Well Zone-MNA	120 to 140
GZ-22	Down Gradient Compliance Monitoring Well	25 to 30
GZ-21	Down Gradient Compliance Monitoring Well	10 to 20
GZ-20	Down Gradient Compliance Monitoring Well	25 to 30

TABLE 1 SUMMARY OF GROUNDWATER WATER MONITORING LOCATIONS		
Monitoring Location ID	Rational	Screened Interval (ft bgs)
RIZ-5	Down Gradient Compliance Monitoring Well	9.5 to 19.5
GZ-19	Down Gradient Compliance Monitoring Well	25 to 30
RIZ-7	Down Gradient Compliance Monitoring Well	5 to 15
GZ-24	Down Gradient Compliance Monitoring Well	24 to 34
GP-28	Down Gradient Compliance Monitoring Well	3 to 15
GZ-25	Down Gradient Compliance Monitoring Well	20 to 30
GZ-27	Down Gradient Compliance Monitoring Well	3 to 15
GZ-26	Down Gradient Compliance Monitoring Well	20 to 30
GZ-28	Down Gradient Compliance Monitoring Well	3 to 15
GZ-3	Source Area Compliance Monitoring Well	30 to 40
RIZ-13	Source Area Compliance Monitoring Well	14 to 34
GZ-7	Source Area Compliance Monitoring Well	33 to 43
GP-26	Source Area Compliance Monitoring Well	4 to 16
GZ-23	Down Gradient Compliance Monitoring Well	10 to 20
RIZ-1	Upgradient Background Monitoring Well	5 to 15
RIZ-6	Upgradient Background Monitoring Well	5 to 15
GP-22	Perimeter Compliance Monitoring Well	3 to 15
RIZ-21	Perimeter Compliance Monitoring Well	9 to 19
GZ-1	Perimeter Compliance Monitoring Well	44 to 54
UIC MW 4A	Former UIC Compliance Monitoring Well	5 to 15

The remaining on-site wells not being used for post-closure or piezometric monitoring will be decommissioned in compliance with Appendix A of RIDEM's Rules and Regulations for Groundwater Quality. Both previously closed monitoring wells and monitoring wells proposed for closure are summarized in the table below. Monitoring well locations are shown on Figure 2 and Figure 4. The details for the decommissioning of obsolete wells can be found in Section 2.20.

TABLE 2 SUMMARY OF MONITORING WELL CLOSURES		
Location	Former Use	Status
UIC-MW-1A	Former UIC Monitoring Well	To Be Closed Under UIC Program
UIC-MW-2A	Former UIC Monitoring Well	To Be Closed Under UIC Program
UIC –MW-3	Former UIC Monitoring Well	To Be Closed Under UIC Program
UIC-MW-5B	Former UIC Monitoring Well	To Be Closed Under UIC Program
UIC-MW-6	Former UIC Monitoring Well	To Be Closed Under UIC Program
RIZ-10 (UIC-MW-1)	Former UIC Monitoring Well	Closed in February 2010
CB-12	Former SI Monitoring Well	Destroyed in December 2007
GP-20	Former SI Monitoring Well	Closed in February 2010
GZ-12	Infiltration Study Monitoring Well	Closed in February 2010
GZ-13	Infiltration Study Monitoring Well	Closed in February 2010
GZ-16	Infiltration Study Monitoring Well	Closed in February 2010
GZ-18	Infiltration Study Monitoring Well	Closed in February 2010
GZ-9	Infiltration Study Monitoring Well	Recommend For Closure in 2011
GZ-10	Infiltration Study Monitoring Well	Recommend For Closure in 2011
GZ-11	Infiltration Study Monitoring Well	Recommend For Closure in 2011

TABLE 2 SUMMARY OF MONITORING WELL CLOSURES		
Location	**Former Use**	**Status**
GZ-14	Infiltration Study Monitoring Well	Recommend For Closure in 2011
GZ-15	Infiltration Study Monitoring Well	Recommend For Closure in 2011
GZ-17	Infiltration Study Monitoring Well	Recommend For Closure in 2011
GZ-4A	Former SI Monitoring Well	Recommend For Closure in 2011
GP-15	Former SI Monitoring Well	Recommend For Closure in 2011
GP-16	Former SI Monitoring Well	Recommend For Closure in 2011
GP-17	Former SI Monitoring Well	Recommend For Closure in 2011
GP-18	Former SI Monitoring Well	Recommend For Closure in 2011
PT-1	Former SI Monitoring Well	Recommend For Closure in 2011
PT-2	Former SI Monitoring Well	Recommend For Closure in 2011
PT-4	Former SI Monitoring Well	Recommend For Closure in 2011

1.22 Soil Monitoring Locations

To evaluate the effectiveness of the proposed remediation in the facility rear maintenance area and demonstrate compliance with the proposed remedial objectives, we propose to verify compliance by using a geometric grid pattern for collecting soil samples in the former source area. A 25-foot offset grid approximately 100-feet by 75-feet will be laid out in the rear facility yard and a total of 20 TPH samples will be collected from this area. Additionally, a 25-foot offset grid approximately 50-feet by 50-feet will be laid out in the vicinity of the oil bunkers and a total of 9 TPH samples will be collected and analyzed. For proposed sampling grid locations, see Figure 3, attached. Sampling and statistical analysis will be performed as described in section 8.10 of the RIDEM's Rules and Regulations for the Investigation and Remediation of Hazardous Materials Releases.

