Long-term Stewardship Plan
Final

Sheffield Former Hazardous Waste Facility
Sheffield, Illinois

for
US Ecology

July 28, 2020

GeoEngineers
Earth Science + Technology

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File No. 19730-002-00

July 28, 2020

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1.0 INTRODUCTION

The Long-term Stewardship Plan (LTSP) represents the approach to be used for managing subsurface contamination at the US Ecology Sheffield facility near Sheffield, Illinois (Figure 1, Vicinity Map). The LTSP follows corrective actions completed under a US Environmental Protection Agency (USEPA) Administrative Order by Consent (AOC) (USEPA 1985). This LTSP describes the ongoing monitoring, evaluation, maintenance and periodic repairs that will be conducted at the facility and also lays out a framework for decision-making should further corrective action be needed for the remaining contamination.

1.1. Site Description and Regulatory History

The US Ecology Sheffield site is a 46-acre permitted hazardous waste facility that operated from 1968 to 1983. The facility includes two hazardous waste landfills referred to as the Old Chem Site and New Chem Site (Figure 2, Site Layout). A closed 20-acre, low-level radioactive waste (LLRW) facility owned and monitored by the state of Illinois is adjacent to the facility and lies within the property owned by US Ecology but is not considered a part of this LTSP. During operations, the US Ecology facility accepted industrial, laboratory and agricultural hazardous wastes. Approximately 165,000 cubic yards (cy) of waste were reportedly disposed at the two landfills (93 percent at the New Chem Site). The Old Chem Site consists of six disposal trenches covering about 6 acres. The New Chem Site consists of 19 clay-lined burial cells covering approximately 40 acres.

In 1985, the facility was subject to an AOC administered by the USEPA under the Resource Conservation and Recovery Act (RCRA). The AOC required (1) investigation of potential site releases that could adversely affect human or environmental health through exposure to hazardous contaminants (primarily volatile organic compounds [VOCs]); (2) evaluation of alternatives to address exposure pathways; and (3) implementation of corrective actions that would protect people and the environment.

Subsequent corrective actions included containment of remaining on-site waste, and groundwater extraction and treatment to address a contaminated groundwater plume in the shallow aquifer beneath the facility. To contain the waste, portions of the landfill were isolated by constructing subsurface barrier walls to divert groundwater away from the cells, followed by capping the landfill surface in 1994. After the initial source control actions, additional groundwater remediation systems were installed in several phases including groundwater extraction and treatment, and in situ treatment by an air-sparging/soil vapor-extraction (AS/SVE) system. Various modifications were made to the remediation systems over the years to optimize performance. In 2006, an injection system was added around some of the AS/SVE wells to further degrade VOC compounds present in groundwater. In 2009, an AS/SVE system was installed to address ongoing regulatory exceedances in seeps along the north side of the landfill.

US Ecology applied for a post-closure permit with Illinois EPA (IEPA) on October 24, 2008. IEPA and USEPA agreed that all future post-closure activities would be carried out under the 1985 USEPA AOC (January 21, 2010 correspondence from USEPA); however, IEPA issued a post-closure permit to US Ecology on March 18, 2010. The IEPA permit required preparation of a post-closure plan for the site and ongoing environmental monitoring for at least 30 years from the September 30, 1996 closure certification date. The IEPA permit also required the facility to follow the post-closure plan associated with the September 30, 1985 AOC between USEPA and US Ecology.

The post-closure groundwater and surface water monitoring program was approved by the USEPA on July 1, 2009 following inclusion of additional groundwater monitoring wells identified in USEPA's response-to-comments (RTC) document for the facility dated October 1990. This program has been conducted from 2009 to the present and forms the basis of the post-closure plan (Appendix A) also required under the IEPA permit.

More than 25 years of groundwater monitoring data have been collected since the initial remedial systems were installed, with VOCs comprising the primary contaminants of concern (COCs). VOC concentrations have declined over time, demonstrating that natural attenuation is occurring, and leading to decommissioning of the on-site wastewater treatment plant in 2013. Other treatment systems were decommissioned as corrective action goals were achieved.

Investigations of site-specific geological conditions have shown the shallow, contaminated aquifer is sufficiently isolated from the deeper water-bearing zone which provides regional drinking water. Site hydrogeology is well known with most of the shallow groundwater discharging to a local surface water feature (Trout Lake) formed by historical coal mining activity. Surface water monitoring results have shown the contaminated groundwater plume does not appear to be impacting Trout Lake, which serves as the point of compliance (POC) for this LTSP.

In 2019, a conceptual site model (CSM) was prepared at USEPA's request for the Sheffield facility to support USEPA decisions regarding long-term site management (GeoEngineers 2019). The information presented in the CSM set the stage for current negotiations between USEPA and US Ecology regarding the elements of an AOC that will govern the long-term care of the facility. This LTSP will be required by the AOC and describes:

- How the facility will be cared for over time,
- How remedy performance will be gauged and problems identified,
- How additional corrective actions would be developed, and
- What those actions may entail.

2.0 LONG-TERM STEWARDSHIP PROGRAM

Long-term stewardship incorporates monitoring of engineering controls and certifying institutional controls to ensure continued performance and site integrity. Environmental monitoring is conducted to demonstrate the effectiveness of existing source controls and support site management decisions regarding performance. Inspections, maintenance and minor repairs are performed to maintain site integrity. Deed restrictions have been filed with the county to ensure the continued land use associated with the landfill.

2.1. Engineering Controls

Engineering controls (i.e., source controls) are designed to control releases of remaining primary or secondary contamination at the facility. Primary contamination is the original waste material contained in the disposal cells and trenches; secondary contamination represents contaminated environmental media (e.g., groundwater) that may migrate from the disposal cells and trenches or former treatment areas.

Engineering/source controls at the facility include:

- Vegetated landfill caps
- Containment/barrier walls
- Leachate collection system
- Stormwater drainage
- Fencing and site-access controls

These elements are managed by (1) long-term monitoring and (2) regular inspections and maintenance, as described in further detail below:

2.1.1. Long-term Monitoring

Long-term monitoring references the current IEPA post-closure program (Appendix A), with modifications discussed in the following sections. The monitoring program will support:

- Identifying contaminated groundwater migration beyond the facility boundary,
- Evaluating groundwater plume stability through COC attenuation,
- Mapping changes to the groundwater flow path,
- Assessing surface water quality at the POCs in Trout Lake,
- Confirming integrity of the engineering/source controls,
- Certifying institutional controls and deed restrictions, and
- Planning contingency actions.

The monitoring program will include collecting and analyzing groundwater and surface water samples, measuring static water level and mapping groundwater contours. In addition, the monitoring program will support USEPA oversight activities including observation of sampling activities, independent collection of samples and inspection of engineering/source controls.

2.1.1.1. Groundwater and Surface Water Chemical Monitoring

The long-term groundwater monitoring program will use portions of the current IEPA post-closure program well array in addition to some wells monitored by other programs. Two surface sampling locations in Trout Lake comprise the POC for the groundwater monitoring program.

Groundwater and surface water sampling protocols will be the same as those followed under the current IEPA post-closure monitoring program with minor modifications. The proposed groundwater and surface water monitoring program approach and rationale is provided in the attached Table 1, Summary of Proposed Post-Closure Care Monitoring Program and Rationale. Monitoring well locations are shown in Figure 3, Long-term Stewardship Program Monitoring Locations. The sampling locations and well type designations are described below.

- Twelve wells (identified in the IEPA post-closure program as boundary, guard and plume wells) will be sampled for the LTSP monitoring program along with two Trout Lake shoreline wells (part of the State of Illinois' radiologic monitoring program). The well designations are discussed below and are included in Table I, Monitoring Well Designations shown below.

- Boundary wells are situated downgradient of the Old Chem and New Chem landfill units to assess whether site-generated contamination is migrating towards the facility boundaries. Note: In general, shallow groundwater flows from south to north; however, the presence of the subsurface barrier walls diverts and splits this northerly flow to the northwest and east.
- Guard wells are located to the east between the disposal cells and Trout Lake and are intended to provide an early warning of contaminant migration towards and possible impacts to the lake.
- Plume wells are located within the historical path of the VOC plume. Analytical data are used to evaluate plume stability and concentration trends.
- The two shoreline wells will be used to monitor groundwater-surface water interactions downgradient of the guard wells.
- The wells will be sampled in the spring and fall of each year (an approximate sampling schedule will be provided to USEPA in advance of sampling). The frequency may be reduced if contaminant concentrations continue to decline or remain stable. Sampling frequency will be evaluated each year during the annual report preparation and a request for a reduction, if warranted, will be made in the annual reporting process.

TABLE I. MONITORING WELL DESIGNATIONS

Boundary Well	Guard Well	Groundwater-Surface Water Interaction Well	Plume Well
G-160	591	211	G-165
G-162	592	570	G-166
--	600	–	G-168
--	–	–	547
--	–	–	564
--	–	–	575
--	–	–	594

- Six additional wells from historical investigations will be monitored as part of a 5-year review cycle to assess the long-term effectiveness of the original corrective actions. These wells, shown on Figure 3 and in Table II, 5-year Cycle Monitoring Wells, shown below, have historically had few, if any, COC criteria exceedances. The locations were selected to be close to various source control structures and will be used to confirm the effectiveness of these source controls provided by the original corrective actions.

TABLE II. 5-YEAR CYCLE MONITORING WELLS

Upgradient of Trench 18	Downgradient of Old Chem Site
G-142	G-148
G-192	G-149
–	G-155
–	G-156

- Water level measurements will be collected in each well sampled during a given monitoring event.
- To assess whether Trout Lake gains/intercepts groundwater or loses water into the surrounding sediments, eight established monitoring wells located along the shoreline and used in the Illinois Emergency Management Agency (IEMA) radiological monitoring program were surveyed and added to the current monitoring well network for static water level measurements in the spring and fall (Figure 4, Shoreline Monitoring Well Locations for Lake Gain/Loss Assessment). Preliminary water levels measured on June 26, 2019 indicate that upland groundwater is discharging to the lake (i.e., the lake level is lower than the well elevations). This single observation will be confirmed by four additional measurements during scheduled monitoring events (i.e., 2 years of data). Once the gain/loss is confirmed, static water level measurements in shoreline wells will cease, except for those that undergo chemical monitoring.
- Trout Lake surface water will continue to be sampled as the facility POC. An additional sampling location (S-502) along the shoreline southeast of S-501 will be added to the program to confirm continued compliance. The two surface water sampling locations are shown on Figure 3.
- The groundwater and surface water samples will be analyzed for COCs, indicator chemicals and metals provided below. Indicator chemicals and metals will be used to potentially discern the presence of landfill waste; however, many of the indicator chemicals may also be present due to the historical coal mining. Details of the laboratory analytical protocol are discussed in the Quality Assurance Project Plan (QAPP) included in Appendix B. Analyses will include:
    - VOCs (1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethane [EDC], 1,2-dichloropropane, benzene, chloroform, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene [PCE], trans-1,2-dichloroethene, trichloroethene [TCE] and vinyl chloride – USEPA Method 8260B
    - Metals (iron, magnesium, manganese) — USEPA Method 6020A
    - Total solids -- SM 254B-1991
    - Dissolved solids — SM 2540C
    - Chloride and sulfate – USEPA Method 300.0
- In addition, physical parameters such as pH and turbidity will be measured to help with monitoring data interpretation.
- Inorganic parameters will be reported on both a total (i.e., results for a whole sample) and dissolved concentration basis. Organic COCs will be analyzed on whole water samples. Total concentrations of COCs will be used for compliance and in trends analyses. The evaluation approach is described in the next section.

US Ecology recognizes that emerging COCs (e.g., perfluoroalkyl substances) may be present at the site. As the methods and technologies to detect and monitor new contaminants are developed and approved for regulatory use, additional COCs may be measured at the POC. However, given the containment of historical sources, attenuation of the groundwater plume and lack of VOC detections at the POC in the lake since 2003 (and never any exceedances), it is unlikely that an emerging contaminant of concern would impact the lake, should they be present in the plume.

2.1.1.2. Evaluation Approach

Groundwater and surface water monitoring data will be evaluated in different ways, depending on the purpose (i.e., compliance, source control effectiveness, rates of natural attenuation, groundwater-surface water interactions) of the sampling locations described below. Contaminant trends will be evaluated using statistical techniques to determine the presence and significance of change in contaminant concentrations over time.

- Trout Lake Point of Compliance

  Analytical results detected within a given monitoring event from surface water samples will be directly compared to USEPA Region 4 surface water screening values, as provided in Table III, Surface Water Screening Levels, shown below. Contaminants of concern have rarely been detected in surface water, so trends analysis will not be performed for these samples.

TABLE III. SURFACE WATER SCREENING LEVELS

Contaminant of Concern	Region 4 Surface Water Screening Values (µg/L)
Benzene	160
Chloroform	140
1,1-Dichloroethane	410
1,1-Dichloroethene	130
EDC	2,000
cis-1,2-Dichloroethene	620
trans-1,2-Dichloroethene	558
1,2-Dichloropropane	520
Methylene chloride (aka dichloromethane)	1,500
PCE	53
TCE	220
Vinyl chloride	930

Note:

µg/L = micrograms per liter

- Boundary and Guard Wells

  Analytical results from boundary and guard wells detected above their respective practical quantitation limit will be directly compared to USEPA Region 4 surface water screening values. COCs exceeding screening levels for more than two consecutive monitoring events will be evaluated for trends over time.

  Concentrations of PCE and TCE have varied over time in the guard wells such that trends will continue to be evaluated. Trends in indicator chemicals and metals at each well and correlations among COCs and other chemical and physical parameters will also be evaluated to interpret changes in PCE and TCE trends, as needed. However, the site exists within a former coal mining area, which may have affected typical groundwater conditions and thus relationships among chemical parameters.

- Plume Wells

  Concentrations reported from whole/total sample analyses will continue to be evaluated using monitoring data compiled since 1999 to evaluate ongoing attenuation trends in these wells.

These trends will be used to evaluate the long-term effectiveness of the corrective actions and support site management decisions, including the need for additional corrective actions.

- Groundwater-Surface Water Interaction (GSI) Sampling Locations

  Collection of GSI samples is a new component of the LTSP. Data collected at wells 570, 211 and surface water compliance sampling points S-501 and S-502 will be tracked over time. When sufficient data are available, correlation and regression analyses may be performed for COCs detected at both the GSI wells and the POCs in Trout Lake to determine if upland groundwater is impacting surface water quality.

