DECISION DOCUMENT

FOR THE REMEDIATION OF
Operable Unit 10 (Portion of Parcel 3B1)
Diamond Shamrock Painesville Works Site
Painesville, Lake County, Ohio

Division of Environmental Response and Revitalization
Northeast District Office

December 2016

I certify this to be a true and accurate copy of the official documents as filed in the records of the Ohio Environmental Protection Agency.

By [Signature]
Date: 4/17
DECLARATION

SITE NAME AND LOCATION

Operable Unit 10
Diamond Shamrock Painesville Works Site
Lake County, Ohio

STATEMENT OF BASIS AND PURPOSE

This Decision Document presents the selected remedial action for Operable Unit 10 (OU10) in Lake County, Ohio, chosen in accordance with the policies of the Ohio Environmental Protection Agency (Ohio EPA), statutes and regulations of the State of Ohio, and the National Contingency Plan, 40 CFR Part 300.

ASSESSMENT OF THE SITE

Actual and threatened releases of industrial, hazardous, and other wastes at OU10, if not addressed by implementing the remedial action selected in the Decision Document, constitute a substantial threat to public health or safety and are causing or contributing to air or water pollution or soil contamination. Approximately 1 acre of land in OU10 was used for land disposal of process and/or research and development (R&D) wastes within constructed cells in native clay. According to records, disposal occurred between 1963 and 1970 and consisted of solid and liquid acids, caustics, organics, metallo-organics, and fungicides. In the late 1980's, the Diamond Shamrock Corp. conducted voluntary closure at the OU10 landfill. This consisted of the installation of a multi-component landfill cap using geosynthetic material and natural clay, a slurry wall around the OU10 site and into bedrock to prevent ground water migration, a ground water extraction system, a perimeter monitoring well network, and a security fence around the OU10 site.

DESCRIPTION OF THE SELECTED REMEDY

The major components of Ohio EPA’s selected remedy for OU10 include:

- Continued operation and maintenance (O&M) of the existing containment and extraction system under a final O&M Plan. Precautions for the OU10 landfill maintenance workers are to be specified in a Risk Mitigation Plan (RMP).

- Restriction of access to OU10 through inspection and maintenance of the OU10 site security perimeter fence and installation of deterrent landscaping.

- Establishment of an enforceable Environmental Covenant (EC) to: restrict the long-term use of OU10 to landfill maintenance and monitoring operations; prohibit development and excavation within the OU10 buffer zone that may interfere with monitoring, maintenance, or potential response activities; prohibit the use of ground
water for potable and non-potable use; prohibit the construction of any new structures on OU10 that would compromise the integrity of the landfill cap, and specifically preclude the construction of habitable structures within the buffer zone.

- Development of a RMP, for Ohio EPA approval, to address potential exposure during monitoring and maintenance activities to contaminated soil, ground water, and other landfill materials, as well as requiring that pre-trenching be performed for any sub-surface work conducted within OU10. The RMP will be referenced in the EC.

STATUTORY DETERMINATIONS

The selected remedial action is protective of human health and the environment, complies with legally applicable state and federal requirements, is responsive to public participation and input and is cost-effective. The remedy uses permanent solutions and treatment technologies to the maximum extent practicable to reduce toxicity, mobility and volume of hazardous substances at OU10. The effectiveness of the remedy will be reviewed regularly every five (5) years.

Craig W. Butler, Director

1/3/17

Date
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DECISION SUMMARY
Diamond Shamrock, OU10
Lake County, Ohio

1.0 SUMMARY OF SITE CONDITIONS

1.1 Site History

The Diamond Shamrock Painesville Works Site (Site), of which OU10 is a part, is an approximately 1,100-acre former chemical manufacturing facility located in Lake County, Ohio (see Figure 1). The Grand River bisects the Site and Lake Erie borders it to the north. The Diamond Shamrock Painesville Works facility operated from 1912 through 1977 and manufactured a variety of products, including, but not limited to, soda ash, baking soda, chromium compounds, carbon tetrachloride, hydrochloric and sulfuric acids, chlorinated wax, and coke. The former facility also generated its own electricity in an on-site power plant. A number of individuals and companies purchased property from Diamond Shamrock and operated industrial facilities within the boundaries of the Site, including an aluminum smelting plant, a polyvinyl chloride monomer facility, and a coke plant.

Director’s Final Findings and Orders (DFFOs) for the Remedial Investigation/Feasibility Study (RI/FS) at the Site were signed in 1995 by Ohio EPA and the potentially responsible parties (PRPs). The PRPs include Chemical Land Holdings, Maxus Energy Corporation, Occidental Chemical Corporation, Painesville Township Board of Trustees, Uniroyal Chemical Company, Village of Fairport Harbor, and the Painesville PRP Group. These DFFOs were issued based on historical data collected by Ohio EPA, U.S. EPA, and others.

Operable Unit (OU) 10 is located on the northeastern portion of the Site. OU10 is approximately five (5) acres in size. OU10 originally consisted of parcel 3B1 and was approximately 11 acres in size. In 2004, the boundary of OU10 was redefined to consist of the landfill system (1 acre) and associated support areas for a total of 2.5 acres. In March of 2012, the northern boundary of OU10 was redefined to extend due north to Lake Erie. This includes the shoreline stabilization system, which was constructed to protect OU10. This 5-acre area is collectively referred to as OU10. Figure 1 shows OU10 as it relates to the entire Site. Figure 2 shows the outline of OU10 specifically. The western, southern, and eastern limits of OU10 are defined as the perimeter of the associated monitoring well network. OU10 operated from 1963 to 1970 and was used for the disposal of a variety of chemical wastes. This included acids, caustics, organic compounds, metallo-organic catalysts, and fungicides. Wastes, in both solid and liquid forms, were disposed within individual cells. A list of chemicals disposed of at OU10 is included in Appendix A of this preferred plan.

Environmental assessments and remediation occurred in the 1980’s for OU10. During the 1980’s, closure activities for OU10 were conducted. Chemicals were containerized and
disposed of in cells constructed in native clay soils (see Appendix B). According to records, approximately 30 cells were constructed and used for disposal within OU10.

In 1988, Diamond Shamrock voluntarily closed OU10 with oversight by Ohio EPA. Closure activities included:

- Construction of a slurry wall around the perimeter of the OU10 landfill, extending into bedrock;
- Stabilization and protection of the Lake Erie shoreline using concrete "dolos" to dissipate wave energy, as well as a combination of geotextiles, topsoil, and a vegetative cover;
- Construction of a multi-layered cap over the One-Acre Site (OAS) landfill and slurry wall, consisting of a minimum 3-foot-thick compacted clay layer, a 60-mil High-Density Polyethylene (HDPE) synthetic liner, and a minimum of 18-inches of topsoil with a vegetative clay cover;
- Installation of piezometers, monitoring wells, and extraction wells;
- Surface drainage improvements; and
- Installation of a 12-foot fence surrounding OU10.

In 1999, Ohio EPA and Chemical Land Holdings, Inc. entered into an Interim Operation and Maintenance Plan (Interim O&M Plan) for the performance of operation and maintenance of the OAS landfill. The contents of the Interim O&M Plan can be found in Appendix C. The O&M plan has since been amended on two (2) separate occasions. The first amendment occurred on April of 2014 which updated the analytical test methods for ground water samples from Contract Laboratory Protocol (CLP) data to the usage of SW-846 methods, which is currently and consistently used across the entire site for sample analysis. The second amendment took place in March of 2016, which memorialized an expansion of the monitoring system at OU10 to include deep ground water sampling, and analysis of slope stability on the northern side of OU10. Data from this on-going monitoring is provided to Ohio EPA on a quarterly basis, and copies of the reports are maintained in the Agency's Northeast District Office (NEDO) files. The OU10 property is currently owned and maintained by Tierra Solutions.

### 1.2 Summary of the Remedial Investigation

Remedial Investigation (RI) activities were conducted by the Painesville PRP Group and other signatories to the 1995 DFFOs with oversight by Ohio EPA. The RI was performed in two phases and included sampling of surface and subsurface soils, surface water, sediment, and ground water for the purposes of determining the nature and extent of contamination on OU10. The data obtained from the RI were used to conduct a baseline risk assessment and to determine the need to evaluate remedial alternatives. This
Preferred Plan contains only a brief summary of the findings of the RI and Feasibility Study (FS). Please refer to the Phase I Remedial Investigation Report (SECOR, 1999) and Phase II Remedial Investigation Report (SECOR, 2003), the Lake Erie and Grand River Human Health Risk Assessment for Site-Wide Issues (Hull, 2003), the Revised Risk Evaluation for the Grand River (Hull, 2006), the Feasibility Study for OU10 (Hull 2011), and the Feasibility Study for OU1N-Lake (Hull, 2008) for additional information regarding contaminant concentrations.

The nature and extent of contamination within OU10 of the Site, in each environmental medium, and the contaminants of concern (COCs) attributable to this OU, are described below.

1.2.1 Soil Contamination

In order to preserve the integrity of the engineered landfill cap, Ohio EPA did not require the collection of surface and subsurface soil samples. In addition, sampling was not necessary, because the contents of the OU10 Landfill had previously been determined to be hazardous substances, hazardous wastes, and other wastes based on disposal records kept by Diamond Shamrock.

In order to determine whether soils in areas adjacent to OU10 were impacted by OU10, Ohio EPA required the installation of two soil borings and groundwater wells within the boundaries of OU3. These were installed along the eastern and southern boundary of OU10 and OU3. Surface soil and subsurface soil samples were collected from each soil boring and analyzed for metals, volatile organic compounds (VOCs), poly-nuclear aromatic hydrocarbons (PAHs), pesticides, herbicides and polychlorinated biphenyls (PCBs). No contaminants were found in excess of residential U.S. EPA Region IX Preliminary Remediation Goals (PRGs) in soils collected and analyzed from these two borings.