1.23 Groundwater Monitoring Via Diffusion Bags

Diffusion bag samplers will be placed in the bed of the Wood River adjacent to the Charbert Facility. The purpose of this monitoring is to evaluate the VOC levels of groundwater seepage to the river. Five proposed diffusion bag monitoring locations are shown on Figure 2.

2.00 FIELD SAMPLING PROGRAM

The following paragraphs describe the proposed field sampling program at the former Charbert Manufacturing Facility. This section includes sampling frequencies, well decommissioning DETAILS, and sampling and analysis protocols.

2.10 FIELD SAMPLING SCHEDULE

2.11 Groundwater Sampling Schedule

The Charbert facility will continue to implement this monitoring plan until it has been demonstrated that there no longer exist an environmental hazard. At this time, we feel it is appropriate to reduce the sampling frequency to semi-annual corresponding to periods of seasonal high and low groundwater (e.g., April and October). We recommend semi-annual sampling for volatile organic compounds (VOCs) via EPA Method 8260 for 22 of the wells identified above with annual sampling for VOCs at all 33 locations. Additionally, we recommend annual sampling for total petroleum hydrocarbons (TPH) via EPA Method 8100M for 9 shallow overburden wells located in the source area. The table below summaries the propose sampling schedule for each location.

TABLE 3
SAMPLING SCHEDULE AND LABORATORY ANALYSIS SUMMARY

Date	Location	Analysis
April	GZ-ML-3-Z-1, GZ-ML-4-Z-1, GZ-ML-5-Z-2, GZ-22, GZ-21, GZ-20, GZ-19, RIZ-7, GZ-24, GP-28, GZ-25, GZ-27, GZ-26, GZ-28, GZ-3, GZ-7, GP-26, GZ-23, GP-22, RIZ-21, GZ-1, MW-4A	VOCs
October (Annual Round)	GZ-ML-1-Z-1 and Z-3, GZ-ML-2-Z-1 and Z-3, GZ-ML-3-Z-1 and Z-3, GZ-ML-4-Z-1 and Z-3, GZ-ML-5-Z-2 and Z-3, GZ-22, GZ-21, GZ-20, RIZ-5, GZ-19, RIZ-7, GZ-24, GP-28, GZ-25, GZ-27, GZ-26, GZ-28, GZ-3, RIZ-13, GZ-7, GP-26, GZ-23, GP-22, RIZ-21, GZ-1, MW-4A, RIZ-1, RIZ-6	VOCs
October	GZ-21, RIZ-5, RIZ-7, GP-28, RIZ-13, GZ-23, GP-26, RIZ-1, RIZ-6	TPH

2.12 Soil Sampling Schedule

As the effects of the proposed remediation will not be immediate, we propose that the first round of soil compliance sampling take place 4 years after the initial start of the soil vapor extraction system, spring/summer of 2012. After the initial round of compliance sampling we recommend selecting a sampling frequency based on the results of the initial sampling.

2.13 Diffusion Bag Sampling Schedule

GZA has performed yearly diffusion bag sampling in the Wood River since 2007 and proposes to continue the yearly sampling and reporting for two more years (through 2012). At that time the need to continue the diffusion bag sampling will be evaluated.

2.20 MONITORING WELL DECOMMISSIONING PROGRAM

After a re-evaluation of the site and past groundwater monitoring data, we recommend that the monitoring wells listed in the Table 2, above, be closed in general accordance with the requirements set forth in Appendix A of the RIDEM's Rules and Regulations for Groundwater Quality. These wells include monitoring wells: GZ-4A, 9, 10, 11, 14, 15, 17; GP-15, 16, 17, 18 and PT-1, 2, 4. The decommissioning method is as follows:

- The wells are to be inspected from the land surface through their entire depth to evaluate if any obstructions that would interfere with sealing operations are present. If they are, the well must be drilled out and grouted. If there are no obstructions proceed to the next step.
- The wells are to be abandoned by cutting off the casing at approximately 4 feet below ground surface (or to the practical reach of PVC cutting tools).
- The well screen and casing are to be completely filled with a cement/bentonite grout, tremied into place by a grout tube from the bottom of the well up.
- The flush mounted road boxes or steel guard pipes are to be removed.
- A neat cement plug is to be placed at the ground surface at each location.

2.30 GROUNDWATER SAMPLING PROCEDURES

As described above, groundwater will be sampled and analyzed on a semi-annual basis (anticipated to be April and October) for the next two years (through 2012), following which the frequency for future monitoring will be assessed. Sample analysis will consist of six field screening parameters (temperature, pH, oxidation/reduction potential, specific conductivity, turbidity, and dissolved oxygen) and volatile organic compounds (VOCs) via EPA Method 8260B.

Static water level readings will be recorded from each observation well prior to well purging. Water level readings will be recorded in all standpipe wells by use of an electronic measuring device (e.g., Slope water level meter) capable of providing $\pm$0.01 foot accuracy. Bedrock zone water levels will be recorded from the pressure transducers installed in each zone.

Various well specific measurements will be made and recorded in field data books. Where applicable, such information will include: the total depth of well, depth to standing water from top of riser pipe, depth to sample collection location from top of riser pipe, depth to standing water from top of protective casing, distance between top of protective casing and riser pipe, and observations regarding tampering or damage.