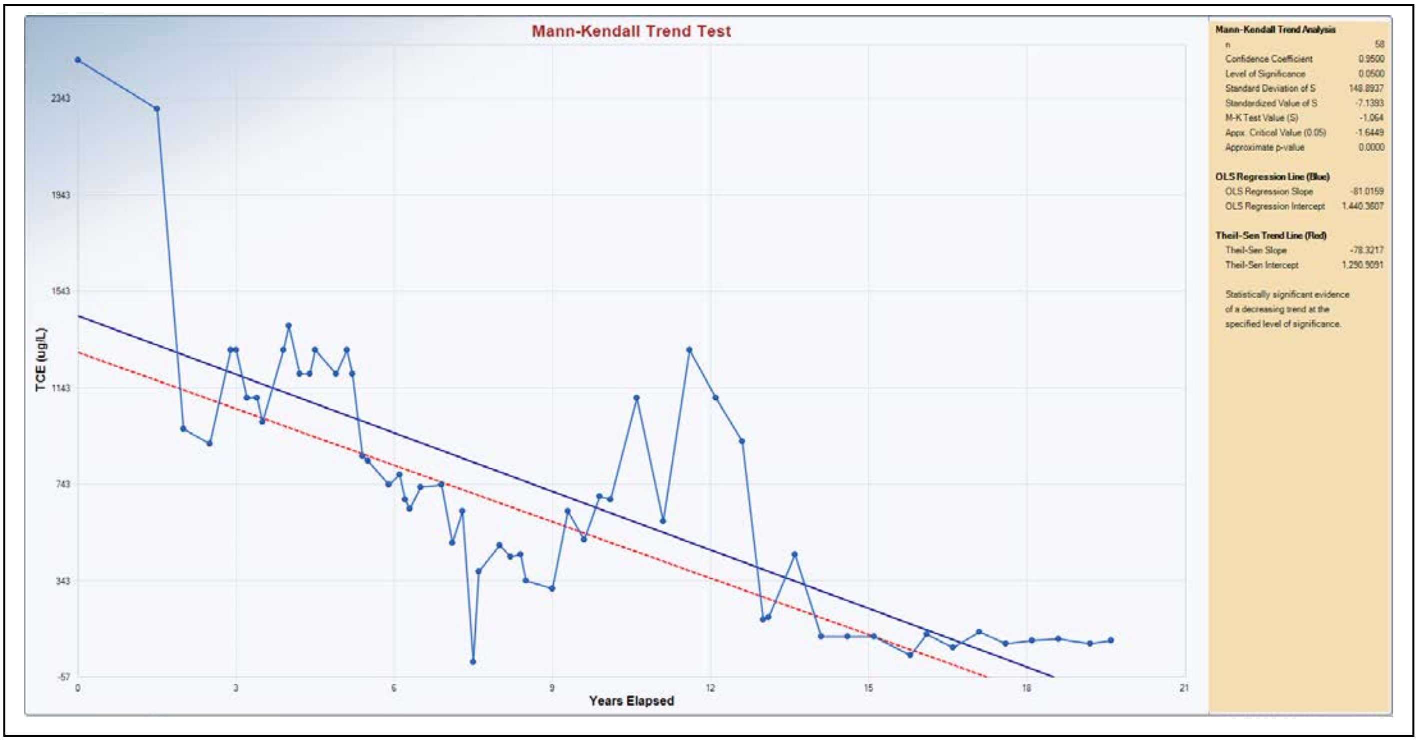
The significance of trends at individual sampling locations will be evaluated as described in the next section.

2.1.1.3. Trends Analysis

Concentration trends for TCE and PCE (at a minimum) will be evaluated in guard wells and plume wells, based on monitoring data compiled since 1999 following the Interstate Technology and Regulatory Council (ITRC) 2013 guidance on statistical analysis of trends in groundwater. More recent periods (e.g., the last 5 or 10 years) may also be evaluated. Trends analyses will have two components: graphical and statistical. Concentrations over time will be plotted for TCE and PCE in each guard or plume well for a visual assessment of trends using graphical tools in USEPA's ProUCL version 5.1 statistical software. Statistical techniques will be used to establish the significance of trends over time; the Trends Analysis module in ProUCL will be used for this analysis.

An example output is provided below and provides several different methods for determining significance. Site data are unlikely to be normally distributed; both Mann-Kendall and Theil-Sen statistics do not assume an underlying distribution of the data and will be used (the Theil-Sen trend line is shown as a red line in the graphic below). The ordinary least squares (OLS) regression (which assumes time as the independent variable) assumes a linear relationship but can be used to infer the presence and significance of a slope (displayed as the blue line in the example below). The Trends Analysis module also provides a graphical display of the data as part of its output.

TABLE IV. STATISTICAL OUTPUT EXAMPLE



2.1.1.4. Groundwater Flow

Groundwater levels will be measured in the monitoring program wells. The collected data will be used to contour groundwater flow direction and gradients to document changes in groundwater flow patterns over time. Shoreline well levels will be compared to lake elevations in the first 2 years of LTSP monitoring to confirm that Trout Lake gains/intercepts groundwater from the upland, as indicated previously.

2.1.2. Inspections and Maintenance

Inspections and maintenance activities will continue as performed currently. These activities include physical inspections and repairs; grounds maintenance and vegetation management; and leachate management and disposal.

2.1.2.1. Physical Inspections

Physical inspections are conducted regularly and include:

- Inspecting the physical integrity and condition of the boundary fence, stormwater drainage ditches, groundwater monitoring wells, leachate sumps and the landfill cell caps and slopes on a monthly basis as ground surface conditions allow (i.e., snow cover may prevent observation of certain components). The inspection will identify deficiencies in the landfill caps, including sinkholes, erosion, evidence of burrowing animals, and areas needing revegetation or vegetation controls. The inspection will also confirm the boundary fence is intact and groundwater wells and leachate sumps are undamaged, accessible and there is no evidence of tampering. Stormwater drainage away from the landfill cells will be maintained.

- Recording the results of each inspection in a maintenance log that documents the date, the personnel involved and a description of the findings, including items in need of repairs.
- Repairing physical deficiencies that may adversely affect the integrity of the remedy as soon as practicable.
- Documenting all related activities in an annual report.

2.1.2.2. Grounds Maintenance and Vegetation Management

Grounds maintenance and vegetation management will include:

- Mowing both New and Old Chem Sites in the spring and fall.
- Clearing monitoring well monuments and sumps using a weed trimmer at the same frequency as mowing.
- Removing invasive growth of large vegetation (including trees, etc.) that may impact the physical integrity of the caps and drainage ditches or affect the ability to inspect or monitor locations at the facility, on an as-needed basis.

2.1.2.3. Leachate Management

Leachate levels and pumping rates have decreased significantly since 1983, when the site stopped receiving waste materials for disposal. Many of the 59 sumps no longer yield pumpable quantities of leachate. Due to the small volumes of leachate generated at the site, the leachate sumps are monitored from July through October to check for the presence of liquids. Measurable leachate volumes are pumped out and stored on site until disposal off site. Removal volumes are recorded and reported on an annual basis. The specifics for the leachate system inspection and leachate removal are included in Appendix C.

2.1.3. Reporting

An annual report will be prepared at the end of each year and submitted to USEPA Region 5. The report will include the long-term groundwater and surface water monitoring data, a compliance assessment and trends evaluation, a summary of the inspections and repairs, and the leachate volume removed from the site.

Every 5 years, as part of the annual report, US Ecology will prepare a more comprehensive review of all monitoring data to evaluate the efficacy of the remedy, including data from the wells listed on Table II. This 5-year remedy review document will include statistical evaluation of groundwater trends and an evaluation of the natural recovery parameters. The site hydrogeology will be evaluated to confirm that groundwater flow conditions have remained consistent. An assessment will be made to determine if the Conceptual Site Model needs to be updated and if so, the updates will be included for USEPA review.

2.2. Institutional Controls and Deed Restrictions

Current institutional controls at the facility include restricted access to the waste facility site, as well as the entire US Ecology property. All visitors are escorted while on the site. The entire property is fenced and gated with limited ingress/egress points. Land use is restricted, and groundwater cannot be withdrawn from beneath the facility nor can other resources be extracted from the site. Deed restrictions for the facility were filed with Bureau County, Illinois in 1981 and were updated to include the entire US Ecology property in approximately 1995.

US Ecology will update the deed restrictions in coordination with the USEPA and IEPA. The following language revision is currently proposed :

> Specifically, because this property has been used to manage hazardous waste, post-closure use of the property on or in which hazardous wastes remain after partial or final closure must never be allowed to disturb the integrity of the final cover, liner(s) or other components of the containment system, or the function of the facility's monitoring systems, unless the agency finds that the disturbance:
>
> (a) is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment; or
>
> (b) is necessary to reduce a threat to human health or the environment; and
>
> (c) Written notice and a plan submitted to [*appropriate regulatory agency]* with a schedule of implementation setting forth worker health and safety requirements, access limitations during the completion of site work, and restoration of the property or other alternatives has been approved by the agency in writing prior to the commencement of site work.

US Ecology will provide an annual certification that institutional controls and deed restrictions remain in place.

2.3. Contingency Plan

US Ecology will develop response actions for adverse events that are identified during long-term monitoring or operations and maintenance of the site in collaboration with USEPA. Adverse events may include:

- Increasing chemical concentrations in plume or guard wells over time.
- Water quality criteria exceedances at the POC.
- Deterioration or erosion of the final landfill cap that may require regrading and/or reseeding.
- Breach or failure of a containment wall surrounding the disposal cells.
- A leachate release from the collection system.

Potential contingency actions and triggers are summarized in Table 2, Potential Contingency Plan Triggers and Response Actions.

US Ecology anticipates that contingency planning will be a collaborative, adaptive process that incorporates new information over time.

2.4. Financial Assurance

US Ecology currently provides financial assurance in the form of a trust for post-closure monitoring, operations and maintenance costs for the Sheffield site. The mechanism for providing financial assurances during long-term care will be in compliance with the agreed upon mechanism specified in the AOC.

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TABLES

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Table 1

Summary of Proposed Post-Closure Care Monitoring Program and Rationale

US Ecology Former Hazardous Waste Facility

Sheffield, Illinois

Number	Monitoring Point Type	Water-Bearing Zone	Screened Interval Lithology	Current Monitoring Interval		Proposed Monitoring Interval	Current Analytes	Proposed Analytes/Measurements	Rationale
				VOCs	Metals and Indicators				
G145	Ambient Well	Bedrock	Shale, coal, shaley sandstone	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	Background/upgradient well; VOCs have not been detected
G186	Ambient Well	Bedrock	Highly weathered shale	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	Background/upgradient well; VOCs have not been detected except acetone in a 2009 sample and TCE in 2001, both at low concentrations
G434	Ambient Well	Unconsolidated Deposits	F-C sand, sand and silt loam, silty clay till	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	Background well upgradient of Trench 18EW; VOCs have not been detected
G105	Boundary Well	Bedrock	Shale	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	VOCs have not been detected; no exceedances of Class IV Groundwater Quality Standards.
G142	Boundary Well	Unconsolidated Deposits	Not available	Annually--fall	Semiannually-spring and fall	Chemical analysis every 5 years, in perpetuity to assess barrier wall integrity. Water level measurements twice a year.	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Assess integrity of Trench 18W slurry wall
G154	Boundary Well	Unconsolidated Deposits	Sand	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	In area where groundwater flow is minimal due to barrier walls; no VOCs detected; no exceedances of Class IV Groundwater Quality Standards).
G157	Boundary Well	Unconsolidated Deposits	Till, sand	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	In area where groundwater flow is minimal due to barrier walls; no VOCs detected; no exceedances of Class IV Groundwater Quality Standards).
G160	Boundary Well	Unconsolidated Deposits	Mine spoils	Annually--fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs4, selected metals[2], inorganic indicators[3] and water levels	Downgradient of historical source area
G162	Boundary Well	Unconsolidated Deposits	Mine spoils	Annually--fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Downgradient well
G191	Boundary Well	Bedrock	Coal	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	Upgradient of Trench 18EW. Several VOCs detected at low levels; no detects since 2005 (no exceedances of Class IV Groundwater Quality Standards).
G192	Boundary Well	Unconsolidated Deposits	Sandy silt, silt (Lacustrine)	Annually--fall	Semiannually-spring and fall	Chemical analysis every 5 years, in perpetuity to assess barrier wall integrity. Water level measurements twice a year.	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Assess integrity of Trench 18W slurry wall
G193	Boundary Well	Bedrock	Shale, coal	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	Upgradient of Trench 18EW. Benzene detected only once (2006) and was slightly above detection limit.
RIB-9	Boundary Well	Unconsolidated Deposits	Not available	Annually--fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	VOCs have not been detected
G591	Guard Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	Annually--fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Downgradient of historical plume; use to evaluate attenuation/concentrations trends based on Region IV surface water standards.
G592	Guard Well	Unconsolidated Deposits	Glasford Fm, Radnor Mbr	Annually--fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Downgradient of historical plume; use to evaluate attenuation/concentrations trends based on Region IV surface water standards.

Number	Monitoring Point Type	Water-Bearing Zone	Screened Interval Lithology	Current Monitoring Interval		Proposed Monitoring Interval	Current Analytes	Proposed Analytes/Measurements	Rationale
				VOCs	Metals and Indicators				
G600	Guard Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	Annually--fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Downgradient of historical plume; use to evaluate attenuation/concentrations trends based on Region IV surface water standards.
G148	Plume Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Chemical analysis every 5 years, in perpetuity to assess barrier wall integrity. Water level measurements twice a year.	None	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Assess integrity of Old Chem Site barrier walls. Within historical plume.
G149	Plume Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr, Glacial Till	None	None	Chemical analysis every 5 years, in perpetuity to assess barrier wall integrity. Water level measurements twice a year.	None	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Assess integrity of Old Chem Site barrier walls. Within historical plume.
G155	Plume Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Chemical analysis every 5 years, in perpetuity to assess barrier wall integrity. Water level measurements twice a year.	None	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Assess integrity of Old Chem Site barrier walls. Within historical plume.
G156	Plume Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Chemical analysis every 5 years, in perpetuity to assess barrier wall integrity. Water level measurements twice a year.	None	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Assess integrity of Old Chem Site barrier walls. Within historical plume.
G165	Plume Well	Unconsolidated Deposits	Silty sand/sandy silt, clayey silt	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Within historical plume
G166	Plume Well	Bedrock	Highly weathered siltstone	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Only two VOCs have been detected (chloroform and methylene chloride) in one sampling event. Concentrations near detection limits
G167	Plume Well	Unconsolidated Deposit/Bedrock Transition[5]	Highly weathered siltstone	Semiannually-spring and fall	Semiannually-spring and fall	Water level measurements twice a year	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Water levels only	A number of VOCs have been detected, similar to adjacent well G168. Proposing G166 to monitor groundwater in bedrock since this well appears to be in a transition zone
G168	Plume Well	Unconsolidated Deposits	Clayey silt	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Within historical plume
G547	Plume Well	Unconsolidated Deposits	Glasford Fm, Duncan Hills Mbr	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Within historical plume
G564	Plume Well	Unconsolidated Deposits	Glasford Fm, Toulon & Hulick Till Mbr	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Within historical plume
G575	Plume Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Within historical plume
G594	Plume Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2], inorganic indicators[3] and water levels	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Within historical plume