1.2.2 Ground Water Contamination

Ground water for OU10 is included within the groundwater operable unit OU1N-Lake, which also includes OU3, OU18, and a portion of the adjacent Dartron site. The geology in the area of OU10 consists primarily of glacial till and lacustrine (lake) deposits. Native soils consist of silty clay, with lesser amounts of sand and gravel. The shale bedrock found in the area is located approximately 65-feet below the glacial and lacustrine deposits. Monitoring wells at the OAS are screened between 23.5 and 54.3 feet below ground surface (bgs).

Ground water yield is limited in the area of OU10 and few wells exist in the vicinity of the overall Site. The closest well for potable purposes is located upgradient, approximately 6,000 feet to the southeast of the Site.

Ground water within OU1N-Lake flows north toward Lake Erie. Ground water yield and quality is very low at the Site and is naturally mineralized in the low permeability silty
material in which the wells are screened. Ground water is encountered at depths of less than 10 feet bgs to depths of 30 feet bgs within OU10.

Five (5) rounds of ground water sampling were performed during the Phase I and Phase II RIs on the six (6) wells installed immediately outside the landfill cap and slurry wall. Ground water was analyzed for metals, VOCs, semi-volatile organic compounds (SVOCs), pesticides, PCBs, hexavalent chromium, and cyanide. In addition, these wells have been sampled on a quarterly basis since 1999 as part of the Interim O&M Plan for OU10. Quarterly samples are analyzed for metals, cyanide, select VOCs and SVOCs, pesticides, herbicides, and PCBs. Two (2) additional wells were installed during the Phase II RI within OU3, located to the south and east of OU10. These wells were sampled during two (2) separate events for metals, VOCs, SVOCs, pesticides, PCBs, hexavalent chromium, and cyanide. Results from ground water sampling were used to determine whether Lake Erie could be potentially impacted by contaminants within OU1N-Lake, including OU10.

1.2.3 Surface Water Contamination

The Lake Erie and Grand River Baseline HHRA (Hull, 2003), submitted as part of the Phase II Remedial Investigation Report, Appendix S-I (SECOR, 2003) evaluated both potential releases of COCs from ground water discharges to the Grand River and Lake Erie using a ground water fate and transport model (BIOSCREEN), and any impacts to surface water posed by OU10. The evaluation was performed, in part, to determine the potential for OU10 related contaminants to impact persons involved in recreational activities including fish ingestion in Lake Erie. Fish ingestion was quantitatively evaluated using historical data, with the current Ohio Department of Health fish advisories for Lake Erie taken into account.

Any chemical detected in ground water at concentrations above its respective State of Ohio Outside the Mixing Zone Average (OMZA) water quality standards were evaluated for their potential to migrate and discharge into Lake Erie. The BIOSCREEN model was used to predict concentrations of chemicals of interest (including total dissolved solids – TDS) in ground water at the point of discharge to surface water, assuming the maximum detected concentration in each well migrates to the lake by the shortest ground water flow path. The predicted surface water concentrations at the point of discharge to surface water were compared to surface water quality standards for the protection of human health (non-drinking).

The only monitoring well evaluated as part of OU10 that had contaminants that exceeded the predicted surface water concentration during any of the sampling was monitoring well SW3-2, which is located adjacent to OU10 within OU3. Silver was detected and was projected to exceed the OMZA at the ground water/surface water interface adjacent to OU1N-Lake for aquatic life. The initial round of sampling during the Phase II RI detected 1.8 μg/L of silver in ground water; however, the second round of sampling did not detect silver above the 0.83 μg/L detection limit. Ohio EPA requested that the Painesville PRP Group collect a third sample from the well in May 2005. Silver was not detected during
the third sampling event in either the original or duplicate sample above the 1.0 ug/L detection limit. Based on the May 2005 results, Ohio EPA and the Painesville PRP Group eliminated silver as a COC in OU1N-Lake.

Since the OU10 landfill is covered with an engineered cap, there is no potential for overland migration of contaminants to Lake Erie from OU10. This situation will continue as long as the OU10 landfill cap is maintained.

**1.2.4 Leachate Contamination**

The ground water extraction system (GES) has been pumped approximately every 4 – 6 weeks to maintain water levels below the waste disposal cells. Ground water which is extracted from the OU10 site is taken to an off-site treatment facility for proper disposal. The extracted ground water is managed as a Resource Conservation and Recovery Act (RCRA) listed hazardous waste. Low levels of VOCs, SVOCs, and metals have been detected in samples obtained from piezometers and extraction wells constructed inside the slurry wall. Although piezometers and extraction wells are not specifically designed for sampling, ground water quality was evaluated at these locations between 4/21 – 4/23, 2009. All five (5) extraction wells and three (3) piezometers were sampled. The water quality analysis from those locations was more of a qualitative evaluation to determine the presence or absence of contaminants. Table 1 shows water quality analysis from internal piezometers and extraction wells collected in April 2009 and January 2010.

All OU10 ground water wells installed for purposes of specifically evaluating ground water quality outside the slurry wall, and used to determine if the remedy is performing in a manner that it was designed to, have not shown a release from the OU10 site for VOCs, SVOCs, PCBs, or metals. Ground water sampling has occurred on a quarterly basis since 1999, and is the primary indicator of the landfill containment system performance.

**1.2.5 Outdoor and Indoor Air Contamination**

Releases of VOCs to outdoor and indoor air were not evaluated for OU10 due to the lack of receptors and structures present.

**1.2.6 Biological Contamination**

Due to the lack of habitat and receptors and the maintenance of the OU10 landfill cap, an ecological risk assessment was not required for OU10.

**1.3 Additional Information, Approved by Ohio EPA, Subsequent to the Remedial Investigation**

**1.3.1 Quarterly Ground Water Monitoring**

Tierra Solutions, Inc. (TSI) has been performing quarterly monitoring of the ground water wells surrounding OU10 uninterrupted since approval of the Interim O&M Plan in 1999, as
amended in 2014 and 2016. The quarterly reports are maintained at the Site information repositories for review. The most current ground water sample results from the Second Quarter 2016 (April – June) are shown on Table 2. Quarterly ground water sampling at OU10 has been on-going since 1999. The results have been consistent in showing that site related constituents detected within the landfill are not migrating through or below the slurry wall containment system.

1.3.2 BIOSCREEN Confirmation

Conservative modeling conducted during the Remedial Investigation identified OU-related contaminants that could potentially impact Lake Erie. When silver was eliminated as a COC, due to confirmatory sampling, only TDS remained.

In order to determine if TDS were reaching Lake Erie in concentrations in excess of the OMZA, the Painesville PRP Group proposed a sampling plan for the portion of Lake Erie adjacent to OU3. This sampling was developed with input from Ohio EPA’s Division of Surface Water and a work plan for this sampling was approved by Ohio EPA. Surface water samples were collected from Lake Erie in late-2007, following the approved plan. Results from the sampling indicated that elevated levels of TDS in ground water are not causing an OMZA exceedance in Lake Erie. A complete discussion of the Lake Erie and Grand River confirmatory sampling may be found in the Feasibility Study for Operable Unit OU1N-Lake (Hull, 2008).

Additional information for OU10 can be reviewed at the public repository.

1.4 Interim or Removal Actions Taken to Date

In 2006, a Work Plan was submitted to Ohio EPA by Hull and Associates for proposed improvements to the OU10 site. These actions contributed to the overall aesthetics of the OU10 site, as well as increasing the ease of operation and reliability of the system. The improvements to the OU10 leachate collection system consisted of mechanical and aesthetic improvements. Removal of all above-ground systems and installation of a subgrade piping system was conducted. Additional soil was also placed over the landfill cap to provide added protection for the landfill liner, and to improve the aesthetic quality of the OU10 site.

The primary activities performed during implementation of the OU10 site improvements include:

- Replacement of the above ground pump discharge piping with subgrade piping that conveys leachate to a central collection point;

- Placement of fill material on the landfill at thicknesses ranging from 0.5 feet to 6.5 feet;
• Installation of under-ground piping connections from each extraction well to a central, below grade manifold to adjust the final grade so the piping slopes towards the extraction wells, and reshaping the existing landfill topography to blend in with surrounding proposed property development;

• Centralizing electrical power, and switching each pump into a breaker panel located in the subgrade piping manifold; and

• Adjusting the height of the extraction wells, monitoring wells, and piezometers to meet a final design grade.

Also part of the OU10 site O&M is pumping of the ground water extraction wells as needed to maintain an inward hydraulic gradient, measuring and recording depths to water in all wells and piezometers on a quarterly basis to ensure and document inward gradients, ground water sampling on a quarterly basis, maintaining the vegetative cover on the OU10 site, and quarterly inspections of the cap for sinking, animal burrows, and perform repairs as needed. Inspection of the bluff below the OU10 site takes place on a quarterly basis, as well as surveying elevations and coordinates of the existing landfill stability benchmarks to monitor any slope movement, and to evaluate the overall OU10 site stability. Figure 3 is a conceptual aerial view of the OU10 landfill including monitoring wells, extraction wells, piezometers, and other components of the existing remedy.

1.5 Summary of site Risks and Need for Remedial Action

A quantitative baseline risk assessment was not performed for OU10, due to its status as a closed hazardous waste landfill. As discussed in Section 1.1, the OU10 landfill was voluntarily closed in 1988. An engineered cap, slurry wall, ground water collection system, and monitoring wells were constructed to protect human health and the environment. These engineering controls prohibit direct contact with ground water, wastes, and contaminated soils within the landfill. Potential risk for maintenance workers at OU10 does exist, due to the possibility of contact with leachate and ground water during extraction, sampling, and maintenance activities. A RMP will be developed to address those potential risks.