Groundwater sampling will be performed in accordance with EPA's January 19, 2010 *Low Stress (low flow) Purging and Sampling Procedure* (Low Flow SOP). Low flow sampling equipment (exclusive of tubing which will be dedicated) will be decontaminated prior to use on-site and between each location following EPA's required protocols. Water quality monitoring for stabilization will be conducted utilizing a Horiba multi-meter (or equivalent) in a flow through cell. The Horiba records temperature, pH, specific conductance, dissolved oxygen, and turbidity simultaneously, and is one of the few meters which include turbidity in a flow through system improving reproducibility and reducing sampling time. Field equipment used to perform the testing will be calibrated according to the manufacturer's instructions before each sampling day, and confirmatory readings will be taken at the end of each sampling day.

Low flow well evacuation will be performed using a portable pump for overburden wells (i.e., stainless-steel submersible such as the Grundfos Redi-flow 2 or a peristaltic pump) and dedicated double valve pumps located in each bedrock well zones, capable of a low flow steady withdrawal rate (i.e., 100 to 500 ml/minute) that will minimize the introduction of particulate matter from the aquifer. This purging and sampling method generally reduces the concentrations of total suspended solids (TSS) in a well, thus yielding a more representative groundwater sample.

2.40 SOIL SAMPLING PROCEDURE

As described above, soil will be sampled and analyzed starting 4 years after the initiation of the remediation systems (i.e., spring/summer of 2012). Based on the 2012 results, a future sampling frequency, if needed, will be determined. Sample analysis will consist of total petroleum hydrocarbons (TPH) via EPA Method 8100M and volatile organic compounds (VOCs) via EPA Method 8260B.

A 25-foot geometric grid will be clearly marked and surveyed prior to the start of sample collection. The samples will be collected using a truck mounted geoprobe which utilizes a 4–foot polycarbonate liner tube inside a steel drive pipe. Continuous soil samples will be collected to a depth of 2-feet below the groundwater table during each Geoprobe. Full sample tubes will be opened and observed on-site for visual and olfactory evidence of contamination.

Samples will be field screened for total volatile organic compounds (TVOCs) with a ThermoEnvironmental Instruments 580B photoionization detector (PID). Soil samples for laboratory analysis will be selected based on field TVOC screening results (PID), visual or olfactory observations, location within the borehole (e.g., at the water table, at the base of borehole, etc.), and sample volume recovered. A minimum of one sample for TPH and VOCs will be collected from each exploration.

2.50 WOOD RIVER DIFFUSION BAG SAMPLING AND ANALYSIS

The following is a brief description of the passive diffusion bag sampling methodology. Please refer to the following two references for a more comprehensive description of the sampling methodology.

- "Distribution of Selected Volatile Organic Compounds Determined with Water to Vapor Diffusion Samplers at the Interface between Ground Water and Surface Water", Centredale Manor Site, North Providence, Rhode Island, September 1999-OFR 00-276. (United States Geological Survey Document prepared in cooperation with the Environmental Protection Agency). Church and others.
- "User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells". U.S. Geological Survey, Water-Resources Investigation Report 01-4060, 2001. Vroblesky, Don A.

Passive diffusion bag samplers are low density polyethylene (LDPE) bags filled with deionized water. When a passive diffusion bag is placed in a well or buried in a river bottom (as is performed at Charbert), volatile organic compounds (VOCs), excluding certain ketones, ethers, and alcohols diffuse through the semi-permeable LDPE bag. Equilibrium is reached between the VOC concentration in the groundwater outside and the deionized water inside the bag. Generally, a minimum of two weeks is required to reach equilibrium to form. The bags are then retrieved and analyzed. The bags GZA deploys in the bed of the Wood River adjacent to Charbert will be deployed for three to four weeks. Samplers were buried approximately 8 to 12 inches deep in river sediments, approximately one half of the way between the Charbert bank and the mid-point of the river.

As noted in the above references, analytical results from diffusion bag samplers buried in a river bottom are indicative of pore water quality (groundwater seeping into the river) not surface water quality. Dilution, volatilization and other attenuation mechanisms greatly reduce the concentration of constituents detected in the river from that observed in pore water.

2.60 LABORATORY ANALYSIS

A laboratory appropriately licensed in the State of Rhode Island (certified by Rhode Island Department of Health (RIDOH)) will be retained for all analytical testing.

All sample collection, handling, storage, transportation, and analyses will be conducted in accordance with a rigorous quality assurance and quality control (QA/QC) program (described in detail in Section 3) to ensure that results are accurate and representative. Analytical results will be evaluated using a modified Tier II approach following the USEPA Region I "Laboratory Data Validation Functional Guidelines for Organic and Inorganic Analyses."

2.70 SVE/AS SYSTEM PERFORMANCE MONITORING

The following subsections describe the bi-monthly performance monitoring for the soil vapor extraction/air sparge system.

2.71 Soil Vapor Extraction System

Qualified environmental personnel will visit the site on approximately a bi-monthly basis to monitor the SVE system. During each visit, the following will be measured at each of the vent wells:

1. Air flow rates;
2. Vacuum response in inches of water column (IW);
3. TVOC measurements using a PID equipped with a 10.6 eV lamp, and
4. O_2, CO_2 and Lower Explosive Limit (LEL) measurements will be collected utilizing a Land-Tech infrared gas meter.