Number	Monitoring Point Type	Water-Bearing Zone	Screened Interval Lithology	Current Monitoring Interval		Proposed Monitoring Interval	Current Analytes	Proposed Analytes/Measurements	Rationale
				VOCs	Metals and Indicators				
211	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Twice a year, with reductions in frequency if chemical trends stable or declining	None	Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Shoreline well downgradient of historical plume. Use to screen groundwater-surface water interactions.
212	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Four monitoring events to confirm gain/losses to Trout Lake		Water levels only	Answer outstanding question from EPA hydrogeologist
570	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Twice a year, with reductions in frequency if chemical trends stable or declining		Reduced VOCs[4], selected metals[2], inorganic indicators[3] and water levels	Shoreline well downgradient of historical plume. Use to screen groundwater-surface water interactions
572	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Four monitoring events to confirm gain/losses to Trout Lake		Water levels only	Answer outstanding question from EPA hydrogeologist
573	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Four monitoring events to confirm gain/losses to Trout Lake		Water levels only	Answer outstanding question from EPA hydrogeologist
574	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Four monitoring events to confirm gain/losses to Trout Lake		Water levels only	Answer outstanding question from EPA hydrogeologist
RIB-6	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Four monitoring events to confirm gain/losses to Trout Lake		Water levels only	Answer outstanding question from EPA hydrogeologist
RIB-11	Shoreline Well	Unconsolidated Deposits	Glasford Fm, Toulon Mbr	None	None	Four monitoring events to confirm gain/losses to Trout Lake		Water levels only	Answer outstanding question from EPA hydrogeologist
S309	Seep	Surface Water	Not applicable	Semiannually-spring and fall	Semiannually-spring and fall	None	Selected VOCs[1], selected metals[2] and inorganic indicators[3]	None	Concentrations are low and stable with no exceedances of Class IV Standards in recent years.
S501	Point of Compliance	Surface Water	Not applicable	Semiannually-spring and fall	Semiannually-spring and fall	Twice a year, with reductions in frequency if chemical trends stable or declining	Selected VOCs[1], selected metals[2] and inorganic indicators[3]	Reduced VOCs[4], selected metals[2], inorganic indicators[3]	Point of compliance. Compared to EPA Region IV screening levels for surface water.
S502	Point of Compliance	Surface Water	Not applicable	None	None	Twice a year, with reductions in frequency if chemical trends stable or declining	None	Reduced VOCs[4], selected metals[2], inorganic indicators[3]	Point of compliance east of guard wells. Compared to EPA Region IV screening levels for surface water.

Notes:

[1]Selected VOCs include 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, 1,4-dioxane, benzene, chloroform, chloromethane, cis-1,2-dichloroethene, methacrylonitrile, methylene chloride, tetrachloroethene, trans-1,2-dichloroethene, trichloroethene, vinyl acetate and vinyl chloride.

[2]Selected metals include iron, magnesium and manganese, reported on both a dissolved and total basis.

[3]Selected conventional indicators include total and dissolved solids, chloride and sulfate.

[4]Reduced VOCs include 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, benzene, chloroform, cis-1,2-dichloroethene, methylene chloride, tetrachloroethene, trans-1,2-dichloroethene, trichloroethene and vinyl chloride (omits 1,4-dioxane, chloromethane, methacrylonitrile and vinyl acetate, which have not been detected in the last 5 years).

[5]This well has been classified as being screened in both bedrock and glacial deposits in different documents. Boring logs indicate it is screened in highly weathered siltstone 2 feet below the glacial deposit noted in the adjacent well, G168. We are treating it as a transitional zone with some likely mixing with the overlying unconsolidated unit.

Table 2

Potential Contingency Plan Triggers and Response Actions

US Ecology Former Hazardous Waste Facility

Sheffield, Illinois

Long-Term Stewardship Program Element	Sampling/ Observation Point	Adverse Event	Trigger	Response
Physical Inspection				
Cap	Cap surface	Excessive consolidation or erosion	Observed deformation of cap	Assess need for additional stormwater controls. Potentially place additional material on cap surface.
		Damage to cap surface from invasive vegetation or burrowing animals	Observed significant disturbance of cap surface or presence of large, invasive shrubs or trees	Remove invasive vegetation. Trap animals and repair any damage to cap. Add exclusion devices.
Stormwater drainage	Ditches and culverts	Altered or blocked drainage including collapsed culverts	Observed ponding or flooding in vicinity of cap	Clear ditches, repair or replace culverts
Fencing and signage	Facility entrance and perimeter	Damage to fence, gates or signage	Observed damage or evidence of trespassers	Repair/replace damaged sections or signage
Chemical Monitoring				
Groundwater	Boundary well	Contaminated groundwater is migrating toward facility boundary	Groundwater COC concentrations exceed Region 4 surface water screening levels at one or more boundary wells	Evaluate short-term (5 year) COC concentration trends and variability in boundary well. If there appears to be a significant increase in concentration or variability exceeds the typical range, evaluate upgradient wells for similar trend along with any change in groundwater flow path. If exceedance is a function of a landfill source, evaluate integrity of source controls at landfill boundary (may include sampling historical wells); repair remedy element (cap, barrier wall) as needed. Continue monitoring according to scheduled interval.
	Plume well	Groundwater contamination trends change	Statistically significant increasing trend in COC concentration in plume detected	Evaluate guard well COC concentration trends. Continue monitoring at scheduled interval.
	Guard well	Contaminated groundwater is migrating toward lake	Groundwater COC concentrations exceed Region 4 surface water screening levels at one or more guard wells	Evaluate short-term (5 year) trend and variability in guard well. If there appears to be a significant increase in a COC concentration or variability exceeds the typical range, evaluate potential correlation with upgradient COC concentrations to determine potential source of increasing trend. Consider sampling additional historical wells to evaluate performance of upgradient barrier walls. Continue monitoring guard wells at scheduled interval.

Long-Term Stewardship Program Element	Sampling/ Observation Point	Adverse Event	Trigger	Response
Groundwater (continued)	GSI well	Groundwater at shoreline shows evidence of site-specific contamination	Site-specific COCs are detected in shoreline wells	Determine if Region 4 water quality screening levels are exceeded at GSI well. If yes, evaluate upgradient wells within the LTSP monitoring array to determine if there is correlative increase in COC concentrations and/or potential source of the increasing trend. Consider sampling additional historical wells. Consider evaluation of sediment porewater adjacent to the shoreline to determine if shoreline groundwater concentrations are attenuating prior to discharge to surface water (sediment-water interface). Consider an increase to monitoring frequency at GSI wells.
Surface water	Surface water points of compliance	Surface water becomes contaminated with site-specific contaminants of concern	Surface water COC concentrations exceed Region 4 surface water quality criteria	Resample points of compliance to confirm. If confirmed, evaluate groundwater concentrations in LTSP monitoring well array to determine likely source area. Consider sampling additional historical wells to evaluate distribution of contaminants near the POC. Determine the need for and type of corrective action needed based on likely risks to aquatic and water-dependent receptors. Consider an increase in monitoring frequency at POCs or locations within the lake.

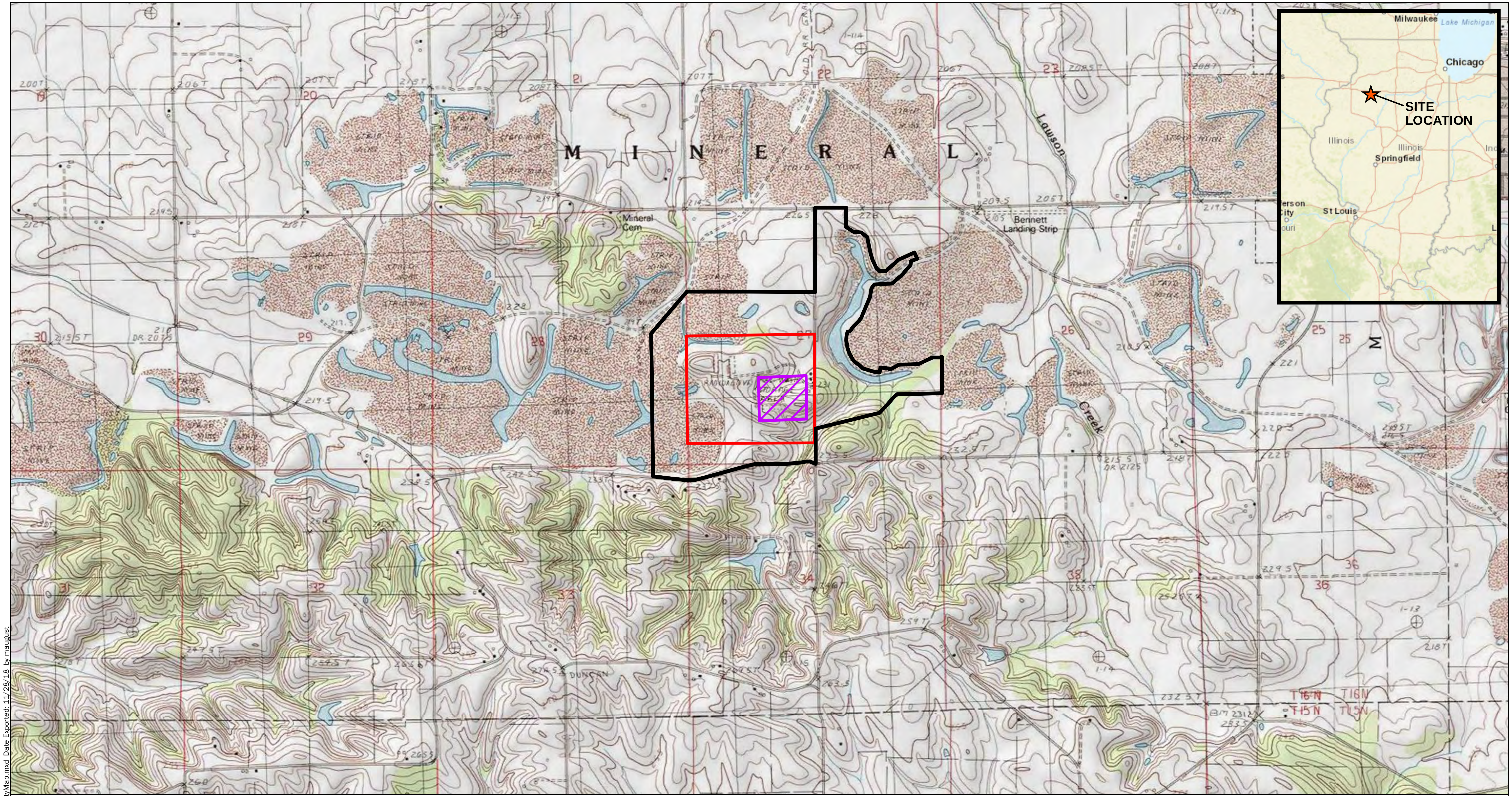
Notes:

COC = chemical of concern

GSI = groundwater-surface water interaction

POC = point of compliance

FIGURES



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

Projection: NAD 1983 StatePlane Illinois West FIPS 1202 Feet

Legend

- U.S. Ecology Sheffield Property Line
- Facility Legal Boundary
- Property Owned by State of Illinois

N
W E
S

2,000 0 2,000
Feet

Vicinity Map

US Ecology Former Hazardous Waste Facility
Sheffield, Illinois

GEOENGINEERS

Figure 1

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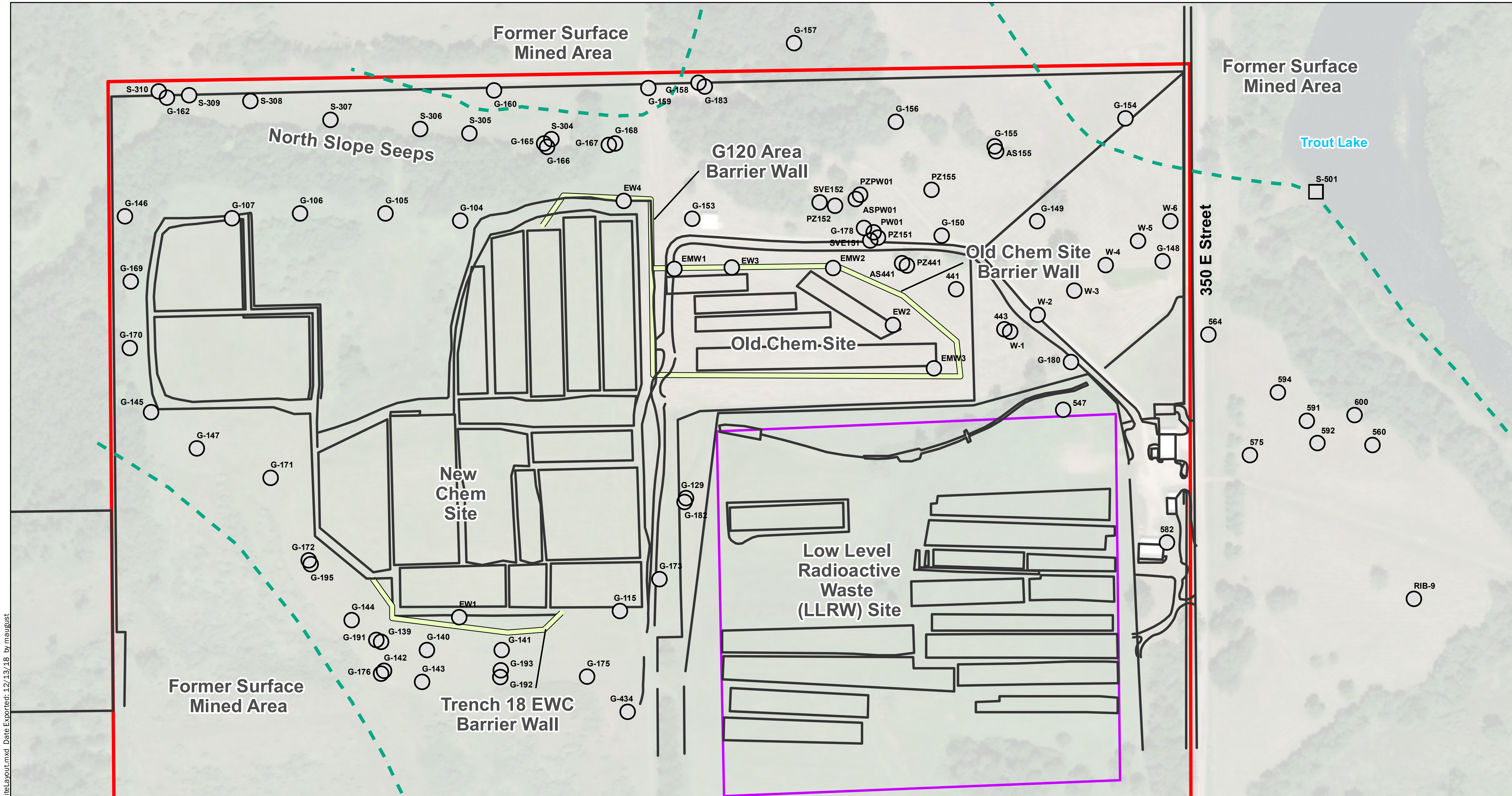


Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: PDC Technical Services, Inc., 2008.