1.5.1 Risks to Human Health

Due to the lack of receptors and the maintenance and monitoring associated with the OU10 landfill cap, a human health risk assessment was not required for OU10. It is assumed that soils, waste, and contaminated ground water below the cap would cause an exceedance of acceptable risk based standards, if exposed. Figure 4 shows a conceptual outline of current and future exposure scenarios for a landfill maintenance worker. As referenced in section 1.5 above, the RMP will address those potential risks.
1.5.2 Risks to Ecological Receptors and the Environment

A quantitative baseline ecological risk assessment was not performed for OU10, due to the limited habitat, limited ecological receptors, and the current and planned end uses of the landfill.

Due to the perimeter slurry wall and engineered landfill cap, as well as maintenance and monitoring of the landfill cap, risks to the environment are considered to be mitigated by the current containment system at OU10. It is assumed that soils, waste, and contaminated ground water below the cap would cause an exceedance of acceptable risk based standards, if exposed.

2.0 REMEDIAL ACTION OBJECTIVES

The FS for OU10 was conducted by the Painesville PRP Group to define and analyze appropriate remedial alternatives. FS activities were conducted under Ohio EPA oversight and the FS Report for OU10 was approved by the Agency in April of 2011. The Phase I and Phase II RI and FS (including its addendum) are the basis for the selection of Ohio EPA's preferred remedial alternative.

As part of the RI/FS process, remedial action objectives (RAOs) were developed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), codified at 40 CFR Part 300, as amended, which was promulgated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, 42 U.S.C. § 9601 et seq., and U.S. EPA guidance. The RAOs are goals that a remedy should achieve in order to ensure the protection of human health and the environment. The goals are designed specifically to mitigate the potential adverse effects of contaminants present in the environmental media in OU10. The following RAOs have been established for soil and ground water at OU10:

- Prevent migration of contaminants from source materials within the landfill to ground water and surface water beyond the OU10 landfill boundaries;

- Prevent direct contact with contaminated soils, ground water, and wastes within OU10;

- Prevent the ingestion of contaminated ground water within OU10; and

- Prevent inhalation of volatile contaminants from soils or ground water within OU10.

The cap, slurry wall, and leachate collection system currently in place within OU10 have addressed these RAOs. The RAOs are addressed further within the proposed remedial alternatives, summarized below.
3.0 SUMMARY OF REMEDIAL ALTERNATIVES

A total of three (3) remedial alternatives were considered in the FS. A description of each remedial alternative can be found below. More detailed information about these alternatives can be found in the Feasibility Study for Operable Unit OU10 (Hull, 2011).

3.1 FS Alternative ALT OU10-A (No Action)

FS Alternative ALT OU10-A is a "no action" remedial alternative. The NCP requires evaluation of a "no action" alternative in order to establish a baseline for the comparison of other remedial alternatives. Under this alternative, no remedial activity, maintenance, or monitoring would be performed.

3.2 FS Alternative ALT OU10-B

FS Alternative OU10-B is a combination of an EC with land use restrictions, and the approval and implementation of a final O&M Plan (to replace the current Interim O&M Plan) for OU10. The EC would include:

- Restricting future use of the area of waste placement to its present undeveloped state.

- Prohibiting development within the buffer zone that would interfere with monitoring, maintenance, or potential response activities.

- Prohibiting ground water extraction for potable or non-potable use, with the exception of ground water monitoring activities, and quarterly pumping the extraction wells for off-site disposal.

- Prohibiting construction of any structures on OU10 and construction of habitable structures within the buffer zone of OU10.

- Prohibiting excavation by construction workers unless the excavation is performed in accordance with an Ohio EPA-approved RMP. This would apply to soils and waste below the landfill cap, which could be made available for direct contact during excavation activities, as well as potentially contaminated ground water. The RMP will address health and safety precautions to be taken by workers excavating below the OAS landfill surface, as well as how to manage potentially contaminated soils and materials.

- The final O&M Plan will describe the known conditions of OU10, the appropriate health and safety components for workers that perform landscaping and maintenance activities, and the appropriate measures required to maintain the existing engineering controls and monitoring. This includes long-term maintenance of the existing shoreline stabilization system, periodic ground water extraction and
off-site disposal, maintenance of the landfill cap, ground water sampling, and inspection/maintenance of the perimeter OU10 site fence.

3.3 FS Alternative ALT OU10-C

FS Alternative ALT OU10-C is a combination of complete waste removal and implementation of land use restrictions through an environmental covenant. This remedy includes:

- Completion of a waste characterization and full design study to evaluate the contents of OU10 and the most appropriate means of excavating the materials.
- Removal and off-site disposal of the wastes by either landfilling or incineration, depending on the characteristics of the wastes.
- Restoration of the excavated area with clean, imported fill.

4.0 COMPARISON AND EVALUATION OF ALTERNATIVES

4.1 Evaluation Criteria

In selecting a remedy for a contaminated site, Ohio EPA considers the following eight evaluation criteria, as outlined in U.S. EPA's NCP promulgated under CERCLA (40 CFR 300.430):

1. **Overall protection of human health and the environment** - Remedial alternatives shall be evaluated to determine whether they can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site.

2. **Compliance with all applicable or relevant and appropriate requirements (ARARs)** - Remedial alternatives shall be evaluated to determine whether a remedy will meet all of the applicable or relevant and appropriate requirements of state and federal environmental laws.

3. **Long-term effectiveness and permanence** - Remedial alternatives shall be evaluated to determine the ability of a remedy to maintain reliable protection of human health and the environment over time once pollution has been abated and RAOs have been met. This includes assessment of the residual risks remaining from untreated wastes and the adequacy and reliability of controls, such as containment systems and institutional controls (i.e., Environmental Covenant).

4. **Reduction of toxicity, mobility, or volume through treatment** - Remedial alternatives shall be evaluated to determine the degree to which recycling or treatment are employed to reduce toxicity, mobility, or volume, including how treatment is used to address the principal threats posed by the site.
5. **Short-term effectiveness** - Remedial alternatives shall be evaluated to determine the following: (1) short-term risks that might be posed to the community during implementation of an alternative; (2) potential impacts on workers during remedial action and the effectiveness and reliability of protective measures; (3) potential environmental impacts of the remedial action and the effectiveness and reliability of mitigating measures during implementation; and (4) time until protection is achieved.

6. **Implementability** - Remedial alternatives shall be evaluated to determine the ease or difficulty of implementation and shall include the following as appropriate: (1) technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy; (2) administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies (for off-site actions); and (3) availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and the availability of prospective technologies.

7. **Cost** - Remedial alternatives shall evaluate costs and shall include the following: (1) capital costs, including both direct and indirect costs; (2) annual O&M costs; and (3) net present value of capital and O&M costs. The cost estimates include only the direct costs of implementing an alternative at the site and do not include other costs, such as damage to human health or the environment associated with an alternative. The cost estimates are based on figures provided by the FS.

8. **Community acceptance** - Remedial alternatives shall be evaluated to determine which of their components interested persons in the community support, have reservations about, or oppose. This assessment is not to be completed until comments on the Preferred Plan are considered.

Evaluation Criteria 1 and 2 are threshold criteria required for acceptance of an alternative that has accomplished the goal of protecting human health and the environment and has complied with the law. Any acceptable remedy must comply with both of these criteria. Evaluation Criteria three (3) through seven (7) are the balancing criteria used to select the best remedial alternative(s) identified in the Preferred Plan. Evaluation Criteria eight (8), community acceptance, is a modifying criterion evaluated through public comment on the alternatives received during the comment period.
4.2 Analysis of Evaluation Criteria

This section examines how each of the evaluation criteria is applied to each of the remedial alternatives found in Section 3.0 and compares how the alternatives achieve the criteria.

4.2.1 Overall Protection of Human Health and the Environment

Evaluation of overall protectiveness of the alternatives focused on whether each achieves adequate protection of human health and the environment and identifies how OU10 risks posed through each pathway being addressed are eliminated, reduced, or controlled by the alternative. This evaluation also includes consideration of whether the alternative poses any unacceptable short-term or cross-media impacts.

Although the baseline human health and ecological risk assessments were not conducted for OU10, it is assumed, based on detailed historical disposal records, that the contents of OU10 pose a threat to both human and ecological receptors. The existing containment system, through proper operation and maintenance, protects these receptors from exposure to the hazards contained within OU10. Maintenance workers performing landscaping and maintenance activities would be the only receptors potentially exposed to these hazards.

ALT OU10-B and OU10-C both adequately protect human health and the environment. OU10-B meets this requirement through implementation of an approved final O&M Plan, which will include operation of the existing containment and extraction system, periodic monitoring of ground water, and maintenance of the shoreline protection structure and implementation of an EC. OU10-C meets the requirement through the removal of wastes and contaminated soils within the OAS landfill and ground water monitoring and maintenance of the shoreline protection structure. In addition, the EC, which would be implemented as a part of ALT OU10-B and ALT OU10-C, would ensure that all receptors were protected through access restrictions and use limitations if all of the wastes were not removed.

ALT OU10-A, the “no action” remedial alternative, does not meet the requirement for overall protection of human health and the environment, since it does not provide for continued operation and maintenance of the existing containment and extraction system, maintenance of the shoreline protection structure, or implementation of an EC.

4.2.2 Compliance with ARARs

Alternatives ALT OU10-B and OU10-C would both meet the requirement of compliance with ARARs, as long as an EC is implemented. Under ALT OU10-B, human and ecological receptors would be protected through the continued operation and maintenance of the containment and ground water extraction system. ALT OU10-C would be protective through the removal of wastes and contaminated soils. All applicable Agency permitting requirements can be readily met for either of these alternatives.
Alternative ALT OU10-A does not meet the requirement of compliance with ARARs, since it is a "no action" alternative.