2.72 Air Sparge System

Qualified environmental personnel will visit the site on approximately a bi-monthly basis to monitor the air sparge system. During each visit, the following will be measured at each of the sparge points:

1. Air flow rates;
2. Air pressures.

2.73 Reporting

The results of the monitoring and maintenance work described above will be reviewed with respect to:

- SVE TVOC (PID), O_2 and CO_2 Levels;
- SVE flows and radius of influence;
- Air sparging flows and pressures;
- Oxygen introduction and consumption, and carbon dioxide generation; and estimated rates of hydrocarbon removal via biodegradation and physical venting to the GAC unit; and
- GAC unit maintenance.

As required in the RIDEM Remediation Regulations, a bi-monthly report of the remedial system monitoring will be provided to RIDEM, including any required system adjustments or modifications, with the semiannual reports.

3.00 QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

The sample collection and handling procedures, field screening methods, quality control mechanisms and record keeping are described in this section. The program is intended to provide written guidelines to achieve data reliability/reproducibility and reduce data error. The overall purpose of the QA/QC program is to define the procedures for providing accurate and reliable environmental measurements. This requires that quality control procedures be carried out during both the collection and analysis portions of sampling. Although these tasks are interrelated, a separate discussion follows to clarify the individual tasks required.

The quality assurance (QA) program described herein provides a set of procedures designed to assess the quality of data generated for the project. Quality control (QC) measures are also specified to ensure that the responsible individuals take appropriate actions to ensure the collection of valid data.

It will be the responsibility of all project personnel to abide by the quality control measures established for the project. The QA officer will have overall responsibility for project QA/QC. This individual will perform periodic inspections of field operations to evaluate equipment operation and calibration procedures, record-keeping, chain-of-custody documents, and field data for accuracy and completeness. In an effort to avoid potential laboratory reporting errors, the QA/QC officer will also review laboratory test data as it is received to evaluate reporting format, dilutions, and completeness and laboratory methods.

3.10 EXTERNAL (FIELD) PROGRAM

To provide a uniform basis for the collection of samples and related field measurements Standard Operating Procedures (SOPs) will be followed. To evaluate the effectiveness of these procedures, several checks in the form of duplicate samples and sample blanks will be prepared. The following subsections provide general procedures to be followed for the collection, handling and analysis of field quality control samples.

Specific record keeping and site documentation procedures will be followed during the field program. These procedures will include the use of field notebooks, field sampling data sheets and, when necessary, new boring/monitoring well installation logs. The following paragraphs discuss the procedures to be followed.

3.11 Field Notebooks

Field observations and site activities will be recorded in permanently bound, waterproof notebooks by on-site personnel. All entries shall be made with indelible ink. These notebooks will document personnel present on-site, activities conducted, samples collected and other information deemed necessary by field personnel to achieve project objectives. Field notebooks will be maintained by the project geologist or engineer, and upon project completion, will be maintained in the project files.

During environmental sampling, data will be recorded in a permanently bound waterproof field notebook and on Field Sampling Data Sheets. In addition to the media specific data identified in previous sections of this plan, recorded information will include the following:

- Sampling Location
- Depth of Sample Collection
- Collection Date
- Sample Description
- Name of Collector(s)
- Weather Conditions
- Sampling Time
- Changes/Modifications to Sampling Procedures
- Names/Affiliations of Others Present

3.12 Boring/Well Installation

Field observations during the drilling of any new or replacement boreholes, or any other subsequent sub-surface investigations, will be recorded on an exploration log (i.e., borehole/well installation logs). Recorded information will include the following:

- Date and time of boring execution.
- Engineer, Contractor, and Inspector.
- Location and designation (identifying number) of test boring and reference to survey data. Survey data will include the top of well pipe elevation for monitoring wells and ground surface for soil borings.
- Soil screening results (e.g., PID screening)
- Results of boring data from each hole arranged in tabular form giving full information on the vertical arrangement, thickness, and classification of the materials penetrated.
- Depth to bottom, type, and number of each sample taken.
- Height of drop and weight of drop hammer for taking drive samples and driving casing.
- Number of blows required for each six-inch (6") penetration of split-spoon sampler and for each twelve-inch (12") penetration of the casing.
- Size, length, and elevation of bottom of casing used in each borehole.
- Depth to groundwater table, and time of observation.
- Description of samples (e.g., Burmister Soil Classification System).
- Sample recovery.

3.13 Trip Blanks

In order to assess the degree and nature of inadvertent contamination associated with sample handling, storage and transportation, VOC analysis will be performed on laboratory prepared samples. The trip blanks consist of a volatile organic compounds (VOCs) sample container (vial) filled with deionized, organic-free water, which is maintained with the other sample containers, prior to and following sample collection. One trip blank will be prepared for each cooler containing VOC samples on everyday of sampling. The trip blank will be analyzed for VOCs only. Trip blanks will accompany the sampler, and subsequently the samples, throughout the sampling effort, transportation, and delivery to the analytical testing laboratory.

3.14 Equipment Decontamination

All non-dedicated, non-new sampling equipment (e.g., bailers, cables, pumps, fittings, tubing, etc.) will be decontaminated prior to use and between samples by the following process.

- A potable water rinse, and scrub,
- A non-phosphate detergent (Alconox or Liquinox) wash and scrub,
- A deionized water rinse, and
- Air dry.

