CECOS
INTERNATIONAL

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Williamsburg, Ohio 45176
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October 1, 2014

Mr. Craig Butler, Director
Ohio Environmental Protection Agency
50 W. Town St., Suite 700
Columbus, Ohio 43216

2014 OCT -2 AM 9: 11
BD OF COUNTY
COMMISSIONERS
CLERMONT COUNTY, OH

RE: Proposed Class 1A (Equivalent) Post-Closure Plan Amendment
Per OAC Rule 3745-66-18
CECOS International, Inc. - Aber Road Facility
Williamsburg, Ohio
EPA I.D. No. OHD 087 433 744

Dear Mr. Butler:

The following is a proposed amendment to CECOS International, Inc.'s (CECOS's) RCRA "Post-Closure Plan" for the closed Aber Road facility in Williamsburg, Ohio. In accordance with the guidelines in OAC Rule 3745-66-18 and OAC Rule 3745-50-51, CECOS requests Ohio EPA approval of the proposed amendment as a Class 1A change (prior-approval required). It is noted that the facility remains in interim status, therefore, the proposed amendments are considered to be equivalent to Class 1A changes described in OAC Rule 3745-50-51.

The majority of the changes proposed herein were anticipated in the Detection Monitoring Program (DMP) (Section 10) and statistical analysis (Section 11) components of the facility's October 2012 Post-Closure Plan. With the implementation of that Plan, CECOS began quarterly background data collection at wells that required at least eight additional water-quality observations before statistical analyses could be performed. The eighth background sampling event was completed in July 2014, as planned. Based on the additional background observations, including all results collected quarterly beginning in October 2012, statistical limits have been generated or updated for the inorganic indicator constituents dissolved arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver at downgradient Channel Sand (2) and Bedrock-Till Interface (BTI; 16) wells. It is anticipated that the updated statistical limits will be implemented to evaluate the upcoming fall 2014 DMP ground-water sampling event for the facility.

In addition to new and updated statistical limits, several housekeeping and administrative revisions are proposed and a new sampling-method option, "minimal purge," has been added. The minimal-purge sampling approach will be an option available for low-yielding wells that have been found to regularly purge to dryness prior to sample collection. To avoid dewatering a low-yielding well's screened interval and in accordance with Ohio EPA Technical Guidance (TGM; Chapter 10; 2012), minimal or "minimum" purging may be necessary when a well displays a tendency to regularly go dry using traditional purging techniques. The proposed minimal-purge procedures have been developed in accordance with the TGM's guidelines.

Recycled Paper

Included herein are three-hole punched, proposed September 2014 revision inserts for the existing October 2012 Plan. The proposed substantive changes and instructions for inserting the affected pages are summarized on the attached Table 1. A loose-leaf version of all of the affected text and tables, with changes shown in standard redline format, also is attached for reference only.

Please call me at (513) 724-6114 if you have any questions regarding this submittal.

Sincerely,
CECOS International, Inc.

Daniel Deborde
Environmental Manager

encl.
cc: Tim Hull, Ohio EPA, SWDO
Steve Johnson, US EPA Region 5 (w/attachment)
Brian Freeman, US EPA Region 5 (w/attachment)
Steve Rabolt, Clermont County Administrator (w/attachment)
Joe Montello, Republic Services, Inc. (w/o attachment)
Michael Gibson, Eagon & Associates, Inc. (w/o attachment)
File: B.3

TABLE 1
POST-CLOSURE PLAN
CECOS INTERNATIONAL, INC. – ABER ROAD FACILITY
SUMMARY OF SEPTEMBER 2014 REVISIONS AND INSTRUCTIONS FOR INSERTING THE CHANGES

Text Revisions

- ***Cover & Spine:*** The cover and spine were revised to reflect the September 2014 revision date. Replace the October 2012 versions with the September 2014 versions.
- ***CD-ROM:*** Replace the CD-ROM of the October 2012 Post-Closure Plan, located in the front of the text, with the September 2014 version.
- ***Cover Page:*** The cover page was revised to reflect the September 2014 revision date. Insert the attached version of the cover page in place of the October 2012 version.
- ***Table of Contents (pages i-v):*** Updated current section page numbers; updated to reflect renamed Table 12, new Section 10.5.2.1.3, and renamed Section 11.2.4.2. Insert the September 2014 versions of pages i-v in place of their October 2012 versions.
- ***Revision Summary:*** Added page (page vi). Listed historical versions and components affected by the September 2014 changes. Insert the new page vi behind page v.
- ***Pages 56 – 81:*** Due to both formatting changes and updates to multiple Sections, insert the September 2014 pages 56-81 in place of pages 56-81 in the October 2012 version. Individual Section changes are described below, where applicable.
- ***Section 10.3:*** Updated to remove the reference to the planned installation of pumps in wells previously sampled by bailers. The pumps are now installed.
- ***Section 10.3.2:*** Added a reference to Figure 11 in the second sentence and updated the text to reflect the fact the water levels will be measured from the survey marks on the pump caps. Removed the reference to Figure 16 from the third paragraph.
- ***Sections 10.4 and 10.5.3:*** Added a "piston pump" to the list of devices that may be used for field filtering samples.
- ***Section 10.5.1:*** Updated to reflect that the survey mark is on the pump cap for wells equipped with pumps.
- ***Sections 10.5.2.1.2:*** Updated to clarify the minimum pumping rate (100 ml/min) below which a well will be sampled once it has sufficiently recovered, regardless of parameter stabilization.
- ***Section 10.5.2.1.3 – Minimal Purging:*** Added section.
- ***Section 10.5.4:*** Removed "Alconox" from the example list of detergents that could be used.
- ***Section 10.5.5:*** Updated to clarify the order of sample collection.
- ***Section 10.6.3:*** Revised the list of items for field documentation to clarify that the volume of water in a well is calculated for traditional purging only.
- ***Section 11.2.2:*** Removed the first paragraph relating to historical information that is no longer germane to the program. Updated to clarify when background will be updated in the event a PQL is lowered in the future. Revised to reflect the September 2014 background update. Revised first sentence in last paragraph to pertain to unnamed future wells.
- ***Section 11.2.4:*** Updated to reflect the handling of non-detects for arsenic to the historically higher PQL of 10 ug/L.
- ***Section 11.2.4.1:*** Updated the entire section on outlier testing to reflect the September 2014 revision.

- ***Section 11.2.4.2:*** Deleted the section on non-detects and replaced it with a section describing trend testing, which was separated out and updated from the previous section (Section 11.2.4.1) on outlier testing. Moved the October 2012 discussion on non-detects to Section 11.2.4.3 – "Distribution."
- ***Section 11.2.4.3:*** Updated the discussion on normality testing and deleted the last paragraph that is no longer applicable. Added the non-detect discussion that was previously in Section 11.2.4.2.
- ***Section 11.2.4.4:*** Revised to reflect the September 2014 update and to remove outdated references to the approach that is now implemented.
- ***Section 11.2.5:*** Revised the section to reflect the September 2014 updates.

Table Revisions:

- ***Table 4:*** Revised to include SW-846 Update IV method references and to reflect the fact that analytical test methods are subject to change. Insert the September 2014 version in place of the October 2012 version.
- ***Tables 10 & 15:*** Revised to include SW-846 Update IV method references and to reflect the fact that analytical test methods and container and preservative requirements are subject to change. Added Method 6020A to the list of potential analytical methods for cadmium, lead, selenium, and silver. Insert the September 2014 versions in place of the October 2012 versions.
- ***Table 12:*** Renamed and replaced the October 2012 version with September 2014 outlier testing results. Insert the September 2014 version in place of the October 2012 version.

Figure Revisions:

- ***Figure 17:*** Revised to show an updated example chain-of-custody record. Insert the September 2014 version in place of the October 2012 version.

Appendices Revisions

- ***Appendices F, G, H, & I:*** Revised with September 2014 update information. Replace the Appendix F CD-ROM with the September 2014 version and replace all October 2012 pages in Appendices G, H, & I with their equivalent September 2014 versions.

Post-Closure Plan

CECOS International, Inc.
Aber Road Facility
Williamsburg, Ohio

EPA I.D. # OHD-087-433-744

Revised September 2014

CECOS International, Inc.
Aber Road Facility
Post-Closure Plan
Revised September 2014

EAGON & ASSOCIATES, INC.

Post-Closure Plan

CECOS International, Inc.
Aber Road Facility
Williamsburg, Ohio

EPA I.D. # OHD-087-433-744

Revised: September 2014

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REVISIONS TO
POST CLOSURE PLAN
CECOS INTERNATIONAL, INC.

Date of Revision	Revision Number
December 1992	1 (Original)
September 1993	2
December 1993	3
March 1994	4 (Amended September 1994 per Ohio EPA approval)
September 2014	5

Added Rev. Summary (page vi); Revised Sections: 10.3, 10.3.2, 10.4, 10.5.1, 10.5.2.1.2, 10.5.2.1.3, 10.5.3, 10.5.4, 10.5.5, 10.6.3, 11.2.2, 11.2.4, 11.2.4.1, 11.2.4.2, 11.2.4.3, 11.2.4.4, and 11.2.5; Figure 17; Tables 4, 10, 12, and 15; Appendices F, G, H, and I

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discussions with Ohio EPA, 11 new wells were installed in 2012 for sampling under the DMP (See **Table 7**).

The monitoring well network presented herein satisfies the regulatory requirements set forth in OAC Rules 3745-54-97(A-G) and 3745-54-98(A-D).

Any future wells will be installed following the procedures in the latest version of Ohio EPA's TGM, where applicable. For wells that will be used for routine water quality sampling, dedicated sampling pumps will be installed at each existing and future well in the routine DMP network. At least eight initial background samples will be collected from each installed well, on a quarterly basis, per discussions with Ohio EPA, technical review, and in accordance with OAC Rule 3745-54-97(G)(1). As-built well construction summaries and borehole logs will be submitted to Ohio EPA for newly installed wells.

Monitoring wells will contain dedicated equipment to avoid the potential for cross-contamination. Dedicated submersible pumps will be utilized for purging and sampling all DMP monitoring wells. If confirmed groundwater quality impact from a regulated unit has been identified, the wells with evidence of impact will generally be sampled last.

10.3.1 Monitoring Well Operations and Maintenance Procedures

An inspection program has been instituted at the Aber Road Facility to ensure that the monitoring wells perform to design specifications throughout the life of the monitoring program as detailed in Section 3.3.5. Each well is visually inspected to assure that access is readily available, to identify needed repairs or maintenance, and to verify that the well is capable of producing representative groundwater samples. Inspections are documented on a Maintenance Evaluation form and notification of the need for repair is made on the Corrective Action form, **Figures 9** and **10**, respectively. In addition, during routine groundwater monitoring, each well to be sampled for water quality is inspected to assure properly functioning dedicated purging/sampling equipment exists, where applicable. If a well is determined not to be operating properly or is in need of repair, appropriate measures will be taken prior to the next semiannual event.

Well redevelopment is discussed in Section 4.2.1. Wells that may become obstructed or otherwise become unserviceable through time will be noted to Ohio EPA prior to the next semiannual event. The need for well abandonment and/or replacement wells will be discussed with Ohio EPA before undertaking the work.

10.3.2 Measurement of Groundwater Elevations: Wells Available for Supplemental Sampling

On a semiannual basis, data to establish the static elevations of groundwater will be collected. The Potentiometric Surface Monitoring Network (**Figure 11; Table 8**) has been developed to include piezometers and monitoring wells across the site.

Data will include depths-to-static groundwater level as measured from a marked reference point on the top of the inner casing during each sampling event. Wells equipped with pumps will be measured from the survey mark on the pump cap. Groundwater elevation data will be measured to an accuracy of 0.01 foot. Immiscible layer detection will be conducted based on a visual analysis of the water level probe, water collected during purging and sampling, and

the results of the analytical program. If immiscible layers are detected they will be noted in the "Specific Comments" section of the field log.

Site-wide groundwater levels will be collected within a 24-hour period, if possible. However, due to the large number of wells requiring water level measurements (approximately 200 wells) and daylight limitations during certain parts of the year, it may not be feasible to collect all water levels in a 24-hour time period.

Potentiometric surface maps generated from the groundwater elevation events will be included with each semiannual groundwater statistical analysis report. In accordance with OAC Rule 3745-54-98(E), an evaluation of the groundwater flow rate and direction will be performed at least annually.

An asterisk has been placed on **Table 8** after wells that are likely viable for future sampling (i.e., 2-inch casing or bigger), if needed. Wells formerly part of the DMP, as well as piezometers, will be maintained in the event they are needed for future investigatory purposes. If it is determined that additional sampling is warranted outside the current detection monitoring well network, an attempt will be made to collect a representative sample from the appropriate piezometer(s). If an appropriate piezometer is not available, or a sample cannot be collected due to a well condition, an additional well may be installed (after discussion with the Ohio EPA). Dedicated pumps may not be installed in wells that are not part of the routine DMP network.

10.4 Indicator Parameters

Table 9 contains a summary of stabilization, water quality, and statistical indicator parameters for wells in the Upper Sand, 880 Sand, Channel Sand, and BTI Zones. The indicator parameter includes hazardous constituents that will provide reliable, early identification of a potential release from the regulated unit. The indicator parameters were determined in accordance with OAC Rules 3745-54-97(G) and 98(G) and Ohio EPA's input.

Because the monitoring zones contain clay and silt as well as sands and are often low-yielding, samples for dissolved metals will be field filtered to ensure representative samples are collected. Samples for metals will be field filtered using a 0.45-micron, high capacity, filter attached to the pump discharge tubing. The filtered sample will be pumped directly into the sample bottles. The flow rate will be adjusted to a rate that is capable of pushing water through the pump discharge tubing when collecting dissolved metal aliquots.

When sampling a bailed well (see Section 10.5.2.2) for dissolved metals, an aliquot will be collected in a new, unpreserved (neat) bottle. The aliquot will be field filtered immediately using a peristaltic or piston pump. The aliquot will travel through a 0.45-micron, high capacity filter attached to disposable tubing and will be collected directly into the sample bottle. Tubing and filters will be discarded after use.

Due to a lack of confirmed detections over a 13 year period between 1998 and 2011, and in concurrence with Ohio EPA, semi-volatile organic compounds (SVOCs) are no longer considered appropriate detection monitoring indicator parameters for the facility and will not be sampled as part of the DMP. SVOCs will continue to be included in the site-specific list of constituents for Appendix IX sampling. Throughout this Plan, references to the Appendix IX sampling list refers to the VOCs listed in the Appendix to OAC Rule 3745-54-98 and other

parameters (SVOCs, pesticides, herbicides, PCBs, metals, etc.) taken from Table 1-1 of the approved November 1997 CMI Quality Assurance Project Plan (QAPjP). Specific sampling and analysis requirements for the DMP parameters, including minimum container size, preservatives, analytical methods, and method holding times, are outlined in **Table 10**.

10.4.1 Stabilization Parameters

Field stabilization parameters were selected based on the most recent Ohio EPA TGM protocol. As discussed in Sections 10.5.2.1.1 and 10.5.2.2.1, field pH, specific conductance, and temperature will be used for stabilization purposes during purging at each well in the DMP. The stabilization parameters will not be statistically evaluated.

10.4.2 Water Quality Parameters

In addition to the stabilization parameters, field turbidity, dissolved oxygen (DO), and oxidation/reduction potential (ORP) measurements will be collected once each event at each DMP well, after purging is completed and prior to sample collection. None of these parameters will be statistically evaluated.

The eight RCRA metals listed on **Table 9** will be collected at wells screened in the Upper Sand and 880 Sand Zones. Data collected for the RCRA metals in Upper Sand and 880 Sand Zone wells will be evaluated qualitatively through time series plots, which will be presented and discussed in report submittals to identify potential changes that may warrant further evaluation. Statistical evaluations will not be performed on RCRA metals in the Upper Sand and 880 Sand Zones.

10.4.3 Statistical Indicator Parameters

The VOCs listed on **Table 11** are the VOCs in the appendix to OAC Rule 3745-54-98, as well as 9 additional parameters typically analyzed as SVOCs as agreed upon with Ohio EPA (62 constituents total) that can be detected using SW-846 Method 8260B (62 constituents total). These 62 parameters will hereafter be referred to as "VOCs." The VOCs on **Table 11** will be analyzed and evaluated as detection monitoring indicator parameters for each of the four water-bearing zones.

Downgradient wells in the Upper Sand Zone and 880 Sand Zone will be statistically evaluated for 62 VOCs.

Downgradient wells in the Channel Sand and BTI Zones will be statistically evaluated for the eight RCRA metals, as well as for the 62 VOCs.

Newly installed wells and wells new to the DMP (MP-214BR and MP-237) will be statistically evaluated for the 62 VOCs beginning with the first monitoring event following implementation of this Plan and/or the installation of the wells. Background will not be collected for VOCs.

10.5 Groundwater Sampling Methodology

The following sections describe groundwater sample collection, handling, and reporting procedures. The Aber Road Facility or its designated consultant will follow these guidelines during sample collection. The intent of these guidelines is to provide procedures designed to

yield representative and comparable analytical data from each monitoring well, during each sampling event.

Three principal steps in collecting groundwater samples from monitoring wells are:

- Measuring static groundwater levels;
- Purging well casings (or low-flow purging) to stabilization; and
- Collecting and preserving samples.

10.5.1 Calculations of Groundwater Level, Total Well Depth, and Well Volume

Water level measurements will be made at the surveyed reference point using a properly decontaminated, battery-operated electronic water level meter with audible signal and calibrated tape or its equivalent. Data to establish the static elevations of groundwater will be collected prior to purging. Data will include both depth-to-water levels and updated total well depths as measured from a marked reference point on the top of the inner casing during each sampling event, if measured. Wells equipped with pumps will be measured from the mark on the pump cap. For wells with dedicated pumps, the total depths will be measured when pumps are removed for maintenance. Otherwise, the well construction diagram will provide total depths whenever the pump makes total depth measurements impractical.

Water level measuring devices coming in contact with groundwater will be thoroughly washed with a non-phosphate detergent and rinsed with deionized water prior to use in each well. Groundwater elevations will be obtained by subtracting the measured depth to groundwater from the surveyed top of inner casing elevation at each well. Total well depth (either measured or assigned per the well construction diagrams) will be used to aid in calculating the initial groundwater volume of each well. The difference between total well depth and depth-to-water level is the stabilized height of the groundwater column in the well. These measurements will be used to determine the static well volume (in gallons) of groundwater in each well as follows:

1. In order to obtain the height (H) of the groundwater column, measure the total depth (TD) of the well and subtract the static measured depth (SMD) of the water level.

$$H = TD - SMD$$

2. The following formula may be used to calculate the static well volume (in gallons) of groundwater:

$$V = (H) \times (F)$$

Where:

V = well volume in gallons.
H = height of groundwater column in the well in feet.
F = factor for volume of 1-foot section of casing in gallons.
0.163 = gallons per foot of depth constant for a 2-inch well.
0.653 = gallons per foot of depth constant for a 4-inch well.

This well volume will be multiplied by three to calculate the minimum required purge volume (when purging volumetrically).

10.5.2 Monitoring Well Purging Procedures

Purging wells prior to sample collection is necessary to remove stagnant water that may not be representative of the groundwater. Purging will be performed at a rate as close as possible to the recharge/recovery rate of the well. Wells will be purged using dedicated submersible pumps, such as the Grundfos Rediflo 2, a bladder pump, or similar device. It is expected that turbidity will be relatively low due to the use of dedicated pumps as the sampling apparatus at each well; however, slightly higher turbidity readings may occur in wells that purge dry.

On-site purge water from downgradient wells will be collected in containers and labeled "P.C. Purge Water." This purge water will be handled as potentially contaminated. Currently, the purge water from downgradient wells is conservatively managed and disposed with F039 liquids. Purge water that is shown to be uncontaminated based on past sample results may be disposed on the ground downgradient of the wellhead at the time of sampling. Purge water from upgradient background monitoring wells will be discarded on the ground away from the wellhead.

10.5.2.1 Pump Purging

10.5.2.1.1 Volume Sampling

Purging may be performed by removing a minimum of three well volumes (calculated as discussed in Section 10.5.1), prior to sampling, except when a well purges dry before three well volumes have been evacuated. This ensures that samples are drawn from formation water, not from stagnant water left in the well between sampling events. The purge rate and volume of groundwater purged from each well will be measured using a graduated bucket. In addition to removing three well volumes, field stabilization parameters including pH, specific conductance, and temperature will be monitored and recorded on a field log.

Stabilization parameters will be collected every one-half (½) well volume after an initial one to one and one-half (1 - 1½) well volumes are purged. The volume removed between readings may be adjusted as well-specific information is developed. Field meter or flow-through cells that allow continuous monitoring of stabilization parameters may be used. When using a flow through cell, the capacity of the cell will be such that the flow of water in the cell is replaced between measurements of the stabilization parameters.