4.2.3 Long-Term Effectiveness and Permanence

ALT OU10-C meets the requirement for long-term effectiveness and permanence. Removing wastes and contaminated soils eliminates potential risk to human health and the environment and, as long as all of the waste and contaminants were to be removed, no maintenance would be required. If waste and contaminants had to be left in place due to engineering concerns, operation and maintenance of OU10 would be required and an EC would be established to restrict access and limit use to protect all receptors.

Alternative ALT OU10-B also meets this requirement. While wastes and contaminated soils would remain within OU10, under this alternative the existing containment and extraction system would be maintained. A final O&M Plan would specify requirements to protect OU10 maintenance workers. In addition, an EC would be put in place to restrict access and limit use in order to protect all receptors.

Alternative ALT OU10-A does not meet this requirement, because the wastes and contaminated soils within OU10 are not removed or remediated. Because there are no controls over the contaminated materials within the operable unit, no reliability exists with this remedy.

4.2.4 Reduction of Toxicity, Mobility or Volume by Treatment

Alternative ALT OU10-B meets the requirement for reduction of toxicity, mobility, or volume through treatment. Ground water extracted from the OAS landfill is currently disposed of off-Site by Chemtron. This method of treatment and disposal would continue under ALT OU10-B. Both the toxicity and mobility of ground water contaminants are addressed through this mode of treatment.

Depending on the treatment selected for wastes and contaminated soils within this OU, Alternative ALT OU10-C may also meet this requirement. If incineration was proposed and conducted, the toxicity, mobility, and volume of wastes would be reduced.

Alternative ALT OU10-A does not meet this requirement.

4.2.5 Short-Term Effectiveness

Alternative ALT OU10-B is immediately effective, since it involves the continued operation and maintenance of the existing containment and collection system. This alternative does not involve the excavation or grading of wastes or contaminated soils. Therefore, risk to the community, OU10 workers, and the environment are not significant under this scenario.
ALT OU10-C would not be effective in the short-term due to the extensive excavation and re-grading work that would be required to implement the alternative. In addition, the increased truck transportation to and from the site could result in traffic accidents leading to potential public health threats. These activities could potentially lead to worker and community exposure to the contaminated materials currently contained within OU10, until the remedy is complete. This increased risk would exist whether or not waste was required to remain in place due to engineering concerns. If waste is left in place under this alternative due to engineering limitations, long-term monitoring would be required, to ensure OU10 site contaminants are contained beneath the OU10 site. Storm water would have to be managed to limit the impact to Lake Erie. This alternative would require six (6) to 12 months to implement, not including the required design studies.

Although ALT OU10-A would be immediately effective, since final remedial actions would not be performed, it may not be protective due to the potential lack of maintenance.

### 4.2.6 Implementability

Alternatives ALT OU10-A and ALT OU10-B are both readily implemented. ALT OU10-A, the no action alternative, does not involve any permits, construction, or maintenance. ALT OU10-B involves the continued operation and maintenance of the existing containment and extraction system and the placement of an EC on the property, both of which are readily performed.

Alternative ALT OU10-C is the most difficult of the alternatives to implement, since it involves excavation, filling, and grading activities. Uncertainties exist regarding the ability to remove all waste materials from OU10. In addition, significant waste management issues exist under this alternative. Approximately 40,000 cubic yards of wastes and contaminated soils would need to be removed. Specialized environmental contractors would need to address the significant risks related to un-capping the landfill and removing the wastes contained therein. Contaminated materials would require appropriate transportation and disposal. An EC will be required for the OU10 site, if residual waste remained in place due to engineering constraints under the ALT OU10-C scenario.

### 4.2.7 Cost

The present worth cost (2007 value) for each remedial alternative, including operation and maintenance, is found below. A more detailed evaluation of costs associated with each alternative can be found in Table 3.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Description</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT OU10-A</td>
<td>No Action Alternative</td>
<td>$ 0</td>
</tr>
<tr>
<td>ALT OU10-B</td>
<td>OU10 Landfill Operation and Maintenance Alternative</td>
<td>$ 1,778,000.00</td>
</tr>
<tr>
<td>ALT OU10-C</td>
<td>OU10 Landfill Removal Alternative</td>
<td>$ 23,100,000.00</td>
</tr>
</tbody>
</table>

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4.2.8 Community Acceptance

Ohio EPA received comments from interested parties during the public comment period and at the public meeting held at the Lake County General Health District on August 16, 2012. Those comments and Ohio EPA's responses are included in the Responsiveness Summary in Section 7.0.

4.3 Summary of Evaluation Criteria

The following summarizes the three (3) alternatives presented within this document, as well as their compliance with the eight (8) criteria presented in Section 4.1.

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>ALT OU10-A</th>
<th>ALT OU10-B</th>
<th>ALT OU10-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Overall protection of human health and the environment</td>
<td>□</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>(2) Compliance with ARARS</td>
<td>□</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>(3) Long-term effectiveness and permanence</td>
<td>□</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>(4) Reduction of toxicity, mobility or volume through treatment</td>
<td>□</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>(5) Short-term effectiveness</td>
<td>□</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>(6) Implementability</td>
<td>■</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>(7) Cost</td>
<td>□</td>
<td>■</td>
<td>■</td>
</tr>
<tr>
<td>(8) Community acceptance*</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

- Fully meets criteria
- Partially meets criteria
- Does not meet criteria

*Please refer to the Community Acceptance section (4.2.8) and the Responsiveness Summary (Section 7.0) of this document.

5.0 SELECTED REMEDIAL ALTERNATIVE

Ohio EPA's selected remedial alternative for OU10 is Alternative ALT OU10-B. Alternative ALT OU10-B is protective of human health and the environment, easy to implement, and can be performed for a reasonable cost. This selected alternative addresses COCs that constitute the principal threats.
Based on information currently available, it is Ohio EPA's position that the selected remedial alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to balancing and modifying criteria. Ohio EPA expects the selected alternative to satisfy the following requirements:

1) Be protective of human health and the environment;

2) Comply with ARARs;

3) Be cost-effective;

4) Utilize permanent solutions and alternative treatment technologies (e.g., innovative) to the maximum extent practicable; and

5) Satisfy the preference for treatment as a principal element.

The elements of the selected remedy (Alternative ALT OU10-B) are as follows:

- Continued O&M of the existing containment and extraction system under a final O&M Plan. Precautions for OAS landfill maintenance workers are to be specified in a RMP.

- Restrict access to OU10 through inspection and maintenance of the site, the security perimeter fence, and installation of deterrent landscaping.

- Establishment of an enforceable EC to: restrict the long-term use of OU10 to landfill maintenance and monitoring operations; prohibit development and excavation within the OU10 buffer zone that may interfere with monitoring, maintenance, or potential response activities; prohibit the use of ground water for potable and non-potable use; prohibit the construction of any new structures on OU10 that would impair the integrity of the OU10 Landfill, and specifically preclude the construction of habitable structures within the buffer zone.

- Development of an RMP (for Ohio EPA approval) to address potential exposure during monitoring and maintenance activities to contaminated soil, ground water, and other landfill materials, as well as requiring that pre-trenching be performed for any sub-surface work conducted within OU10. The RMP will be referenced in the EC.

**5.1 Continued Operation & Maintenance (Final O&M Plan)**

Continued O&M of OU10 will be performed under a Final O&M Plan. At a minimum, the Final O&M Plan will contain all of the requirements set forth in the Interim O&M Plan. A copy of the 1999, Interim O&M Plan, as amended in 2014 and 2016 is presented in **Appendix C**, as mentioned in Section 1.1 (Site History).
Performance Standard

The performance standard is met through the establishment and adherence to the Final O&M Plan. Periodic review of the remedy will be conducted by Ohio EPA, to ensure compliance with the Final O&M Plan.

5.2 Environmental Covenant (EC)

An EC specifying activity and use limitations will be employed to: (1) restrict the long-term use of OU10 to OAS landfill maintenance and monitoring operations and, specifically, preclude public access to the OAS landfill; (2) prohibit any development or excavation within the OU10 buffer zone that might interfere with monitoring, maintenance, or potential response activities; (3) preclude potable or non-potable use of ground water beneath OU10; (4) prohibit the construction of any new structures on OU10 that would impair the integrity of OU10 and specifically preclude the construction of habitable structures within the buffer zone. The EC will reference the RMP.

Performance Standard

The performance standard is met if an EC, which includes the activity and use limitations stated above, is executed between Ohio EPA and Tierra Solutions.

The performance standard is met if within thirty (30) days of the execution of the EC documentation is provided to Ohio EPA that the activity and use limitations specified in the EC for OU10 have been recorded at the Lake County Recorder’s Office. The EC must reference the Ohio EPA-approved RMP.

The performance standard is met if periodic remedy review by Ohio EPA confirms that the activity and use limitations specified in the EC remain in effect and are not being violated.

6.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The remedy selected for OU10 is a combination of engineering controls and monitoring which was implemented prior to the administrative order with some modifications including institutional controls (ICs). Separate from the remedy selection process, on-going technical evaluations were being conducted during the same time period, which identified several concerns related to performance of the existing remedy. In order to address those concerns, the Ohio EPA suspended the remedy selection process in January of 2013 to conduct a more thorough evaluation of the landfill containment system, which led to numerous improvements to the existing remedy. The assessment of the landfill, its containment system, and monitoring program was performed and based on information submitted to the Ohio EPA from data collected during quarterly monitoring events, and other historical data.