Down hole measuring equipment (e.g., water level meters, measuring tapes, etc.) which contacts formation water will be rinsed prior to and between uses with potable water and wiped dry with a clean cloth or paper towel.

3.20 INTERNAL (LABORATORY) QA/QC PROGRAM

A laboratory licensed in the State of Rhode Island (by RIDOH) will be retained for all analyses. Analytical laboratories will be required to submit a project specific Quality Assurance Plan (QAP) to Charbert for their review and approval prior to performing any analyses. The QAP details procedures routinely employed by the laboratory for the purposes of producing reliable data, and ensuring that generated data conforms to specific requirements for accuracy, precision, and completeness.

Data from laboratory QC samples is used as a measure of laboratory performance or as an indicator of potential sources of cross-contamination. This data will be used to qualify results when appropriate.

3.21 Laboratory Quality Control Samples

The types of internal QC checks and samples performed by laboratory include method and reagent blanks, internal duplicates and replicates, surrogate spikes and calibration check standards. QC samples will be project specific and reported with the analytical results. The QA program requires that laboratory QC samples be performed by "batch" at a minimum of one for every twenty target samples or smaller sample delivery groups (SDG's).

3.22 Sample Preservation and Handling

All sample containers will be provided by the analytical testing laboratory and will be free of contaminants. Samples requiring specific preservations will be prepared by the analytical testing laboratory, where appropriate.

Soil samples collected will be placed in a 40-ml methanol preserved VOA vial and an 8-ounce jar with a Teflon-lined lid and labeled. Groundwater samples collected will be placed in a 40-mil hydrochloric acid preserved VOA vial and labeled. All samples will immediately be place in an ice filled cooler and transported to the analytical laboratory under chain-of-custody.

3.23 Sample Custody Procedures

The logging of a sample (accountability) begins when the sample is taken from its media. Sample labels, chain-of-custody forms and field data records must be completed in full at the time of sample collection. Sample custody is the responsibility of the field personnel.

Each sample will be assigned a unique identification number which will be used consistently during all sampling rounds and on all documents associated with the project. The sample identification number will be used to track samples through all subsequent handling, analysis and data reduction procedures. Groundwater sample identification will be based on the well numbering system and the date of collection. Example: a sample collected from well GZ-2 on September 15, 2007 would be designated GZ02091507.

Completed labels will be placed on all sample containers following collection. The labels will be consistent for all samples collected and between sampling rounds. At a minimum the label will contain the following information: (1) type of sample (groundwater); (2) sample location (GZ-2); (3) sampling date (mm/dd/yy); and (4) collectors initials (GZA).

The chain-of-custody form will contain information to distinguish individual samples, sampling locations and sampling personnel. Upon sample collection, the completed chain-of-custody record must accompany the samples at all times after collection. When samples are transferred in possession, the individuals relinquishing and receiving (including receiving laboratory) will sign, date and note the time the transfer occurred on the chain-of-custody record.

4.00 DATA EVALUATION AND REPORTING

This section describes the data evaluation to be employed and the reporting procedures to be used. Reports of groundwater water sampling events will be submitted by Charbert to the RIDEM within 45 days of sample collection as set forth in Rule 12 of the RIDEM Groundwater Regulations.

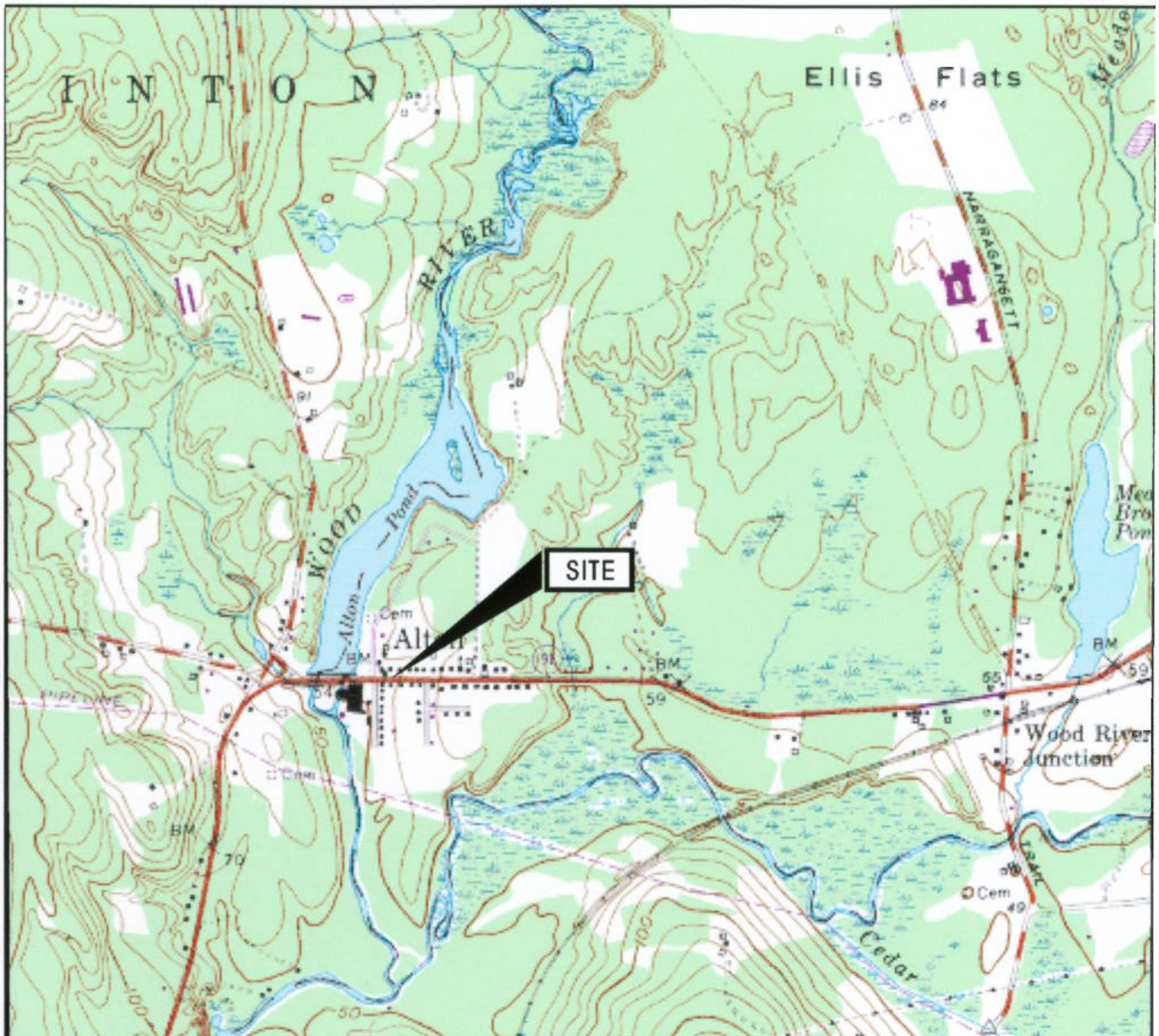
In accordance with these requirements, each report will include:

-1- A cover letter with a narrative summary of contraventions of water quality standards, sampling dates, sampling observations, and sampling techniques. A table showing the location designation (e.g., well number), the sample collection dates, the sample collection depths, the sample number, the analytical results, designation of upgradient and compliance wells, applicable water quality standards, and method detection limits (MDLs).

-2- A plan depicting groundwater elevations and inferred flow directions based on current measurements in all wells sampled.

-3- Tables and/or graphical representations comparing current water quality data to previous water quality data and upgradient water quality data based on appropriate statistical evaluations.

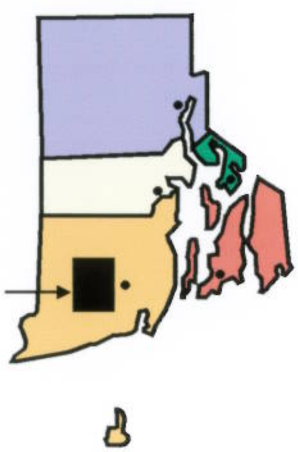
FIGURES



FROM USGS WESTERLY, RI QUADRANGLE MAP

(DIGITAL TOPOGRAPHIC MAPS PROVIDED BY MAPTECH, INC.)

(CONTOUR ELEVATIONS ARE IN METERS ABOVE NGVD, AT 3 METER INTERVALS)



APPROXIMATE SCALE IN FEET

0' 1200' 2400' 4800'