Projection: NAD 1983 StatePlane Illinois West FIPS 1202 Feet

Legend

- Surface Water Sample Location
- Groundwater Monitoring Wells
- Facility Legal Boundary
- Property Owned by State of Illinois
- Barrier Walls
- Boundary of Former Surface Mining

N S E W

240 0 240

Feet

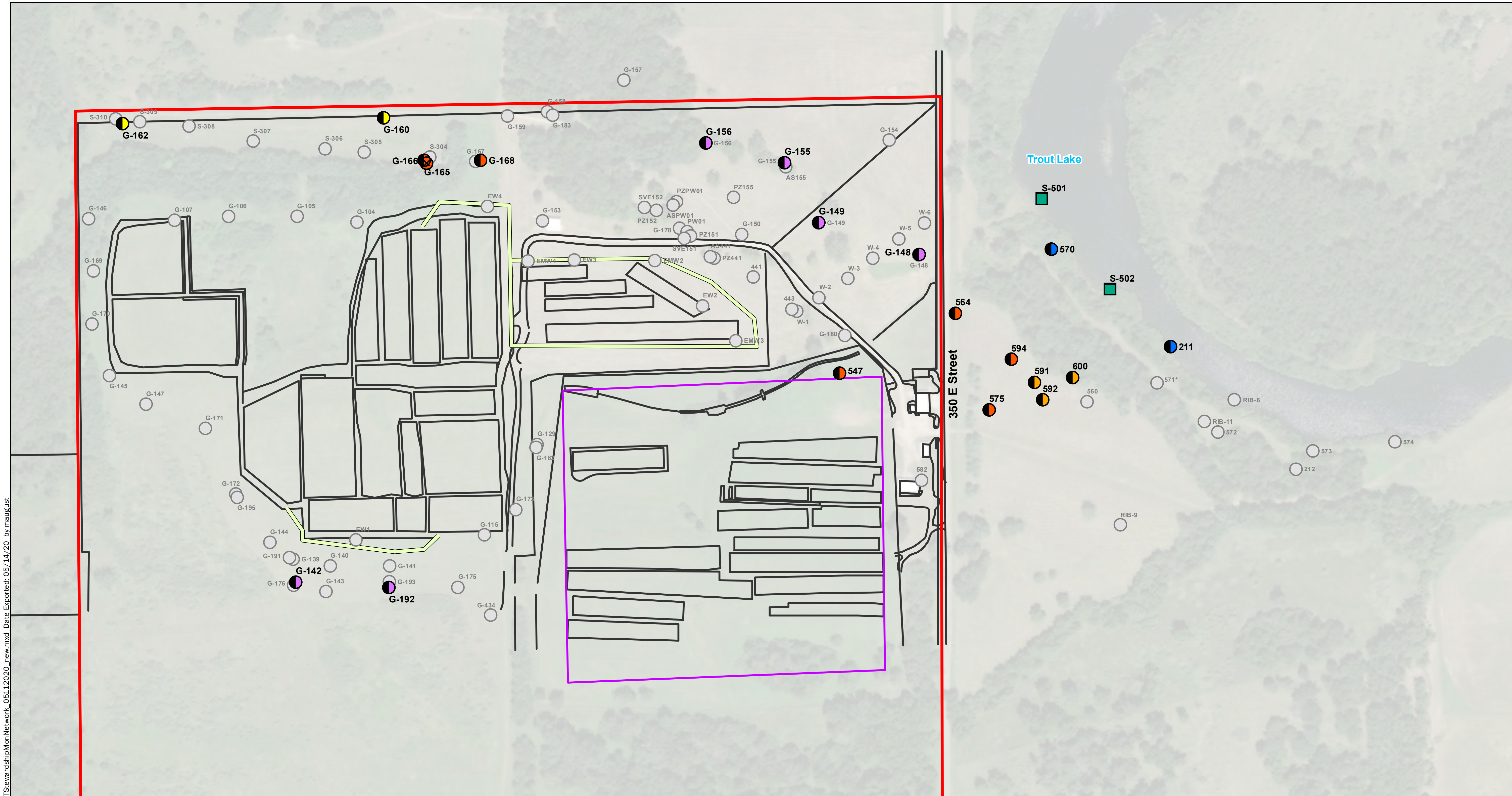
Site Layout

US Ecology Former Hazardous Waste Facility
Sheffield, Illinois

GeoEngineers

Figure 2

P:\19\19730002\GIS\MXD\1973000200_Fig2_SiteLayout.mxd Date Exported: 12/13/18 by maugust



Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: PDC Technical Services, Inc., 2008.

Projection: NAD 1983 StatePlane Illinois West FIPS 1202 Feet

Legend

- Boundary Well
- Plume Well
- Guard Well
- 5-Year Review Well
- Groundwater-Surface Interaction Well
- Surface Water Sample Location
- Other Wells
- Facility Legal Boundary
- Property Owned by State of Illinois
- Barrier Walls
- Screened in Glacial Deposits or Mine Spoils
- Screened in Pennsylvanian Bedrock

* Sediment in well 571 dry. Replaced with well 570.

N W E S

300 0 300

Feet

Long-term Stewardship Plan Monitoring Locations

U.S. Ecology Illinois
Sheffield, Illinois

GEOENGINEERS

Figure 3

P:\19\19730002\GIS\MXD\1973000200_Fig2_LTStewardshipMonNetwork_05112020_new.mxd Date Exported: 05/14/20 by maugust

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Potentiometric elevation data are in feet.

Data Source: Aerial from ESRI

Projection: NAD 1983 StatePlane Illinois West FIPS 1202 Feet

Legend

⊗ Water Level Measurement Well

Earthen Dam Approximate Location

* Sediment in well 571 dry.
Replaced with well 570.

N W E S

200 0 200
Feet

Shoreline Monitoring Well Locations for Lake Gain/Loss Assessment

U.S. Ecology Illinois
Sheffield, Illinois

GeoEngineers

Figure 4

P:\19\19730002\GIS\MXD\1973000200_Fig4_ShorelineGainLoss.mxd Date Exported: 05/14/20 by maugust

APPENDICES

APPENDIX A
IEPA Post-Closure Plan (revised 2020)

US Ecology Sheffield

Post-Closure Plan

Illinois EPA's regulations require that post-closure care of hazardous waste management facilities include environmental monitoring and reporting, and the maintenance and monitoring of waste containment systems. The time frame for post-closure monitoring for hazardous waste landfills extends for 30 years from the date of closure. For US Ecology Sheffield, the post-closure care period began in 1996 when closure was certified to the Illinois EPA. The post-closure care period may be lengthened by the IEPA Director in order to ensure protection of human health and the environment.

Environmental Monitoring

The facility's environmental monitoring plan is included as Attachment A.

The facility is an interim status site, which has demonstrated that there is a low potential for migration of hazardous waste or hazardous waste constituents from the facility via the uppermost aquifer to water supply wells or to surface water. This demonstration is contained within the facility's application for a post-closure permit. Therefore, all or part of the interim status groundwater monitoring requirements may be waived.

As a consequence of this demonstration, the Illinois EPA has established a groundwater management zone that encompasses the full extent of the property owned by US Ecology. The groundwater underlying the property is classified as Class IV due to prior coal strip-mining activities and is unusable as drinking water. The compliance boundary is set at the facility property line, and concentration limits are set for individual groups of monitoring points.

Monitoring is conducted at a series of wells and surface monitoring points to assure that:

- Any changes in groundwater flow paths or constituent concentration trends are detected,
- No contaminated groundwater migrates beyond the compliance boundary,
- Groundwater concentrations in the vicinity of the strip mine pit continue to remain below modeled limits which are protective of aquatic resources and human health.
- No changes in surface water quality are occurring, and
- Groundwater contaminant concentrations do not rise.

Monitoring points are divided into the following categories:

- Boundary Wells assure that contaminated groundwater is not migrating towards the compliance boundary.
- Observation Wells substantiate trends in groundwater quality improvement.
- Guard Wells assure that groundwater contamination levels do not exceed modeled standards which are protective of human health and aquatic resources.
- Surface Water sampling assures that surface water quality is not affected by the facility.

Landfill Maintenance

The integrity and effectiveness of the final cover is primarily maintained through routine site inspections. The landfill covers are inspected monthly and inspections are documented using the form shown in Figure 1. If settling, subsidence, erosion, animal burrowing, or other events are detected, these will be remedied as soon as is practicable.

A series of 59 leachate sumps are located at the facility. These sumps are inspected and maintained per the plan included as Attachment B.

Due to the age of the facility, no leak detection system is in place.

Stormwater run-on and run-off are addressed in the storm water pollution prevention plan, which has been approved by Illinois EPA. No portions of the former waste disposal areas are subject to inundation from run-on. Positive drainage is maintained to channel water away from the facility. The storm water control plan identifies potential pollution sources and lists best management practices for preventing contaminated run-off.

There is no historical record of flooding of streams near the site. Based on the Federal Emergency Management Agency's Flood Insurance Rate Map, Community-Panel No. 170729 0175 A, none of map Section 27, which contains the site, is in the 100-year flood plain.

Additional Site Inspections

Other portions of the facility are also inspected:

- Containers, tanks and containment devices in the Waste/Leachate Accumulation Building are inspected daily whenever waste or leachate are present in the building to check for leaks and for deterioration caused by corrosion or other factors.
- Fire Extinguishers are inspected monthly.
- Site Safety Inspection is completed monthly.

The waste/leachate accumulation building inspection form shown in Figure 2 is used to document inspections.

Fire extinguishers are inspected monthly using the form shown in Figure 3.

Site safety equipment is inspected monthly using the form shown in Figure 4.

Site Security

Site security is maintained by a combination of active and passive security. The facility perimeter is completely fenced with barbed wire. The perimeter is posted with signs warning individuals that trespassing is prohibited and identifying the site as a hazardous waste management facility. The signs are in English and are legible from a distance of more than 25 feet. All gated entrances carry the same warning signage. Routine facility inspections also check for signs of trespass and check to ensure that fences are in good repair and signage is present.

Visitors are required to sign the visitor log book and provided with a copy of the "Visitor/Contractor On-Site Authorization Form" and directed to read it and sign it. Copies of signed forms are kept on site. (See Figure 5.)

Contingency Plan

The Facility's Contingency Plan is included as Attachment C.

Figure 1: Facility Inspection Form

US ECOLOGY SHEFFIELD LANDFILL INSPECTION FORM
(Inspect Landfill Monthly)

Date: ________________ Time: ______________ Weather: ________________________________

Site Conditions:____

Inspector's Signature: ____

Items Inspected:	Satisfactory Yes	Satisfactory No
1. Facility Fence and Signs	______	______
2. Landfill Covers and Barrier Wall	______	______
3. Storm Water Ditches	______	______
4. Leachate Risers	______	______
5. Benchmarks	____	____

Explain any items marked "No" and identify corrective action to be taken. Attach documentation (work orders, photographs, field notes, etc.) to this form to verify how and when corrective action was completed. Maintain inspection forms and attached documentation in the facility operating record.

Remarks/Corrective Action: ____

____

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Figure 2: Waste/Leachate Building Inspection Form

LEACHATE & WASTE ACCUMULATION BUILDING
(Inspect Daily If Leachate or Waste Are Present)

DATE:_________________________________ TIME:_______________________

Inspector's Signature: ____

Items Inspected:	Satisfactory? Yes	No
1. Tote tank levels	__________	_______
2. Construction materials of tanks	__________	_______
3. Flooring and dikes	__________	_______
4. Drum accumulation area	__________	_______
5. Building integrity	__________	_______

Explain any items marked "No" and identify corrective action to be taken. Attach documentation (work orders, photographs, field notes, etc.) to this form to verify how and when corrective action was completed. Maintain inspection forms and attached documentation in the facility operating record.

Remarks/Corrective Action: ____

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Figure 3: Fire Extinguisher Inspection Form

MONTHLY FIRE EXTINGUISHER INSPECTIONS

Location	Number of Extinguishers	Seal Integrity Sat/UnSat	Pressure Indication Sat/UnSat	Physical Condition Sat/UnSat	Inspection Card Sat/UnSat	Inspectors Initals
Leachate Building	2					
Storage Building	2					
Open Shed	2					
Oil Shed	1					
Shop Building	9					
John Deere 6415 Tractor	1					
John Deere Backhoe	1					
John Deere 5065E Tractor	1					
Waldon Forklift	1					

Comments: ______________________________

____

Reviewed By: ______________________________

Figure 4: Safety Inspection Form

US ECOLOGY SHEFFIELD MONTHLY SAFETY INSPECTION FORM

Date: _______________ Time: _____________

Inspector's Signature: ____

Items Inspected:	Satisfactory Yes	Satisfactory No
1. Facility Housekeeping	______	______
2. Communication Equipment	______	______
3. Respirators	______	______
4. Personal Protective Equipment	______	______
5. Confined Space Entry Equipment	___	_______

Explain any items marked "No" and identify corrective action to be taken. Attach documentation (work orders, photographs, field notes, etc.) to this form to verify how and when corrective action was completed. Maintain inspection forms and attached documentation in the facility operating record.

Remarks/Corrective Action: ____

____

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____

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____

____

Figure 5: Site Access Authorization Form

US ECOLOGY SHEFFIELD
VISITOR/CONTRACTOR ON-SITE ACCESS AUTHORIZATION

As a visitor/contractor, you must adhere to US Ecology security, safety, and emergency procedures at all times while on the facility.

Facility Security
Visitors/contractors must sign in and sign out every time you visit.

You will be escorted at all times while on the facility unless otherwise authorized by the facility manager.

For Your Safety
Safety equipment will be issued by the facility manager to you as needed.

Wear your seat belt.

The speed limit is 15 mph.

No smoking is allowed unless authorized by the facility manager.

In Case of Emergency
If you notice a fire or other emergency condition, immediately notify facility personnel and follow their instructions.

Report all accidents/injuries immediately to the facility manager.

______________________________,_____________________________________,
Name (Please Print) Address

I agree to follow these procedures.

SIGNED: ___________________________________

DATE: ___________________________________

Attachment A

Environmental Monitoring Plan

2008 (with 2020 updates)

Groundwater Monitoring Plan

1. Responsibilities

The US Ecology Sheffield Facility Groundwater Monitoring Program is the responsibility of the facility manager.

2. Sampling Procedures

Equipment

The following equipment is required to conduct groundwater sampling:

- Field Log Book;
- Groundwater Well Monitoring Log;
- Sample bottles with required labels and preservatives as supplied by the laboratory;
- An electronic water level measuring tape or equivalent;
- Portable pH, conductivity and temperature meters;
- Laboratory grade detergent (Liquinox);
- Deionized water;
- Submersible pumps for each well; Individual dedicated bailers/rope for those wells, which will not accept a submersible pump or have low yield/slow recovery;
- Plastic for ground to prevent cross-contamination of bailer rope;
- Ice chests and ice for transport of samples to the laboratory;
- Containers for well evacuation water storage;
- Clear glass beaker;
- Disposable gloves and rags;

Precautions

- Do not eat/drink/smoke during well sampling.
- All monitoring shall begin at the upgradient well and end with the most-contaminated down-gradient well.
- All sample bottles shall be inspected for cleanliness and flaws prior to use.