Concerns identified from Ohio EPA’s evaluation of OU10 were: (1) whether the current ground water monitoring network was adequately monitoring the confined silt aquifer,
which is the most vulnerable for potential impact from the landfill, and what the ground water quality is at depth; (2) whether the existing piezometer network is sufficient and if those observation points are accurately determining if hydraulic gradients within the slurry wall are inward as required by the interim O&M agreement; (3) unexplained and excessive ground water recharge into the landfill requiring an increased frequency of extraction events; (4) the integrity of the slurry wall itself and the need for a deep monitoring well to ensure that landfill constituents, primarily denser chlorinated compounds known to be present in OU10 ground water are not migrating below the monitored ground water zones; (5) the cause of the excessive recharge into the landfill leading to increased frequency of ground water pumping events, and whether extraction wells EW-2 through EW-5 should be modified and sealed similar to the method employed on EW-1 in 2012. Since the modification and improvements to hydraulically seal EW-1, that extraction well has performed the most efficiently of the five (5), requiring significantly less pumping during extraction events to lower water levels; and, (6) the issue of slope stability on the northern boundary of the landfill due to observations reported in quarterly O&M reports from geotechnical inspections of the northern slope. Vertical movements have been documented at various survey pins installed to monitor land movement, and have shown a northerly drift of soils at rates up to 0.04 feet/year. Other evidence of soil creep northward was observed and recorded including tilting and structural damage to piezometers and monitoring wells. Numerous tension cracks on the surface of the northern slope have also been documented in quarterly O&M reports. With these slope and land stability issues, Ohio EPA’s primary concern was the potential for a deep rotational slope failure leading to compromised structural integrity of the north slurry wall and contaminant releases from the landfill and potentially to Lake Erie. During the May 2013 monthly coordination meeting with the PRP Group, the Ohio EPA requested that those issues be addressed prior to finalizing and issuing the Decision Document.

6.1 Storm Water and Monitoring Improvements Performed at OU10

From a procedural and administrative standpoint, it was determined that these assessments would be conducted in accordance with the Section VII (Additional Work) provision of the existing 1995 RI/FS DFFOs. After a time period of review and comment on work plan submittals, subsequent addendums and modifications, a final work plan was approved on June 30, 2014. Final construction activities and remedy improvements were completed in January 2015. On December 16, 2015, the PRP’s submitted a report entitled Construction Completion Report for Storm Water, and Monitoring Improvement, OU10, Former Diamond Shamrock Painesville Works Site, Painesville, Ohio, December 2015. Specific remedy and monitoring improvements performed at OU10 were:

- Ground modifications to improve performance of surface and storm water drainage along the landfill cap perimeter, and additions to the subsurface drainage layer to divert storm water off and away from the landfill cap promoting positive drainage. Toe-drains were installed to connect with the existing geonet drainage layer in shallow trenches, lined with filter fabric, along all four (4) sides of the landfill. Six (6) inch perforated Poly vinyl chloride (PVC) pipe was placed in the trenches, and backfilled with #57 stone. New six (6)
inch PVC cleanouts were installed at each of the four (4) toe-drain corners with an additional 5th cleanout placed in the northwest corner of the landfill for access to the entire length of the toe-drain. Additionally, storm water catch basins were also modified such that areas around the existing catch basins were excavated, and the piping from the landfill’s new toe-drain system were connected to the catch basins. Water tight connections of piping and catch basin inlets were created using a Quick-Seal brand product.

- Extraction well surface seal improvements was performed on wells EW-2 through EW-5 to prevent surface water infiltration into the wells using the same procedure as that performed on EW-1 in 2012. This consisted of excavation of soil around each well casing to a depth of six (6) feet to expose the geosynthetic liner followed by the application of an impermeable material (Aquablock) around the entire perimeter in 12 inch lifts. A 48-inch-high density polyethylene (HDPE) riser extension was then attached to the top of each extraction well. New pumps and drop hoses were also installed in each extraction well.

- Repairing existing ground water monitoring well MW-5, which was originally planned for abandonment and replacement. The Ohio EPA approved a modification to remove and replace the damaged section of riser pipe in this monitoring well. New casing for this well was also installed.

- Installation of a deep monitoring well (MW-5D) to monitor ground water down gradient and directly above bedrock to ensure denser constituents, such as chlorinated solvents, detected in extraction wells during historical sampling are not migrating through the slurry wall at depth. This new deep well was advanced into the shale bedrock with three (3) of the 10-foot screened interval in the shale bedrock. This well was sampled on two (2) occasions. The first sampling event was on March 3, 2015, and the second event was on May 20, 2015. Analysis show that no landfill constituents are migrating past the slurry wall at depth. Other general water quality parameters are consistent with background concentrations at the Site such as calcium, magnesium, manganese, iron, sulfide, pH, and TDS.

- Installation of an additional outside piezometer (OP-5) to verify and more accurately characterize hydraulic gradients outside the slurry wall versus inside the wall. This piezometer is located on the northern landfill perimeter between outside slurry wall piezometers OP-1 and OP-2.

- Installation of two (2) slope inclinometers to monitor potential deep rotational movement in the north slope of OU10. One (1) inclinometer is located on the northeast corner of OU10, and the other in the northwest corner. Both inclinometers were advanced five (5) feet into the shale bedrock, and are approximately 70 feet below ground surface. Baseline readings were collected on December 30, 2014. Quarterly measurements have been recorded since
December 2014 baseline readings, and are presented in graphical form in the interim Operation and Maintenance (O&M) reports submitted to the Ohio EPA.

- Final grading and ground surface modifications including top soil placement, and placement of seed for establishment of the vegetative cover on the landfill cap for those areas which were disturbed.

With improvements to the landfill containment system, analysis of the effect from those actions is evident when ground water removal events and volumes are compared to those prior to implementation of the improvements. Data since the remedy improvements showed a decrease in frequency from three (3) ground water removal events per month to one (1), and a 31% reduction of daily ground water generated by volume was calculated. The extracted ground water is taken off-site for disposal as a listed hazardous waste. Also, with two (2) rounds of data from the newly installed deep monitoring well, DERR-NEDO has confirmed that landfill constituents are not migrating outside the slurry wall, and the containment system is functioning properly. The Ohio EPA approved the Construction Completion Report for Storm Water and Monitoring Improvements at OU10 in a letter to the PRP Group dated March 14, 2016. A map showing these new features at OU10 can be seen on Figure 5. A copy of the Storm Water and Monitoring Improvements Work Plan, and the Construction Completion Report for those activities are available for review at the Diamond Shamrock information repositories.

6.2 Monitoring Expansion and Changes to Analytical Methods and Sampling Protocols at OU10

Since the August 2012 public meeting presenting Ohio EPA’s selected remedy for OU10, there were significant changes with respect to monitoring expansion, sampling protocols, and laboratory methods employed for ground water sample analysis, which were approved by Ohio EPA. All of the changes required amending and updating the Interim O&M Plan to include those changes. The first amendment was a change in sample and analytical protocols for ground water analysis from Contract Laboratory Program (CLP) methods in accordance with the 1997 Quality Assurance Project Plan (QAPP) to the use of U.S. EPA SW-846 methods, which is used at all other operable units for ground water analysis at the Site. The SW-846 analytical methods are in compliance with the approved 2007 QAPP for Remedial Design/Remedial Action (RD/RA) and Supplemental Feasibility Sampling. This change was approved in a letter from the Ohio EPA to the PRP Group dated May 6, 2014.

The second amendment and update to the Interim O&M Plan was the incorporation of the additional monitoring points installed during the storm water and monitoring improvements including monitoring the newly installed deep ground water monitoring well MW-5D, quarterly ground water elevation readings in newly installed outside piezometer OP-5, and quarterly measurements of the two (2) slope indicators (inclinometers) to evaluate any potential deep rotational movement of the northern OU10 slope. The quarterly inclinometer readings will also be included as part of the annual slope stability reports. This was approved in a letter to the PRP Group dated February 26, 2016. The third change to the monitoring program at OU10 was approval to sample the new deep well
MW-5D by use of a Teflon bailer due to insufficient recharge in accordance with Standard Operating Procedure (SOP) F3008, which has been included in the 2007 RD/RA QAPP. The letter from the Ohio EPA to the PRP Group approving the use of a bailer for sampling well MW-5D is dated April 20, 2016. The three (3) letters referenced above describing changes to the sampling and analysis at OU10 are shown in Appendix D.

Ohio EPA received public comments on the Preferred Plan. The Agency’s responses to the comments are provided below in Section 7.0 (Responsiveness Summary).

7.0 RESPONSIVENESS SUMMARY

A public meeting was held on August 16, 2012, to present the Agency’s Preferred Plan for OU10 and to solicit public comment. Additionally, oral and written comments were accepted at the meeting and during the comment period which ran to August 31, 2012. For those comments received by Ohio EPA, a summation of each comment (in italics) followed by the Agency’s responses (in plain text) is presented below.

Comment # 1 [Lake County General Health District (LCGHD)]:
LCGHD believes it is vitally important that the environmental covenant and/or the O&M Plan for OU10 contain financial assurance to extend beyond the typical MSW Landfill 30-year post closure requirement. Considering that the site contains a variety of very hazardous wastes, some in very large quantities and the site is located on the Lake Erie shore, there needs to be adequate financial assurance for proper maintenance for this site well beyond 30 years.

Ohio EPA Response:

The Applicable or Relevant and Appropriate Requirement (ARAR) identified in the Feasibility Study (FS, 2010) for OU10 regarding post-closure site care is Ohio Administrative Code (OAC) 3745-55-17(A)(1) and (2)(b). This ARAR states that post-closure care will continue for thirty (30) years, and the Director of Ohio EPA may extend the post-closure care period if it is necessary to protect human health and the environment beyond the 30-year period. Financial assurance will be required in the final O&M Plan, which will be part of the Director’s Orders. It is envisioned that the 30-year monitoring and site O&M will begin at such time, and that the O&M will include quarterly reporting to the Agency. Periodic and comprehensive remedy reviews will occur every 5 (five) years, to ensure compliance with the final O&M Plan, and to evaluate the effectiveness and performance of the remedy.