Purging will be considered complete when at least three well volumes have been removed and the following field parameters have stabilized for a minimum of three consecutive readings:

pH	+/- 0.2 S.U.
Specific Conductance	+/- 3% umhos/cm
Temperature	+/- 0.5 Degrees Celsius

Turbidity, DO, and ORP, in addition to pH, specific conductance, and temperature, will be measured at the end of purging. Turbidity, DO, and ORP will not be used as stabilization parameters. All field measurements, including the volume of water purged at the time of each field parameter measurement, and the date and time of sample collection will be recorded on the field log. A depth-to-water measurement will also be collected after purging but prior to sample collection.

Upon removal of three well volumes and equilibrium of field water quality parameters, the well will be sampled. If one or more of the stabilization criteria are not met after five well volumes have been purged, the sample will be collected. If a well purges dry prior to three volumes and/or equilibrium, the well will be evacuated to the lowest reasonable level, allowed to recover, and then sampled within 24 hours of purging. If a well does not recover sufficiently to fill the sample bottles after 24 hours, the samplers may attempt to collect additional volume during consecutive 24-hour periods, as practical. The volume of water purged will be recorded on the field log.

10.5.2.1.2 Low-Flow Sampling

Low-flow (minimal drawdown) ground-water sampling procedures may be used for purging and sampling monitoring wells that will sustain a pumping rate of at least 100 ml/min. Water will be purged from these wells at low rates in order to minimize drawdown in the well during purging and sampling. Depth-to-water measurements and field water quality parameters specific conductance, pH, and temperature collected during purging will be used as criteria to determine when purging has been completed. Sample collection will be initiated immediately after purging at each well.

Prior to purging, a static water level will be measured and the time of measurement will be recorded on the field form (See **Figure 16** for an example field form). Depth-to-water measurements recorded during purging to verify water level stabilization also will be recorded on this form.

During purging, wells will be pumped at very low rates. Purging rates in the range of 0.1-0.5 L/min (100-500 ml/min) typically will be used and no well will be purged in excess of 1 L/min (1000 ml/min). Stabilization of the water column will be considered achieved when three consecutive water level measurements vary by 0.3 foot or less at a pumping rate of no less than 100 ml/min. If a bladder pump is used, the manufacturer's recommendations will be used for adjusting the emptying/filling cycle to minimize the potential for turbid flow.

Stabilization measurements will begin after drawdown of the water level has stabilized. Depth-to-water measurements and water quality parameter measurements of pH, specific conductance, and temperature typically will be conducted every 3-5 minutes during purging. If a meter equipped with a flow cell is used, the volume of the flow cell should be purged between field measurements. Stabilization will be considered achieved and purging will be considered complete when three consecutive measurements vary by no more than:

Depth-to-Water	0.3 ft
pH	+/- 0.2 S.U.
Specific Conductance	+/- 3% umhos/cm

Temperature	+/- 0.5 Degrees Celsius

Samples will be collected immediately after purging is complete at each well. Turbidity, DO, and ORP, in addition to depth-to-water, pH, specific conductance, and temperature, will be measured at the end of purging. Turbidity, DO, and ORP will not be used as stabilization parameters. All field measurements, including the volume of water purged at the time of each field parameter measurement, and the date and time of sample collection will be recorded on the field form.

If the recharge rate of the well is less than 100 ml/min., and the well is essentially dewatered during purging, a sample will be taken as soon as the water level has recovered sufficiently to collect the sample, regardless of parameter stabilization.

10.5.2.1.3 Minimal Purging

Wells that yield less than 100 ml/min. may also be sampled using a minimal purging procedure. Wells sampled using this method will be purged of a minimum of the volume of water in the pumping system (i.e., pump and tubing volume) prior to collecting samples. The pumping system volume is determined by adding the volume of the sampling pump (e.g., P1150 = 130 ml; P1101 = 395 ml) to the volume of the tubing at each well. The tubing volume at a given well is calculated by multiplying the feet of tubing in the well by a conversion factor for tubing size (e.g., 10 ml/ft for ¼-inch ID tubing; 4.5 ml/ft for 0.17-inch ID tubing). Once the minimum volume has been evacuated, samples may be collected. The pump system volumes will be recorded on the field form for each well.

The goal of minimal purging is to sample only water from the screened interval of the well. Therefore, water levels will be monitored during sample collection and drawdown will not be permitted to exceed the distance between the pump intake and the top of the screen. If the maximum drawdown is reached prior to filling a complete bottle set, sampling will be discontinued and resumed when sufficient water has recovered in the well and no later than 24 hours after sampling. Maximum drawdowns for wells purged using this method will be recorded on the field form.

10.5.2.2 Bailer Purging

Purging and sampling with a bailer will only be used in the event that a dedicated pump is inoperable or if a well must be sampled that lacks a dedicated pump because it is not part of the routine DMP sampling network. Only bailers and monofilament line that will not alter the sample parameters are permissible when bailer purging is required. Dedicated stainless steel bailers, dedicated/non-dedicated PVC bailers, or dedicated/non-dedicated polyethylene bailers will be used for sampling. Non-dedicated bailers will be properly decontaminated following procedures described in Section 10.5.4. In the event that a tripod-mounted downrigger style reel is used, the following procedure will be used:

- The line will be walked out an appropriate distance for the respective well;
- The downrigger reel will be rinsed with deionized water, a paper towel wetted with deionized water and dry towel will be held in sequence in the line as it is drawn on the spool;
- The bailer will be fastened to the monofilament line using a latch secured with a knot;

- The latch will also be rinsed with deionized water prior to hooking it on the bailer;
- After cleaning the line, the bailer will be lowered slowly in the water column until submerged; and
- The bailer will be retrieved slowly, recording the actual volume removed as the well is continuously bailed until the purge requirements in Section 10.5.2.1.1 are achieved.

10.5.3 Sample Collection

Groundwater monitoring wells will be sampled immediately after completion of purging in moderate to high yield wells. For monitoring wells that purge dry, sample collection will take place as soon as practical; i.e., within 24 hours of purging if the monitoring well has recharged sufficiently. If a well does not recover sufficiently to fill the sample bottles after 24 hours, the samplers may attempt to collect additional volume during consecutive 24-hour periods, as practical.

Groundwater will be analyzed for the parameters listed on **Table 9**. The site will utilize the analytical procedures provided in the most current edition of EPA report SW-846 "Test Methods for Evaluating Solid Waste." **Table 10** lists containers, preservation requirements, analytical methods, and holding times for each parameter.

Samples for metals will be field filtered using a 0.45-micron, high capacity, filter attached to the pump discharge tubing. The filtered sample will be pumped directly into the sample bottle. The flow rate will be adjusted to a rate that is capable of pushing water through the pump discharge tubing when collecting dissolved metal aliquots.

When sampling a bailed well for dissolved metals, an aliquot will be collected in a new, unpreserved (neat) bottle. The aliquot will be field filtered immediately using a peristaltic or piston pump. The aliquot will travel through a 0.45-micron, high capacity filter attached to disposable tubing and will be collected directly into the sample bottle. Tubing and filters will be discarded after use.

10.5.4 Equipment Decontamination

If utilized, all non-dedicated purging and sampling equipment, including bailers, pumps, and water level indicators will be cleaned prior to use in each well. This does not apply to disposable equipment. A wash with a non-phosphate detergent (such as Liquinox) and a thorough rinse, both inside and out, with deionized or distilled water is the minimum acceptable cleaning method for non-dedicated reusable sampling equipment. Field parameter meters will be rinsed between wells with clean water. Any disposable equipment such as polyethylene bailers and monofilament will be properly disposed.

10.5.5 Sample Handling

Sample handling and preservation techniques will depend on the analytical parameters. Sample bottles will be supplied by the laboratory in the correct sizes, quantity, and with any applicable preservatives. Groundwater samples will be collected in the same order at each well. For DMP sampling events, this involves collecting VOCs first, then dissolved metals. The purpose of sample preservation is to stabilize parameters of interest by retarding chemical or biological changes. Methods of preservation are generally limited to pH

adjustment, chemical addition, and cooling. Field parameter measurements (DO, ORP, pH, specific conductance, temperature, and turbidity) will be collected prior to sample collection.

VOC sample containers will be completely filled to form a meniscus and capped promptly to minimize volatilization. VOC containers will be checked for air bubbles after filling and capping. VOC sample bottles will be discarded and a new bottle will be filled if significant air bubbles occur. If VOC samples could not be taken without significant air bubbles, a notation will be made in the field logbook and/or field form and the appropriate chain-of-custody.

Proper preservation will help ensure that samples are representative of groundwater. Aliquots for dissolved metal analysis will be filtered at the sample location using an in-line disposable 0.45 micron filter cartridge, or similar device. Samples will be collected to minimize disturbance using appropriate sampling techniques for collecting representative groundwater samples. Field measurements (i.e. DO, temperature, pH, ORP, turbidity, and specific conductance) will be taken in a flow through cell or on a portion of the sample that was placed in a separate field container and will not be analyzed for any other parameters.

Completed sample sets will be stored on-site at or below 4 degrees Celsius until shipment to the analytical laboratory.

10.5.6 Sample Documentation and Chain-of-Custody

The Chain-of-Custody (COC) records document the history of collection, transfer, and transport of each sample. The COC record facilitates tracing the possession and handling of each sample from the time of field collection through laboratory analysis. Each individual responsible for the samples from the time of collection to the time they are received by the laboratory will be consecutively documented on the COC record. Each sample shipped, including trip blanks and other QA/QC samples, will be identified on the COC. The COC will include field and laboratory information to provide effective sample tracking and to ensure that samples are properly identified, preserved, and analyzed. An example of a COC form is located in **Figure 17**.

Sample labels identify samples in a unique manner. Sample labels will include name of the site, name of sampler(s) (initials are sufficient), well designation, date and time of sample collection, any added preservatives, and analysis requested. An indelible pen or marker will be used to complete sample labels. The sampler(s) will take measures to secure and protect the sample labels to ensure legibility at the laboratory, and deviations from required procedures will be noted in the field logbook and/or field form, as well as the applicable COC, if necessary.

A seal will be placed on the sample coolers prior to transport to confirm that containers are not opened or otherwise compromised prior to their receipt at the analytical laboratory. In addition, the field log books or field forms will be completed to document information about each sample collected from each monitoring point in the groundwater monitoring program.

10.5.7 Field Quality Assurance/Quality Control Samples

Field QA/QC samples will be collected as part of the groundwater sampling program. Quality assurance addresses the accuracy and repeatability of analytical results. Quality assurance

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is accomplished by incorporating field duplicate samples and matrix spike/matrix spike duplicate (MS/MSD) samples into the analytical program. Quality control addresses preserving the integrity of samples in the field and shipping phases of collection. Quality control is accomplished by incorporating trip blanks, field blanks, and equipment (rinsate) blanks (if non-dedicated equipment is used) into the analytical program. The collection of field QA/QC samples is based in general accordance with procedures in the latest version of Ohio EPA's TGM.

10.5.7.1 Trip Blanks

One trip blank will be collected per semiannual DMP monitoring event and during any resampling event involving VOCs. Trip blanks consist of deionized water placed in appropriate sample containers by the analytical laboratory and included in the shipping container with the other (empty) sample containers prior to shipment. The trip blank sample accompanies site groundwater samples sent back to the laboratory and is analyzed for VOCs. Trip blanks assess the potential influences of transport-induced contamination of the samples and can also be used to assess potential laboratory contamination.

10.5.7.2 Field Blanks

One field blank (including all DMP parameters) will be collected per semiannual DMP monitoring event. If new statistically significant detections occur, a verification resampling event will be conducted. Field blanks may be collected during verification resampling. A field blank will be collected during verification resampling for VOC detections. Field blanks consist of deionized water poured into sample containers at the site during the sampling event and under the same environmental conditions as the monitoring well samples. If collected, the field blank will be analyzed for the same parameters as other samples collected for the day.

10.5.7.3 Equipment Blanks

Since dedicated purging and sampling equipment will be used at each groundwater monitoring well, equipment blanks will generally not be collected at the Aber Road Facility. If non-dedicated, non-disposable purging and sampling equipment is used, the effectiveness of cleaning and decontamination procedures will be verified by collecting and analyzing an equipment blank. After decontamination, equipment blanks are prepared by passing deionized or distilled water through a cleaned sampling apparatus and collecting it into clean sample containers. Equipment blanks will be handled and analyzed in the same manner as other samples being collected. A minimum of one equipment blank will be collected (when non-dedicated, non-disposable purging and sampling equipment is used) to analyze the effectiveness of cleaning and decontamination procedures.

10.5.7.4 Field Duplicates

Field duplicate samples are an extra set of samples collected from a certain monitoring point. This set of samples is independent of the primary sample set but collected as close as possible to the primary set in both location and time. Field duplicates provide an indication of the variability in analytical results associated with sampling and laboratory procedures. A minimum of one field duplicate will be collected for each twenty monitoring well samples. Duplicate samples will generally not be collected during verification resampling events or background events that involve a small number of wells. Field duplicates will be labeled in

such a manner so that persons performing laboratory analyses are not able to distinguish duplicates from other collected samples (i.e. "blind duplicates"). Blind duplicates eliminate the possibility of laboratory bias reporting analytical results.

10.5.7.5 Matrix Spike/Matrix Spike Duplicates

One matrix spike sample and one matrix spike duplicate sample will be collected and analyzed with the site samples during each routine sampling event or each 14-day calendar period if a sampling event spans more than 14 days. The matrix spike is used to determine the bias of a method in a given sample matrix. Matrix spike duplicates are intra-laboratory split samples spiked with identical concentrations of target analyte(s). Matrix spikes and matrix spike duplicates are used to document the precision and bias of a method in a given sample matrix.

10.6 Field Activities, Documentation, and Reporting

10.6.1 Field Activities

Field activities will be conducted in a manner consistent with safe and proper work practices. Quality control checks will be incorporated into the sampling and analysis program. Quality control checks will be accomplished by ensuring that proper field calibration, sampling, transporting, analytical, and documentation procedures are followed.

Each laboratory will have standard operating procedures and maintain full documentation of analytical work. Groundwater monitoring results will be submitted via electronic data delivery (EDD) techniques to the appropriate party performing statistical analyses and summary reporting.

10.6.2 Field Equipment

Field parameters will be measured as required using commercially available, portable metering equipment such as a pH meter, conductivity meter, temperature probe, turbidity meter, DO meter, ORP meter, and water level probe. Calibration procedures and frequencies for these instruments will be consistent with those recommended by the manufacturer(s), and as discussed below. Calibration (and recalibration) date, time, and results will be recorded on a form or in a log book along an indication of equipment maintenance performed associated with the sampling event. Calibration will be checked prior to beginning the sampling event. Equipment malfunctions and measures to correct malfunctions will be documented in the field log book and/or field form. Any meter that cannot maintain calibration will be repaired or replaced prior to use.

pH Meter - The pH meter will be calibrated with standard buffer solutions prior to field use. The buffer solutions will have approximate pH values of 4.0, 7.0, and 10.0 and will be traceable to the National Institute of Standards and Technology (NIST). In the field, the meter will be calibrated daily with buffer solutions before use, checked with a pH 7.0 buffer solution for drift if anomalous readings are observed, and recalibrated if necessary. The pH meter will be calibrated following the manufacturer's specifications. During extended periods between measurements, the pH probe should be stored in the protective boot.

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Temperature Probe - Sample temperatures are measured with a temperature probe. According to manufacturers' instructions, temperature probes do not require calibration. However, if anomalous temperatures are observed, the test probe will be checked against another instrument and will be replaced if found to be inaccurate.

Specific Conductance Meter - The conductivity cells of the specific conductance meter will be cleaned and checked against a known conductance standard(s) prior to field sampling. The standard(s) will be traceable to NIST. In the field, the instrument will be calibrated at least daily, checked for drift if anomalous readings are observed, and recalibrated if necessary. Calibration will be according to the manufacturer's specifications.

Turbidity Meter - Particles in turbid water will cause light to scatter, giving it a cloudy appearance. The meter determines turbidity by measuring the amount of scatter when a light is passed through a sample. Readings are accomplished by placing a small amount of sample in a glass vial and placing the vial in the instrument. The vial will be rinsed with distilled or deionized water between readings. Care will be taken to keep the outside of the vial clean and free of fingerprints and condensation.

Field turbidity meters do not require frequent calibration. Instead, the meter will be calibrated once every three months and the meter will be checked every day during sampling using a known standard provided by the manufacturer. If the meter does not read to within 5 percent of the known value of the standard, it will be recalibrated in the field or a replacement meter will be used. Meters will be kept away from extreme temperatures and weather conditions as much as possible.

ORP Meters – The meters for measuring ORP will be checked and/or calibrated to manufacturer's specifications prior to use each day.

DO Meters – The meters for measuring DO will be checked and/or calibrated to manufacturer's specifications prior to use each day.

Sampling equipment will not be placed directly on the ground or in other potentially contaminated areas.

10.6.3 Field Documentation

Field documentation will be maintained on a continuing basis for this project. Either field logbooks or field forms will include field observations, purging, and well sampling details. Additionally, field documentation will contain the following information:

- Site name;
- Site well designation;
- Sample collector's name (or initials) and affiliation (e.g., landfill, laboratory, or contract personnel);
- Weather conditions (e.g., rain, snow, fog, etc.) that could affect sample;
- General condition of well and wellhead (note damage or suspected tampering);
- Type of purging and/or sampling device used;
- Static (pre-purge) depth-to-water;

- Total depth (or depth-to-dedicated pump) from top of inner casing;
- Volume of water in the well (traditional purging only) and purge volume with calculation;
- Starting and ending times for well purging;
- Approximate purging rate;
- Water level measurement at time of sample collection;
- Sample collection date and time;
- Field measurements;
- Sample appearance;
- Any indication of redevelopment required; and
- Any additional notes or comments pertinent to the sampling process.

An example of a field form is included as **Figure 16**.

10.6.4 Reporting Requirements

After analytical results are available, the groundwater monitoring data will be statistically evaluated using the procedures and schedule described in the Groundwater Statistical Analysis Plan (Section 11).

The results of the groundwater monitoring and the statistical analysis will be reported on the schedule listed below.

- Spring (April-May) Semiannual Detection Monitoring Report for Groundwater Monitoring Wells;
  - To include analytical results for monitoring wells, statistical evaluation, and potentiometric surface maps for the Spring event.
  - Reported within 90 days of the completion of the sampling event in hard copy and electronic form.

- Fall (October-November) Semiannual Detection Monitoring Report for Groundwater Monitoring Wells;
  - To include analytical results for monitoring wells, statistical evaluation and potentiometric surface maps for the Fall event.
  - Reported within 90 days of completion of the sampling event in hard copy and electronic form.

- A supplemental annual groundwater report will be submitted to Ohio EPA-Division of Materials and Waste Management (DMWM) by March 1st of each year and will include the previous year's groundwater monitoring information required by OAC Rules 3745-65-75 and 3745-54-75, where applicable. The facility will be submitting hard copies of the routine groundwater monitoring information semiannually. Components of the Ohio EPA supplemental annual groundwater report forms and instructions not previously submitted, such as the facility's electronic database, will be included in the annual report only.

Reports will be signed and certified as discussed in OAC Rule 3745-50-58(K).

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11.0 GROUNDWATER STATISTICAL ANALYSIS PLAN

11.1 Statistical Evaluations

The following Groundwater Statistical Analysis Plan (StAP) has been prepared to outline the methods and procedures which will be utilized for statistically evaluating groundwater detection monitoring data collected at the Aber Road Facility. This StAP is intended to update and supersede all previous statistical evaluation procedures for the groundwater DMP. The statistical approach presented herein has been developed to comply with OAC Rules 3745-54-90 to 3745-54-101.

11.2 Statistical Approach

Downgradient wells listed on **Table 7** will be statistically evaluated for their zone-specific RCRA indicator parameters on a semiannual basis per OAC Rule 3745-54-98(D). The procedures described in Sections 11.2.1 through 11.2.5 below apply to the inorganic parameters listed in **Table 9** for the Channel Sand and BTI Zones. Wells in the Upper Sand and 880 Sand Zones will be statistically evaluated for VOCs only, as discussed in Section 10.4. VOCs listed on **Table 9** will be evaluated separately, as described in Section 11.2.6 below.

Figure 18 is a flow chart outlining the DMP sampling and reporting processes to meet regulatory compliance requirements listed in OAC Rule 3745-54-98.

11.2.1 Statistical Software

The statistical evaluation software program, *Sanitas™* or equivalent, will be utilized to statistically evaluate the inorganic groundwater data during detection monitoring. An equivalent software package may be utilized if it complies with the statistical procedures allowed under U.S. EPA and Ohio EPA regulations, policy, and guidance. The selected statistical methods contained within this StAP (i.e. parametric and nonparametric prediction limits) have been prepared following the recommendations contained in the March 2009 U.S. EPA document entitled "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance", where applicable. Current Ohio EPA regulations, guidance, policy, and standard practices for statistical evaluations have been applied to the groundwater monitoring data for the units monitored under the DMP. Any changes in statistical protocol will first be approved by the Ohio EPA before implementation. Per OAC Rule 3745-54-97(H), statistical evaluations will be performed on parameters listed in this StAP.