- □ Prior to sampling, calibrate the conductivity meter and standardize the pH meter per manufacturer’s operating instruction. Complete the calibration log.
- □ A new pair of gloves must be worn when sampling each well.

Water Level Measurement

- □ Inspect the well to ensure that it has not been tampered with or damaged.
- □ Unlock the well.
- □ Rinse the water level measuring device with laboratory grade detergent and deionized water and allow to air dry.
- □ Lower the measuring device into the well until water is detected (positive indication on the meter). The distance from the top of the well casing to water is the depth to water in feet and inches. Log this level in the Field Log Book

Well Purging

Calculate Casing Volume as follows:

- □ For each well, subtract the depth to water measurement from the total depth listed in Attachment 1-1.
- □ For wells with 4-inch diameter casings, multiply the result of the above calculation by 2. This number represents three times the volume of water present in the well casing (in gallons). This is the volume to be purged prior to sampling.
- □ (Total Depth - Depth to Water) x 2 = Volume to be purged
- □ For wells with 2- or 3-inch diameter casings, multiply the result of the calculation by 0.5 or 1.1, respectively. This number represents the volume (in gallons) to be purged prior to sampling at that well.
- □ (Total Depth - Depth to Water) x 0.5 or 1.1 = Volume to be purged
- □ Perform water level measurements and casing volume calculations at all wells before proceeding to purge the well. Note: All measurements should be in feet.
- □ Bail two casing volumes from the well using the wells’ dedicated submersible pump. If using a dedicated bailer and rope, do not allow the bailer rope to

touch the ground by using a figure eight rope recovery technique. We have one well (600), which is low yielding and only one case volume will be removed.

- □ The bailed water from wells with prior positive detections of hazardous chemicals will be managed in accordance with the generator rules as outlined in 35 Ill. Adm. Code 722, as amended. Bailed water from wells that have never had any hazardous chemicals detected in groundwater is released to the ground.
- □ After two casing volumes have been removed, fill a glass beaker with water and examine for indication of immiscible layers by checking for multiple phases (layers of liquid in the water). Note the results in the Field Log Book.
- □ Remove a third casing volume.

Sample Collection

Inspect all sample bottles and other equipment for cleanliness and for flaws before use. Each bottle shall have a tag or label for recording location, date, time, analysis to be performed, preservatives and sampler.

- □ Fill all sample bottles until each bottle is full. VOC sample VOAs will be filled such that no air is observed in the filled vial. Fill the pH-conductivity sample bottles last. Samples to be filtered will be collected in a common bottle for subsequent filtration. The samples should be taken in the order of their volatility. Cap each sample bottle securely, and complete the labeling of the bottles. The following information shall be noted:
    1. Date of sample:
    2. Time of sample:
    3. Analysis:
    4. Well number:
    5. Sampler's signature.

- □ Place all samples in an ice chest with ice, to assure samples are maintained near 4 degrees C. Protect samples to eliminate the chance of breakage during shipment. As the samples are packed, the sample type, number, time, date, sample tech signature, and analysis to be performed shall be recorded on the chain of custody form. When all the samples have been packed, the ice chest shall be security sealed, with the seal number recorded on the chain of custody form.

pH and Conductivity Measurement (Field Measurement)

- Analyze for conductivity as follows:
  1. Rinse the probe with DI water. Insert the probe into the sample.
  2. Hold the probe vertically and at least 1/2 inch from the surface of the beaker.
  3. Turn the selection switch to the scale. Allow five minutes for equilibrium. Note the conductivity in the Field Log Book and Groundwater Monitoring Log. Turn off the meter, remove the probe from the sample and rinse.

- Analyze for pH as follows:
  1. Rinse the probe with DI water and insert the probe into the sample.
  2. Holding the probe vertically and at least 1/2 inch from all surfaces of the beaker, turn on the pH meter. Allow the reading to stabilize and record the temperature and pH results in the Field Log Book and Groundwater Monitoring Log.
  3. Rinse the probe in DI water and store.
  4. Dump the sample water into the water saved from well purging.

3. Quality Assurance/Quality Control

Blanks

Each of the following field blanks will be prepared and analyzed for all of the required monitoring parameters. The bottles filled with the blank should be handled and transported to the laboratory.

Trip Blank - Fill one of each type of sample bottle with reagent grade water, transport to the site, handle like a sample and return to the laboratory for analysis. One trip blank per sampling event will be collected.

Equipment Blank - To ensure that the non-dedicated water level device or the filtration apparatus has been effectively cleaned (in the laboratory or field), rinse the device with reagent grade water, transfer to sample bottle(s), and return to the laboratory for analysis. One equipment blank for measurement device and filtration apparatus for each groundwater monitoring well sampling event will be collected.

Field Blank - Transport one of each type of sample bottle to the sample area. Fill each bottle with demineralized water, handle like a sample and return to the laboratory for analysis. One field blank per sampling event will be collected.

Sample Packaging and Shipment

Groundwater monitoring samples must be sent to the laboratory within 24 hours of sampling. On-site testing should be done as soon as possible. Samples for transport should be stored at 4 degrees C.

All preserved samples should be clearly marked with the type of preservative. All samples should be stabilized in a refrigerator or cooler with ice or dry ice, then packed into a cooler(s) and sealed with tape to ensure they stay at 4 degrees C.

Containers

All containers shall be sealed/stored in a clean environment immediately after cleaning or upon receipt from an outside laboratory to prevent any accumulation of dust or other contaminants.

Store inverted or capped with aluminum foil. Attachment 1 addresses the proper sample containers, preservation and handling for the parameters which will be tested for in groundwater samples. If a parameter is to be analyzed which is not listed in these attachments, contact the laboratory for the proper sample container, preservative and holding time.

Groundwater Monitoring Log

The groundwater monitoring log shall contain the following information:

- Well identification number;
- Date and time of inspection;
- Depth to water/Depth to bottom;
- pH;
- Temperature (water);
- Specific conductance;
- Odor; and
- Appearance/Samplers Initials.

The Field Log Book Contains

- Identification of well;
- Well depth;
- Static water level depth;
- Static water elevations:
- Well depth to bottom;
- Date and time of collection;
- Well sampling sequence;
- Field analysis data, temp, pH, spec conductivity;
- Name of collector;
- Climatic conditions/temp;
- Sufficient information to reconstruct the sampling event without reliance on memory. The Field Log Book shall be protected and filed when complete.

Sample Labels

Preprinted, gummed labels are applied to the sample container before sampling. The sample label must contain the following information:

- Well number;
- Name of sampling collector;
- Date and time of sampling;
- Preservatives used; and
- Type of analysis to be performed.

Chain of Custody Record

The Chain of Custody Record identifies each person who has custody of the sample from the time it is sampled until all analyses have been completed. Each custodian's signature certifies that the sample was secure from tampering during the custody period. Apply a security seal to the sample cooler so that the seal must be broken when the cooler is opened. Record the security seal number on the Chain of Custody Record to be checked by laboratory personnel. If the seal has been broken, or the numbers do not match, the sample will be discarded.

The Chain of Custody Record accompanies the sample to the laboratory.

File one copy of the record and seal the original in the sample shipping container. When the sample is received at the laboratory, the Chain of Custody Record will be signed and stamped with the laboratory control number. A copy of the record will then be sent to the facility to confirm that the sample arrived intact.

Shipment

No person may offer or accept a hazardous material for transportation in commerce within the United State unless that material is properly classed, described, packaged, marked, labeled and in the condition for shipment.

Laboratory QA/QC

Use a laboratory which has a documented QA/QC program. Request and maintain current copies of laboratory certifications and available audits.

Decontamination Procedures for Monitoring Equipment

Since dedicated equipment may not be used for water level measurement or for all well sampling, avoid cross contamination of sampling points. Dissemble and clean equipment as follows:

Inorganic/Organic Constituent Procedure

1. Disassemble equipment to the extent possible;
2. Wash equipment with a nonphosphate detergent/soap mixture;
3. Rinse with distilled water;
4. Rinse with reagent grade distilled water;
5. Allow to air dry and reassemble; and
6. Store in an uncontaminated area.

ATTACHMENTS

1 Sample Containerization, Preservation and Handling

2 Typical Sample Label

3 Wells Requiring Sampling (Reserved)

4 Analysis Required (Reserved)

ATTACHMENT 1

(Note—the following information in this attachment has been replaced by the Quality Assurance Project Plan in Appendix B)

SAMPLING AND PRESERVATION PROCEDURES

Parameter	Container	Preservation[b]	Holding Time	Minimum Require Volume
Indicators of Groundwater Contamination (a)				
pH	T,P,G	None	Field determined	25 mL
Specific conductance	T,P,G	None	Field determined	25 mL
TOC	G (amber), T-lined cap	Cool (4°C)[c];H_2SO_4 to pH<2	28 days	40 mL
TOX	G (amber), T-lined septa or cap	Cool (4°C);H_2SO_4 to pH<2	28 days	250 mL
Groundwater Quality Characteristics				
Chloride	T,P,G	Cool (4°C);	28 days	50 mL
Iron	T,P	HNO_3 to pH<2	6 months	200 mL
Manganese	T,P	HNO_3 to pH<2	6 months	200 mL
Phenols	G	Cool (4°C);H_2SO_4 to pH<2	28 days	250 mL
Sulfate	P,G	Cool (4°C)	28 days50 mL	
EPA Interim Drinking Water Characteristics				
Arsenic	P,G	HNO_3 to pH<2	6 months	200 mL
Barium	P,G	HNO_3 to pH<2	6 months	200 mL
Cadmium	P,G	HNO_3 to pH<2	6 months	200 mL
Chromium	P,G	HNO_3 to pH<2	6 months	200 mL
Lead	P,G	HNO_3 to pH<2	6 months	200 mL
Mercury	P,G	HNO_3 to pH<2	28 days	200 mL
Selenium	P,G	HNO_3 to pH<2	6 months	200 mL
Silver	P,G	HNO_3 to pH<2	6 months	200 mL
Fluoride	P,G	Cool (4°C)	28 days	200 mL
Nitrate	P,G	Cool (4°C)	2 days	100 mL
Cyanide	P,G	Cool (4°C)	14 days[d]	500 mL
Other Contaminants of Concern				
Semi- or non-volatile organics	T,G	Cool (4°C)	7 days to extract	2,500 mL
Volatile organics	G, T-lined	Cool (4°C); NaOH to pH>12	14 days	40 mL
Dissolved metals	P,G	HNO_3 to pH<2	6 months	200 mL
Dissolved mercury	P,G	HNO_3 to pH<2	28 days	200 mL
Bicarbonate/carbonate	P,G	None	Field determined	100 mL
Pesticides/PCBs	G,Teflon-lined	Cool (4°C)	7 days to extraction; 40 days after extraction	2,500 mL
Orthophosphate	P,G	Cool (4°C)	48 hours	150 mL

References:

Test Methods for Evaluating Solid Waste- Physical/ Chemical Methods, SW-846 (2nd Edition, 1982).

Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020

Standard Methods for the Examination of Water and Wastewater, (16th Edition, 1985)

Container Types:
P = Plastic (polyethylene)
G = Glass
T = Fluorocarbon resins (PTFE, Teflon, FEP, PPA, etc.)

(a) EPA requirements for detection monitoring (40 CFR 265.93), require the owner/operator to collect a sufficient volume of groundwater to allow for the analysis of four separate replicates.

(b) Shipping containers (cooling chest with ice or ice pack) should be certified as to the 4°C temperature at time of sample placement into these containers. Preservation of samples requires that the temperature of collected samples be adjusted to the 4°C and maintained at 4°C immediately after collection. Shipping coolers must be at 4°C and maintained at 4°C upon placement of sample and during shipment. Maximum/minimum thermometers are to be placed into the shipping chest to check temperature history.

(c) Do not allow any head space in the container.

(d) Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before the pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by addition of admium nitrate powder until a negative spot-test is obtained. The sample is filtered and then NaOH is added to pH 12.

Attachment 2

Sample Label Provided by Laboratory

Field Sample #____

Sample ID: ____

Analysis: ____

Facility Location: ____

Date and Time: ____

Sample Collector: ____

Preservative: ____

Attachment 3
Wells to be Sampled
(Reserved)

Please see the Long-term Stewardship Plan for wells that will be included in the monitoring program

Attachment 4

Sampling Frequency
And Analytes

(Reserved)

Please see the Long-term Stewardship Plan for sampling frequency and analyses that will be included in the monitoring program

ATTACHMENT B

LEACHATE RECOVERY PROCEDURES

Leachate Recovery Procedures

Background

Sump risers consist of PVC or steel pipe and are clearly visible in the field as they rise above the landfill cover. Each sump is equipped with a cap and security seal to provide evidence of tampering. For field identification, a long-lasting, non-rusting, metal plate stamped with the sump number has been permanently affixed to the riser pipe.

There are fifty-nine leachate monitoring sumps at the facility. Leachate levels and pumping rates have decreased significantly since 1983 due to sump pumping and the positive effects of the final cap system. Daily pumping rates decreased from 198 gallons per day in December 1983 to the current rate of less than 3,800 gallons per year. A total of 47,912 gallons of leachate have been collected by sumps since 1995. See Table B.1.

Table B.1: Leachate Production 1995 to 2019

Year	Total Leachate Pumped	Total Annual Precipitation
1995	2,390	32.14
1996	2,133	30.62
1997	1,268	31.93
1998	1,123	45.73
1999	1,793	43.47
2000	1,980	37.10
2001	2,595	36.70
2002	1,715	35.97
2003	980	35.24
2004	1,080	34.44
2005	900	19.84
2006	990	37.11
2007	1,180	36.75
2008	1,550	49.20
2009	3,920	53.25
2010	2,580	34.25
2011	1,520	42.40
2012	1,280	28.97
2013	1,050	44.64
2014	1,000	43.47
2015	1,750	38.68
2016	3,223	39.87
2017	2,615	42.33
2018	3,611	49.15
2019	3686	41.92
	47,912	

Sump Inspections & Pumping

1.0 Leachate collection sumps in closed trenches will be monitored annually for depth of liquids. At the time of inspection, the date, depth of liquid, depth to bottom of the sump (both measured from top of casing) and name and signature of the inspector will be entered on the sump log.

If the depth of liquid (depth to bottom minus depth to liquid) is one foot or greater above the primary liner system, leachate will be pumped from the sump until all liquid which can be practically removed has been removed. The total amount of liquid removal will be recorded on the sump log.