Comment # 2 (Lake County General Health District):

The O&M Plan should include a provision for telemetry and visual inspection of the pumping system on the ground water extraction system. In the event of a pump failure, the procedure should be to notify a contact person and there should be an alternate contact person(s) in case of vacations or illness.
Ohio EPA Response:

Ohio EPA agrees with the LCGHD that these are important components to ensure a fully functional and efficient GES. Telemetry monitoring of the system for remote data collection and assessment is not likely to be incorporated into the Final O&M Plan, unless it proves to be of significant need. The reason being is that there are weekly inspections of the OU10 site to measure ground water levels in all wells to assess the need for a pumping event. This activity is done in conjunction with the quarterly inspection and monitoring events, which are described below. Current requirements of the quarterly inspections include visual observation of the extraction wells (covers, locks, and grates), the electrical controls and pump control vaults, and signs of any vandalism. In the event of a ground water extraction well pump failure, a spare pump is maintained in stock and on-site for use. Since inspections occur frequently at OU10 (weekly and quarterly), decisions are made during these times when to pump water. If the GES was operating continuously, there could be a need for the system to operate on an auto-dialer type of frequency. Finally, Ohio EPA agrees with LCGHD that there will be a main point of contact and a secondary contact person in the event of mechanical or electrical problems with the system. Also, with the improvements to the landfill containment system, there are significantly less ground water extraction events. A ground water elevation performance standard agreed upon by the Ohio EPA and the PRP Group is a ground water elevation inside the slurry wall of no greater than 595 feet above mean sea level (amsl), which maintains the desired inward hydraulic gradient. This will be a requirement in the final O&M Plan for OU10.

Comment # 3 (Lake County General Health District):

The routine inspections of the one-acre site indicated that there is evidence of settlement/slumping on the lake side slope of the site. The cause of this settlement must be determined and appropriate remediation should take place and maintenance of such is to be included in the O&M Plan.

Ohio EPA Response:

A comprehensive slope stability evaluation was conducted in January of 2010 and the results were submitted to the Agency (Slope Stability Evaluation, Tierra, 2010). Based on the analysis, large scale instability of the slope does not exist and does not appear to be of concern to the integrity of the landfill. There have been localized shallow veneer slips within the shallow soil cover along the slope. These are monitored closely and will be repaired and maintained as needed. Due to these isolated and localized veneer slips, continued monitoring and maintenance will be required and incorporated into a Final O&M Plan. Inspection frequencies may also increase if self-stabilization of the slope is not evident. There are several methods of monitoring and maintenance that will be explored to ensure maximum slope stability during finalization of the O&M Plan.

A total of nine survey pins located on the northern slope are surveyed as part of quarterly activities at OU10. All results are compared to each pin’s original baseline survey point
location. The most recent survey (Second Quarter 2012) showed a slight variation of the northing, easting, and elevation of the survey pins. This variation is not indicative of substantial movement of the slope. Based on the quantitative evaluation and visual observations of the existing slope conditions, the current configuration of the slope itself does not present a danger to human health and the environment. Slope maintenance is a very important component to the O&M remedy that will be required for OU10.

With the installation of slope indicators and quarterly monitoring and measurements, the Ohio EPA is confident that accurate slope movements are being recorded, and the potential for deep rotational slope failure can be predicted. Also, quantitative annual slope stability reports are conducted by the PRP Group and submitted to the Ohio EPA.

Comment # 4 (Lake County General Health District):

The ground water extraction system pumping volume records indicate that large quantities of water have been collected and disposed of as a hazardous waste. The volume of water pumped this summer during the drought conditions was considerably less than previously pumping volume totals that indicates that surface water is infiltrating into the system. The cap system and annular spaces around the well system should be inspected/tested to determine how the surface water is entering the system and should be remediated prior to approving the preferred plan or incorporated into the preferred plan, so that it can be addressed later.

Ohio EPA Response:

Ohio EPA agrees with LCGHD that this is an important issue. The Agency is aware of the volume of water that has been extracted during quarterly pumping events. Ohio EPA has reviewed the data and is confident that the cutoff wall is performing as designed to prevent chemical migration from OU10. This is evidenced by ground water data over the years in the monitoring wells outside the wall. Additionally, an evaluation of head elevations inside the wall versus outside the wall does demonstrate an inward hydraulic gradient inside the slurry wall. The data was evaluated from September of 2010 to the present time. The head levels over that period of time (recorded weekly) consistently show water level elevations at monitoring points ranging from 11 – 14 feet higher outside the wall than those inside the wall. Model predictions, documented in the "Ground Water Recovery System Design, Landfill Closure One-Acre Site" (Woodward Clyde, 1988), estimated pumping periods to be every sixty (60) days with approximately 5,000 gallons or less of water for each removal cycle.

The Agency and Tierra Solutions, Inc. believe that surface water is getting below the cap in some manner. As pointed out in LCGHD’s comment, there does appear to be a direct correlation between the amount of precipitation and ground water volumes extracted during pumping events. In response to these concerns, Tierra Solutions, Inc. submitted a Work Plan on June 28, 2012, to evaluate conduits for water flow into the landfill at extraction well #1 (EW-1). The plan was approved on July 28, 2012 and proposes the
installation of a hydraulic seal around the EW-1 well spacer, increasing the spacer elevation to eliminate surface water infiltration into the landfill and promoting surface flow away from EW-1. The connection between the steel casing and the extraction piping will be exposed, inspected, and hydraulically sealed. Water is likely entering by two ways. The first scenario is ground water in the landfill cap material itself (clean soil) can enter and fill spaces between the High Density Polyethylene (HDPE) casing and the steel casing allowing for flow through unsealed connections. Secondly, the HDPE tops are at ground level, which could allow for surface water sheet flow to enter through the lid, fill the space between the casings, and ultimately enter the unsealed connections. The Agency believes that significant water contribution is occurring by these mechanisms. The data will take some time to assess whether remediating these deficiencies will effectively reduce infiltration. The Agency and Tierra Solutions, Inc. will evaluate this condition during final O&M activities and further explore other potential sources of recharge if needed.

As mentioned in the second bullet of Section 6.1 (Storm Water and Monitoring Improvements Performed at OU10, the hydraulic sealing of extraction wells EW-2 through EW-5 has resulted in significantly less ground water generated during extraction events. Also, all of the subsurface improvements to the drainage layers has resulted in more effective and efficient conveyance of storm water to the catch basins, which has reduced the volume of infiltration into the landfill.

Comment # 5 (Lake County General Health District):

The ground water monitoring data indicates that elevated concentrations of Sodium, Chloride, Magnesium, Manganese, Iron, and Potassium are present in the monitoring wells both up gradient and down gradient of the one-acre site. These results indicate that the ground water is impacted from the surrounding operable units of the site. The Health District is concerned that with the northern ground water flow direction, there may be future impacts to Lake Erie. What precautions/routine testing will be performed to monitor any impacts to Lake Erie from the site?

Ohio EPA Response:

As part of performance monitoring at OU10, a final O&M Plan will be implemented under the Director’s Orders. This will include continued ground water monitoring to ensure organic compounds and metals do not breach the cut-off wall and migrate towards Lake Erie. Ohio EPA acknowledges that the levels of parameters referenced in LCGHD’s comment are elevated. An evaluation of ground water at the Diamond Shamrock site for other operable units shows similar water quality. Ground water quality and yield are very poor at OU10 and naturally mineralized in the low permeability soils where wells are screened. This is also seen across the entire Diamond Shamrock site, and the general Painesville area, which is not specific to ground water at OU10. Ground water is naturally of poor quality regionally in the area. Quarterly samples are analyzed for metals, cyanide, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), pesticides, herbicides, and poly-chlorinated biphenyls (PCB’s). The objective is to prevent these COCs from migrating off-site towards Lake Erie.
The Lake Erie and Grand River Baseline Human Health Risk Assessment (Hull, 2003) evaluated potential releases of COCs from ground water discharges to the Grand River and Lake Erie using the BIOSCREEN fate and transport model. The model predicted the concentrations of COCs (including TDS) in ground water at the point of discharge to surface water. The predicted concentrations and comparison to actual data did not show OU10 related COCs reaching Lake Erie from OU10 above respective State of Ohio OMZA water quality standards or above surface water quality standards for the protection of human health (non-drinking water standard).

Since OU10 is covered with an engineered cap system and contained with the cut-off wall, overland migration of COCs to Lake Erie is not a threat. Ground water will continue to be monitored in the future to ensure COCs are not detected outside the cut-off wall.

Information Received from Russell Bimber

Several pages of information were received from Mr. Bimber in the form of electronic mail (email), U.S. mail, and hand-delivered copies. All of the information submitted by Mr. Bimber was reviewed by the Agency and is included as Appendix 1 to this Responsiveness Summary. Below is a list of material received by Mr. Bimber, along with responses to specific questions regarding OU10 and the Preferred Plan.

1. Email dated August 28, 2012 regarding “Additional Testimony on OU-10” to Kristopher Weiss (Ohio EPA-PIC), Teri Heer (Ohio EPA-DERR), and Larry Antonelli (Ohio EPA-DERR), 5 pages.