11.2.2 Background Data

In order to facilitate the reduction of statistical false positives and false negatives, and to comply with OAC Rule 3745-54-97(H), intra-well statistical methods, with resampling, will be utilized at the Facility. Per OAC Rule 3745-54-97(I)(6), since significant spatial and temporal variability exists across the units monitored under the DMP, intra-well statistical methods are best-suited for the StAP. Therefore, intra-well prediction limit analysis will be the statistical method applied to inorganic parameters collected at all DMP wells except upgradient wells that were used as background for historic inter-well statistics (indicated with "*" on **Table 7**). Upgradient wells are not required to be

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statistically evaluated under OAC Rule 3745-54-98. Separate statistical tests will be completed for each hazardous parameter as indicated in OAC Rule 3745-54-97(H).

Practical quantitation limits (PQLs) are taken from the approved November 1997 CMI QAPjP with the exception of PQLs that were at or above established National Primary Drinking Water Standards-Maximum Contaminant Levels (MCLs). Where achievable by the analytical laboratory, PQLs for these parameters (such as arsenic) have been revised to be below MCLs. In a few instances laboratory PQLs were above QAPjP PQLs. In these cases, PQLs for this Plan were updated to meet current laboratory PQLs. PQLs for DMP parameters are listed on **Table 11**. If a PQL for an inorganic statistical parameter is lowered in the future, background will be updated every two years until a minimum of eight routine observations are available at the new PQL.

Table 9 includes a summary of the statistical indicator parameters for each zone. Of the eight RCRA metals listed on **Table 9**, only dissolved arsenic and dissolved chromium were part of the previous approved indicator parameter list under the March 1994 DMP. Quarterly background data collection for the BTI and Channel Sand wells was completed in July 2014. The background periods used for dissolved arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver are shown on the summary tables included in Appendix G for the Channel Sand wells and Appendix H for the BTI wells. An electronic data file containing groundwater data collected from October 1997 through July 2014 is included in **Appendix F**.

As discussed in Section 10.4, the eight RCRA metals will be analyzed on a semiannual basis at Upper Sand and 880 Sand DMP wells and will be qualitatively evaluated for those zones in each semiannual report. In the event that the 62 indicator parameter VOCs used to statistically evaluate semiannual groundwater quality for the Upper Sand and 880 Sand Zones alone are deemed to no longer be effective for identifying a potential release of hazardous constituents from the regulated units, Ohio EPA may request that CECOS also begin statistically evaluating the eight RCRA metals analyzed semiannually for those zones (See **Table 9**). In accordance with the appendix to OAC Rule 3745-50-51, such a change to the monitoring program would require that the Site submit a request for Ohio EPA approval to implement a Class 2 amendment to the Post-Closure Plan.

Prior to October 1997, six different analytical laboratories were used to analyze Aber Road Facility groundwater samples. These laboratories used different PQLs and methods based on instrument limitations. To provide more consistency with laboratory analytical and reporting practices, background for dissolved arsenic and dissolved chromium is being utilized beginning with the October 1997 event. Exygen Research (Exygen) was the analytical laboratory for the Aber Road Facility from October 1997 through January 2006. TestAmerica, Inc.-Buffalo (TestAmerica) was subsequently contracted as the analytical laboratory.

Metals analyzed by Exygen were reported down to the method detection limit (MDL) and PQLs were not listed in Exygen's analytical reports or in electronic data files. The PQLs during that period were based on the November 1997 QAPjP. Therefore, results between the MDL and PQL were flagged by Exygen as estimated with a "J" flag. The intra-laboratory PQLs were not listed in Exygen's analytical reports and may have varied somewhat between events or between samples due to multiple factors such as sample

matrix affects, QA/QC, or instrument performance. For statistical purposes, estimated values will be treated as non-detect results at the QAPjP PQL and Exygen non-detects will be listed as <QAPjP PQL.

TestAmerica began analyzing Aber Road Facility samples in April 2006. Revisions to PQLs at the time of the laboratory switch are indicated in a February 14, 2006 CECOS document entitled Proposed Modifications to Quality Assurance Project Plan Corrective Measures Implementation, CECOS International, Inc., Aber Road Facility, Ohio and were approved by U.S. EPA in a letter dated March 10, 2006. In addition, based on discussions with Ohio EPA, the PQL for arsenic was lowered starting with the October 2010 event to be below the MCL.

New wells included in the DMP network will require a minimum of eight initial background observations (collected quarterly for two years) prior to initiating statistical evaluations for inorganic indicator parameters. This frequency will ensure independent samples are collected, in accordance with OAC Rule 3745-54-97(G)(1). Additional quarterly background events may be necessary if outliers are identified in the initial eight results for a well/constituent. These wells will be statistically evaluated for VOCs beginning with the first monitoring event following implementation of this Plan and/or the installation of the wells. Background will not be collected for VOCs.

11.2.3 Background Updates

Background data will be updated periodically to minimize the occurrence of false positive statistical results and increase statistical power. Updating the background will allow for a more accurate determination of the background mean and standard deviation for each well and parameter. Background updates will be performed by incorporating a minimum of four new observations into background.

The new background (previous background plus new observations) will be checked for statistically significant increasing trends. If a statistically significant increasing trend is identified, an evaluation will be performed to determine if the trend is due to a release from the facility. Background will not be updated in cases where a statistically significant trend has been identified unless it can be successfully demonstrated that the trend is not the result of a release of hazardous constituents from the facility.

Background updates will be cumulative and not based on a moving window unless a statistically significant trend is identified in the background data. If a statistically significant increasing trend is identified in the background data and concurrence from Ohio EPA has been received that the trend is not due to a release of hazardous constituents, then the background period may be based on a moving window. If a background statistical limit greater than an MCL is recalculated to a value below an MCL, the newer, lower limit will be used. If background for a well/parameter indicates a statistical downward trend, background may be truncated to include the newer, lower results and the statistical limit may decrease accordingly.

11.2.4 Statistical Tests

Future inorganic compliance data will be compared to prediction limits that are calculated using the background periods and methods and procedures presented herein. The data will

be evaluated based on the percent of non-detects and the distributional properties of the background data. Historic dissolved arsenic results reported as non-detects at 10 ug/L were excluded from all statistical analyses prior to testing to ensure that potential outliers were not masked or prediction limits artificially inflated by the arsenic results reported at the higher PQL. Detections for dissolved arsenic were not excluded prior to outlier testing. Future organic compliance data will be compared to the PQL, which is considered the statistical limit. A confirmed VOC detection at or above the PQL will be considered an SSEC.

11.2.4.1 Outlier Testing

The statistical parameter data utilized for background purposes were evaluated for the presence of statistical outliers. Outlier testing was conducted using procedures in the Sanitas software based on USEPA guidance and the outlier identification process developed by the Ohio EPA Statistics Workgroup (Division of Drinking and Ground Waters) as documented in Ohio EPA Guidance Document 0715 (DSIWM) dated September 12, 2012. For parameters comprised of less than 75% nondetect background data, the Sanitas software screens each well and parameter for suspected outliers using the USEPA 1989 outlier test using a 0.05 fixed level of significance. Suspected outliers identified by the software using this method are then tested using Dixon's or Rosner's outlier test depending on the total number of background results. Outlier testing is conducted for inorganic parameters using Dixon's outlier test for parameters with 22 results or less or Rosner's outlier test for parameters with greater than 22 results. Outlier testing performed using Dixon's or Rosner's test is performed at the 0.01 level of significance. The Dixon's or Rosner's testing is used only for data sets comprised of less than 75% nondetect data. For any data set comprised of 75% or greater nondetect data, Dixon's/Rosner's outlier tests are not performed. In this instance, the Ohio EPA "Rare Detect" outlier identification procedure for data sets comprised of 75% or greater nondetect data is followed. The following procedures developed by Ohio EPA is used to conduct outlier testing for this facility.

Dixon's/Rosner's Outlier Test

1. The facility will provide a listing of identified outliers based on the results of Dixon's/Rosner's test (for data sets comprised of less than 75% nondetect data) within the statistical program document for the facility, which will be submitted each time background is updated or a new well is added to the program.

2. Based on the results of the outlier test, any outlier identified will either be excluded from background or documentation will be presented within the statistical program that provides justification for retaining the result.

Ohio EPA Rare-Detect Outlier Test

1. The facility will provide a listing of identified outliers based on the results of the Rare-Detect outlier test (for data sets comprised of greater than or equal to 75% nondetect data) within the statistical program document for the facility, which will be submitted each time background is updated or a new well is added to the program.

2. Based on the results of the Rare-Detect outlier test, any outlier identified will either be excluded from background or documentation will be presented within the statistical program with justification for retaining the result.

3. For parameters comprised of greater than or equal to 75% nondetect data, the following procedure developed by Ohio EPA for Rare-Detect parameters will be used:
   a. When censored data are ≥ 75%:

      i. If there is only a single detection ≥ the PQL;
         a. And detections ≥ the MDL are ≥ 50%, then any result ≥ 2 times the /current PQL will be identified as a potential outlier.
         b. And detections ≥ the MDL are < 50%, then any result ≥ current PQL will be identified as a potential outlier.

      ii. If there are at least 2 detections ≥ the PQL:
         a. And detections ≥ the MDL are ≥ 50%, then any result ≥ 3 times the current PQL will be identified as a potential outlier.
         b. And detections ≥ the MDL are less than 50%, then any result ≥ 2 times the current PQL will be identified as a potential outlier.

Table 12 is a summary of the outlier evaluation that provides the results of Dixon's or Rosner's test and an evaluation of detected results above the current PQL for data sets comprised of 75% or greater nondetect data. The results to be excluded as outliers are labeled with a "Yes" on **Table 12** and the results that will not be excluded are labeled with a "No[1]". Justification for retaining results labeled with a "No[1]" on **Table 12** for parameters with greater than or equal to 75 % nondetect data is based on the result not being identified as an outlier following the Ohio EPA Rare Detect outlier test. All results determined to be outliers in accordance with the outlier testing procedure described above were set as outliers and excluded from the statistical analyses. The outlier testing results from Sanitas are located on the CD provided in **Appendix F**.

11.2.4.2 Trend Testing

After performing outlier testing, statistical trend evaluations were performed on the entire updated or newly established background data set for each parameter at each sample location. Trend evaluations were performed at a 0.01 level of significance (per tail) for each well/parameter using the Sen's Slope/Mann Kendall trend test (see CD in **Appendix F**). The time periods tested for trends are those listed on the summary tables included in Appendix G (Channel Sand Wells) and Appendix H (BTI Wells). Based on the trend testing, there were statistically significant upward trends for barium at BTI well MP-238R and for arsenic at Channel Sand Well MP-406C. Each of the trends is slight and the concentrations are consistent with other wells that monitor the same zone.

11.2.4.3 Distribution

Per OAC Rule 3745-54-97(I)(1), tests of normality will be conducted to assess the distribution of groundwater concentration data to ensure that the statistical method used is appropriate for the distribution. Shapiro-Wilk normality testing will be used with a

Type I error rate of $\alpha = 0.01$. Original or transformed data (via ladder of powers) that are not normally distributed will be analyzed using non-parametric methods. In those instances where the background data are not normally distributed, the following data transformations may be used to construct the prediction limits depending on the data transformation (W statistic) that is determined to be normally distributed: untransformed, $x^{1/2}$, x^2, $x^{1/3}$, x^3, ln(x), x^4, x^5, and x^6. Using the "Ladder of Powers" function, the first data transformation that passes normality testing, starting with untransformed data, is utilized for calculating the parametric prediction limit.

In order to determine the appropriate substitution method for inorganic non-detect results, the proportion of non-detect data within background will be evaluated. The following substitution methods will be used based on the proportion of non-detect results in background:

- If non-detects are ≤ 15 percent, then non-detects will be replaced with one-half the PQL prior to performing the evaluation;
- If non-detects are > 15 percent and ≤ 50 percent, then the data's sample mean and standard deviation will be adjusted according to the Kaplan-Meier technique; and
- If non-detects are > 50 percent, or the background dataset does not follow a normal distribution, a non-parametric prediction limit test will be used.

Normality test results are detailed on the prediction limit summary tables located on the CD in **Appendix F** and the conclusions regarding normality are indicated under the "Method" and "Transform" columns on the prediction limit summary tables. If the data passed the normality test, the summary tables show a parametric prediction limit method was used. If transformations were needed to achieve normal data sets these are listed on the tables. The tables also list cases where non-parametric tests were used because normality testing failed (indicated as "NP Normality"). If greater than 50 percent of the observations are below the PQL, a non-parametric test was used and normality testing was not needed.

Normality results for intra-well statistical evaluations of the Channel Sand and BTI Zones, as well as intra-well prediction limits, are also included in tabular format in **Appendices G** and **H**, respectively. The percentage of non-detects listed on the tables provided in **Appendices G** and **H** were calculated after outliers were removed.

Note that normality tables were not included for upgradient wells since these wells are not required to be statistically evaluated. Since the Upper Sand and 880 Sand wells are being statistically evaluated for VOCs only, normality tables for these wells are not applicable.

11.2.4.4 Prediction Limit

The prediction limit is a statistical method used to compare a single observation to a group of observations. The prediction limit is calculated to include observations from the same population with a specified confidence that is protective of human health and the environment, pursuant to OAC Rule 3745-54-97(I)(4). In groundwater monitoring, a prediction limit approach may be used to make comparisons between background and compliance data. The limit is developed to contain all future observations, within a certain probability. The general equation for a prediction limit is:

$$PL = x + Ks$$

where x is the sample mean in background, s is the background standard deviation, and K is a multiplier depending on the type of prediction limit under construction. For the Aber Road Facility, intra-well prediction limits have been developed based on a 99% confidence that future observations will fall within the range. Per OAC Rule 3745-54-97(I)(4), prediction limits are based on the number of samples in the background database, data distribution, and the range of concentration values for each constituent. If any future observation exceeds this limit, this is considered statistically significant evidence that the observation is not representative of the background set. Statistical calculations are based on the March 2009 U.S. EPA Unified Guidance.

Prediction limits for each Channel Sand and BTI Well for the eight dissolved metals are listed on the tables included in **Appendices G** and **H**, respectively.

During parametric prediction limit evaluations, the mean and the standard deviation are calculated for the raw or transformed background data. The number of comparison observations is defined to be included within the lower and upper limits. During nonparametric evaluations, the highest value from the background data is used to set the upper limit of the prediction limit. If background is 100% non-detect, the most current PQL in background will be the prediction limit, and a result equal to or above the PQL will be considered an SSEC.

Included in each statistical analysis report will be a summary of the prediction limits calculated from the background data for each well/parameter. The summary tables define the background sample size, mean, standard deviation, background distribution for each parameter, any transformations applied to specific parameters, and the proportion of non-detects. SSECs will be summarized in a table in the statistical report.

11.2.5 Statistical Power of Evaluation Methods

Under the March 2009 Unified Guidance, the statistical power of the prediction interval is dependent on the frequency of monitoring events, the number of compliance wells in the hydrogeologic unit of interest, the number of constituents being evaluated, the background sample size, and the selected resampling scheme.

The groundwater DMP at the site incorporates constituents that are monitored semiannually. Of the proposed DMP network, there are currently 2 wells statistically evaluated in the Channel Sand and 16 wells statistically evaluated in the BTI with sufficient background data to perform statistical analyses. The wells are statistically evaluated for eight inorganic constituents (dissolved arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). The DMP will utilize a "1-of-2" verification resampling scheme, as described in Section 11.2.7.

For the Channel Sand zone, using the lowest number of background observations (n = 8), 2 downgradient wells, 8 constituents, and a 1 of 2 resampling protocol, parametric intra-well prediction limits provide approximately 75% annual power at three standard deviations and 95% annual power at four standard deviations, while non-parametric intra-well prediction limits provide approximately 80% annual power at three standard deviations and 95% power at four standard deviations. This exceeds the U.S. EPA-recommended power of 55% at three standard deviations and 80% at four standard deviations.

For the BTI zone, using the lowest number of background observations (n = 8), 16 downgradient wells, 8 constituents, and a 1 of 2 resampling protocol, non-parametric intra-well prediction limits provide approximately 80% annual power at three standard deviations and 95% annual power at four standard deviations, while parametric intra-well prediction limits provide approximately 20% annual power at three standard deviations and 65% power at four standard deviations. The power curve charts for the non-parametric prediction limits exceed the U.S. EPA-recommended power of 55% at three standard deviations and 80% at four standard deviations. It was not unexpected that the statistical power for intrawell parametric prediction limits for wells and parameters with newly established background periods would be below the U.S. EPA-recommended power of 55% at three standard deviations and 80% at four standard deviations and the SWFPR will be conservatively higher than desired due to the initial number of background samples available at this time. However, statistical power will increase and the SWFPR will decrease once additional background observations are available. The 1-of-2 retesting strategy and limited number of statistically evaluated parameters implemented at the site will assist in reducing the SWFPR.

Statistical power curve graphs demonstrating the above are presented in **Appendix I**. For comparison purposes, U.S. EPA reference power curves are also plotted on the graphs presented in **Appendix I**.

Parametric and non-parametric statistical power curves will be submitted with each background update.

The facility will utilize a site-wide false positive rate (SWFPR) goal of 10% per year, or 5% per monitoring event, as recommended in the March 2009 Unified Guidance, to allow for a balance between the overall cumulative false positive error rate and statistical power.

11.2.6 Volatile Organic Compounds

The statistical limit for VOCs will be set equal to the current PQL for the respective parameter (See **Table 11**). A confirmed VOC detected at or above the PQL will be considered an SSEC. **Table 11** lists the MCLs for each DMP VOC. The PQLs for the DMP VOCs are equal to or below applicable MCLs.

The strategy for determining an SSEC for a VOC in a DMP well will be based on the following procedural steps:

1) The laboratory analytical report of the groundwater sample results will undergo a data review. The review will include checking holding times and evaluating QA/QC blanks for the presence of contaminants. A list will be made of VOCs with a detectable concentration in QA/QC samples. Detections for VOCs in groundwater samples that can be clearly attributed to QA/QC issues will be discussed in report submittals but will not be considered SSECs. The site will work to resolve any QA/QC issues before the subsequent sampling event.

2) DMP wells with one or more quantifiable VOCs may be resampled in accordance with the verification resampling protocol in Section 11.2.7 to determine a "confirmed presence" of an SSEC. If a resample is not collected or the VOC SSEC is confirmed, a demonstration report may be submitted as allowed per OAC Rule 3745-

54-98(G)(6) or CECOS will proceed into a compliance monitoring program. If the VOC is not confirmed during the resampling event, then the DMP will continue.

11.2.7 Verification Sampling and Notifications for SSECs

A single resample will be used for verification. The "1-of-2" verification resampling protocol (comprising the original sample as "1" and the resample as "2") is very conservative and yields increased statistical power. If the facility chooses to perform a verification resampling event for an inorganic SSEC or VOC detection indicated by the sample results from the routine semiannual DMP event, it will be performed such that the verification resampling data will be available to report to Ohio EPA within 90 days from the completion of the semiannual event. Verification resampling results will be compared to the calculated statistical limits. If verification resampling indicates that an exceedance did not occur, the DMP will continue. If verification resampling confirms an exceedance, then an SSEC will be declared to the Director of Ohio EPA within seven days of making the SSEC determination. The Director also will be notified of the site's intent to submit an ASD (if applicable).

As discussed in the March 2009 Unified Guidance, a confirmed SSEC will be declared if any well/constituent pair which was previously 100% non-detect exhibits a result at or above the PQL in consecutive sample and resample results. Per OAC Rule 3745-54-98(G)(1), the Director will be notified about confirmed SSECs within seven days of making the SSEC determination. In the event that an initial sampling result indicates a potential SSEC, the initial result will be declared a confirmed SSEC if CECOS elects not to collect a resample. In practice, the seven-day notification will be presented in the semiannual report due within 90 days of completing the sampling event.

In accordance with OAC Rule 3745-54-98(F)(2), the owner or operator must determine whether there is an SSEC at each DMP well within a reasonable period of time after completion of sampling. The statistical results will be submitted within 90 days from completion of each semiannual groundwater sampling event.

11.3 Response to SSEC

The flow chart provided as **Figure 18** indicates CECOS' response to an SSEC. In accordance with OAC Rule 3745-54-98(G)(2), within 30 days of the SSEC determination, site-specific Appendix IX sampling will be performed at the well with the SSEC, adjacent monitoring wells in the same zone (intended to characterize the horizontal extent), and wells in vertically adjacent zones (intended to characterize the vertical extent). **Table 13** contains a summary of the DMP Appendix IX sampling system for each downgradient DMP well. A list of current PQLs for Appendix IX parameters is summarized on **Table 14**. The site-specific Appendix IX parameter list includes VOCs listed in the Appendix to OAC Rule 3745-54-98 and other parameters (SVOCs, pesticides, herbicides, PCBs, metals, etc.) taken from Table 1-1 of the approved November 1997 CMI QAPjP. Specific sampling and analysis requirements for the Appendix IX parameters, including minimum container size, preservatives, analytical methods, and method holding times, are outlined in **Table 15**.

The site-specific Appendix IX resampling network was developed by reviewing, for each water-bearing zone, current (2011) potentiometric surface maps of the facility. Historical potentiometric surface maps were also reviewed to establish a historical perspective for groundwater flow.