CHARBERT FACILITY

ALTON
RHODE ISLAND

LOCUS PLAN

March-2008

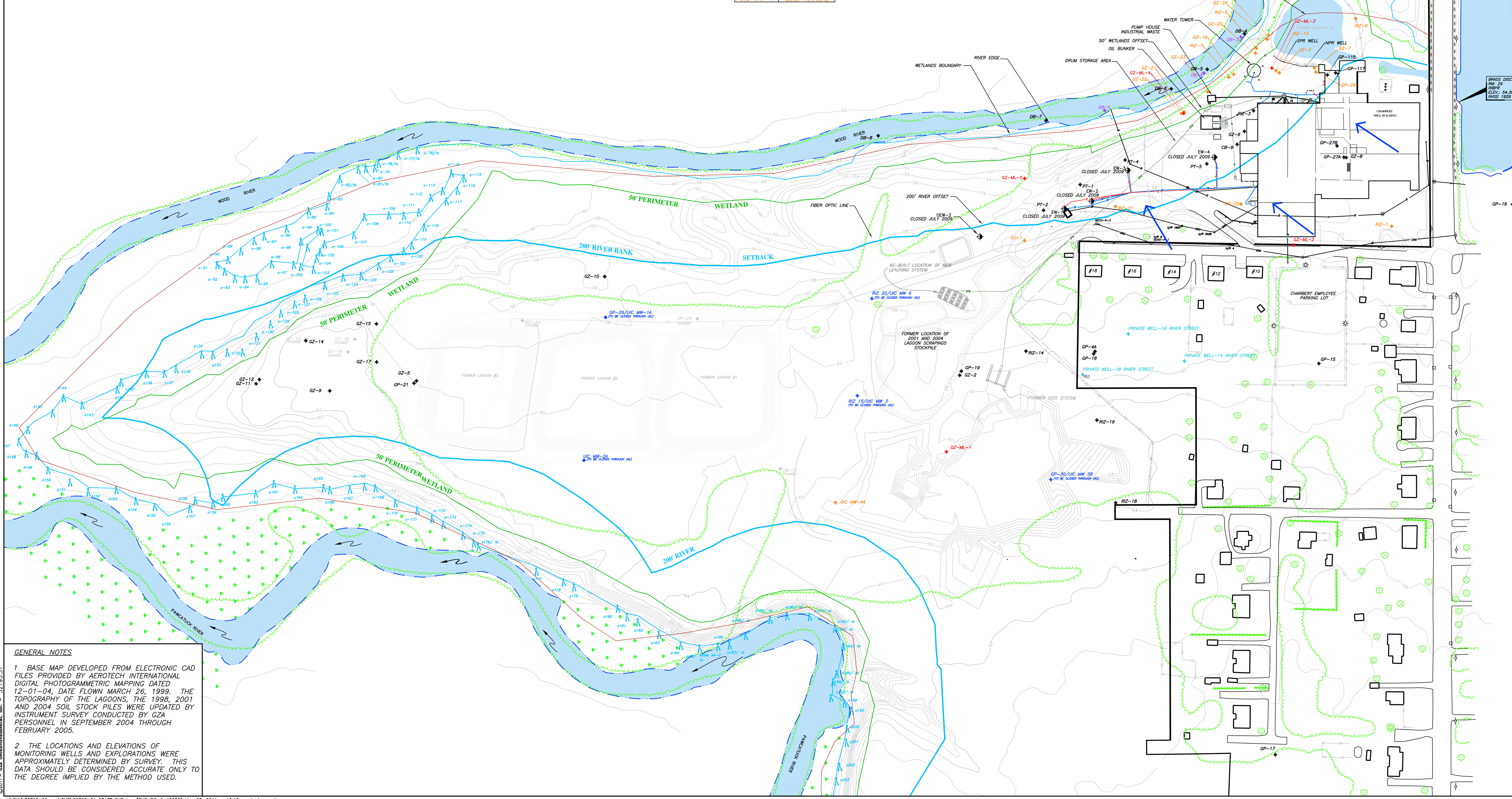
FIGURE NO. 1

LEGEND

- 200 FT. RIVER BANK BUFFER
- 50 FT. WETLAND BUFFER
- SEWER LINE
- INDUSTRIAL WASTEWATER LINE
- UNDERGROUND ELECTRICAL LINE
- STORM WATER DRAINAGE LINE
- OIL LINE
- EXISTING SEWER FORCE MAIN
- OVERHEAD UTILITY
- FEMA 100 FLOOD LEVEL
- POST INDICATOR VALVE
- FIRE HYDRANT
- UTILITY POLE
- CHAIN LINK FENCE
- EXISTING SURFACE CONTOURS
- EDGE OF RIVER
- DB-5 — 2007 DIFFUSION BAG MONITORING LOCATION
- DB-5 — 2008-2010 AND FUTURE SAMPLIMG EVENT DIFFUSION BAG MONITORING LOCATION
- UIC MW-4A — FORMER UIC PROGRAM GROUNDWATER MONITORING WELL
- GZ-ML-1 — EXISTING MULTI-LEVEL BEDROCK MONITORING WELL
- GZ-21 — EMP GROUNDWATER MONITORING WELL
- RIZ-3 — EXISTING GROUNDWATER MONITORING WELL
- EW-2 — FORMER EXTRACTION WELL
- INFERRED GROUNDWATER FLOW DIRECTION BASED ON SIR GROUNDWATER CONTOUR PLANS
- GZ-13 (CLOSED) — FORMER MONITORING WELL CLOSED BY GZA
- AS-3 — AS-BUILT LOCATION OF AIR SPARGE WELL
- SVE-3 — AS-BUILT LOCATION OF SOIL VAPOR EXTRACTION WELL
- SSVW-4 — AS-BUILT LOCATION OF SUB-SLAB VENT
- SVE-18 — AS-BUILT LOCATION OF SOIL VAPOR EXTRACTION TRENCH
- SPR WELL — SOUTH PRODUCT RECOVERY WELL
- NPR WELL — NORTH PRODUCT RECOVERY WELL

PROPOSED EMP OVERBURDEN WELLS	
LOCATION	SAMPLING FREQUENCY
RIZ-1	ANNUAL
RIZ-6	ANNUAL
RIZ-13	ANNUAL
GZ-3	SEMI-ANNUAL
GP-26	SEMI-ANNUAL
GZ-7	SEMI-ANNUAL
RIZ-7	SEMI-ANNUAL
GZ-19	SEMI-ANNUAL
RIZ-5	ANNUAL
GZ-20	SEMI-ANNUAL
GP-28	SEMI-ANNUAL
GZ-21	SEMI-ANNUAL
GZ-22	SEMI-ANNUAL
GZ-23	SEMI-ANNUAL
GZ-24	SEMI-ANNUAL
GZ-25	SEMI-ANNUAL
GZ-26	SEMI-ANNUAL
GZ-27	SEMI-ANNUAL
GZ-28	SEMI-ANNUAL
RIZ-21	SEMI-ANNUAL
GP-22	SEMI-ANNUAL
GZ-1	SEMI-ANNUAL
UIC MW-4A	SEMI-ANNUAL

PROPOSED EMP BEDROCK WELLS		
LOCATION	ZONE	SAMPLING FREQUENCY
GZ-ML-1	ZONE 1	ANNUAL
	ZONE 3	ANNUAL
GZ-ML-2	ZONE 1	ANNUAL
	ZONE 3	ANNUAL
GZ-ML-3	ZONE 1	SEMI-ANNUAL
	ZONE 3	ANNUAL
GZ-ML-4	ZONE 1	SEMI-ANNUAL
	ZONE 3	ANNUAL
GZ-ML-5	ZONE 2	SEMI-ANNUAL
	ZONE 3	ANNUAL