2. Hard copy of material received during an August 31, 2012 file review of OU10 by Mr. Bimber at Ohio EPA’s Northeast District Office. Specific information included:
   - Suspected waste material delivered to OU10, 3 pages.
   - A map of the Painesville water intake, treatment, and pumping station.
   - Ohio Department of Natural Resources Earthquake Epicenters in Ohio and Adjacent Areas, Ohio Division of Geological Survey (2012), 4 pages.
   - Cover page for “The Ohio Experience: What Can Be Done to Spur Brownfield Redevelopment in America’s Heartland?” a Hearing before the Subcommittee on Federalism and the Census of the of the Committee on Government Reform House of Representatives, May 16, 2005, 1 page.

- Copy of a letter from John A. Licata (Diamond Shamrock) to Steve Tuckerman (Ohio EPA), dated September 30, 1981, 1 page.

3. Rearranged 7-page list – Chronological, R. Bimber, materials disposed of at the OAS, hard copy received on August 28, 2012 (3 pages).

4. Combined 7 + 9 Page Lists, Waste in One Acre Site (in chronological order by R. Bimber, August 31, 2012), received by Ohio EPA on September 6, 2012 (9 pages).

5. Email dated August 29, 2012 from Russell Bimber to Teri Heer (Ohio EPA-DERR) and Larry Antonelli (Ohio EPA-DERR), re: OU-10, (1 page).

6. Email dated August 30, 2012 from Russell Bimber to Teri Heer (Ohio EPA-DERR) and Larry Antonelli (Ohio EPA-DERR), re: More (AUG. 30) Testimony on OU-10, (1 page).

7. Email dated September 3, 2012 from Russell Bimber to Kristopher Weiss (Ohio EPA-PIC, Teri Heer (Ohio EPA-DERR), and Larry Antonelli (Ohio EPA-DERR), re: Last Additional Testimony (9/3/2012) of Russell Bimber on OU-10, (3 pages).

8. Material in the form of one map and four pages of disposal data submitted to Ohio EPA at the conclusion of the August 16, 2012 Public Meeting (5 pages).

Comment # 1 (R. Bimber):

From the email dated August 30, 2012 (R. Bimber to Teri Heer and Larry Antonelli). The email focuses on disposal dates and types of wastes placed in OU10. Mr. Bimber questions the information provided in the Preferred Plan regarding the issue of disposal dates/types of wastes placed in OU10.

Ohio EPA Response:

There is sufficient information regarding quantities and waste types disposed of at OU10 to proceed with the Agency's Preferred Alternative (ALT OU10-B) at OU10. All records of disposal at OU10 are documented in the Woodward-Clyde report entitled "Phase II Field Investigation Report One Acre Site, Painesville, Ohio (October 1986)." Figure 2 – 3B of this report is referenced as Appendix A of the Preferred Plan, which documents the inventoried waste and materials disposed. It shows disposal of waste materials in cells 1 through 30 from June 1962 through August 1970. OU10 has approximate disposal dimensions of 200 feet by 200 feet. Although it is not exactly known how the cells were constructed, the available records indicate that each cell was constructed five feet apart as a means of preventing cave-ins. The depth of each cell was reportedly 20 feet below ground surface. The information contained in the 1986 Woodward-Clyde report consisted
of internal memorandums from Diamond Shamrock personnel which describes the nature of disposal and logs of materials buried at OU10.

Comment # 2 (R. Bimber):

From the August 30, 2012 email. This comment specifically addresses construction of the northern portion of the slurry wall that is closest to Lake Erie, page 3 of 3. "WVC Slope Stability Studies-Cut-off Wall Construction August 1987 (Document 458 in Box 53 at NEDO) advised installing the Slurry Wall after the slope had been stabilized by completion of the rock and dolo buttress. I have seen no detail on how construction of that wall nearest the Lake was planned and no written reports from the period during or after its construction. Lacking any reports on the difficulties of digging 25-30 feet below the Lake in gravel, I would expect only the upper part of the wall was built, and the ends anchored to the side walls being expected to hold it in place."

Ohio EPA Response:

Details regarding construction of the northern wall are described in the OU10 slurry wall profile stations STA 6+03 (northeast corner) to 11+83.2 (northwest corner), which documents installation of the north wall (Construction Observations Report, Volume I of II, 1989, figure 8 of 13). The entire section of the north wall was constructed in the same manner as the east, west, and south walls. Along the northern section, the wall is anchored into the underlying shale bedrock. Details on the construction of the northern wall are shown in the Construction Observations Report, Volume II of II (Woodward-Clyde, 1989).

Comment # 3 (R. Bimber):

From the August 30, 2012 email. "Well TB-1 was outside the OAS, but inside the Slurry Wall. Was the well plugged?"

Ohio EPA Response:

Test boring TB-1 was one of nine exploratory borings installed to evaluate ground water flow direction and ground water quality at OU10 during characterization activities in the 1980s. TB-1 was completed on September 25, 1984 and converted into a monitoring well for evaluating the ground water recovery system design in 1988. In the Construction Observations Report, Volume I of II (Woodward-Clyde, 1989), TB-1 was abandoned as part of landfill closure activities. Specifically, this well is shown in the document as drawing 3 of 13 as a well proposed for abandonment. The Landfill Closure Plans and Specifications (Woodward-Clyde, 1987), page IV-2-3, Section 2.3 specifies removal of existing monitoring wells. This consisted of removing the well casing to a minimum depth of 4 feet below ground surface. The well was then pressure grouted from the bottom to the top. Note # 3 of drawing 3 of 13 referenced above states that wells and piezometers shown were installed and grouted prior to slurry wall construction.
Comment # 4 (R. Bimber):

From the August 28, 2012 email (page 4 of 5). "Dissolved Solids seem to be leaking from the Landfill, and the shoreline west of it, based on Lake Erie water sampling. I think the Lake sampling should be extended west until the pain source is passed, and some effort made to identify the solids, especially if the main source appears to be the Landfill."

Ohio EPA Response:

As indicated in previous responses regarding ground water quality, results show elevated TDS across the entire site. Predicted concentrations of the 2003 BIOSCREEN fate and transport model did not show OU10 related COCs reaching Lake Erie from OU10 above respective State of Ohio OMZA water quality standards or above surface water quality standards for the protection of human health (non-Drinking Water standard). This included the assessment of TDS. In response to elevated TDS in ground water within OU10, Ohio EPA requested that the PRP Group sample Lake Erie along the OU10 shoreline. Samples were collected in accordance with "Work Plan for Surface Water Sampling for the Operable Unit 1 North Lake Feasibility Study" dated November 15, 2007. A total of 800 feet of shoreline was sampled and consisted of two sampling events (December 11, 2007, and January 10, 2008). A total of twenty-six (26) surface water samples were collected from Lake Erie. The results showed TDS values ranging from 162 – 360 mg/L, which are below the OMZA standard of 1,500 mg/L. The results were submitted to Ohio EPA on February 28, 2008 in the document "Feasibility Study Addendum for Operable Unit 1-North Lake (OU1N-Lake) of the Former Diamond Shamrock Painesville Works Site". A final O&M Plan will be implemented pursuant to the Director's Orders. The O&M Plan will require, among other things, continued ground water monitoring to ensure COCs (including TDS) are not getting beyond the slurry wall and migrating to Lake Erie. Based on all ground water and surface water data available to date, additional sampling of Lake Erie is not warranted at this time.

Comment # 5 (Klineisfine@aol.com):

This comment was received by email on August 31, 2012. I was unable to attend the 8/16/12 meeting at the Lake County Health District regarding plans for the Diamond Shamrock Superfund site Operable Unit 10. However, as a Lake County resident, I have followed (and been appalled by) this Superfund site over the years. I am still astounded at the sheer volume and toxicity of the chemicals so carelessly dumped at Diamond Alkali/Shamrock, particularly given its proximity to Lake Erie. I was disappointed that the public comment period was a mere two weeks long. I never saw a public notice about the 8/16/12 meeting, and the only printed information was an 8/14/12 article in the News Herald newspaper. After reading the documentation on the Ohio EPA's website, Preferred Plan OU-10 B appears to be less costly and seems to reduce potential worker, environmental, and public exposure to contaminants by not disturbing or moving them. HOWEVER, I fervently hope that the OEPA will give serious consideration and weight to the invaluable expert testimony of retired Diamond Alkali chemist Russell Bimber as provided in-person on 8/16/12 and subsequently by email especially his concerns
regarding hexachlorobutadiene, carbon tetrachloride and other toxic volatile organic compounds and solvents.

Mr. Bimber recommends more Lake Erie water testing given that "dissolved solids seem to be leaking from the Landfill and the shoreline west of it, based on Lake Erie water sampling." Mr. Bimber questions why wastes "formally reported to the USEPA & OEPA as being buried in this Landfill...(are) not recognized as being present in the Preferred Plan for OU-10." Mr. Bimber expresses concerns regarding groundwater protection and the construction and integrity of the Slurry Wall. Mr. Bimber challenges the Plan's assertion that risks of human interaction with waste in the Landfill have been mitigated "without knowing what became of more than 100,000 gallons of chlorinated solvents that Diamond formally reported burying in the Landfill, and what is leaching from the landfill into Lake Erie." In closing, my main concerns involve protection of groundwater and the waters of Lake Erie from the chemicals on this site. The OEPA is extremely fortunate to have a resource like Russell Bimber who worked at the Diamond site for over 40 years and should fully utilize his expertise.

Ohio EPA Response:

Please see the responses to Mr. Bimber's technical comments regarding ground water and surface water quality at OU10, which are included above. The public notice was posted in the News-Herald and ran for 1 week beginning on July 7, 2012. The Preferred Plan for OU10 was available for public review and comment from July 16, 2012 through August 31, 2012.
8.0 GLOSSARY

Aquifer - An underground geological formation capable of holding and yielding water.

ARARs - Applicable or relevant and appropriate requirements. Those statutes and rules which strictly apply to remedial activities at the site, or those statutes and rules whose requirements would help achieve the remedial goals for the site.