Groundwater flow patterns were found to be relatively insensitive to the range of seasonal conditions. The potentiometric surface maps indicated that the designated background wells remained upgradient of the site and the downgradient relationship between SCMFs and monitoring wells is generally consistent.

The first column of **Table 13** is a per zone list of monitoring wells that will be sampled as part of the DMP. The other information provided on **Table 13** provides a list of sampling locations that are intended to characterize the extent, in both the horizontal wells (adjacent wells in the same zone) and vertical wells (wells in the same cluster or area set in the next lower zone or, if not part of a cluster, the closest downgradient well in the next lower zone), of any release detected by the DMP. **Table 13** was prepared assuming no groundwater flow occurs through areas where the water bearing zone is absent. There is no zone beneath the BTI; therefore, no wells are listed in the "Next Lower Zone" column on **Table 13** for the BTI wells. Wells listed on **Table 13** are part of the routine DMP sampling network.

If a detection for an Appendix IX parameter occurs above background, the well/constituent may be resampled within 30 days in accordance with OAC Rule 3745-54-98(G)(3). Naturally occurring inorganic parameters such as barium will likely be detected above the PQL during an Appendix IX sampling event. Detected metals will be compared to statistical limits, if applicable. No further action will be required if the detection is below the statistical limit. If an Appendix IX parameter which does not have an established statistical limit is detected above the PQL, background samples may be collected for that well/parameter combination and a background statistical limit may be generated. An ASD may also be submitted for the Appendix IX detection to demonstrate the result was not due to impact from the landfill.

If verification resampling for the detected Appendix IX parameter is conducted and the result does not confirm the detection above background, then an application to amend the Post-Closure Plan will be submitted to make appropriate changes to the DMP or StAP and detection monitoring will continue under OAC Rule 3745-98(G)(6)(d).

If a resample is not collected, the verification resampling result confirms the detection, or a successful ASD is not submitted, then the detection will be declared and, in accordance with OAC Rule 3745-54-98(G)(4), within 90 days of identifying the SSEC(s) per Section 11.2.7 above CECOS will submit a Post-Closure Plan amendment to establish a Compliance Monitoring Program that meets the requirements of OAC Rule 3745-54-99.

Any Appendix IX results and associated Appendix IX verification resampling results will be submitted to the Ohio EPA within 90 days of making the SSEC determination.

If Appendix IX monitoring indicates the SSEC(s) is not related to the units monitored under the DMP, the results will be discussed in an ASD per OAC Rule 3745-54-98(G)(6)(b). In preparation of an ASD, the site may also review other water quality data, including surface water or leachate data, as needed, that are available from any other of

the site's monitoring program that provides relevant data. The ASD will be submitted within 90 days of identifying the SSEC. If the ASD is successful, the DMP will be continued.

Under OAC Rule 3745-54-98(G)(6)(c), once SSEC(s) are declared, and a successful ASD has been made, the DMP will be evaluated and, within 90 days of identifying the SSEC(s), if appropriate, an application for a Post-Closure Plan amendment will be submitted to make changes to the DMP/StAP. If a successful ASD has not been made, in accordance with OAC Rule 3745-54-98(G)(4), within 90 days of identifying a confirmed SSEC(s), an application for a Post-Closure Plan amendment will be submitted to establish a Compliance Monitoring Program under OAC Rule 3745-54-99.

11.3.1 Notification and Additional Response Requirements

If a confirmed SSEC is identified in a DMP well, the following steps will be conducted (See **Figure 18**):

1) Notify the director of this finding in writing within seven days of making the SSEC determination (OAC Rule 3745-54-98(G)(1). The notification will be presented with the report due within 90 days of completing the sampling event and must indicate what hazardous constituents have shown an SSEC.

2) Unless CECOS submits an ASD that is deemed successful by Ohio EPA, in accordance with Rule 3745-54-98(G)(4), within ninety days of making the SSEC determination, CECOS will submit an application for a Post-Closure Plan amendment to establish a compliance monitoring program meeting the requirements of Rule 3745-54-99 of the Administrative Code. The application will include the following information:

    a) An identification of the concentration of any constituent detected in the groundwater at each DMP well;
    b) Any proposed changes to the groundwater monitoring system at the facility necessary to meet the requirements of Rule 3745-54-99 of the Administrative Code;
    c) Any proposed additions or changes to the monitoring frequency, sampling and analysis procedures or methods, or statistical methods used at the facility necessary to meet the requirements of Rule 3745-54-99 of the Administrative Code; and
    d) For each hazardous constituent detected at a DMP well, a proposed concentration limit under paragraph (A)(1) or (A)(2) of Rule 3745-54-99 of the Administrative Code, or a notice of intent to seek an alternate concentration limit under paragraph (B) of Rule 3745-54-94 of the Administrative Code.

3) Within one hundred eighty days, where applicable, CECOS will then submit to the director:

    a) All data necessary to justify an alternate concentration limit sought under Rule 3745-54-94 of the Administrative Code; and an engineering feasibility plan for a

corrective action program necessary to meet the requirement of Rule 3745-54-100 of the Administrative Code, unless:

(i) All hazardous constituents identified are listed in Table 1 of Rule 3745-54-94 of the Administrative Code and their concentrations do not exceed the respective values given in that table; or

(ii) CECOS has sought an alternate concentration limit under paragraph (B) of Rule 3745-54-94 of the Administrative Code for every hazardous constituent identified.

4) If CECOS determines that there is an SSEC at a DMP well, it may be demonstrated that a source other than a regulated unit caused the increase or that the detection is an artifact caused by an error in sampling, analysis, or statistical evaluation or natural variation in the groundwater. CECOS may make a demonstration under paragraphs (G) to (G)(6)(d) of Rule 3745-54-98, in addition to, or in lieu of, submitting a Post-Closure Plan alteration request application under paragraph (G)(4) of that rule; In making a demonstration under paragraphs (G) to (G)(6)(d) of Rule 3745-54-98, CECOS will:

   a) Notify the director in writing within seven days of determining an SSEC that the site intends to make a demonstration that the SSEC was not the result of the regulated unit;
   b) Within ninety days, submit a report to the director which demonstrates that a source other than the regulated unit caused the SSEC or that the contamination resulted from error in sampling, analysis, or evaluation;
   c) Within ninety days, submit to the director an application for a Post-Closure Plan amendment request to make any appropriate changes to the detection monitoring program at the facility; and
   d) Continue to monitor in accordance with the detection monitoring program established under this rule.

5) In the event of compliance monitoring or corrective action the site may elect to complete surface water sampling for investigational purposes, as required in OAC Rule 3745-54-91.

11.4 Evaluation of Detection Monitoring Results from Background Wells

Upgradient wells will be sampled/analyzed for DMP parameters as part of each semiannual event. In the event that a VOC is detected in an upgradient well, verification resampling will be performed for that well/VOC. The following protocol will be used for confirmed VOC detections at upgradient wells:

1) Tier I Appendix IX Sampling: If a VOC is confirmed detected at an upgradient well, that well will be sampled/analyzed for Appendix IX constituents;
2) Tier II Appendix IX Sampling: If an Appendix IX constituent (other than the VOC that was already confirmed detected) is detected, Appendix IX sampling will be completed in the same zone and next lower zone (if applicable), as listed on **Table 13**. Note that this may exclude naturally occurring parameters such as trace metals, if the concentrations are within background conditions for the site; and

3) If no other Appendix IX parameters are detected at the upgradient well (besides the confirmed VOC), no additional Appendix IX sampling will be required at other wells.
4) CECOS will coordinate with Ohio EPA for additional action(s) needed to address confirmed VOC detections at upgradient wells.

TABLES

TABLE 4. ANALYTICAL TEST METHODS - F039 LEACHATE
CECOS ABER ROAD FACILITY

Constituent	Test Method[4]
Semivolatile Organics	8270D [2]
Fluoride	300.0 [1]
Cyanide	335.4 [1]
Arsenic	6010C [2]
Barium	6010C [2]
Cadmium	6010C [2]
Chromium	6010C [2]
Lead	6010C [2]
Mercury	7470A [2]
Selenium	6010C [2]
Silver	6010C [2]
Phenol	8270D [2]
Total Organic Carbon (TOC)	9060A [2]
Total Organic Halides (TOX)	9020B [2]
Volatile Organic Compounds	8260C [2]
Pesticides and PCBs	8081B/8082A [2]
2,4-D	8151A [2]
2,4,5-TP (Silvex)	8151A [2]
Dioxins and Dibenzofurans	8280A [2]
TCLP Procedure	1311C [3]

Notes:

1. MCAWW = "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020
2. SW-846 = USEPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
3. OAC 3745-51-24 Appendix.
4. Subject to change with routine method revisions.

TABLE 10. DMP PARAMETERS SAMPLING AND ANALYSIS REQUIREMENTS CECOS ABER ROAD FACILITY

Constituent	Container and Preservation[5]	Analytical Method Number[6]	Holding Time
Volatile Organic Compounds (VOCs)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8260C	14 days
1,2-Dibromo-3-chloropropane (DBCP) and 1,2-Dibromoethane (EDB)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8011	14 days
Arsenic, Dissolved	1 P-250 ml field filtered, HNO_3 to pH <2	6020A	6 months
Barium, Dissolved		6010C	
Cadmium, Dissolved		6010C/6020A	
Chromium, Dissolved		6010C	
Lead, Dissolved		6010C/6020A	
Selenium, Dissolved		6010C/6020A	
Silver, Dissolved		6010C/6020A	
Mercury, Dissolved	1 P-250 ml field filtered, HNO_3 to pH <2	7470A	28 days

Notes:

1. G = Glass, P = Polyethylene, PTFE = Polytetrafluoroethylene (Teflon), HCL = hydrochloric acid, HNO_3 = nitric acid
2. The four-digit method references in Table 10 are from SW-846 and EPA.
3. Pre-preserved containers provided by analytical laboratory.
4. Field parameters (ORP, pH, specific conductance, temperature, and turbidity) are not preserved and measurements are taken immediately.
5. Subject to change based on method revisions and laboratory requirements
6. Subject to change with routine method revisions

TABLE 12. OUTLIER EVALUATION SUMMARY
ABER ROAD FACILITY

Well No.	Parameters	Date Range Tested	Outliers Identified by Dixons Test	Detections Identified for >75% ND data sets	Date	Result to be Excluded Yes / No
MP-233R	Chromium, Dissolved	10/97 - 7/14	--	0.007794 mg/L	4/98	No[1]
			--	0.00957 mg/L	10/98	No[1]
			--	0.0117 mg/L	4/99	Yes
MP-234R	Chromium, Dissolved	10/97 - 7/14	--	0.0107 mg/L	10/98	Yes
			--	0.00572 mg/L	4/99	No[1]
MP-235R	Arsenic, Dissolved	10/97 - 7/14	0.0144 mg/L	--	10/03	Yes
	Chromium, Dissolved	10/97 - 7/14	--	000702 mg/L	10/98	No[1]
			--	0.00751 mg/L	10/00	No[1]
MP-238R	Chromium, Dissolved	10/97 - 7/14	--	0.005204 mg/L	4/98	Yes
MP-241R	Chromium, Dissolved	10/97 - 7/14	--	0.006653 mg/L	4/98	Yes
MP-244R	Chromium, Dissolved	10/97 - 7/14	--	0.0071 mg/L	10/98	No[1]
			--	0.0118 mg/L	4/99	Yes
MP-250	Arsenic, Dissolved	10/97 - 7/14	0.0315 mg/L	--	10/97	Yes
	Chromium, Dissolved	10/97 - 7/14	--	0.0102 mg/L	4/98	Yes
			--	0.0134 mg/L	10/01	Yes
MP-274	Arsenic, Dissolved	10/97 - 7/14	0.015 mg/L	--	10/03	Yes
	Chromium, Dissolved	10/97 - 7/14	--	0.007753 mg/L	4/98	No[1]
			--	0.00569 mg/L	4/99	No[1]
MP-279	Arsenic, Dissolved	10/97 - 7/14	0.235 mg/L	--	4/01	Yes
	Chromium, Dissolved	10/97 - 7/14	--	0.01008 mg/L	4/98	Yes
			--	0.0358 mg/L	10/98	Yes
			--	0.0523 mg/L	4/99	Yes
MP-280	Arsenic, Dissolved		0.0412 mg/L	--	10/03	Yes
			0.01 mg/L	--	10/07	Yes
		10/97 - 7/14	0.0093 mg/L	--	4/12	Yes
	Chromium, Dissolved	10/97 - 7/14	--	0.008372 mg/L	4/98	No[1]
			--	0.0052 mg/L	10/06	No[1]
MP-281	Arsenic, Dissolved	10/97 - 7/14	0.0117 mg/L	--	10/03	Yes
	Chromium, Dissolved	10/97 - 7/14	--	0.007088 mg/L	4/98	No[1]
			--	0.0054 mg/L	10/6/98	No[1]
			--	0.03093 mg/L	10/15/98	Yes
MP-281C	Arsenic, Dissolved	10/97 - 7/14	0.0167 mg/L	--	10/03	Yes
	Chromium, Dissolved	10/97 - 7/14	--	0.006565 mg/L	4/98	Yes

[1] *Result retained as permitted in accordance with OEPA outlier evaluation criteria.*

TABLE 15. APPENDIX IX PARAMETERS SAMPLING AND ANALYSIS REQUIREMENTS CECOS ABER ROAD FACILITY

Constituent	Container and Preservation[4]	Analytical Method Number[5]	Holding Time
Volatile Organic Compounds (VOCs)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8260C	14 days
1,2-Dibromo-3-chloropropane (DBCP) and 1,2-Dibromoethane (EDB)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8011	14 days
Semi-Volatile Organic Compounds (SVOCs)	2 G-250 ml, PTFE-lined lid, cool	8270D	7 days to extraction, 40 days for analysis
Organochlorine Pesticides	2 G-250 ml, PTFE-lined lid, cool	8081B	7 days to extraction, 40 days for analysis
Polychlorinated Biphenyls (PCBs)	2 G-250 ml, PTFE-lined lid, cool	8082A	7 days to extraction, 40 days for analysis
Organophosphorus Pesticides	2 G-250 ml, PTFE-lined lid, cool	8141A	7 days to extraction, 40 days for analysis
Herbicides	2 G-1000 ml, PTFE-lined lid, cool	8151A	7 days to extraction, 40 days for analysis
Antimony, Dissolved	1 P-250 ml field filtered, HNO_3 to pH <2	6020A	6 months
Arsenic, Dissolved		6020A	
Barium, Dissolved		6010C	
Beryllium, Dissolved		6010C	
Cadmium, Dissolved		6010C/6020A	
Chromium, Dissolved		6010C	
Cobalt, Dissolved		6010C	
Copper, Dissolved		6010C	
Lead, Dissolved		6010C/6020A	
Nickel, Dissolved		6010C	
Selenium, Dissolved		6010C/6020A	

TABLE 15. APPENDIX IX PARAMETERS SAMPLING AND ANALYSIS REQUIREMENTS, CONTINUED
CECOS ABER ROAD FACILITY

Constituent	Container and Preservation	Analytical Method Number[5]	Holding Time
Silver, Dissolved	1P-250 ml field filtered, HNO_3 to pH <2	6010C/6020A	6 months
Thallium, Dissolved		6010C	
Tin, Dissolved		6010C	
Vanadium, Dissolved		6010C	
Zinc, Dissolved		6010C	
Mercury, Dissolved	1 P-250 ml field filtered, HNO_3 to pH <2	7470A	28 days
Cyanide, Total	1P-250 ml, NaOH, cool	9012B	14 days
Sulfide, Total	1 P-250 ml, Zinc Acetate & NaOH, cool	SM 4500 S2 D	7 days

Notes:

G = Glass, P = Polyethylene, PTFE = Polytetrafluoroethylene (Teflon), HCL = hydrochloric acid, HNO_3 = nitric acid, NaOH = sodium hydroxide

1. The four-digit method references in Table 15 are from SW-846 and EPA.
2. Pre-preserved containers provided by analytical laboratory.
3. Field parameters (ORP, pH, specific conductance, temperature, and turbidity) are not preserved and measurements are taken immediately.
4. Subject to change based on method revisions and laboratory requirements
5. Subject to change with routine method revisions.

FIGURES

TestAmerica Buffalo
10 Hazelwood Drive

Amherst, NY 14228
phone 716.504.9852 fax 716.691.7991

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager:	Site Contact:	Date:	COC No:
	Tel/Fax:	Lab Contact:	Carrier:	_____ of _____ COCs
	Analysis Turnaround Time			For Lab Use Only:
	☐ CALENDAR DAYS ☐ WORKING DAYS			Walk-in Client:
Phone	TAT if different from Below: 21 Days			Lab Sampling:
FAX	☐ 2 weeks			
Project Name:	☐ 1 week			Job / SDG No.:
Site:	☐ 2 days			
P O #	☐ 1 day			Sampler:

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	DMP VOCs (8260B)	DMP VOCs (8011)	TOC (9060)	PCBs (8082)												Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl, 3= H2SO4, 4=HNO3, 5=NaOH, 6= None

All samples preserved on ice

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☐ Disposal by Lab ☐ Archive for_____ Months

Special Instructions/QC Requirements & Comments:

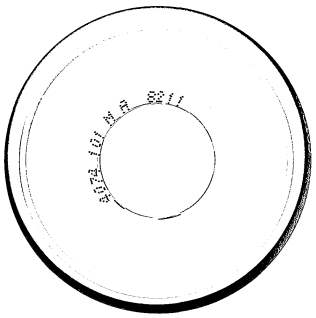
Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company: Eagon & Associates, Inc.	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Figure 17. Example Chain of Custody

APPENDIX F
ELECTRONIC DATA FILES ON CD

CECOS International, Inc.
Aber Road Facility
Post-Closure Plan
Revised September 2014



Appendix F.
Electronic Data Files

EAGON & ASSOCIATES, INC.

APPENDIX G
NORMALITY RESULTS AND INTRA-WELL PREDICTION LIMITS, CHANNEL SAND ZONE

RESULTS OF INTRAWELL STATISTICAL ANALYSES
CHANNEL SAND WELL MP-281C
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	0	10/10 - 7/14	0.9585	0.805	Original	PPL	0.0052
Barium, Dissolved	8	0	10/12 - 7/14	0.8574	0.749	Original	PPL	0.057
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	39	100	10/97 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
CHANNEL SAND WELL MP-406C
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	8	0	10/12 - 7/14	0.8492	0.749	Original	PPL	0.0043
Barium, Dissolved	8	0	10/12 - 7/14	--	--	--	NPPL	0.15
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

APPENDIX H
NORMALITY RESULTS AND INTRA-WELL PREDICTION LIMITS, BTI ZONE

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-233R
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	14	0	10/97 - 7/14	0.9054	0.825	Original	PPL	0.013
Barium, Dissolved	8	0	10/12 - 7/14	0.9344	0.749	Original	PPL	0.55
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	37	95	10/97 - 7/14	--	--	--	NPPL	0.0096
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-234R
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	16	0	10/97 - 7/14	0.9037	0.844	Original	PPL	0.015
Barium, Dissolved	8	0	10/12 - 7/14	0.8874	0.749	Original	PPL	0.051
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	36	97	10/97 - 7/14	--	--	--	NPPL	0.0057
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-235R
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	0	10/97 - 7/14	0.9171	0.805	Original	PPL	0.0057
Barium, Dissolved	8	0	10/12 - 7/14	0.9423	0.749	Original	PPL	0.052
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	38	95	10/97 - 7/14	--	--	--	NPPL	0.0075
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-237
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	8	13	10/12 - 7/14	0.8078	0.749	Original	PPL	0.0023
Barium, Dissolved	8	0	10/12 - 7/14	0.846	0.749	Original	PPL	0.033
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-238R
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	100	10/10 - 7/14	--	--	--	NPPL	<0.001
Barium, Dissolved	8	0	10/12 - 7/14	0.9716	0.749	Original	PPL	0.053
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	37	100	10/97 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-241R
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	0	10/10 - 7/14	0.9507	0.805	Original	PPL	0.0034
Barium, Dissolved	8	0	10/12 - 7/14	0.8327	0.749	Original	PPL	0.057
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	37	100	10/97 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-244R
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	8	10/10 - 7/14	0.9229	0.805	Original	PPL	0.0076
Barium, Dissolved	8	0	10/12 - 7/14	0.8748	0.749	Original	PPL	0.027
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	37	97	10/97 - 7/14	--	--	--	NPPL	0.0071
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-250
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	17	10/10 - 7/14	0.9254	0.805	Original	PPL	0.0047
Barium, Dissolved	8	0	10/12 - 7/14	0.8469	0.749	Original	PPL	0.063
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	36	100	10/97 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-274
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	0	10/10 - 7/14	0.9473	0.805	Original	PPL	0.0039
Barium, Dissolved	8	0	10/12 - 7/14	0.9628	0.749	Original	PPL	0.5
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	38	95	10/97 - 7/14	--	--	--	NPPL	0.0078
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-279
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	26	0	10/97 - 7/14	0.9609	0.891	Original	PPL	0.045
Barium, Dissolved	8	0	10/12 - 7/14	0.9286	0.749	Original	PPL	1.1
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	35	100	10/97 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-280
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	37	0	10/97 - 7/14	0.981	0.914	Original	PPL	0.034
Barium, Dissolved	8	0	10/12 - 7/14	0.7818	0.749	Original	PPL	0.37
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	38	95	10/97 - 7/14	--	--	--	NPPL	0.0084
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-281
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	12	0	10/10 - 7/14	0.9661	0.805	Original	PPL	0.0041
Barium, Dissolved	8	0	10/12 - 7/14	0.9302	0.749	Original	PPL	0.31
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	38	95	10/97 - 7/14	--	--	--	NPPL	0.0071
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-404
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	8	0	10/12 - 7/14	0.8956	0.749	Original	PPL	0.0063
Barium, Dissolved	8	0	10/12 - 7/14	0.9271	0.749	Original	PPL	0.44
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-407
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	8	0	10/12 - 7/14	0.8349	0.749	Original	PPL	0.0091
Barium, Dissolved	8	0	10/12 - 7/14	0.9654	0.749	Original	PPL	0.81
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-408
ABER ROAD FACILITY

Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	8	0	10/12 - 7/14	0.9186	0.749	Original	PPL	0.099
Barium, Dissolved	8	0	10/12 - 7/14	0.9444	0.749	Original	PPL	0.81
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

RESULTS OF INTRAWELL STATISTICAL ANALYSES
BEDROCK-TILL INTERFACE (BTI) WELL MP-409
ABER ROAD FACILITY

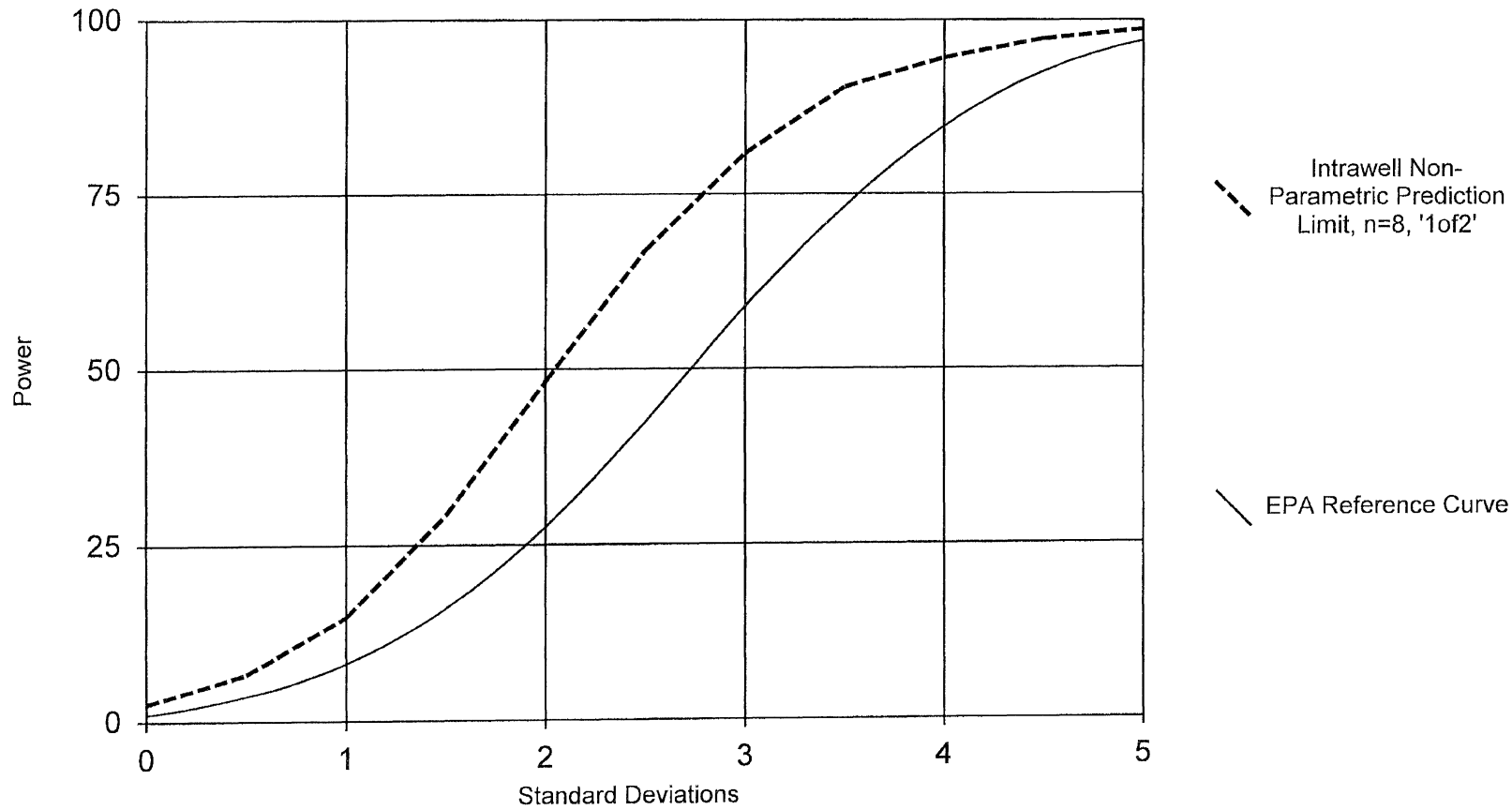
Parameter	Number of Background Observations	Background Percent Nondetect	Background Period	Shapiro-Wilks Test		Distribution Used	Statistical Method*	Prediction Limit (mg/L)
				W Statistic	Critical Value			
Arsenic, Dissolved	8	0	10/12 - 7/14	0.8928	0.749	Original	PPL	0.0039
Barium, Dissolved	8	0	10/12 - 7/14	--	--	--	NPPL	0.12
Cadmium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.001
Chromium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Lead, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.005
Mercury, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.0002
Selenium, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.015
Silver, Dissolved	8	100	10/12 - 7/14	--	--	--	NPPL	<0.003

* *NPPL = Nonparametric Prediction Limit; PPL = Parametric Prediction Limit;*

Note: Outliers were removed prior to conducting statistical analyses.

APPENDIX I
STATISTICAL POWER CURVES

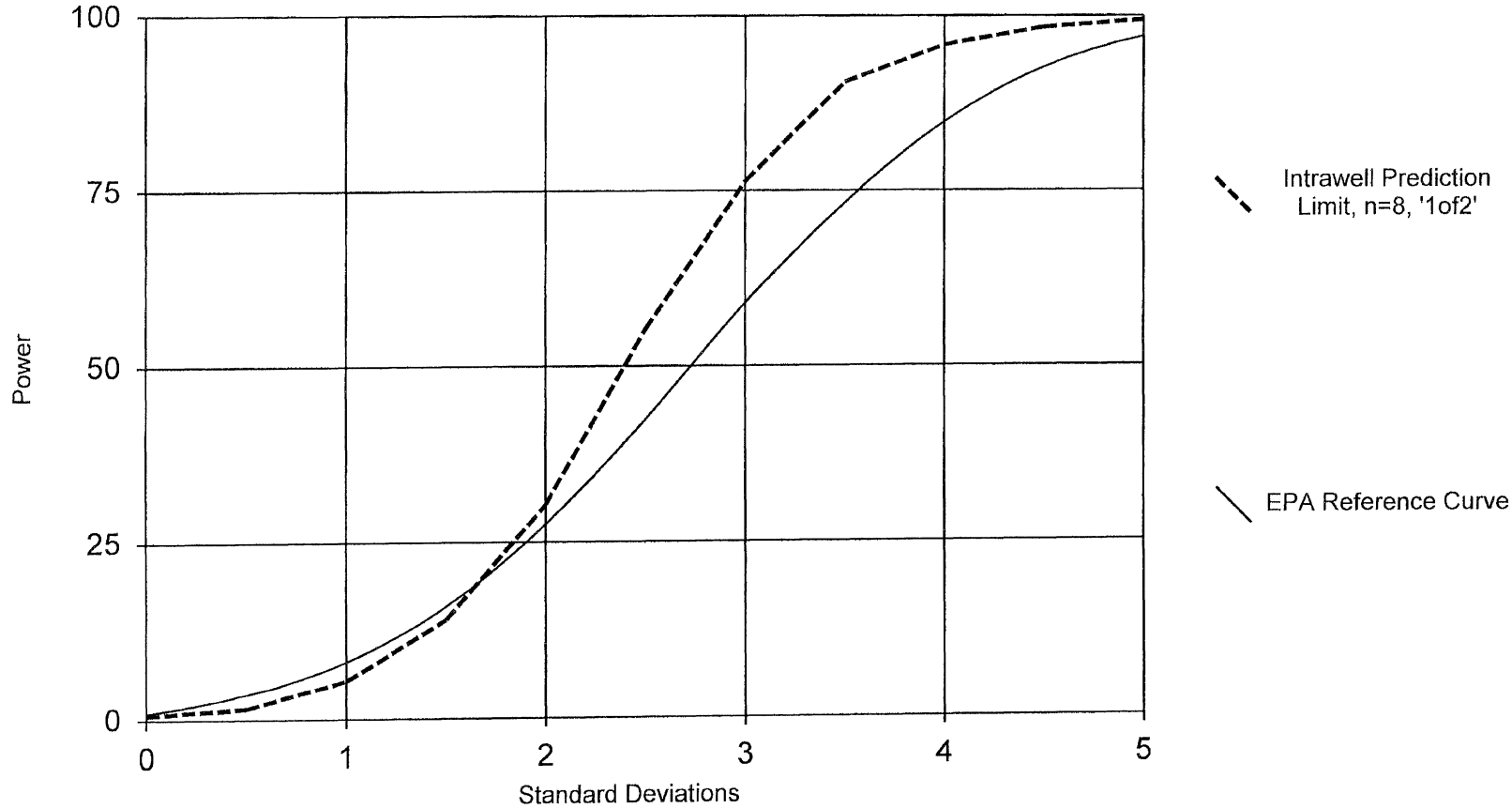
Power Curve



Analysis Run 9/23/2014 2:05 PM View: Stats

Facility: Aber Road Landfill Client: Aber Road Landfill Data File: Aber Road - CS

Power Curve

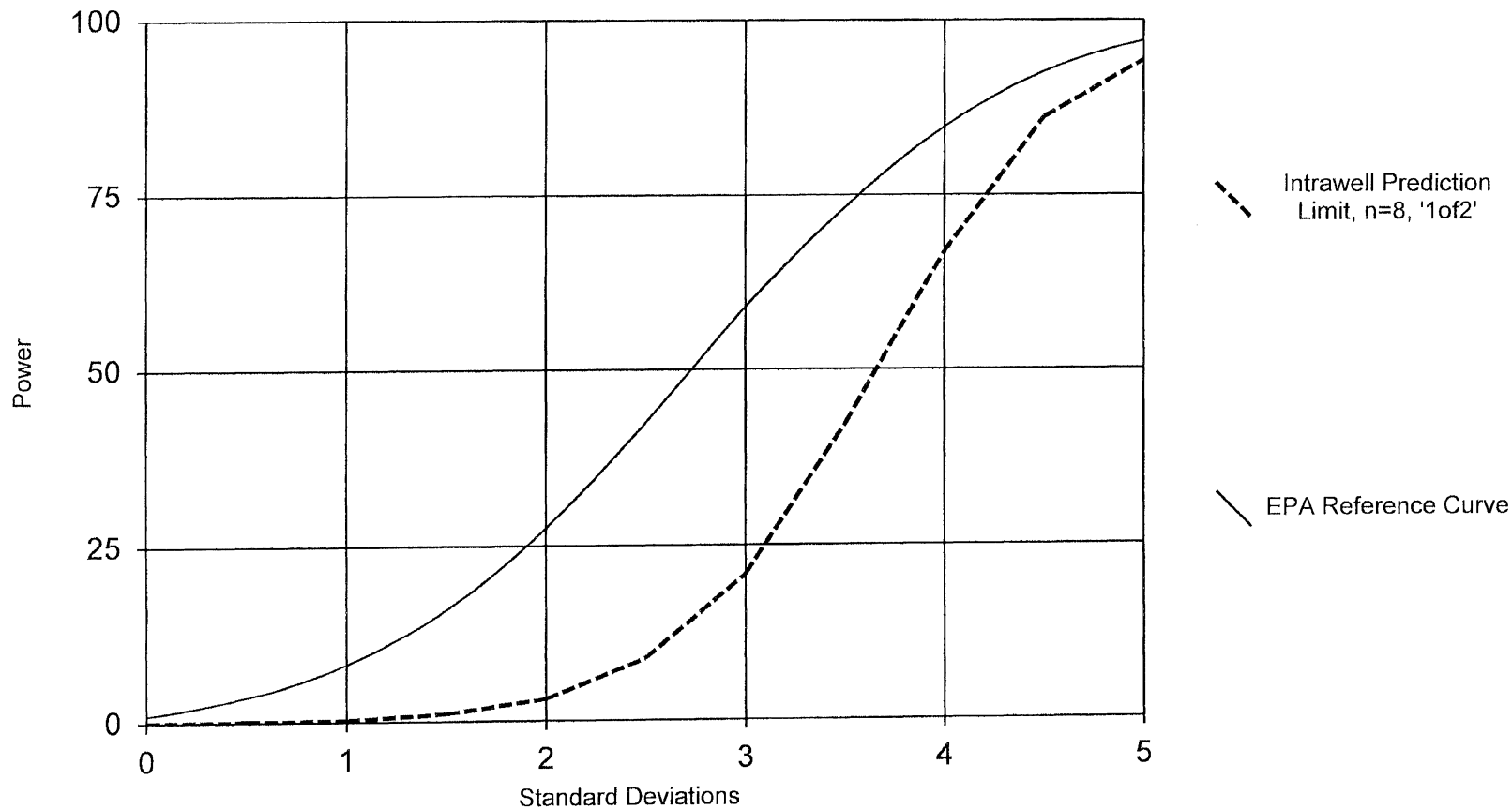


Kappa = 2.312, based on 2 compliance wells and 8 constituents, evaluated semi-annually (this report reflects annual total).

Analysis Run 9/23/2014 2:03 PM View: Stats

Facility: Aber Road Landfill Client: Aber Road Landfill Data File: Aber Road - CS

Power Curve

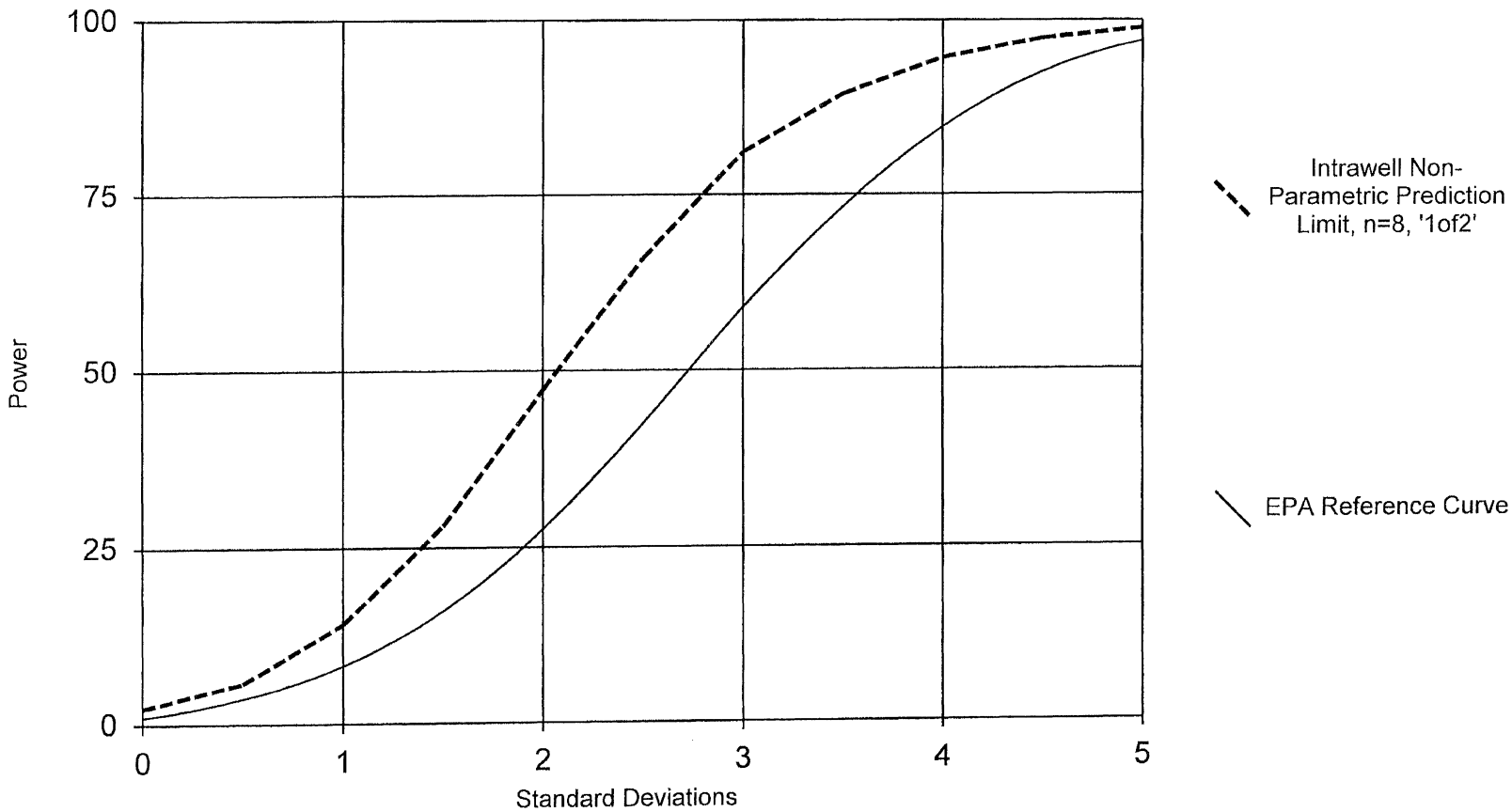


Kappa = 3.524, based on 16 compliance wells and 8 constituents, evaluated semi-annually (this report reflects annual total).

Analysis Run 9/23/2014 2:06 PM View: Stats

Facility: Aber Road Landfill Client: Aber Road Landfill Data File: Aber Road - BTI

Power Curve



Analysis Run 9/23/2014 2:05 PM View: Stats

Facility: Aber Road Landfill Client: Aber Road Landfill Data File: Aber Road - BTI

PROPOSED SEPTEMBER 2014 REVISION INSERTS

SEPTEMBER 2014 REVISIONS IN REDLINE FORMAT

Post-Closure Plan

CECOS International, Inc.
Aber Road Facility
Williamsburg, Ohio

EPA I.D. # OHD-087-433-744

~~January 2012~~
Revised ~~October 2012~~: September 2014

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REVISIONS TO
POST CLOSURE PLAN
CECOS INTERNATIONAL, INC.

Date of Revision	Revision Number
December 1992	1 (Original)
September 1993	2
December 1993	3
March 1994	4 (Amended September 1994 per Ohio EPA approval)
September 2014	5

Added Rev. Summary (page vi); Revised Sections: 10.3, 10.3.2, 10.4, 10.5.1, 10.5.2.1.2, 10.5.2.1.3, 10.5.3, 10.5.4, 10.5.5, 10.6.3, 11.2.2, 11.2.4, 11.2.4.1, 11.2.4.2, 11.2.4.3, 11.2.4.4, and 11.2.5; Figure 17; Tables 4, 10, 12, and 15; Appendices F, G, H, and I

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discussions with Ohio EPA, 11 new wells were installed in 2012 for sampling under the DMP (See **Table 7**).

The monitoring well network presented herein satisfies the regulatory requirements set forth in OAC Rules 3745-54-97(A-G) and 3745-54-98(A-D).

Any future wells will be installed following the procedures in the latest version of Ohio EPA's TGM, where applicable. For wells that will be used for routine water quality sampling, dedicated sampling pumps will be installed at each existing and future well in the routine DMP network. At least eight initial background samples will be collected from each installed well, on a quarterly basis, per discussions with Ohio EPA, technical review, and in accordance with OAC Rule 3745-54-97(G)(1). As-built well construction summaries and borehole logs will be submitted to Ohio EPA for newly installed wells.

~~Dedicated submersible pumps will be utilized for purging and sampling all DMP monitoring wells. Pumps will be installed in DMP wells previously purged and sampled by bailer.~~

Monitoring wells will contain dedicated equipment to avoid the potential for cross-contamination. Dedicated submersible pumps will be utilized for purging and sampling all DMP monitoring wells. If confirmed groundwater quality impact from a regulated unit has been identified, the wells with evidence of impact will generally be sampled last.

10.3.1 Monitoring Well Operations and Maintenance Procedures

An inspection program has been instituted at the Aber Road Facility to ensure that the monitoring wells perform to design specifications throughout the life of the monitoring program as detailed in Section 3.3.5. Each well is visually inspected to assure that access is readily available, to identify needed repairs or maintenance, and to verify that the well is capable of producing representative groundwater samples. Inspections are documented on a Maintenance Evaluation form and notification of the need for repair is made on the Corrective Action form, **Figures 9** and **10**, respectively. In addition, during routine groundwater monitoring, each well to be sampled for water quality is inspected to assure properly functioning dedicated purging/sampling equipment exists, where applicable. If a well is determined not to be operating properly or is in need of repair, appropriate measures will be taken prior to the next semiannual event.