2.0 When required to pump sumps, the following safety and operational procedures will be followed:

- 2.0.1 Dedicated 12 volt electric sump pumps will be used for all sumps.
- 2.0.2 Chemical resistant boots, tyvek coveralls, nitrile gloves and a half-face air purifying respirator with combination cartridges will be worn when pumping sumps.
- 2.0.3 Each sump will be pumped into a mobile transfer tank.
- 2.0.4 PCB caution and hazardous waste labels will be placed on the transfer tank.
- 2.0.5 Absorbent material will be available during the sump pumping and transporting, in the event that a leak develops or a spill occurs.
- 2.0.6 When the transfer tank is full or when the sump pumping operations are completed that day, the liquids will be transported to the Leachate Accumulation Building for packaging and off-site disposal.
- 2.0.7 All contaminated rags, tyvek clothing and gloves will be placed in an open head DOT approved drum and accumulated in the leachate accumulation building with a PCB caution and hazardous waste labels affixed. Open head drums will be closed at all times except when adding solid waste.) Before the drum has reached its 90-day accumulation period, the drum will be shipped to an approved disposal facility.

3.0 When pumping leachate into the storage totes located inside the leachate accumulation building, the following safety and operational procedures will be followed:

- 3.0.1 Personnel will wear chemical resistant tyvek suits and gloves, safety glasses with side shields or chemical splash goggles, steel-toed boots with chemical resistant rubber pull-over boots, FM two-way radios, and respirators with organic vapor, acid gas dust, fume mist combination cartridges.
- 3.0.2 A pump dedicated to the leachate accumulation building will be used for pumping leachate from the portable collection tank to the totes.
- 3.0.3 The level in the totes will be checked prior to filling in order to prevent any overtopping of the totes.
- 3.0.4 Absorbent material will be placed under the hose to catch any liquid which may leak or drip while pumping.
- 3.0.5 Chemical resistant boots, tyvek coveralls, nitrile gloves and a respirator with combination cartridges will be worn while pumping leachate, or working on containers and/or associated equipment.
- 3.0.6 A record will be generated stating the amount of leachate treated and pumped in the totes during each filling. The 90-day accumulation period begins when leachate is first pumped into the totes.
- 3.0.7 All contaminated disposal clothing, gloves, rags and absorbent material will be placed in an open-head DOT approved drum along with all other contaminated disposal articles and absorbent materials. Open-head drums will be closed at all times except when adding waste.

4.0 Pre-Operation / Safety Training

The facility manager is responsible for ensuring that all personnel on site are informed of safety and operational procedures associated with leachate sump management.

5.0 Personnel and Work Area

Personnel allowed in work area are as follows:

a. Facility manager
b. Site employees designated by the facility manager.

c. Regulatory agency representatives.

d. Escorted site visitors.

6.0 Operations

6.0.1 The facility manager is responsible for all work.

6.0.2 Persons in the work area shall wear assigned protective equipment.

7.0 Decontamination and Cleanup

7.1 All materials and equipment shall be stored inside the leachate building.

7.2 If necessary, decontamination will be completed within the leachate building and any wash water will be pumped into the totes for off-site disposal and materials kept in storage until disposed.

ATTACHMENT C

CONTINGENCY PLAN

Contingency Plan
US ECOLOGY SHEFFIELD

General Information

US Ecology Sheffield, IEPA No. 0110950003 and U.S. EPA No. ILD04-506-3450, is located near Sheffield, Illinois, and is owned and maintained by US Ecology, Inc. The site is located in western Bureau County in northwestern Illinois, approximately three miles southwest of the town of Sheffield (latitude 89°47'47", longitude 41°20'28"). See Figure C-1.

The site was operated as a hazardous and industrial waste disposal facility from 1968 to 1983. During this period, the site disposed of approximately 160,000 cubic yards of waste in 24 disposal trenches covering approximately 19 acres in a portion of the facility called the New Chem Site and on 5.8 acres in an adjacent portion of the site called the Old Chem Site.

Emergency Coordinator

The facility manager is the primary emergency coordinator. In the event that the contingency plan is initiated, the emergency coordinator will have full authority to commit all necessary resources to implement the plan and carry it out until complete recovery from the contingency is achieved. The Contingency Plan Notification List contains all emergency numbers.

Plan Distribution and Modification

The facility manager will distribute the Contingency Plan and Notification List to the following agencies and consult with these agencies to assure they are familiar with the contingency plan and the site layout:

- Sheffield Fire Department
- Kewanee Public Hospital
- Bureau County Hospital
- Buda Fire Department
- Buda Rescue Unit
- Sheffield Rescue Unit
- Bureau County Sheriff
- Illinois Environmental Protection Agency

The Contingency Plan may be modified by the Facility Manager as needed. In addition, the Contingency Plan will be reviewed and amended, if necessary, whenever:

- The facility permit is revised
- The plan fails in an emergency
- Improvements are recognized during contingency drills which would enhance effective response
- The list of emergency coordinators changes
- The list of response agencies changes

Contingency Plan and Notification List

US Ecology, Sheffield, Illinois Facility

US Ecology Facility Office---815/454-2342
American Ecology Corporate Office--------------------------------------208/331-8400

Primary Coordinator	Doug Long	101 East Center St Neponset, IL. 61345	309-854-1096 cell
First Alternate	R. Shawn Long	101 East Center St Neponset, IL. 61345	309-854-1500 cell
US Ecology, Inc. (Corporate Office)	Andrew Marshall	101 S. Capitol Blvd. Suite 1000 Boise, ID. 83702	208-331-8400

Mineral & Gold Twp. Fire District ---309/228-3341
Sheffield Fire District--815/454-2341
Sheffield Rescue Unit --815/45-42715
Neponset Fire Unit --309/594-2341
Bureau County Sheriff --815/875-3344
Illinois Emergency Response---217/782-7860

Any person may initiate the Contingency Plan by notifying the Emergency Coordinator or alternate upon identifying:

1. **Fire, explosion**
2. **Release of hazardous materials to the air, soil, surface**
3. **Injured or ill personnel requiring immediate medical assistance**
4. **Intrusion of unauthorized personnel**
5. **Any imminent hazard to personnel, facilities, or the environment.**

If unable to contact the Emergency Coordinator or alternative, please contact the Bureau County Sherriff's Department at 815 875 3344.

Reports
After initiation of the Contingency Plan, the Emergency Coordinator will record the time, date, and details of the incident and provide 24 hour oral notification and 5 day written report to the Illinois EPA Regional Administrator after the incident.

The Emergency Coordinator will direct all on-scene US Ecology response efforts unless relieved by law enforcement agencies. The Emergency Coordinator will:

1. Insure personnel are evacuated to a safe area.
2. Establish personal protection requirements
3. Provide all necessary respiratory and personal protective equipment
4. Monitor affected areas for changes in the emergency condition.
5. Limit or restrict the use of motor vehicles in the affected areas as needed.
6. Remove or isolate, if practical, any waste materials.
7. Control all discharges from the facility, through the construction of temporary barrier walls or dikes with heavy equipment such as bull dozers and front-end loaders
8. Collect emergency response equipment for decontamination.
9. Initiate remedial clean-up operations when the incident has been brought under full control and no longer presents a threat to human health or the environment
10. Comply with all Federal and State regulatory requirements for immediate and supplementary notification.

Evacuation Plan
The Emergency Coordinator is responsible for determining if facility evacuation is required. In the event that this determination is made, the following action will be taken:

1. All persons on site will immediately leave, while minimizing potential exposure.
2. No one will re-enter the facility unless specifically authorized by the Emergency Coordinator.

The Emergency Coordinator will account for all facility personnel, visitors and contractors.

APPENDIX B
Quality Assurance Project Plan

Appendix B
Quality Assurance Project Plan

Sheffield Former Hazardous Waste Facility
Sheffield, Illinois

for
US Ecology

July 28, 2020

GeoEngineers

412 East Parkcenter Boulevard, Suite 305
Boise, Idaho 83706
208.433.8098

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LIST OF TABLES

APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

This Quality Assurance Project Plan (QAPP) was developed to support field sampling activities at the Sheffield Former Hazardous Waste Facility to conform with United States Environmental Protection Agency (USEPA) groundwater and surface water sampling guidelines (USEPA 2001; USEPA 2002a). The QAPP covers Quality Assurance/Quality Control (QA/QC) procedures for long-term monitoring.

The QAPP serves as the primary guide for the integration of QA and QC functions into monitoring activities. The QAPP presents the objectives, procedures, organization, functional activities, and specific QA and QC activities designed to achieve data quality goals established for the project. This QAPP is based on USEPA guidelines for data quality assessment (USEPA 2006b; USEPA 2017a; USEPA 2017b).

Throughout the project, environmental measurements will be conducted to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that precision, accuracy, representativeness, completeness and comparability (PARCC) of data generated meet the specified data quality objectives.

Project Objective

This QAPP establishes qualitative and quantitative measures so that data of acceptable quality are collected and to ascertain that project-specific data quality objectives (DQOs) are met. DQOs include:

- Generating data able to withstand scientific scrutiny and are suitable for their intended use;
- Generating data using controlled, approved field sampling procedures, chain-of-custody (COC) record keeping and laboratory analysis; and
- Using collection and analytical methods to produce data of known precision and accuracy.

Data quality will be evaluated by how well the final data meet the established objectives. Specific QA elements have been established from "*Guidance on Systematic Planning Using the Data Quality Objectives Process*" (EPA 2006a) to verify that data quality objectives are met, and field and analytical procedure elements are outlined in the following sections. This information has been compiled based on the anticipated work to be performed. Changes to procedures or unexpected difficulties in the field may require amendment of this QAPP. Changes in the QAPP will be brought to the attention of USEPA for review and approval.

Supporting Documentation

This QAPP provides supporting information in the form of table attachments that detail analytical data and technical procedures needed to successfully complete field and laboratory actions. Attached Table B-1, Test Methods, Sample Containers, Preservation and Holding Time, provides a summary of analytical methods with water sample collection requirements. Attached Table B-2, Measurement Quality Objectives, lists measurement quality objectives. Attached Table B-3, Water Analytical Methods and Target Reporting Limits, provide potential site contaminant analyte lists, laboratory method detection limits (MDLs) and practical quantitative limit/method reporting limits (PQLs/MRLs) for comparison to USEPA Region 4 screening levels. Attached Table B-4, Water Laboratory Precision and Accuracy Limits, provide laboratory accuracy and precision criteria. Table B-5, Quality Control Sample Type and Frequency, lists quality control sample type and frequency. Control limits related to analytes listed in the tables are associated with data validation requirements as stated in the National Functional Guideline documents (USEPA 2017a, 2017b).

DISTRIBUTION LIST

Key project personnel and their responsibilities are defined in Table I below. The final approved QAPP will be distributed to the following personnel and analytical laboratory contacts.

TABLE I. PROJECT DISTRIBUTION LIST

Name	Project Affiliation	Organization and Location	Contact Number
Michael Takacs	Groundwater Program Manager	US Ecology, Livonia, MI	734.521.8179
Doug Long	Site Manager	US Ecology, Sheffield, IL	815.454.2342
Kurt Stepping	Laboratory Project Manager	PDC Laboratories, Peoria, IL	309.683.1719

Project Organization and Responsibility

Descriptions of the responsibilities, lines of authority, and communication for the key positions for QA and QC are provided below. The project organization facilitates the efficient performance of project work, allows for an independent quality review and permits resolution of any QA issues before submittal.

Project Leadership and Management

The Site Manager's duties consist of providing concise technical work statements for project tasks, selecting project team members, determining subcontractor participation, establishing budgets and schedules, adhering to budgets and schedules, providing technical oversight, and providing overall production and review of project deliverables. The Site Manager is responsible for coordinating with the USEPA regarding the sampling schedule, site access for oversight activities and split sampling requests. Doug Long is the Site Manager for activities at the Sheffield facility. The LTSP for the facility is conducted as part of, and supported by, the Groundwater Management Program within US Ecology.

Field Coordinator

The Field Coordinator is assigned by the Site Manager and is responsible for the daily management of activities in the field. Specific responsibilities include the following:

- Develops schedules and allocates resources for field tasks.
- Coordinates data collection activities to be consistent with information requirements.
- Collects field data and submits samples to laboratory.
- Assures that data are correctly and completely reported.
- Implements field sampling in accordance with the LTSP and QAPP.
- Schedules sample delivery to the analytical laboratory.
- Assures that appropriate sampling, testing and measurement procedures are followed.

- Participates in QA corrective actions, as required.

The Field Coordinator for the LTSP will be determined at the time of field activities.

Quality Assurance Leader

The Quality Assurance Leader is responsible for the project's overall QA and will be assigned by the Site Manager. The Project QA Leader is responsible for coordinating QA/QC activities as they relate to the acquisition of field data. The QA Leader has the following responsibilities:

- Serves as the official contact for laboratory data QA concerns.
- Responds to laboratory data, QA needs, resolves issues, and answers requests for guidance and assistance.
- Reviews the implementation of the QAPP and the adequacy of the data generated from a quality perspective.
- Maintains the authority to implement corrective actions, as necessary.
- Reviews and approves the laboratory QA Plan.
- Evaluates the laboratory's final QA report for any condition that adversely impacts data generation.
- Ensures that appropriate sampling, testing and analysis procedures are followed and that correct quality control checks are implemented.
- Monitors laboratory compliance with data quality requirements.

Laboratory Management

The laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. Specific responsibilities of this position include:

- Ensures implementation of the QA Plan.
- Serves as the laboratory point of contact.
- Activates corrective action for out-of-control events.
- Issues the final QA/QC report.
- Administers QA sample analysis.
- Complies with the specifications established in the project plans as related to laboratory services.
- Participates in QA audits and compliance inspections.
- Coordinates with the USEPA regarding requests for laboratory access.

The chemical analytical laboratory QA Coordinator will be determined by the laboratory (PDC Laboratories, Inc. in Peoria, Illinois, a National Environmental Accreditation Program [NELAP]-accredited lab).

Data Quality Objectives

The QA objective for technical data is to collect environmental monitoring data of known, acceptable and reportable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for PARCC parameters and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures and QC procedures are set up to provide high-quality and defensible data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness and reporting limits) and qualitative factors (representativeness and comparability). The measurement quality objectives (MQO) associated with these data quality factors are summarized in Table B-2.

Analytes

Groundwater and surface water samples will be submitted for chemical analysis of one or more of the following:

- Volatile Organic Compounds (VOCs) by USEPA Method 8260B;
- Total and dissolved iron, magnesium and manganese by USEPA Method 6020A;
- Chloride and sulfate by USEPA Method 300.0 Rev 2.1;
- Total Solids by SM 2540B-1991;
- Total Dissolved Solids by SM 2540C; and
- Perfluoroalkyl Substances (PFAS) by USEPA Method 8327

Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as MDL. Individual instruments often can detect but not accurately quantify compounds at concentrations lower than the MDL, referred to as the instrument detection limit (IDL). Although results reported near the MDL or IDL provide insight to site conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the practical quantitation limit (PQL) or reporting limit (RL). The analytical laboratory will provide numerical results for all analytes and report them as detected above the RL or undetected at the RL.