GENERAL NOTES

1 BASE MAP DEVELOPED FROM ELECTRONIC CAD FILES PROVIDED BY AEROTECH INTERNATIONAL DIGITAL PHOTOGRAMMETRIC MAPPING DATED 12-01-04, DATE FLOWN MARCH 26, 1999. THE TOPOGRAPHY OF THE LAGOONS, THE 1998, 2001 AND 2004 SOIL STOCK PILES WERE UPDATED BY INSTRUMENT SURVEY CONDUCTED BY GZA PERSONNEL IN SEPTEMBER 2004 THROUGH FEBRUARY 2005.

2 THE LOCATIONS AND ELEVATIONS OF MONITORING WELLS AND EXPLORATIONS WERE APPROXIMATELY DETERMINED BY SURVEY. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

REV. NO.	DESCRIPTION	BY	DATE
1	LEGEND REVISED PER RIDEM COMMENTS	SMA	05-03-11

SCALE: 1" = 100'

0 50' 100' 200'

GZA GeoEnvironmental, Inc.
Engineers and Scientists
530 BROADWAY
PROVIDENCE, RHODE ISLAND 02909
(401) 421-4140
(401) 751-8613

PROJ MGR: SMA
DESIGNED BY:
REVIEWED BY: EAS
OPERATOR: SMA
CHECKER: ALF
DATE: FEB. 2011

CHARBERT FACILITY
ALTON, RHODE ISLAND

PROPOSED ENVIRONMENTAL MONITORING PLAN
SITE PLAN AND MONITORING WELL LOCATIONS

PROJECT NO. 32795.31

FIGURE NO. 2


LEGEND
200 FT. RIVER BANK BUFFER
50 FT. WETLAND BUFFER
SEWER LINE
INDUSTRIAL WASTEWATER LINE
UNDERGROUND ELECTRICAL LINE
STORM WATER DRAINAGE LINE
OIL LINE
EXISTING SEWER FORCE MAIN
OVERHEAD UTILITY
FEMA 100 FLOOD LEVEL
POST INDICATOR VALVE
FIRE HYDRANT
UTILITY POLE
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SSVW-4 AS-BUILT LOCATION OF SUB-SLAB VENT
SVE-18 AS-BUILT LOCATION OF SOIL VAPOR EXTRACTION TRENCH
SPR WELL SOUTH PRODUCT RECOVERY WELL
NPR WELL NORTH PRODUCT RECOVERY WELL
FORMER (LAGOON 5)
CHARBERT MILL BUILDING
LOCATION OF BLOWERS, AIR DRYERS AND CARBON DRUMS FOR INTERIOR AND EXTERIOR SOIL VAPOR EXTRACTION SYSTEMS
LOCATION OF AIR COMPRESSOR FOR INTERIOR AND EXTERIOR SPARGE SYSTEMS
PROPOSED SOIL SAMPLING GRID
WATER TOWER
INDUSTRIAL WASTE PUMP HOUSE
50' WETLANDS OFFSET
OIL BUNKER
RIVER EDGE
WETLANDS BOUNDARY
DRUM STORAGE AREA
FEMA 100-YEAR FLOOD BOUNDARY
200' RIVER OFFSET
DRILL HOLE FOUND ELEV.: 54.53
CLOSED JULY 2009
AS-BUILT LOCATION OF NEW LEACHING SYSTEM
CHARBERT EMPLOYEE PARKING LOT
PRIVATE WELL-16 RIVER STREET
PRIVATE WELL-14 RIVER STREET
#18
#16
#14
#12
#10
GENERAL NOTES
1 BASE MAP DEVELOPED FROM ELECTRONIC CAD FILES PROVIDED BY AEROTECH INTERNATIONAL DIGITAL PHOTOGRAMMETRIC MAPPING DATED 12-01-04, DATE FLOWN MARCH 26, 1999. THE TOPOGRAPHY OF THE LAGOONS, THE 1998, 2001 AND 2004 SOIL STOCK PILES WERE UPDATED BY INSTRUMENT SURVEY CONDUCTED BY GZA PERSONNEL IN SEPTEMBER 2004 THROUGH FEBRUARY 2005.
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1 LEGEND REVISED PER RIDEM COMMENTS SMA 05-03-11
REV. NO. DESCRIPTION BY DATE
SCALE: 1" = 40'
GZA GeoEnvironmental, Inc. Engineers and Scientists
530 BROADWAY PROVIDENCE, RHODE ISLAND 02909
PROJ MGR: SMA
DESIGNED BY:
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CHARBERT FACILITY
ALTON, RHODE ISLAND
PROPOSED ENVIRONMENTAL MONITORING PLAN
AIR SPARGE AND SOIL VAPOR EXTRACTION WELL LOCATIONS
PROJECT NO. 32795.31
FIGURE NO. 3
©2011 - GZA GeoEnvironmental, Inc. - 32795.31
J:\ENV\32795-29.smo\EMP\32795-31 DRAFT EMP.dwg [EMP FIG-3] May 03, 2011 - 12:16pm stephen.andrus