Well redevelopment is discussed in Section 4.2.1. Wells that may become obstructed or otherwise become unserviceable through time will be noted to Ohio EPA prior to the next semiannual event. The need for well abandonment and/or replacement wells will be discussed with Ohio EPA before undertaking the work.

10.3.2 Measurement of Groundwater Elevations: Wells Available for Supplemental Sampling

On a semiannual basis, data to establish the static elevations of groundwater will be collected. The Potentiometric Surface Monitoring Network (**Figure 11; Table 8**) has been developed to include piezometers and monitoring wells across the site.

Data will include depths-to-static groundwater level as measured from a marked reference point on the top of the inner casing during each sampling event. Wells equipped with pumps

will be measured from the ~~water level measurement port.~~survey mark on the pump cap. Groundwater elevation data will be measured to an accuracy of 0.01 foot. Immiscible layer detection will be conducted based on a visual analysis of the water level probe, water collected during purging and sampling, and the results of the analytical program. If immiscible layers are detected they will be noted in the "Specific Comments" section of the field log.

Site-wide groundwater levels will be collected within a 24-hour period, if possible. However, due to the large number of wells requiring water level measurements (approximately 200 wells) and daylight limitations during certain parts of the year, it may not be feasible to collect all water levels in a 24-hour time period ~~(**Figure 16**)~~.

Potentiometric surface maps generated from the groundwater elevation events will be included with each semiannual groundwater statistical analysis report. In accordance with OAC Rule 3745-54-98(E), an evaluation of the groundwater flow rate and direction will be performed at least annually.

An asterisk has been placed on **Table 8** after wells that are likely viable for future sampling (i.e., 2-inch casing or bigger), if needed. Wells formerly part of the DMP, as well as piezometers, will be maintained in the event they are needed for future investigatory purposes. If it is determined that additional sampling is warranted outside the current detection monitoring well network, an attempt will be made to collect a representative sample from the appropriate piezometer(s). If an appropriate piezometer is not available, or a sample cannot be collected due to a well condition, an additional well may be installed (after discussion with the Ohio EPA). Dedicated pumps ~~will~~may not be installed in wells that are not part of the routine DMP network.

10.4 Indicator Parameters

Table 9 contains a summary of stabilization, water quality, and statistical indicator parameters for wells in the Upper Sand, 880 Sand, Channel Sand, and BTI Zones. The indicator parameter includes hazardous constituents that will provide reliable, early identification of a potential release from the regulated unit. The indicator parameters were determined in accordance with OAC Rules 3745-54-97(G) and 98(G) and Ohio EPA's input.

Because the monitoring zones contain clay and silt as well as sands and are often low-yielding, samples for dissolved metals will be field filtered to ensure representative samples are collected. Samples for metals will be field filtered using a 0.45-micron, high capacity, filter attached to the pump discharge tubing. The filtered sample will be pumped directly into the sample bottles. The flow rate will be adjusted to a rate that is capable of pushing water through the pump discharge tubing when collecting dissolved metal aliquots.

When sampling a bailed well (see Section 10.5.2.2) for dissolved metals, an aliquot will be collected in a new, unpreserved (neat) bottle. The aliquot will be field filtered immediately using a peristaltic or piston pump. The aliquot will travel through a 0.45-micron, high capacity filter attached to disposable tubing and will be collected directly into the sample bottle. Tubing and filters will be discarded after use.

Due to a lack of confirmed detections over a 13 year period between 1998 and 2011, and in concurrence with Ohio EPA, semi-volatile organic compounds (SVOCs) are no longer

considered appropriate detection monitoring indicator parameters for the facility and will not be sampled as part of the DMP. SVOCs will continue to be included in the site-specific list of constituents for Appendix IX sampling. Throughout this Plan, references to the Appendix IX sampling list refers to the VOCs listed in the Appendix to OAC Rule 3745-54-98 and other parameters (SVOCs, pesticides, herbicides, PCBs, metals, etc.) taken from Table 1-1 of the approved November 1997 CMI Quality Assurance Project Plan (QAPjP). Specific sampling and analysis requirements for the DMP parameters, including minimum container size, preservatives, analytical methods, and method holding times, are outlined in **Table 10**.

10.4.1 Stabilization Parameters

Field stabilization parameters were selected based on the most recent Ohio EPA TGM protocol. As discussed in Sections 10.5.2.1.1 and 10.5.2.2.1, field pH, specific conductance, and temperature will be used for stabilization purposes during purging at each well in the DMP. The stabilization parameters will not be statistically evaluated.

10.4.2 Water Quality Parameters

In addition to the stabilization parameters, field turbidity, dissolved oxygen (DO), and oxidation/reduction potential (ORP) measurements will be collected once each event at each DMP well, after purging is completed and prior to sample collection. None of these parameters will be statistically evaluated.

The eight RCRA metals listed on **Table 9** will be collected at wells screened in the Upper Sand and 880 Sand Zones. Data collected for the RCRA metals in Upper Sand and 880 Sand Zone wells will be evaluated qualitatively through time series plots, which will be presented and discussed in report submittals to identify potential changes that may warrant further evaluation. Statistical evaluations will not be performed on RCRA metals in the Upper Sand and 880 Sand Zones.

10.4.3 Statistical Indicator Parameters

The VOCs listed on **Table 11** are the VOCs in the appendix to OAC Rule 3745-54-98, as well as 9 additional parameters typically analyzed as SVOCs as agreed upon with Ohio EPA (62 constituents total) that can be detected using SW-846 Method 8260B (62 constituents total). These 62 parameters will hereafter be referred to as "VOCs." The VOCs on **Table 11** will be analyzed and evaluated as detection monitoring indicator parameters for each of the four water-bearing zones.

Downgradient wells in the Upper Sand Zone and 880 Sand Zone will be statistically evaluated for 62 VOCs.

Downgradient wells in the Channel Sand and BTI Zones will be statistically evaluated for the eight RCRA metals, as well as for the 62 VOCs.

Newly installed wells and wells new to the DMP (MP-214BR and MP-237) will be statistically evaluated for the 62 VOCs beginning with the first monitoring event following implementation of this Plan and/or the installation of the wells. Background will not be collected for VOCs.

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10.5 Groundwater Sampling Methodology

The following sections describe groundwater sample collection, handling, and reporting procedures. The Aber Road Facility or its designated consultant will follow these guidelines during sample collection. The intent of these guidelines is to provide procedures designed to yield representative and comparable analytical data from each monitoring well, during each sampling event.

Three principal steps in collecting groundwater samples from monitoring wells are:

- Measuring static groundwater levels;
- Purging well casings (or low-flow purging) to stabilization; and
- Collecting and preserving samples.

10.5.1 Calculations of Groundwater Level, Total Well Depth, and Well Volume

Water level measurements will be made at the surveyed reference point using a properly decontaminated, battery-operated electronic water level meter with audible signal and calibrated tape or its equivalent. Data to establish the static elevations of groundwater will be collected prior to purging. Data will include both depth-to-water levels and updated total well depths as measured from a marked reference point on the top of the inner casing during each sampling event, if measured. Wells equipped with pumps will be measured from the ~~water level measurement port.~~mark on the pump cap. For wells with dedicated pumps ~~installed~~, the total depths will be measured when pumps are removed for maintenance. Otherwise, the well construction diagram will provide total depths whenever the pump makes total depth measurements impractical.

Water level measuring devices coming in contact with groundwater will be thoroughly washed with a non-phosphate detergent and rinsed with deionized water prior to use in each well. Groundwater elevations will be obtained by subtracting the measured depth to groundwater from the surveyed top of inner casing elevation at each well. Total well depth (either measured or assigned per the well construction diagrams) will be used to aid in calculating the initial groundwater volume of each well. The difference between total well depth and depth-to-water level is the stabilized height of the groundwater column in the well. These measurements will be used to determine the static well volume (in gallons) of groundwater in each well as follows:

1. In order to obtain the height (H) of the groundwater column, measure the total depth (TD) of the well and subtract the static measured depth (SMD) of the water level.

$$H = TD - SMD$$

2. The following formula may be used to calculate the static well volume (in gallons) of groundwater:

$$V = (H) \times (F)$$

Where:

V = well volume in gallons.
H = height of groundwater column in the well in feet.
F = factor for volume of 1-foot section of casing in gallons.
0.163 = gallons per foot of depth constant for a 2-inch well.
0.653 = gallons per foot of depth constant for a 4-inch well.

This well volume will be multiplied by three to calculate the minimum required purge volume (when purging volumetrically).

10.5.2 Monitoring Well Purging Procedures

Purging wells prior to sample collection is necessary to remove stagnant water that may not be representative of the groundwater. Purging will be performed at a rate as close as possible to the recharge/recovery rate of the well. Wells will be purged using dedicated submersible pumps, such as the Grundfos Rediflo 2, a bladder pump, or similar device. It is expected that turbidity will be relatively low due to the use of dedicated pumps as the sampling apparatus at each well; however, slightly higher turbidity readings may occur in wells that purge dry.

On-site purge water from downgradient wells will be collected in containers and labeled "P.C. Purge Water." This purge water will be handled as potentially contaminated. Currently, the purge water from downgradient wells is conservatively managed and disposed with F039 liquids. Purge water that is shown to be uncontaminated based on past sample results may be disposed on the ground downgradient of the wellhead at the time of sampling. Purge water from upgradient background monitoring wells will be discarded on the ground away from the wellhead.

10.5.2.1 Pump Purging

10.5.2.1.1 Volume Sampling

Purging may be performed by removing a minimum of three well volumes (calculated as discussed in Section 10.5.1), prior to sampling, except when a well purges dry before three well volumes have been evacuated. This ensures that samples are drawn from formation water, not from stagnant water left in the well between sampling events. The purge rate and volume of groundwater purged from each well will be measured using a graduated bucket. In addition to removing three well volumes, field stabilization parameters including pH, specific conductance, and temperature will be monitored and recorded on a field log.

Stabilization parameters will be collected every one-half (½) well volume after an initial one to one and one-half (1 - 1½) well volumes are purged. The volume removed between readings may be adjusted as well-specific information is developed. Field meter or flow-through cells that allow continuous monitoring of stabilization parameters may be used. When using a flow through cell, the capacity of the cell will be such that the flow of water in the cell is replaced between measurements of the stabilization parameters.

Purging will be considered complete when at least three well volumes have been removed and the following field parameters have stabilized for a minimum of three consecutive readings:

pH	+/- 0.2 S.U.
Specific Conductance	+/- 3% umhos/cm
Temperature	+/- 0.5 Degrees Celsius

Turbidity, DO, and ORP, in addition to pH, specific conductance, and temperature, will be measured at the end of purging. Turbidity, DO, and ORP will not be used as stabilization parameters. All field measurements, including the volume of water purged at the time of each field parameter measurement, and the date and time of sample collection will be recorded on the field log. A depth-to-water measurement will also be collected after purging but prior to sample collection.

Upon removal of three well volumes and equilibrium of field water quality parameters, the well will be sampled. If one or more of the stabilization criteria are not met after five well volumes have been purged, the sample will be collected. If a well purges dry prior to three volumes and/or equilibrium, the well will be evacuated to the lowest reasonable level, allowed to recover, and then sampled within 24 hours of purging. If a well does not recover sufficiently to fill the sample bottles after 24 hours, the samplers may attempt to collect additional volume during consecutive 24-hour periods, as practical. The volume of water purged will be recorded on the field log.

10.5.2.1.2 Low-Flow Sampling

Low-flow (minimal drawdown) ground-water sampling procedures may be used for purging and sampling monitoring wells that will sustain a pumping rate of at least 100 ml/min. Water will be purged from these wells at low rates in order to minimize drawdown in the well during purging and sampling. Depth-to-water measurements and field water quality parameters specific conductance, pH, and temperature collected during purging will be used as criteria to determine when purging has been completed. Sample collection will be initiated immediately after purging at each well.

Prior to purging, a static water level will be measured and the time of measurement will be recorded on the field form (See **Figure 16** for an example field form). Depth-to-water measurements recorded during purging to verify water level stabilization also will be recorded on this form.

During purging, wells will be pumped at very low rates. Purging rates in the range of 0.1-0.5 L/min (100-500 ml/min) typically will be used and no well will be purged in excess of 1 L/min (1000 ml/min). Stabilization of the water column will be considered achieved when three consecutive water level measurements vary by 0.3 foot or less at a pumping rate of no less than 100 ml/min. If a bladder pump is used, the manufacturer's recommendations will be used for adjusting the emptying/filling cycle to minimize the potential for turbid flow.

Stabilization measurements will begin after drawdown of the water level has stabilized. Depth-to-water measurements and water quality parameter measurements of pH, specific conductance, and temperature typically will be conducted every 3-5 minutes during purging. If a meter equipped with a flow cell is used, the volume of the flow cell should be purged between field measurements. Stabilization will be considered achieved and purging will be considered complete when three consecutive measurements vary by no more than:

Depth-to-Water	0.3 ft
pH	+/- 0.2 S.U.
Specific Conductance	+/- 3% umhos/cm
Temperature	+/- 0.5 Degrees Celsius

Samples will be collected immediately after purging is complete at each well. Turbidity, DO, and ORP, in addition to depth-to-water, pH, specific conductance, and temperature, will be measured at the end of purging. Turbidity, DO, and ORP will not be used as stabilization parameters. All field measurements, including the volume of water purged at the time of each field parameter measurement, and the date and time of sample collection will be recorded on the field form.

If the recharge rate of the well is less than ~~the lowest achievable pumping rate,~~100 ml/min., and the well is essentially dewatered during purging, a sample will be taken as soon as the water level has recovered sufficiently to collect the sample, regardless of parameter stabilization.

10.5.2.1.3 Minimal Purging

Wells that yield less than 100 ml/min. may also be sampled using a minimal purging procedure. Wells sampled using this method will be purged of a minimum of the volume of water in the pumping system (i.e., pump and tubing volume) prior to collecting samples. The pumping system volume is determined by adding the volume of the sampling pump (e.g., P1150 = 130 ml; P1101 = 395 ml) to the volume of the tubing at each well. The tubing volume at a given well is calculated by multiplying the feet of tubing in the well by a conversion factor for tubing size (e.g., 10 ml/ft for ¼-inch ID tubing; 4.5 ml/ft for 0.17-inch ID tubing). Once the minimum volume has been evacuated, samples may be collected. The pump system volumes will be recorded on the field form for each well.

The goal of minimal purging is to sample only water from the screened interval of the well. Therefore, water levels will be monitored during sample collection and drawdown will not be permitted to exceed the distance between the pump intake and the top of the screen. If the maximum drawdown is reached prior to filling a complete bottle set, sampling will be discontinued and resumed when sufficient water has recovered in the well and no later than 24 hours after sampling. Maximum drawdowns for wells purged using this method will be recorded on the field form.

10.5.2.2 Bailer Purging

Purging and sampling with a bailer will only be used in the event that a dedicated pump is inoperable or if a well must be sampled that lacks a dedicated pump because it is not part of the routine DMP sampling network. Only bailers and monofilament line that will not alter the sample parameters are permissible when bailer purging is required. Dedicated stainless steel bailers, dedicated/non-dedicated PVC bailers, or dedicated/non-dedicated polyethylene bailers will be used for sampling. Non-dedicated bailers will be properly decontaminated following procedures described in Section 10.5.4. In the event that a tripod-mounted downrigger style reel is used, the following procedure will be used:

- The line will be walked out an appropriate distance for the respective well;
- The downrigger reel will be rinsed with deionized water, a paper towel wetted with deionized water and dry towel will be held in sequence in the line as it is drawn on the spool;
- The bailer will be fastened to the monofilament line using a latch secured with a knot;
- The latch will also be rinsed with deionized water prior to hooking it on the bailer;
- After cleaning the line, the bailer will be lowered slowly in the water column until submerged; and
- The bailer will be retrieved slowly, recording the actual volume removed as the well is continuously bailed until the purge requirements in Section 10.5.2.1.1 are achieved.

10.5.3 Sample Collection

Groundwater monitoring wells will be sampled immediately after completion of purging in moderate to high yield wells. For monitoring wells that purge dry, sample collection will take place as soon as practical; i.e., within 24 hours of purging if the monitoring well has recharged sufficiently. If a well does not recover sufficiently to fill the sample bottles after 24 hours, the samplers may attempt to collect additional volume during consecutive 24-hour periods, as practical.

Groundwater will be analyzed for the parameters listed on **Table 9**. The site will utilize the analytical procedures provided in the most current edition of EPA report SW-846 "Test Methods for Evaluating Solid Waste." **Table 10** lists containers, preservation requirements, analytical methods, and holding times for each parameter.

Samples for metals will be field filtered using a 0.45-micron, high capacity, filter attached to the pump discharge tubing. The filtered sample will be pumped directly into the sample bottle. The flow rate will be adjusted to a rate that is capable of pushing water through the pump discharge tubing when collecting dissolved metal aliquots.

When sampling a bailed well for dissolved metals, an aliquot will be collected in a new, unpreserved (neat) bottle. The aliquot will be field filtered immediately using a peristaltic or piston pump. The aliquot will travel through a 0.45-micron, high capacity filter attached to disposable tubing and will be collected directly into the sample bottle. Tubing and filters will be discarded after use.

10.5.4 Equipment Decontamination

If utilized, all non-dedicated purging and sampling equipment, including bailers, pumps, and water level indicators will be cleaned prior to use in each well. This does not apply to disposable equipment. A wash with a non-phosphate detergent (such as ~~Alconox and~~ Liquinox) and a thorough rinse, both inside and out, with deionized or distilled water is the minimum acceptable cleaning method for non-dedicated reusable sampling equipment. Field parameter meters will be rinsed between wells with clean water. Any disposable equipment such as polyethylene bailers and monofilament will be properly disposed.

10.5.5 Sample Handling

Sample handling and preservation techniques will depend on the analytical parameters. Sample bottles will be supplied by the laboratory in the correct sizes, quantity, and with any applicable preservatives. ~~At each well, groundwater~~Groundwater samples will be collected in ~~decreasing~~the same order ~~of sensitivity to volatilization (most sensitive to least sensitive).~~at each well. For DMP sampling events, this involves collecting VOCs first, then dissolved metals. The purpose of sample preservation is to stabilize parameters of interest by retarding chemical or biological changes. Methods of preservation are generally limited to pH adjustment, chemical addition, and cooling. Field parameter measurements (DO, ORP, pH, specific conductance, temperature, and turbidity) will be collected prior to sample collection.

VOC sample containers will be completely filled to form a meniscus and capped promptly to minimize volatilization. VOC containers will be checked for air bubbles after filling and capping. VOC sample bottles will be discarded and a new bottle will be filled if significant air bubbles occur. If VOC samples could not be taken without significant air bubbles, a notation will be made in the field logbook and/or field form and the appropriate chain-of-custody.

Proper preservation will help ensure that samples are representative of groundwater. Aliquots for dissolved metal analysis will be filtered at the sample location using an in-line disposable 0.45 micron filter cartridge, or similar device. Samples will be collected to minimize disturbance using appropriate sampling techniques for collecting representative groundwater samples. Field measurements (i.e. DO, temperature, pH, ORP, turbidity, and specific conductance) will be taken in a flow through cell or on a portion of the sample that was placed in a separate field container and will not be analyzed for any other parameters.

Completed sample sets will be stored on-site at or below 4 degrees Celsius until shipment to the analytical laboratory.

10.5.6 Sample Documentation and Chain-of-Custody

The Chain-of-Custody (COC) records document the history of collection, transfer, and transport of each sample. The COC record facilitates tracing the possession and handling of each sample from the time of field collection through laboratory analysis. Each individual responsible for the samples from the time of collection to the time they are received by the laboratory will be consecutively documented on the COC record. Each sample shipped, including trip blanks and other QA/QC samples, will be identified on the COC. The COC will include field and laboratory information to provide effective sample tracking and to ensure that samples are properly identified, preserved, and analyzed. An example of a COC form is located in **Figure 17**.

Sample labels identify samples in a unique manner. Sample labels will include name of the site, name of sampler(s) (initials are sufficient), well designation, date and time of sample collection, any added preservatives, and analysis requested. An indelible pen or marker will be used to complete sample labels. The sampler(s) will take measures to secure and protect the sample labels to ensure legibility at the laboratory, and deviations from required procedures will be noted in the field logbook and/or field form, as well as the applicable COC, if necessary.

A seal will be placed on the sample coolers prior to transport to confirm that containers are not opened or otherwise compromised prior to their receipt at the analytical laboratory. In

addition, the field log books or field forms will be completed to document information about each sample collected from each monitoring point in the groundwater monitoring program.