Achieving a stated detection limit for a given analyte is helpful in providing statistically useful data. Intended data uses, such as comparison to numerical criteria or risk assessments, typically dictate specific project target reporting limits (TRLs) necessary to fulfill stated objectives. For this project, the TRLs are less than or equal to USEPA Region 4 screening levels. The project analytes, applicable screening levels, and laboratory TRLs are shown in Tables B-3 and B-5 for water, respectively. The TRLs were obtained from PDC Laboratories in Peoria, Illinois. The analytical methods and processes selected will provide RLs less than the TRLs under ideal conditions. Therefore, a particular TRL is considered a target because several factors may influence final RLs. Data users must be aware that high non-detect values, although correctly reported, can bias statistical summaries. Careful interpretation is required to correctly characterize site conditions.

Precision

Precision is the measure of agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates) and laboratory control duplicates. The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons and field duplicate comparisons. This value is calculated by:

$$RPD\,(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} X\ 100,$$

Where:

RPD = relative percent difference

D_1 = sample analytical result

D_2 = duplicate sample analytical result

The RPD will be calculated for appropriate sample sets and compared to the applicable criteria. Persons performing the evaluation must review one or more pertinent documents (USEPA, 2017a; USEPA, 2017b) that address criteria exceedances and courses of action. Relative percent difference goals for this effort are 35 percent in water for all analyses, unless either the sample or duplicate values are within 5 times the reporting limit. In this case, the absolute difference is used instead of the RPD. The absolute difference control limit for water is equal to the lowest reporting limit of the two samples.

Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported value versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest.

Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detect results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detect values are considered accurate while detected results may be higher than the true value.

Accuracy will be expressed as the percent recovery of a surrogate compound (also known as “system monitoring compound”), a matrix spike result, or from a standard reference material where:

$$Recovery\,(\%) = \frac{Sample\ Result}{Spike\ Amount} X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (USEPA 2017a; USEPA 2017b) that address criteria exceedances and courses of action. Accuracy criteria for surrogate spikes, matrix spikes and laboratory control spikes are found in Table B-2.

Representativeness, Completeness and Comparability

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those delineated within this QAPP.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative. Only representative data will be used in subsequent data reduction, validation and reporting activities.

Completeness establishes whether a sufficient number of valid measurements was obtained to meet project objectives. The number of samples and results expected establishes the comparative basis for completeness. Completeness goals are 90 percent useable data for samples/analyses planned. If the completeness goal is not achieved, an evaluation will be made to determine if the data are adequate to meet study objectives.

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

SAMPLE COLLECTION, HANDLING AND CUSTODY

Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling and documentation. Water samples obtained during this study will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table B-1.

Sample containers will be labeled with the following information at the time of collection:

- Project name and number;
- Sample name, which will include a reference to depth if appropriate; and
- Date and time of collection.

Sample collection activities will be noted in the field logbooks. The Field Coordinator will monitor consistency between the QAPP, sample containers/labels, field logbooks and the COC.

Split Sampling

The USEPA can request split samples during any sampling event. The Site Manager will coordinate such requests with the USEPA and the Field Coordinator. Split sample collection and handling will be consistent with protocol specified in this QAPP. The USEPA can also collect samples as part of their oversight; split samples will be made available to US Ecology for analysis for any samples collected by the USEPA.

Sample Storage

Samples will be placed in a cooler with "blue ice" or double-bagged "wet ice" immediately after they are collected; the objective being to attain a sample temperature of 4 ± 2 degrees Celsius. Holding times will be observed during sample storage. Holding times for the project analyses are summarized in Table B-1.

Sample Shipment

The samples will be delivered to the analytical laboratory in the coolers as soon as practical. Field personnel will ship samples to PDC Laboratories, Inc. in Peoria, Illinois for analysis.

Measures will be implemented to minimize the potential for sample breakage, which includes packaging materials and placing sample bottles in the cooler in a manner intended to minimize damage. Sample bottles will be appropriately wrapped with bubble wrap or other protective material before being placed in coolers.

Chain-of-Custody Records

Field personnel are responsible for the security of samples from the time the samples are collected until the samples have been received by the analytical laboratory or shipping service company. A COC form will be completed at the end of the field day for samples being shipped to the laboratory. Information to be included on the chain-of-custody form includes:

- Project name and number;
- Sample identification numbers;
- Date and time of sampling;
- Sample matrix and number of containers from each sampling point, including preservatives used;
- Analyses to be performed or samples to be archived; and
- Names of sampling personnel and transfer of custody acknowledgment spaces.

The original COC record will be signed by the field collector and bear a unique tracking number. Field personnel shall retain carbon copies and place the original and remaining copies in a plastic bag, placed within the cooler or taped to the inside lid of the cooler before sealing the container for transport. This record will accompany the samples during transit by the field team member or shipping service company to the analytical laboratory.

Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include at a minimum, the analysts name or initial, and the time and date of receipt.

Field Documentation

Field documentation provides important information about potential problems or special circumstances surrounding sample collection. Field personnel will maintain daily field logs while on site. The field logs will be prepared on field report forms or in a bound logbook. Entries in the field logs and associated sample documentation forms will be made in waterproof ink, and corrections will consist of line-out deletions that are initialed and dated. Individual logbooks will become part of the project files after the site characterization field explorations. Sampling activities also will be photo-documented at the site.

At a minimum, the following information will be recorded during the collection of each sample:

- Sample location and description
- Site or sampling area sketch showing sample location and measured distances. Sample locations might be logged with a GPS capable device instead of measured and sketched by hand
- Sampler's name(s)
- Date and time of sample collection
- Designation of sample as composite or discrete
- Type of sample matrix
- Type of sampling equipment used
- Field instrument readings
- Field observations and details that are pertinent to the integrity/condition of the samples (e.g., weather conditions, performance of the sampling equipment, sample depth control, sample disturbance, etc.)
- Preliminary sample descriptions (e.g., lithologies, noticeable odors, colors, field-screening results)
- Sample preservation
- Shipping arrangements (overnight air bill number)
- Name of recipient laboratory

In addition to the sampling information, the following specific information also will be recorded in the field log for each day of sampling:

- Team members and their responsibilities
- Time of arrival/entry on site and time of site departure
- Weather conditions
- Other personnel present at the site
- Summary of pertinent meetings or discussions with regulatory agency or contractor personnel
- Deviations from sampling plans, site safety plans and QAPP procedures
- Changes in personnel and responsibilities with reasons for the changes
- Levels of safety protection

- Calibration readings for any equipment used and equipment model and serial number

The handling, use and maintenance of field logbooks are the field coordinator's responsibilities.

Sampling Equipment

Disposable sampling equipment will be used whenever possible. Disposable sampling equipment shall not require decontamination prior to sampling; however, field personnel will carefully inspect equipment and maintain cleanliness prior to use.

Laboratory instrument/equipment testing, inspection and maintenance will be performed and documented by the laboratory. Procedures and schedules for sampling equipment preventive maintenance are the laboratory's responsibility. Each instrument or item of laboratory equipment will be maintained periodically to ensure accuracy. These procedures and performance frequency are designated in the individual instrument manuals. A copy of the laboratory Quality Assurance Manual was received by US Ecology and has been placed in the project file for reference.

CALIBRATION PROCEDURES

Field Instrumentation

Equipment and instrumentation calibration facilitate accurate and reliable field measurements. Field and laboratory equipment used on the project will be calibrated and adjusted in general accordance with the manufacturer's recommendations. Methods and intervals of calibration and maintenance will be based on the type of equipment, stability characteristics, required accuracy, intended use and environmental conditions.

Laboratory Instrumentation

For analytical chemistry, calibration procedures will be performed in general accordance with the methods cited and laboratory standard operating procedures. Calibration documentation will be retained at the laboratory and readily available for a period of six months.

DATA REPORTING AND LABORATORY DELIVERABLES

The laboratory will report data in a digital form acceptable to US Ecology. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates and detection limit (RL only). Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues.

Laboratory electronic data deliverables (EDD) will be established by US Ecology with the analytical laboratory. Final results will be sent to the Site Manager. US Ecology will submit analytical results to the USEPA as part of the annual reporting for the Long-term Stewardship program.

INTERNAL QUALITY CONTROL

Table B-5 summarizes the types and frequency of QC samples to be collected, including both field QC and laboratory QC samples. The following sections describe field and laboratory QC samples.

Field Quality Control

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods. The following sections provide a description of field QC samples.

Field Duplicates

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Under ideal field conditions, field duplicates are created when a volume of the sample matrix is thoroughly mixed, placed in separate containers and identified as different samples. This tests both the precision and consistency of laboratory analytical procedures and methods, and the consistency of the sampling techniques used by field personnel.

One sample for every 10 samples collected will be analyzed for the same analytes as the primary sample.

Trip Blanks

Trip blanks (typically for volatile analysis) are placed with samples during shipment and travel with samples from the laboratory to the field and back to the laboratory. One trip blank will be placed in each cooler that contains samples to be analyzed for VOCs.

Laboratory Quality Control

Laboratory quality control procedures will be evaluated through a formal data validation process. The analytical laboratory will follow standard method procedures that include specified QC monitoring requirements. These requirements will vary by method but generally include:

- Method blanks
- Internal standards
- Calibrations
- Matrix spike/matrix spike duplicates (MS/MSD)
- Laboratory control spikes/spike duplicates (LCS/LCSD)
- Laboratory replicates or duplicates
- Surrogate spikes

Laboratory Blanks

Laboratory procedures employ the use of several types of blanks, but the most commonly used blank for QA/QC assessments are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material having undergone a contaminant destruction process or high-performance liquid chromatography (HPLC) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. Method blanks are particularly useful during volatiles analysis since VOCs can be transported in the laboratory through the vapor phase. If a substance is found in the method blank, then one (or more) of the following occurred:

- Measurement apparatus or containers were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.
- Contaminated analytical equipment was not properly cleaned.
- Volatile substances in the air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios occurred if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. Given method blank results, validation rules assist in determining which substances in samples are considered "real," and which ones are attributable to the analytical process. Furthermore, USEPA guidelines (2017b) state, "There may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

Calibrations

Several types of calibrations are used, depending on the method, to determine whether the methodology is "in control" by verifying the linearity of the calibration curve and to assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations and continuing calibration verifications.

Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix effects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a known amount of one or more of the target analytes ideally at a concentration of 5 to 10 times higher than the sample result. A percent recovery is calculated by subtracting the sample result from the spike result, dividing by the spiked amount, and multiplying by 100.

The field samples for the MS and MSD analyses should be collected from a sampling location that is believed to exhibit low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for these analyses. The MS/MSD samples will be a composite to achieve a level of representativeness and reproducibility in the data. For this long-term monitoring, the MS/MSD samples will be collected at the discretion of the Field Coordinator.

Laboratory Control Spikes/Laboratory Control Spike Duplicates (LCS/LCSD)

Also known as blanks spikes, LCS samples are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared media and a percent recovery of the spiked substances are calculated. The primary difference between a MS and LCS is that the LCS spike media is considered "clean" or contaminant free. For example, HPLC water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance and analyst performance. LCS data must be reviewed in context with other controls to determine if out-of-control events occur.

Laboratory Replicates/Duplicates

Laboratories often utilize MS/MSDs, LCS/LCSDs and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process, but most commonly occur as a second analysis on the extracted media.

Surrogate Spikes

The purposes of using a surrogate are to verify the accuracy of the instrument being used and extraction procedures. Surrogates are substances similar to, but not one of, the target analytes. A known concentration of surrogate is added to the sample and passed through the instrument, noting the surrogate recovery. Each surrogate used has an acceptable range of percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified range of acceptance a possibility of false positives exist, although non-detected results are considered accurate.

Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. Holding times for the analyses in this project are shown in Table B-1.

DATA REDUCTION AND ASSESSMENT PROCEDURES

Data Reduction

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA Leader and Site Manager.

Field Measurement Evaluation

Field data will be reviewed at the end of each day by following the QC checks outlined below. Field data documentation will be checked against the applicable criteria as follows:

- Sample collection information
- Field instrumentation and calibration
- Sample collection protocol
- Sample containers, preservation and volume
- Field QC samples collected at the frequency specified
- Sample documentation and chain of custody protocols
- Sample delivery

Cooler receipt forms and sample condition forms provided by the laboratory will be reviewed for out-of-control incidents. If anything is found to be out-of-control, the Site Manager will implement corrective actions to ensure that additional out-of-control incidents do not occur. The final report will contain what effects, if any, the out-of-control incident may have on data quality. Sample collection information will be reviewed for correctness before inclusion in a final report.

Field Quality Control Evaluation

A field QC evaluation will be conducted by reviewing field logs and daily reports, discussing field activities with staff and reviewing field QC samples (trip blanks and field duplicates). Trip blanks will be evaluated using the same criteria as method blanks.

Laboratory Data Quality Control Evaluation

The laboratory data assessment will consist of a formal review of the following QC parameters:

- Holding times
- Method blanks
- Matrix spike/spike duplicates
- Laboratory control spikes/spike duplicates
- Surrogate spikes
- Replicates

In addition to these QC mechanisms, other documentation such as cooler receipt forms and case narratives will be reviewed to fully evaluate laboratory QA/QC.

DATA QUALITY REVIEW AND VALIDATION PROCEDURES

Analytical data shall first be compiled by the analytical laboratory and reduced to include the specified deliverable elements. PDC Laboratories will conduct an internal review of analytical data prior to data report submission to US Ecology. Data reports must be signed by laboratory personnel responsible for production and analytical data review. Once received, the data will be validated by QA/QC Leader assigned by US Ecology in compliance with existing validation guidelines prior to submitting to the Site Manager for data assessment.

ASSESSMENT AND RESPONSE ACTIONS

Project QAPP assessment will be performed by reviewing field notes, laboratory reports, and by conducting field and laboratory audits where possible and as resources allow. This assessment will be completed or directed by the US Ecology Site Manager. Errors or inconsistencies identified in the field notes will be investigated and corrected to ensure data integrity, and conformance to the QAPP and associated field sampling procedures. Laboratory internal QA reviews, audits, surveillances or other types of assessment will also be reviewed. If unexpected analytical results are reported, the US Ecology Site Manager will contact the laboratory to perform a review of the questionable data. A note to the file regarding follow-up QA activities will be included with the field notes and laboratory reports, if warranted.

The US Ecology Site Manager will review the QAPP to ascertain if the document continues to meet the data user(s) needs. If the QAPP or SAP requires revision as a result of the audit or review, the corrections will be made, and the revised QAPP submitted to USEPA and the original signatories for preapproval prior to implementation.

DATA MANAGEMENT

Data management consists of routing and storing incoming data and project correspondence to facilitate security, access and compliance with project goals.

Analytical Data Management

PDC Laboratories will provide data to US Ecology in an electronic format. Electronic data will be sent to the US Ecology QA/QC Leader for validation. The electronic data will be processed into an analytical database and/or Microsoft Excel spreadsheet for reporting.