10.5.7 Field Quality Assurance/Quality Control Samples

Field QA/QC samples will be collected as part of the groundwater sampling program. Quality assurance addresses the accuracy and repeatability of analytical results. Quality assurance is accomplished by incorporating field duplicate samples and matrix spike/matrix spike duplicate (MS/MSD) samples into the analytical program. Quality control addresses preserving the integrity of samples in the field and shipping phases of collection. Quality control is accomplished by incorporating trip blanks, field blanks, and equipment (rinsate) blanks (if non-dedicated equipment is used) into the analytical program. The collection of field QA/QC samples is based in general accordance with procedures in the latest version of Ohio EPA's TGM.

10.5.7.1 Trip Blanks

One trip blank will be collected per semiannual DMP monitoring event and during any resampling event involving VOCs. Trip blanks consist of deionized water placed in appropriate sample containers by the analytical laboratory and included in the shipping container with the other (empty) sample containers prior to shipment. The trip blank sample accompanies site groundwater samples sent back to the laboratory and is analyzed for VOCs. Trip blanks assess the potential influences of transport-induced contamination of the samples and can also be used to assess potential laboratory contamination.

10.5.7.2 Field Blanks

One field blank (including all DMP parameters) will be collected per semiannual DMP monitoring event. If new statistically significant detections occur, a verification resampling event will be conducted. Field blanks may be collected during verification resampling. A field blank will be collected during verification resampling for VOC detections. Field blanks consist of deionized water poured into sample containers at the site during the sampling event and under the same environmental conditions as the monitoring well samples. If collected, the field blank will be analyzed for the same parameters as other samples collected for the day.

10.5.7.3 Equipment Blanks

Since dedicated purging and sampling equipment will be used at each groundwater monitoring well, equipment blanks will generally not be collected at the Aber Road Facility. If non-dedicated, non-disposable purging and sampling equipment is used, the effectiveness of cleaning and decontamination procedures will be verified by collecting and analyzing an equipment blank. After decontamination, equipment blanks are prepared by passing deionized or distilled water through a cleaned sampling apparatus and collecting it into clean sample containers. Equipment blanks will be handled and analyzed in the same manner as other samples being collected. A minimum of one equipment blank will be collected (when non-dedicated, non-disposable purging and sampling equipment is used) to analyze the effectiveness of cleaning and decontamination procedures.

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10.5.7.4 Field Duplicates

Field duplicate samples are an extra set of samples collected from a certain monitoring point. This set of samples is independent of the primary sample set but collected as close as possible to the primary set in both location and time. Field duplicates provide an indication of the variability in analytical results associated with sampling and laboratory procedures. A minimum of one field duplicate will be collected for each twenty monitoring well samples. Duplicate samples will generally not be collected during verification resampling events or background events that involve a small number of wells. Field duplicates will be labeled in such a manner so that persons performing laboratory analyses are not able to distinguish duplicates from other collected samples (i.e. "blind duplicates"). Blind duplicates eliminate the possibility of laboratory bias reporting analytical results.

10.5.7.5 Matrix Spike/Matrix Spike Duplicates

One matrix spike sample and one matrix spike duplicate sample will be collected and analyzed with the site samples during each routine sampling event or each 14-day calendar period if a sampling event spans more than 14 days. The matrix spike is used to determine the bias of a method in a given sample matrix. Matrix spike duplicates are intra-laboratory split samples spiked with identical concentrations of target analyte(s). Matrix spikes and matrix spike duplicates are used to document the precision and bias of a method in a given sample matrix.

10.6 Field Activities, Documentation, and Reporting

10.6.1 Field Activities

Field activities will be conducted in a manner consistent with safe and proper work practices. Quality control checks will be incorporated into the sampling and analysis program. Quality control checks will be accomplished by ensuring that proper field calibration, sampling, transporting, analytical, and documentation procedures are followed.

Each laboratory will have standard operating procedures and maintain full documentation of analytical work. Groundwater monitoring results will be submitted via electronic data delivery (EDD) techniques to the appropriate party performing statistical analyses and summary reporting.

10.6.2 Field Equipment

Field parameters will be measured as required using commercially available, portable metering equipment such as a pH meter, conductivity meter, temperature probe, turbidity meter, DO meter, ORP meter, and water level probe. Calibration procedures and frequencies for these instruments will be consistent with those recommended by the manufacturer(s), and as discussed below. Calibration (and recalibration) date, time, and results will be recorded on a form or in a log book along an indication of equipment maintenance performed associated with the sampling event. Calibration will be checked prior to beginning the sampling event. Equipment malfunctions and measures to correct malfunctions will be documented in the field log book and/or field form. Any meter that cannot maintain calibration will be repaired or replaced prior to use.

pH Meter - The pH meter will be calibrated with standard buffer solutions prior to field use. The buffer solutions will have approximate pH values of 4.0, 7.0, and 10.0 and will be traceable to the National Institute of Standards and Technology (NIST). In the field, the meter will be calibrated daily with buffer solutions before use, checked with a pH 7.0 buffer solution for drift if anomalous readings are observed, and recalibrated if necessary. The pH meter will be calibrated following the manufacturer's specifications. During extended periods between measurements, the pH probe should be stored in the protective boot.

Temperature Probe - Sample temperatures are measured with a temperature probe. According to manufacturers' instructions, temperature probes do not require calibration. However, if anomalous temperatures are observed, the test probe will be checked against another instrument and will be replaced if found to be inaccurate.

Specific Conductance Meter - The conductivity cells of the specific conductance meter will be cleaned and checked against a known conductance standard(s) prior to field sampling. The standard(s) will be traceable to NIST. In the field, the instrument will be calibrated at least daily, checked for drift if anomalous readings are observed, and recalibrated if necessary. Calibration will be according to the manufacturer's specifications.

Turbidity Meter - Particles in turbid water will cause light to scatter, giving it a cloudy appearance. The meter determines turbidity by measuring the amount of scatter when a light is passed through a sample. Readings are accomplished by placing a small amount of sample in a glass vial and placing the vial in the instrument. The vial will be rinsed with distilled or deionized water between readings. Care will be taken to keep the outside of the vial clean and free of fingerprints and condensation.

Field turbidity meters do not require frequent calibration. Instead, the meter will be calibrated once every three months and the meter will be checked every day during sampling using a known standard provided by the manufacturer. If the meter does not read to within 5 percent of the known value of the standard, it will be recalibrated in the field or a replacement meter will be used. Meters will be kept away from extreme temperatures and weather conditions as much as possible.

ORP Meters – The meters for measuring ORP will be checked and/or calibrated to manufacturer's specifications prior to use each day.

DO Meters – The meters for measuring DO will be checked and/or calibrated to manufacturer's specifications prior to use each day.

Sampling equipment will not be placed directly on the ground or in other potentially contaminated areas.

10.6.3 Field Documentation

Field documentation will be maintained on a continuing basis for this project. Either field logbooks or field forms will include field observations, purging, and well sampling details. Additionally, field documentation will contain the following information:

- Site name;

- Site well designation;
- Sample collector's name (or initials) and affiliation (e.g., landfill, laboratory, or contract personnel);
- Weather conditions (e.g., rain, snow, fog, etc.) that could affect sample;
- General condition of well and wellhead (note damage or suspected tampering);
- Type of purging and/or sampling device used;
- Static (pre-purge) depth-to-water;
- Total depth (or depth-to-dedicated pump) from top of inner casing;
- Volume of water in the well (traditional purging only) and purge volume with calculation;
- Starting and ending times for well purging;
- Approximate purging rate;
- Water level measurement at time of sample collection;
- Sample collection date and time;
- Field measurements;
- Sample appearance;
- Any indication of redevelopment required; and
- Any additional notes or comments pertinent to the sampling process.

An example of a field form is included as **Figure 16**.

10.6.4 Reporting Requirements

After analytical results are available, the groundwater monitoring data will be statistically evaluated using the procedures and schedule described in the Groundwater Statistical Analysis Plan (Section 11).

The results of the groundwater monitoring and the statistical analysis will be reported on the schedule listed below.

- Spring (April-May) Semiannual Detection Monitoring Report for Groundwater Monitoring Wells;
  - To include analytical results for monitoring wells, statistical evaluation, and potentiometric surface maps for the Spring event.
  - Reported within 90 days of the completion of the sampling event in hard copy and electronic form.

- Fall (October-November) Semiannual Detection Monitoring Report for Groundwater Monitoring Wells;
  - To include analytical results for monitoring wells, statistical evaluation and potentiometric surface maps for the Fall event.
  - Reported within 90 days of completion of the sampling event in hard copy and electronic form.

- A supplemental annual groundwater report will be submitted to Ohio EPA-Division of Materials and Waste Management (DMWM) by March 1st of each year and will include the previous year's groundwater monitoring information required by OAC Rules 3745-65-75 and 3745-54-75, where applicable. The facility will be submitting hard copies of the routine groundwater monitoring information semiannually. Components of the Ohio EPA supplemental annual groundwater report forms and instructions not previously submitted, such as the facility's electronic database, will be included in the annual report only.

Reports will be signed and certified as discussed in OAC Rule 3745-50-58(K).

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11.0 GROUNDWATER STATISTICAL ANALYSIS PLAN

11.1 Statistical Evaluations

The following Groundwater Statistical Analysis Plan (StAP) has been prepared to outline the methods and procedures which will be utilized for statistically evaluating groundwater detection monitoring data collected at the Aber Road Facility. This StAP is intended to update and supersede all previous statistical evaluation procedures for the groundwater DMP. The statistical approach presented herein has been developed to comply with OAC Rules 3745-54-90 to 3745-54-101.

11.2 Statistical Approach

Downgradient wells listed on **Table 7** will be statistically evaluated for their zone-specific RCRA indicator parameters on a semiannual basis per OAC Rule 3745-54-98(D). The procedures described in Sections 11.2.1 through 11.2.5 below apply to the inorganic parameters listed in **Table 9** for the Channel Sand and BTI Zones. Wells in the Upper Sand and 880 Sand Zones will be statistically evaluated for VOCs only, as discussed in Section 10.4. VOCs listed on **Table 9** will be evaluated separately, as described in Section 11.2.6 below.

Figure 18 is a flow chart outlining the DMP sampling and reporting processes to meet regulatory compliance requirements listed in OAC Rule 3745-54-98.

11.2.1 Statistical Software

The statistical evaluation software program, *Sanitas*™ or equivalent, will be utilized to statistically evaluate the inorganic groundwater data during detection monitoring. An equivalent software package may be utilized if it complies with the statistical procedures allowed under U.S. EPA and Ohio EPA regulations, policy, and guidance. The selected statistical methods contained within this StAP (i.e. parametric and nonparametric prediction limits) have been prepared following the recommendations contained in the March 2009 U.S. EPA document entitled "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance", where applicable. Current Ohio EPA regulations, guidance, policy, and standard practices for statistical evaluations have been applied to the groundwater monitoring data for the units monitored under the DMP. Any changes in statistical protocol will first be approved by the Ohio EPA before implementation. Per OAC Rule 3745-54-97(H), statistical evaluations will be performed on parameters listed in this StAP.

11.2.2 Background Data

~~Per OAC Rule 3745-54-98(G)(6), alternate source demonstrations (ASDs) have been submitted after each semiannual DMP sampling event since 1997 to address confirmed statistical differences, referred to as "statistically significant evidence of contamination (SSEC)" in OAC Rule 3745-54-98(F). An addendum demonstration for arsenic SSECs was also submitted for the 2010 first semiannual event. The ASDs concluded that the past SSECs were the result of natural variability across the units monitored under the DMP, not releases from the regulated units. Supporting this conclusion is the fact that no VOCs or SVOCs have been confirmed detected at or above the PQL at any DMP well.~~

In order to facilitate the reduction of statistical false positives and false negatives, and to comply with OAC Rule 3745-54-97(H), intra-well statistical methods, with resampling, will be utilized at the Facility. Per OAC Rule 3745-54-97(I)(6), since significant spatial and temporal variability exists across the units monitored under the DMP, intra-well statistical methods are best-suited for the StAP. Therefore, intra-well prediction limit analysis will be the statistical method applied to inorganic parameters collected at all DMP wells except upgradient wells that were used as background for historic inter-well statistics (indicated with "*" on **Table 7**). Upgradient wells are not required to be statistically evaluated under OAC Rule 3745-54-98. Separate statistical tests will be completed for each hazardous parameter as indicated in OAC Rule 3745-54-97(H).

Practical quantitation limits (PQLs) are taken from the approved November 1997 CMI QAPjP with the exception of PQLs that were at or above established National Primary Drinking Water Standards-Maximum Contaminant Levels (MCLs). Where achievable by the analytical laboratory, PQLs for these parameters (such as arsenic) have been revised to be below MCLs. In a few instances laboratory PQLs were above QAPjP PQLs. In these cases, PQLs for this Plan were updated to meet current laboratory PQLs. PQLs for DMP parameters are listed on **Table 11**. If a PQL ~~is lowered in the future~~ for aan inorganic statistical parameter~~, procedures and timing for updating~~ is lowered in the future, background will ~~follow Ohio EPA guidance described in~~be updated every two years until a minimum of eight routine observations are available at the ~~April 21, 2008 response to frequently asked questions (FAQs) posted on the following website or subsequent updates issued by Ohio EPA.~~new PQL.

Table 9 includes a summary of the statistical indicator parameters for each zone. Of the eight RCRA metals listed on **Table 9**, only dissolved arsenic and dissolved chromium were part of the previous approved indicator parameter list under the March 1994 DMP. ~~Therefore, sufficient~~Quarterly background ~~has only been collected~~data collection for the ~~dissolved arsenic~~ BTI and ~~chromium. A~~Channel Sand wells was completed in July 2014. The background ~~period of October 1997 through January 2010 will be~~periods used for dissolved arsenic, barium, cadmium, chromium, lead, mercury, selenium, and ~~dissolved chromium at~~silver are shown on the summary tables included in Appendix G for the Channel Sand wells and Appendix H for the BTI wells. An electronic data file containing groundwater data collected from October 1997 through ~~January 2010 is included in **Appendix F**. Once sufficient background is collected for dissolved barium, cadmium, lead, mercury, selenium, and silver at Channel Sand and BTI wells, the StAP will be updated to include outlier and trend evaluations, normality information, and statistical limits for each well/parameter combination. A revised database will then be provided on CD. Ohio EPA approval is necessary prior to implementation of new or revised statistical limits~~July 2014 is included in **Appendix F**.

As discussed in Section 10.4, the eight RCRA metals will be analyzed on a semiannual basis at Upper Sand and 880 Sand DMP wells and will be qualitatively evaluated for those zones in each semiannual report. In the event that the 62 indicator parameter VOCs used to statistically evaluate semiannual groundwater quality for the Upper Sand and 880 Sand Zones alone are deemed to no longer be effective for identifying a potential release of hazardous constituents from the regulated units, Ohio EPA may request that CECOS also begin statistically evaluating the eight RCRA metals analyzed semiannually for those zones (See **Table 9**). In accordance with the appendix to OAC

Rule 3745-50-51, such a change to the monitoring program would require that the Site submit a request for Ohio EPA approval to implement a Class 2 amendment to the Post-Closure Plan.

Prior to October 1997, six different analytical laboratories were used to analyze Aber Road Facility groundwater samples. These laboratories used different PQLs and methods based on instrument limitations. To provide more consistency with laboratory analytical and reporting practices, background for dissolved arsenic and dissolved chromium is being utilized beginning with the October 1997 event. Exygen Research (Exygen) was the analytical laboratory for the Aber Road Facility from October 1997 through January 2006. TestAmerica, Inc.-Buffalo (TestAmerica) was subsequently contracted as the analytical laboratory.

Metals analyzed by Exygen were reported down to the method detection limit (MDL) and PQLs were not listed in Exygen's analytical reports or in electronic data files. The PQLs during that period were based on the November 1997 QAPjP. Therefore, results between the MDL and PQL were flagged by Exygen as estimated with a "J" flag. The intra-laboratory PQLs were not listed in Exygen's analytical reports and may have varied somewhat between events or between samples due to multiple factors such as sample matrix affects, QA/QC, or instrument performance. For statistical purposes, estimated values will be treated as non-detect results at the QAPjP PQL and Exygen non-detects will be listed as <QAPjP PQL.

TestAmerica began analyzing Aber Road Facility samples in April 2006. Revisions to PQLs at the time of the laboratory switch are indicated in a February 14, 2006 CECOS document entitled Proposed Modifications to Quality Assurance Project Plan Corrective Measures Implementation, CECOS International, Inc., Aber Road Facility, Ohio and were approved by U.S. EPA in a letter dated March 10, 2006. In addition, based on discussions with Ohio EPA, the PQL for arsenic was lowered starting with the October 2010 event to be below the MCL.

~~New wells that were installed to optimize the DMP network, new wells that will be installed to replace a DMP well, and wells that were not previously part of the DMP network (880 Sand well MP-214BR and BTI well MP-237)~~New wells included in the DMP network will require a minimum of eight initial background observations (collected quarterly for two years) prior to initiating statistical evaluations for inorganic indicator parameters. This frequency will ensure independent samples are collected, in accordance with OAC Rule 3745-54-97(G)(1). Additional quarterly background events may be necessary if outliers are identified in the initial eight results for a well/constituent. These wells will be statistically evaluated for VOCs beginning with the first monitoring event following implementation of this Plan and/or the installation of the wells. Background will not be collected for VOCs.

11.2.3 Background Updates

Background data will be updated periodically to minimize the occurrence of false positive statistical results and increase statistical power. Updating the background will allow for a more accurate determination of the background mean and standard deviation for each well and parameter. Background updates will be performed by incorporating a minimum of four new observations into background.

The new background (previous background plus new observations) will be checked for statistically significant increasing trends. If a statistically significant increasing trend is identified, an evaluation will be performed to determine if the trend is due to a release from the facility. Background will not be updated in cases where a statistically significant trend has been identified unless it can be successfully demonstrated that the trend is not the result of a release of hazardous constituents from the facility.

Background updates will be cumulative and not based on a moving window unless a statistically significant trend is identified in the background data. If a statistically significant increasing trend is identified in the background data and concurrence from Ohio EPA has been received that the trend is not due to a release of hazardous constituents, then the background period may be based on a moving window. If a background statistical limit greater than an MCL is recalculated to a value below an MCL, the newer, lower limit will be used. If background for a well/parameter indicates a statistical downward trend, background may be truncated to include the newer, lower results and the statistical limit may decrease accordingly.

11.2.4 Statistical Tests

Future inorganic compliance data will be compared to prediction limits that are calculated using the background periods and methods and procedures presented herein. The data will be evaluated based on the percent of non-detects and the distributional properties of the background data. Historic dissolved arsenic results reported as non-detects at 10 ug/L were excluded from all statistical analyses prior to testing to ensure that potential outliers were not masked or prediction limits artificially inflated by the arsenic results reported at the higher PQL. Detections for dissolved arsenic were not excluded prior to outlier testing. Future organic compliance data will be compared to the PQL, which is considered the statistical limit. A confirmed VOC detection at or above the PQL will be considered an SSEC.

11.2.4.1 ~~Outliers~~Outlier Testing

~~Dissolved arsenic and chromium~~The statistical parameter data utilized for background purposes were evaluated for the presence of statistical outliers. ~~Methodologies for determining statistical outliers for wells/parameters with equal to or greater than 75% non-detects in the background dataset are defined in the Ohio EPA~~ Outlier testing was conducted using procedures in the Sanitas software based on USEPA guidance and the outlier identification process developed by the Ohio EPA Statistics Workgroup (Division of Drinking and Ground Waters) as documented in Ohio EPA Guidance Document ~~IP0406.101 – Procedure for DDAGW Review of Statistical Outliers and Trends in a Background Demonstration or Update for a DHWM Facility. **Table 12** summarizes the evaluation of background results detected above the current PQL for datasets~~ 0715 (DSIWM) dated September 12, 2012. For parameters comprised of ~~equal to or greater than 75% non-detect data, including a listing of results that have been determined to be outliers and thus excluded from background.~~

~~Prior to performing outlier testing on wells/parameters with~~ less than 75% ~~non-detects in~~ nondetect background data, the Sanitas software screens each well and parameter for suspected outliers using the ~~background dataset, professional judgment and time series plots were employed to identify visually anomalous data that should not be used in background.~~

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~~Data were then pre-screened using the~~ USEPA 1989 ~~EPA~~ outlier test ~~at an alpha of~~ using a 0.05 ~~to evaluate potential outlying results. For future outlier tests, other appropriate Ohio EPA Guidance methods may also be used to screen for outliers. Following the screening,~~ fixed level of significance. Suspected outliers identified by the software using this method are then tested using Dixon's or Rosner's outlier test depending on the total number of background results. Outlier testing is conducted for inorganic parameters using Dixon's outlier test ~~was used (alpha = 0.01) when background was comprised of less than or equal to~~ for parameters with 22 ~~observations and~~ results or less or Rosner's outlier test ~~was used (alpha = 0.01) when background was comprised of~~for parameters with greater than 22 ~~observations.~~ results. Outlier testing performed using Dixon's/ or Rosner's ~~outlier evaluation results for~~test is performed at the ~~BTI Zone are located on the CD provided in **Appendix F**.~~ 0.01 level of significance. The Dixon's/ or Rosner's ~~outlier evaluations were not completed for the Channel Sand since dissolved arsenic and dissolved chromium at well MP-281C (the~~ testing is used only ~~well currently statistically analyzed in the Channel Sand) had greater than~~ for data sets comprised of less than 75% nondetect data. For any data set comprised of 75% or greater nondetect data, Dixon's/Rosner's outlier tests are not performed. In this instance, the Ohio EPA "Rare Detect" outlier identification procedure for data sets comprised of 75% ~~non-detects. Professional judgment was utilized when examining the~~ or greater nondetect data is followed. The following procedures developed by Ohio EPA is used to conduct outlier ~~test results to determine which data to exclude from background~~testing for this facility.

Dixon's/Rosner's Outlier Test

1. The facility will provide a listing of identified outliers based on the results of Dixon's/Rosner's test (for data sets comprised of less than 75% nondetect data) within the statistical program document for the facility, which will be submitted each time background is updated or a new well is added to the program.

2. Based on the results of the outlier test, any outlier identified will either be excluded from background or documentation will be presented within the statistical program that provides justification for retaining the result.

Ohio EPA Rare-Detect Outlier Test

1. The facility will provide a listing of identified outliers based on the results of the Rare-Detect outlier test (for data sets comprised of greater than or equal to 75% nondetect data) within the statistical program document for the facility, which will be submitted each time background is updated or a new well is added to the program.

2. Based on the results of the Rare-Detect outlier test, any outlier identified will either be excluded from background or documentation will be presented within the statistical program with justification for retaining the result.

3. For parameters comprised of greater than or equal to 75% nondetect data, the following procedure developed by Ohio EPA for Rare-Detect parameters will be used:
   a. When censored data are ≥ 75%:

i. If there is only a single detection ≥ the PQL;
   a. And detections ≥ the MDL are ≥ 50%, then any result ≥ 2 times the /current PQL will be identified as a potential outlier.
   b. And detections ≥ the MDL are < 50%, then any result ≥ current PQL will be identified as a potential outlier.

ii. If there are at least 2 detections ≥ the PQL:
   a. And detections ≥ the MDL are ≥ 50%, then any result ≥ 3 times the current PQL will be identified as a potential outlier.
   b. And detections ≥ the MDL are less than 50%, then any result ≥ 2 times the current PQL will be identified as a potential outlier.

Table 12 is a summary of the outlier evaluation that provides the results of Dixon's or Rosner's test and an evaluation of detected results above the current PQL for data sets comprised of 75% or greater nondetect data. The results to be excluded as outliers are labeled with a "Yes" on **Table 12** and the results that will not be excluded are labeled with a "No[1]". Justification for retaining results labeled with a "No[1]" on **Table 12** for parameters with greater than or equal to 75 % nondetect data is based on the result not being identified as an outlier following the Ohio EPA Rare Detect outlier test. All results determined to be outliers in accordance with the outlier testing procedure described above were set as outliers and excluded from the statistical analyses. The outlier testing results from Sanitas are located on the CD provided in **Appendix F**.

11.2.4.2 Trend Testing

After performing outlier testing, statistical trend evaluations were performed on the entire updated or newly established background data set for each parameter at each sample location. Trend evaluations were performed at a 0.01 level of significance (per tail) for each well/parameter using the Sen's Slope/Mann Kendall trend test (see CD in **Appendix F**). ~~Dissolved arsenic and chromium~~The time periods tested for trends are those listed on the summary tables included in Appendix G (Channel Sand Wells) and Appendix H (BTI ~~wells did not exhibit~~Wells). Based on the trend testing, there were statistically significant upward trends ~~when utilizing data from October 1997 through January 2010.~~for barium at BTI well MP-238R and for arsenic at Channel Sand Well MP-406C. Each of the trends is slight and the concentrations are consistent with other wells that monitor the same zone.

~~Outlier evaluations will be completed for new downgradient wells in the Channel Sand and BTI once at least eight requisite background samples are collected. Outlier summaries for existing Channel Sand and BTI wells will be updated with information for new DMP statistical parameters dissolved barium, dissolved cadmium, dissolved lead, dissolved mercury, dissolved selenium, and dissolved silver once at least eight background results are collected for each well. Similarly, BTI well MP-237 is an existing well that has not previously been part of the DMP network. Once at least eight background samples are collected for MP-237, an outlier summary will be created for this well.~~

~~11.2.4.2 Non-Detects~~

~~In order to determine the appropriate substitution method for inorganic non-detect results, the proportion of non-detect data within background will be evaluated. The following substitution methods will be used based on the proportion of non-detect results in background:~~

- ~~If non-detects are ≤ 15 percent, then non-detects will be replaced with one-half the PQL prior to performing the evaluation;~~
- ~~If non-detects are > 15 percent and ≤ 50 percent, then the data's sample mean and standard deviation will be adjusted according to the Kaplan-Meier technique; and~~
- ~~If non-detects are > 50 percent, or the background dataset does not follow a normal distribution, a non-parametric prediction limit test will be used.~~

11.2.4.3 Distribution

Per OAC Rule 3745-54-97(I)(1), tests of normality will be conducted to assess the distribution of groundwater concentration data to ensure that the statistical method used is appropriate for the distribution. Shapiro-Wilk normality testing will be used ~~for sample datasets with fifty or fewer samples. Shapiro-Francia normality testing will be used for sample datasets with greater than fifty samples. These normality tests were implemented with a Type I error rate of $\alpha = 0.1$ where $n < 10$, $\alpha = 0.05$ where $10 \leq n < 20$, and $\alpha = 0.01$ where $n \geq 20$.~~with a Type I error rate of $\alpha = 0.01$. Original or transformed data (via ladder of powers) that are not normally distributed will be analyzed using non-parametric methods. In those instances where the background data are not normally distributed, the following data transformations may be used to construct the prediction limits depending on the data transformation (W statistic) that is determined to be normally distributed: untransformed, $x^{1/2}$, x^2, $x^{1/3}$, x^3, ln(x), x^4, x^5, and x^6. Using the "Ladder of Powers" function, the first data transformation that passes normality testing, starting with untransformed data, is utilized for calculating the parametric prediction limit.

In order to determine the appropriate substitution method for inorganic non-detect results, the proportion of non-detect data within background will be evaluated. The following substitution methods will be used based on the proportion of non-detect results in background:

- If non-detects are ≤ 15 percent, then non-detects will be replaced with one-half the PQL prior to performing the evaluation;
- If non-detects are > 15 percent and ≤ 50 percent, then the data's sample mean and standard deviation will be adjusted according to the Kaplan-Meier technique; and
- If non-detects are > 50 percent, or the background dataset does not follow a normal distribution, a non-parametric prediction limit test will be used.

Normality test results are detailed on the prediction limit summary tables located on the CD in **Appendix F** and the conclusions regarding normality are indicated under the "Method" and "Transform" columns on the prediction limit summary tables. If the data passed the normality test, the summary tables show a parametric prediction limit method was used. If transformations were needed to achieve normal data sets these are listed on the tables.

~~The parametric prediction limit summary tables include the normality test used, the W statistic, and the W quantile for parameters passing the normality tests.~~ The tables also list cases where non-parametric tests were used because normality testing failed (indicated as

"NP Normality"). If greater than 50 percent of the observations are below the PQL, a non-parametric test was used and normality testing was not needed.

Normality results for intra-well statistical evaluations of the Channel Sand and BTI Zones, as well as intra-well prediction limits, are also included in tabular format in **Appendices G** and **H**, respectively. The percentage of non-detects listed on the tables provided in **Appendices G** and **H** were calculated after outliers were removed.

Note that normality tables were not included for upgradient wells since these wells are not required to be statistically evaluated. Since the Upper Sand and 880 Sand wells are being statistically evaluated for VOCs only, normality tables for these wells are not applicable.

~~Normality tables will be completed for new downgradient wells in the Channel Sand and BTI once the eight requisite background samples are collected. Normality tables for existing Channel Sand and BTI wells will be updated with information for new DMP statistical parameters dissolved barium, dissolved cadmium, dissolved lead, dissolved mercury, dissolved selenium, and dissolved silver once eight background results are collected for each well. Similarly, BTI well MP-237 is an existing well that has not previously been part of the DMP network. Once eight background samples are collected for MP-237, a normality table will be created for this well.~~

11.2.4.4 Prediction Limit

The prediction limit is a statistical method used to compare a single observation to a group of observations. The prediction limit is calculated to include observations from the same population with a specified confidence that is protective of human health and the environment, pursuant to OAC Rule 3745-54-97(I)(4). In groundwater monitoring, a prediction limit approach may be used to make comparisons between background and compliance data. The limit is developed to contain all future observations, within a certain probability. The general equation for a prediction limit is:

$$PL = x + Ks$$

where x is the sample mean in background, s is the background standard deviation, and K is a multiplier depending on the type of prediction limit under construction. For the Aber Road Facility, intra-well prediction limits have been developed based on a 99% confidence that future observations will fall within the range. Per OAC Rule 3745-54-97(I)(4), prediction limits are based on the number of samples in the background database, data distribution, and the range of concentration values for each constituent. If any future observation exceeds this limit, this is considered statistically significant evidence that the observation is not representative of the background set. Statistical calculations are based on the March 2009 U.S. EPA Unified Guidance.

Prediction limits for ~~dissolved arsenic and dissolved chromium for Channel Sand and BTI wells with sufficient background data are listed on the tables in **Appendices G** and **H**, respectively. Note that in determining the K for calculating the parametric prediction limit for dissolved arsenic at BTI well MP-280 (**Appendix H**), the total number of site-wide comparisons was conservatively set based on the current number of existing BTI wells with sufficient background data for dissolved arsenic and chromium. This limit will be updated in the future as new wells are installed and background data collection is~~

~~completed. All other Channel Sand and BTI wells in the DMP exhibit non-parametric prediction limits for dissolved arsenic and dissolved chromium due to greater than 50% non-detects or data that could not be transformed to achieve a normal distribution.~~each Channel Sand and BTI Well for the eight dissolved metals are listed on the tables included in **Appendices G** and **H**, respectively.

During parametric prediction limit evaluations, the mean and the standard deviation are calculated for the raw or transformed background data. The number of comparison observations is defined to be included within the lower and upper limits. During nonparametric evaluations, the highest value from the background data is used to set the upper limit of the prediction limit. If background is 100% non-detect, the most current PQL in background will be the prediction limit, and a result equal to or above the PQL will be considered an SSEC.

Included in each statistical analysis report will be a summary of the prediction limits calculated from the background data for each well/parameter. The summary tables define the background sample size, mean, standard deviation, background distribution for each parameter, any transformations applied to specific parameters, and the proportion of non-detects. SSECs will be summarized in a table in the statistical report.

11.2.5 Statistical Power of Evaluation Methods

Under the March 2009 Unified Guidance, the statistical power of the prediction interval is dependent on the frequency of monitoring events, the number of compliance wells in the hydrogeologic unit of interest, the number of constituents being evaluated, the background sample size, and the selected resampling scheme.

The groundwater DMP at the site incorporates constituents that are monitored semiannually. Of the proposed DMP network, there are currently ~~1 well~~2 wells statistically evaluated in the Channel Sand and ~~11~~16 wells statistically evaluated in the BTI with sufficient background data to perform statistical analyses. The wells are ~~currently~~ statistically evaluated for ~~two of the~~ eight inorganic constituents (dissolved arsenic~~ and dissolved~~, barium, cadmium, chromium, lead, mercury, selenium, and silver). The DMP will utilize a "1-of-2" verification resampling scheme, as described in Section 11.2.7.

For the Channel Sand zone, using the lowest number of background observations (n = ~~26), 1~~ 8), 2 downgradient ~~well, 2~~wells, 8 constituents, and a 1 of 2 resampling protocol, parametric intra-well prediction ~~intervals~~limits provide approximately ~~99~~75% annual power at three standard deviations and ~~100~~95% annual power at four standard deviations, while non-parametric intra-well prediction ~~intervals~~limits provide approximately ~~70~~80% annual power at three standard deviations and ~~90~~95% power at four standard deviations. ~~This exceeds the U.S. EPA recommended power of 55% at three standard deviations and 80% at four standard deviations.~~
~~For the BTI zone, using the lowest number of background observations (n = 23), 11 downgradient wells, 2 constituents, and a 1 of 2 resampling protocol, parametric intra-well prediction intervals provide approximately 90% annual power at three standard deviations and 100% annual power at four standard deviations, while non-parametric intra-well prediction intervals provide approximately 70% annual power at three standard deviations and 90% power at four standard deviations.~~ This exceeds the U.S. EPA-recommended power of 55% at three standard deviations and 80% at four standard deviations.

For the BTI zone, using the lowest number of background observations (n = 8), 16 downgradient wells, 8 constituents, and a 1 of 2 resampling protocol, non-parametric intra-well prediction limits provide approximately 80% annual power at three standard deviations and 95% annual power at four standard deviations, while parametric intra-well prediction limits provide approximately 20% annual power at three standard deviations and 65% power at four standard deviations. The power curve charts for the non-parametric prediction limits exceed the U.S. EPA-recommended power of 55% at three standard deviations and 80% at four standard deviations. It was not unexpected that the statistical power for intrawell parametric prediction limits for wells and parameters with newly established background periods would be below the U.S. EPA-recommended power of 55% at three standard deviations and 80% at four standard deviations and the SWFPR will be conservatively higher than desired due to the initial number of background samples available at this time. However, statistical power will increase and the SWFPR will decrease once additional background observations are available. The 1-of-2 retesting strategy and limited number of statistically evaluated parameters implemented at the site will assist in reducing the SWFPR.

Statistical power curve graphs demonstrating the above are presented in **Appendix I**. For comparison purposes, U.S. EPA reference power curves are also plotted on the graphs presented in **Appendix I**.

Parametric and non-parametric statistical power curves will be submitted with each background update.

The facility will utilize a site-wide false positive rate (SWFPR) goal of 10% per year, or 5% per monitoring event, as recommended in the March 2009 Unified Guidance, to allow for a balance between the overall cumulative false positive error rate and statistical power. ~~Statistical analysis for parameters without sufficient background will begin once a minimum of eight background observations are available for a given statistical parameter (excluding outliers). Statistical power for parameters with newly established background will be below the U.S. EPA recommended power of 55% at three standard deviations and 80% at four standard deviations and the SWFPR will be conservatively higher than desired due to the number of background samples that will be available at that time. However, statistical power will increase and the SWFPR will decrease once additional background observations are available. The 1-of-2 retesting strategy and limited number of statistically evaluated parameters implemented at the site will assist in reducing the SWFPR.~~

11.2.6 Volatile Organic Compounds

The statistical limit for VOCs will be set equal to the current PQL for the respective parameter (See **Table 11**). A confirmed VOC detected at or above the PQL will be considered an SSEC. **Table 11** lists the MCLs for each DMP VOC. The PQLs for the DMP VOCs are equal to or below applicable MCLs.

The strategy for determining an SSEC for a VOC in a DMP well will be based on the following procedural steps:

1) The laboratory analytical report of the groundwater sample results will undergo a data review. The review will include checking holding times and evaluating QA/QC blanks for the presence of contaminants. A list will be made of VOCs with a

TABLES

TABLE 4. ANALYTICAL TEST METHODS - F039 LEACHATE
CECOS ABER ROAD FACILITY

Constituent	Test Method[4]
Semivolatile Organics	8270~~C~~D [2]
Fluoride	300.0 [1]
Cyanide	335.4 [1]
Arsenic	6010~~B~~C [2]
Barium	6010~~B~~C [2]
Cadmium	6010~~B~~C [2]
Chromium	6010~~B~~C [2]
Lead	6010~~B~~C [2]
Mercury	7470A [2]
Selenium	6010~~B~~C [2]
Silver	6010~~B~~C [2]
Phenol	8270~~C~~D [2]
Total Organic Carbon (TOC)	~~SM 5310D~~ [3]9060A
Total Organic Halides (TOX)	9020B [2]
Volatile Organic Compounds	8260~~B~~C [2]
Pesticides and PCBs	8081~~A~~B/8082A [2]
2,4-D	8151A [2]
2,4,5-TP (Silvex)	8151A [2]
Dioxins and Dibenzofurans	8280A [2]
TCLP Procedure	1311C [43]

Notes:

1. MCAWW = "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020
2. SW-846 = USEPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods"
3. ~~SM = "Standard Methods for the Examination of Water and Wastewater"~~
4~~3~~. OAC 3745-51-24 Appendix.
4. Subject to change with routine method revisions.

TABLE 10. DMP PARAMETERS SAMPLING AND ANALYSIS REQUIREMENTS CECOS ABER ROAD FACILITY

Constituent	Container and Preservation[5]	Analytical Method Number[6]	Holding Time
Volatile Organic Compounds (VOCs)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8260~~B~~C	14 days
1,2-Dibromo-3-chloropropane (DBCP) and 1,2-Dibromoethane (EDB)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8011	14 days
Arsenic, Dissolved	1 P-250 ml field filtered, HNO_3 to pH <2	6020A	6 months
Barium, Dissolved		6010~~B~~C	
Cadmium, Dissolved		6010~~B~~C/6020A	
Chromium, Dissolved		6010~~B~~C	
Lead, Dissolved		6010~~B~~C/6020A	
Selenium, Dissolved		6010~~B~~C/6020A	
Silver, Dissolved		6010~~B~~C/6020A	
Mercury, Dissolved	1 P-250 ml field filtered, HNO_3 to pH <2	7470A	28 days

Notes:

1. G = Glass, P = Polyethylene, PTFE = Polytetrafluoroethylene (Teflon), HCL = hydrochloric acid, HNO_3 = nitric acid
2. The four-digit method references in Table 10 are from SW-846 and EPA.
3. Pre-preserved containers provided by analytical laboratory.
4. Field parameters (ORP, pH, specific conductance, temperature, and turbidity) are not preserved and measurements are taken immediately.
5. Subject to change based on method revisions and laboratory requirements
6. Subject to change with routine method revisions

TABLE 15. APPENDIX IX PARAMETERS SAMPLING AND ANALYSIS REQUIREMENTS CECOS ABER ROAD FACILITY

Constituent	Container and Preservation[4]	Analytical Method Number[5]	Holding Time
Volatile Organic Compounds (VOCs)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8260~~B~~C	14 days
1,2-Dibromo-3-chloropropane (DBCP) and 1,2-Dibromoethane (EDB)	3 G-40 ml, PTFE-lined septum, HCl to pH <2, cool	8011	14 days
Semi-Volatile Organic Compounds (SVOCs)	2 G-~~1000~~250 ml, PTFE-lined lid, cool	8270~~C~~D	7 days to extraction, 40 days for analysis
Organochlorine Pesticides	2 G-~~1000~~250 ml, PTFE-lined lid, cool	8081A~~B~~	7 days to extraction, 40 days for analysis
Polychlorinated Biphenyls (PCBs)	2 G-250 ml, PTFE-lined lid, cool	8082A	7 days to extraction, 40 days for analysis
Organophosphorus Pesticides	2 G-~~1000~~250 ml, PTFE-lined lid, cool	8141A	7 days to extraction, 40 days for analysis
Herbicides	2 G-1000 ml, PTFE-lined lid, cool	8151A	7 days to extraction, 40 days for analysis
Antimony, Dissolved	1 P-250 ml field filtered, HNO_3 to pH <2	6020A	6 months
Arsenic, Dissolved		6020A	
Barium, Dissolved		6010~~B~~C	
Beryllium, Dissolved		6010~~B~~C	
Cadmium, Dissolved		6010~~B~~C/6020A	
Chromium, Dissolved		6010~~B~~C	
Cobalt, Dissolved		6010~~B~~C	
Copper, Dissolved		6010~~B~~C	
Lead, Dissolved		6010~~B~~C/6020A	
Nickel, Dissolved		6010~~B~~C	
Selenium, Dissolved		6010~~B~~C/6020A	

TABLE 15. APPENDIX IX PARAMETERS SAMPLING AND ANALYSIS REQUIREMENTS, CONTINUED
CECOS ABER ROAD FACILITY

Constituent	Container and Preservation[4]	Analytical Method Number[5]	Holding Time
Silver, Dissolved	1P-250 ml field filtered, HNO_3 to pH <2	6010~~B~~C/6020A	6 months
Thallium, Dissolved		6010~~B~~C	
Tin, Dissolved		6010~~B~~C	
Vanadium, Dissolved		6010~~B~~C	
Zinc, Dissolved		6010~~B~~C	
Mercury, Dissolved	1 P-~~1000~~250 ml field filtered, HNO_3 to pH <2	7470A	28 days
Cyanide, Total	1P-250 ml, NaOH, cool	9012~~A~~B	14 days
Sulfide, Total	1 P-250 ml, Zinc Acetate & NaOH, cool	SM 4500 S2 D	7 days

Notes:

G = Glass, P = Polyethylene, PTFE = Polytetrafluoroethylene (Teflon), HCL = hydrochloric acid, HNO_3 = nitric acid, NaOH = sodium hydroxide

1. The four-digit method references in Table 15 are from SW-846 and EPA.
2. Pre-preserved containers provided by analytical laboratory.
3. Field parameters (ORP, pH, specific conductance, temperature, and turbidity) are not preserved and measurements are taken immediately.
4. Subject to change based on method revisions and laboratory requirements
5. Subject to change with routine method revisions.