Data Review, Verification and Validation

Data Review

Data review is performed by the Site Manager to verify that project data has been recorded, transmitted and processed correctly.

Data Verification

Data verification follows data review and is performed to evaluate data completeness, correctness, conformance and compliance against QAPP-specified method, procedural or contractual requirements. Data verification evaluates actual project performance against QAPP established requirements.

Data Validation

Data validation is conducted by the QA/QC Leader, or qualified expert not otherwise assigned to the project or data generating activities. Validation follows the data review and verification process and is an analyte- and sample-specific process that determines specific data quality with respect to project objectives. Data validation efforts shall include reviewing a minimum of 90 percent of all project data.

Project data validation must be equivalent, or at a minimum to USEPA Stage 1 and Stage 2A verification and validation checks as outlined in the guidance (USEPA 2009). These checks include verifying the following:

- Documentation identifying sample-receiving analytical laboratory for samples submitted for analyses
- Requested analytical methods performed and analysis dates
- Requested target analyte results reported with original laboratory data qualifiers and data qualifier definitions
- Requested target analyte units are reported
- Requested reporting limits for samples are present and results at or below the reporting limits are identified
- Documentation of sample collection dates and times; date and time of laboratory sample receipt; and sample conditions upon receipt by laboratory
- Sample results are evaluated by comparing sample conditions upon receipt by the laboratory and sample characteristics to the requirements and guidelines present in national or regional data validation documents or analytical method(s)

- Required handling, preparation, cleanup and analytical methods are performed
- Method dates for handling preparation, cleanup and analysis are present, as appropriate
- Sample-related QC data and QC acceptance criteria (e.g. method blanks, surrogate recoveries, laboratory control sample recoveries, duplicate analyses, matrix spike, and matrix spike duplicate recoveries, serial dilutions, post-digestion spikes, standard reference materials) are provided and linked to the reported field samples
- Requested spike analytes or compounds are added, as appropriate
- Sample holding times are evaluated
- Frequency of laboratory QC samples is checked for appropriateness
- Sample results are evaluated by comparing holding times and sample-related QC data to the requirements and guidelines present in national or regional validation documents or analytical method(s)

Potential unacceptable departures from the project QAPP requirements will be noted during the data validation process. If the QA/QC Leader determine the data do not meet the project needs, or the QAPP DQOs and/or conclusions drawn from the data do not appear reasonable, they shall immediately report such findings to the Site Manager to address necessary corrective actions. Such findings and activities shall be documented and maintained in the project files.

Non-direct Measurements and Data

Non-direct measurements and data acquisition refer to data obtained for project use from existing data sources, obtained or produced by others, and not directly measured or generated in this project scope. Once existing data has been received, reviewed and validated referencing EPA QA/G-8 (USEPA 2002b) it may be incorporated into an annual report.

Corrective Action

Any deviation from the established criteria will be documented and the data will be qualified, as appropriate. If significant quality assurance problems are encountered, appropriate corrective action as determined by the Site Manager and/or the analytical laboratory will be implemented as appropriate.

REFERENCES

U.S. Environmental Protection Agency (USEPA). 2001. Requirements for Quality Assurance Project Plans, USEPA QA/R-5, Office of Environmental Information, EPA/240/B-01/003. March 2001.

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USEPA. 2017a. Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Methods Data Review, EPA-540-R-2017-001. January 2017.

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USEPA. 2019. Proposed Method 8327 for Per- and Polyfluoroalkyl Substances (PFAS) using External Standard Calibration and Multiple Reaction Monitoring (MRM) Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS). June 2019.

Table B-1

Test Methods, Sample Containers, Preservation and Holding Time[1]

US Ecology Former Hazardous Waste Facility
Sheffield, Illinois

Analysis	Matrix	Method	Minimum Sample	Sample Containers	Sample Preservation	Holding Times
Volatile Organic Compounds (VOCs)	Water	8260B	40 mL	3 x 40 mL amber VOA vial, PFTE septa cap, no headspace	pH<2 with HCl, Cool to 4±2°C	14 days
Metals (Total and Dissolved)		6020A	100 mL	250-mL HDPE	Total-pH<2 with HNO_3, Cool to 4±2°C Dissolved - Field filter into a separate 250-mL HDPE	6 months
Chloride and Sulfate		300.0 Rev 2.1	50 mL	125-mL HDPE	Cool to 4±2°C	28 days
Total Solids		SM2540B-1991	200 mL	500-mL HDPE	Cool to 4±2°C	7 days
Total Dissolved Solids		SM2540C	1000 mL	1-L HDPE	Cool to 4±2°C	7 days
Perfluoroalkyl Substances (PFAS)		8327	5 mL	15 mL-HDPE	Cool to 4±2°C	28 days

Notes:

[1]Holding times are based on elapsed time from date of collection.

HCl = Hydrochloric acid

HDPE = High-density Polyethylene

HNO3 = Nitric acid

PFTE = Polytetrafluoroethylene

VOA = volatile organic analysis

mL = milliliter; L = Liter; C = Celsius

Table B-2

Measurement Quality Objectives

US Ecology Former Hazardous Waste Facility

Sheffield, Illinois

Laboratory Analysis	Reference Method	Surrogate Standards (SS) %R Limits[1,2,3]	Check Standard (LCS) %R Limits[2,3]	Matrix Spike %R Limits[3]	MSD Samples or Lab Duplicate RPD Limits[4]	Field Duplicate Samples RPD Limits[4]
		Water	Water	Water	Water	Water
Volatile Organic Compounds (VOCs)	8260B	72.4%-124%	70.1%-139%	13.8%-200%	≤40%	≤35%
Metals (Total and Dissolved)	6020A	NA	80%-120%	75%-125%	≤20%	≤35%
Chloride and Sulfate	300.0 Rev 2.1	NA	NA	80%-120%	≤20%	≤35%
Total Solids	SM2540B-1991	NA	NA	NA	≤5%	≤35%
Total Dissolved Solids	SM2540C	NA	67.9%-132%	NA	≤5%	≤35%
Perfluoroalkyl Substances (PFAS)	8327	70%-130%	70%-130%	70%-130%	≤30%	≤35%

Notes:

[1]Individual surrogate recoveries are compound specific.

[2]Recovery Ranges are estimates. Actual ranges will be provided by the laboratory when contracted.

[3]Percent Recovery Limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes.

[4]RPD control limits are only applicable if the concentration is greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the sample and duplicate must be less than the lowest reporting limit of the two samples.

Method numbers refer to EPA SW-846 Analytical Methods recommended analytical methods.

%R = percent recovery; LCS = Laboratory Control Sample; MS/MSD = Matrix Spike/Matrix Spike Duplicate; RPD = Relative Percent Difference;

NA = Not applicable

Table B-3

Water Analytical Methods and Target Reporting Limits

US Ecology Former Hazardous Waste Facility

Sheffield, Illinois

Analyte	EPA Analytical Method	Method Detection Limit (µg/L)	Practical Quantitation Limit (µg/L)	Region 4 Surface Water Screening Values - Freshwater (µg/L)
Volatile Organic Compounds (VOCs)				
1,1-Dichloroethane	8260B	0.80	1.0	410
1,1-Dichloroethene		0.70	1.0	130
1,2-Dichloroethane		0.20	1.0	2,000
1,2-Dichloropropane		0.40	1.0	520
Benzene		0.80	1.0	160
Chloroform		0.20	1.0	140
cis-1,2-Dichloroethene		0.60	1.0	620
Methylene chloride		0.40	1.0	1,500
Tetrachloroethene		0.70	1.0	53
trans-1,2-Dichloroethene		0.90	1.0	558
Trichloroethene		0.80	1.0	220
Vinyl chloride		0.80	1.0	930
Metals				
Total iron	6020A	1.1	2.0	1,000
Dissolved iron		0.50	2.0	1,000
Total magnesium		3.8	20	82,000
Dissolved magnesium		0.40	20	82,000
Total manganese		0.11	0.20	93
Dissolved manganese		0.011	0.20	93
Conventionals				
Total solids	SM2540B-1991	NA	17,000	NE
Total dissolved solids	SM2540C	NA	17,000	NE
Chloride	300.0 Rev 2.1	72	1,000	NE
Sulfate		62	1,000	NE
Perfluoroalkyl Substances (PFAS)				
Perfluorooctanoic acid (PFOA)	8327	NA	0.002	NE
Perfluorooctanesulfonic acid (PFOS)		NA	0.00	NE

Notes:

µg/L = micrograms per Liter

NE = Not established

NA = Not applicable

Table B-4

Water Laboratory Precision and Accuracy Limits

US Ecology Former Hazardous Waste Facility

Sheffield, Illinois

Analyte	EPA Analytical Method	Precision Difference (%)	Accuracy Limit (%)
Volatile Organic Compounds (VOCs)			
1,1-Dichloroethane	8260B	40	72.4-124
1,1-Dichloroethene		40	68.8-169
1,2-Dichloroethane		40	72.4-124
1,2-Dichloropropane		40	72.4-124
Benzene		40	72.4-124
Chloroform		40	69.4-138
cis-1,2-Dichloroethene		40	72.4-124
Methylene chloride		40	72.4-124
Tetrachloroethene		40	71.6-128
trans-1,2-Dichloroethene		40	72.4-126
Trichloroethene		40	13.8-200
Vinyl chloride		40	70.1-139
Metals			
Total iron	6020A	20	75-125
Dissolved iron		20	75-125
Total magnesium		20	75-125
Dissolved magnesium		20	75-125
Total manganese		20	75-125
Dissolved manganese		20	75-125
Conventionals			
Total solids	SM2540B-1991	5	NA
Total dissolved solids	SM2540C	5	67.9-132
Chloride	300.0 Rev 2.1	20	80-120
Sulfate		20	80-120
Perfluoroalkyl Substances (PFAS)			
Perfluorooctanoic acid (PFOA)	8327	30	70-130
Perfluorooctanesulfonic acid (PFOS)		30	70-130

Notes:

% = Percent

NA = Not applicable

Table B-5

Quality Control Sample Type and Frequency

US Ecology Former Hazardous Waste Facility

Sheffield, Illinois

Parameter	Field QC		Laboratory QC			
	Field Duplicates	Trip Blanks	Method Blanks	LCS	MS / MSD	Lab Duplicates
VOCs	1/every 10 samples	1/batch	1/batch	1/batch	1/batch	NA
Metals	1/every 10 samples	NA	1/batch	1/batch	1/batch	1/batch
Chloride and Sulfate	1/every 10 samples	NA	1/batch	NA	1/batch	NA
Total Solids	1/every 10 samples	NA	1/batch	NA	NA	1/batch
Total Dissolved Solids	1/every 10 samples	NA	1/batch	1/batch	NA	1/batch
Perfluoroalkyl Substances (PFAS)	1/every 10 samples	NA	1/batch	1/batch	1/batch	NA

Notes:

No more than 20 field samples can be contained in one batch.

LCS = Laboratory control sample

MS = Matrix spike sample

MSD = Matrix spike duplicate sample

NA = Not applicable

QC = Quality control

VOCs = volatile organic compounds

Appendix C
Leachate Collection, Storage and Disposal Protocol

Appendix C. Leachate Collection and Disposal Procedures

There are 59 leachate monitoring sumps at the facility. Leachate levels and pumping rates have decreased significantly since 1983 when the site stopped receiving waste materials for disposal. Many locations no longer yield pumpable quantities of leachate.

Due to the small volumes of leachate generated at the site, the leachate sumps are monitored from July through October to check for the presence of liquids. Leachate sump risers consist of polyvinyl chloride (PVC) or steel pipe and are clearly visible in the field, as they rise above the landfill cover. Each sump is equipped with a cap and security seal to provide evidence of tampering. For field identification, a long-lasting, non-rusting, metal plate stamped with the sump number has been permanently affixed to the riser pipe. The specifics for the leachate system inspection and leachate removal are provided below.

- At the time of inspection, the date, depth of liquid, depth to bottom of the sump (both measured from top of casing) and the initials of the inspector will be entered on the sump log.
- If the depth of liquid (depth to bottom minus depth to liquid) is 1 foot or greater, leachate will be pumped from the sump until all liquid is removed. The total amount of liquid removed will be recorded on the sump log.
- Sumps that are essentially dry (less than 1 foot of leachate on the liner) in July will be sealed and not accessed until the following year.
- Any sumps that have 1 foot or greater of leachate will be pumped and monitored regularly until there is less than 1 foot for two consecutive months. At that time, these sumps will be sealed and monitored again the following year.

When required to pump sumps, these operational procedures are followed:

- 12-volt electric sump pumps will be used for all sumps.
- Each sump will be pumped into a mobile transfer tank.
- Polychlorinated biphenyl (PCB) caution and hazardous waste labels will be placed on the transfer tank.
- When the transfer tank is full or when the sump pumping operations are completed that day, the liquids will be transported to the Leachate Accumulation Building for transfer and packaging for off-site disposal.

The Leachate Accumulation Building containment area is an 18- by 40-foot area surrounded by a 12-inch-high berm. All leachate is transferred to 250-gallon totes that sit inside the containment area. Spill management equipment (oil dry, absorbent pads, shovels, empty drums and liners) is stored in the building and all personnel are trained in spill response protocol.

When pumping leachate into the storage totes located inside the Leachate Accumulation Building, these operational procedures will be followed:

- A pump dedicated to the leachate accumulation building will be used for pumping leachate from the portable collection tank to the totes.

- The leachate level in the totes will be checked prior to filling to control overfill.
- Absorbent material will be placed under the hose to catch any liquid that may leak or drip while pumping.
- The amount of leachate pumped in the totes during each filling will be recorded. The 90-day accumulation period begins when leachate is first pumped into the totes.
- Persons in the work area wear assigned protective equipment.
- All materials and equipment are stored inside the Leachate Accumulation Building.
- When pumping sumps, transferring leachate, or packaging leachate for shipment, all personnel will be informed of and will follow safety and operational procedures as described below:
  - Personnel will wear chemical resistant Tyvek® suits and gloves, safety glasses with side shields or chemical splash goggles, boots with chemical resistant rubber pull-over boots, FM two-way radios, and respirators with organic vapor, acid gas dust, fume mist combination cartridges.
  - Absorbent material will be included in the field equipment in case a leak or a spill occurs.
  - All contaminated rags, Tyvek clothing and gloves will be placed in an open-head Department of Transportation (DOT)-approved drum and stored in the Leachate Accumulation Building with a polychlorinated biphenyl (PCB) caution and hazardous waste labels affixed. Open-head drums are closed except when adding solid waste. Before the drum has reached its 90-day accumulation period, the drum is shipped to an approved disposal facility.

Collected leachate is periodically hauled to a permitted disposal facility for hazardous materials. Leachate liquids are disposed at the Veolia facility in Baytown, Texas. Any hazardous solids are disposed at the US Ecology facility in Robstown, Texas.

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