Baseline Risk Assessment - An evaluation of the risks to humans and the environment posed by a site.

Carcinogen - A chemical that causes cancer.


Contaminants of Concern (COCs) - Chemicals identified at the site which are present in concentrations that may be harmful to human health or the environment.

Decision Document - A statement issued by Ohio EPA giving the Director's selected remedy for a site and the reasons for its selection.

Ecological Receptor - Animals or plant life exposed or potentially exposed to chemicals released from a site.

EE/CA - Engineering Evaluation/Cost Assessment. A report issued under the U.S. EPA's Superfund Accelerated Cleanup Model that evaluates remedies for a site and estimates their costs. EE/CA's are generally shorter and include fewer alternatives than Feasibility Studies.

Environmental Covenant - A servitude arising under an environmental response project that imposes activity and use limitations and that meets the requirements established in section 5301.82 of the Ohio Revised Code.

Exposure Pathway - Route by which a chemical is transported from the site to a human or ecological receptor.
Feasibility Study - A study conducted to ensure that appropriate remedial alternatives are developed and evaluated such that relevant information concerning the remedial action options can be presented to a decision-maker and an appropriate remedy selected.

Final Cleanup Levels - Final cleanup levels are identified in the Decision Document along with the RAOs and performance standards.

Hazardous Substance - A chemical that may cause harm to humans or the environment.

Hazardous Waste - A waste product, listed or defined by the RCRA, which may cause harm to humans or the environment.

Human Receptor - Person or population exposed to chemicals released from a site.

Leachate - Water contaminated by contact with wastes.

LOE Contractor - Level of Effort Contractor. A person or organization retained by Ohio EPA to assist in the investigation, evaluation, or remediation of a site.

Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in a public drinking water supply. The level is established by U.S. EPA and incorporated into OAC 3745-81-11 and 3745-81-12.

NCP - National Oil and Hazardous Substances Pollution Contingency Plan, codified at 40 C.F.R. Part 300 (1990), as amended. A framework for remediation of hazardous substance sites specified in CERCLA.

O&M - Operation and Maintenance. Long-term measures taken at a site, after the initial remedial actions, to assure that a remedy remains protective of human health and the environment.

PAHs - Polycyclic aromatic hydrocarbons. Class of semi-volatile chemicals including multiple six-carbon rings. Often found as residue from coal-based chemical processes.

PCBs - Polychlorinated biphenyls. An oily chemical typically used in electrical equipment.
PCE - Tetrachloroethene or Perchloroethylene. A common industrial solvent and cleaner, often used for dry cleaning.

Performance Standard - Measures by which Ohio EPA can determine if RAOs have been met.

Preferred Plan - The plan that evaluates the preferred remedial alternative chosen by Ohio EPA to remediate the site in a manner that best satisfies the evaluation criteria.

Preliminary Remediation Goal (PRG) - Initial cleanup goals that (1) are protective of human health and the environment and (2) comply with ARARs. They are developed early in the process (scoping) based on readily available information and are modified to reflect the results of the baseline risk assessment (termed site-specific PRGs at this point in time). They are also used during the analysis of remedial alternatives in the remedial investigation/feasibility study (RI/FS).


Remedial Action Objectives (RAOs) - Specific goals of the remedy for reducing risks posed by the site.

Remedial Investigation - A study conducted to collect information necessary to adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives.

Responsiveness Summary- A summary of all comments received concerning the Preferred Plan and Ohio EPA’s response to all issues raised in those comments.

TCA - 1,1,1-Trichloroethane. A common industrial solvent and cleaner.

TCE - Trichloroethylene. A common industrial solvent and cleaner.

Water Quality Criteria - Chemical, physical, and biological standards that define whether a body of surface water is unacceptably contaminated. These standards are intended to ensure that a body of water is safe for fishing, swimming, and as a drinking water source.
These standards can be found in Chapter 3745-1 of the Ohio Revised Code.
TABLE 1

Water Quality Analysis from Internal Piezometers and Extraction Wells collected in April 2009 and January 2011

(After Table 1 of the 2011 Feasibility Study, Hull and Associates)
### TABLE 1

**INTERNAL PIEZOMETER AND EXTRACTION WELL DATA (APRIL 2009 AND JANUARY 2010) (UG/L)**

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>EW1</th>
<th>EW2</th>
<th>EW3</th>
<th>EW4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample ID</td>
<td>TER300:EW1: G042209</td>
<td>TER300:EW2: G042209</td>
<td>TER300:EW2: G042209</td>
<td>TER300:EW2: G042209</td>
</tr>
<tr>
<td><strong>Volatile Organic Compounds (VOCs)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,1,1-Trichloroethane</td>
<td>5 J</td>
<td>74</td>
<td>72</td>
<td>18000</td>
</tr>
<tr>
<td>1,1,2,2-Tetrachloroethane</td>
<td>2 U</td>
<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>1,1,2-Trichloroethane</td>
<td>2 U</td>
<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>1,1-Dichloroethane</td>
<td>3 J</td>
<td>240</td>
<td>260</td>
<td>11000</td>
</tr>
<tr>
<td>1,1-Dichloroethene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>1,2-Dichloroethane</td>
<td>2 U</td>
<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>1,2-Dichloropropane</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>2-Butanone</td>
<td>3 U</td>
<td>3 U</td>
<td>3 U</td>
<td>150 U</td>
</tr>
<tr>
<td>2-Hexanone</td>
<td>7 U</td>
<td>7 U</td>
<td>7 U</td>
<td>350 U</td>
</tr>
<tr>
<td>4-Methyl-2-Pentanone</td>
<td>5 U</td>
<td>5 U</td>
<td>5 U</td>
<td>250 U</td>
</tr>
<tr>
<td>Acetone</td>
<td>6 U</td>
<td>6 U</td>
<td>6 U</td>
<td>300 U</td>
</tr>
<tr>
<td>Benzene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Bromodichloromethane</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Bromoform</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Bromomethane</td>
<td>3 U</td>
<td>3 U</td>
<td>3 U</td>
<td>150 U</td>
</tr>
<tr>
<td>Carbon Disulfide</td>
<td>3 U</td>
<td>3 U</td>
<td>3 U</td>
<td>150 U</td>
</tr>
<tr>
<td>Carbon Tetrachloride</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Chlorobenzene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Chloroethane</td>
<td>3 U</td>
<td>5 J</td>
<td>5 J</td>
<td>150 U</td>
</tr>
<tr>
<td>Chloroform</td>
<td>1 U</td>
<td>9 J</td>
<td>9 J</td>
<td>81 J</td>
</tr>
<tr>
<td>Chloromethane</td>
<td>3 U</td>
<td>3 U</td>
<td>3 U</td>
<td>150 U</td>
</tr>
<tr>
<td>cis-1,2-Dichloroethene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>cis-1,3-Dichloropropene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Dichloromethane</td>
<td>2 U</td>
<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Methylene Chloride</td>
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<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>Styrene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Tetrachloroethene</td>
<td>1 U</td>
<td>72</td>
<td>71</td>
<td>1200</td>
</tr>
<tr>
<td>Toluene</td>
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<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>trans-1,2-Dichloroethene</td>
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<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>1 U</td>
<td>2 J</td>
<td>2 J</td>
<td>50 U</td>
</tr>
<tr>
<td>Trichlorofluoromethane</td>
<td>2 U</td>
<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td>2 U</td>
<td>2 U</td>
<td>2 U</td>
<td>100 U</td>
</tr>
<tr>
<td>Xylene (Total)</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>50 U</td>
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<table>
<thead>
<tr>
<th><strong>Semi-Volatile Organic Compounds (SVOCs)</strong></th>
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<tbody>
<tr>
<td>1,1'-Biphenyl</td>
</tr>
<tr>
<td>1,2,4-Trichlorobenzene</td>
</tr>
<tr>
<td>2,4,5-Trichlorophenol</td>
</tr>
<tr>
<td>2,4,6-Trichlorophenol</td>
</tr>
</tbody>
</table>
# Table 1

## Internal Piezometer and Extraction Well Data (April 2009 and January 2010) (µg/L)

<table>
<thead>
<tr>
<th>Sample Location</th>
<th>EW1</th>
<th>EW2</th>
<th>EW3</th>
<th>EW4</th>
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<td>Sample ID</td>
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<td>TER300:EW2: G042305</td>
<td>TER300:EW2: G042309D Duplicate</td>
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>EW1</th>
<th>EW2</th>
<th>EW3</th>
<th>EW4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,2'-oxybis(1-Chloropropane)</td>
<td>NT</td>
<td>NT</td>
<td>NT</td>
<td>NT</td>
</tr>
<tr>
<td>2,4-Dichlorophenol</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>1 J</td>
</tr>
<tr>
<td>2,4-Dimethylphenol</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
</tr>
<tr>
<td>2,4-Dinitrophenol</td>
<td>5 U</td>
<td>5 U</td>
<td>5 U</td>
<td>5 U</td>
</tr>
<tr>
<td>2,4-Dinitrotoluene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
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<tr>
<td>2,6-Dinitrotoluene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
</tr>
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<td>2-Chloronaphthalene</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
<td>1 U</td>
</tr>
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<td>2-Chlorobenzene</td>
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<td>1 U</td>
</tr>
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</tr>
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<td>2-Nitroaniline</td>
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<td>2-Nitrophenol</td>
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<td>1 U</td>
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<td>3,3'-Dichlorobenzidine</td>
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<td>3-Nitroaniline</td>
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HULL & ASSOCIATES, INC.
BEDFORD, OHIO
## Table 1

**Internal Piezometer and Extraction Well Data (April 2009 and January 2010)(μg/L)**

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<th>Sample Location</th>
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<th>EW4</th>
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**Notes:**
1. All concentrations presented in μg/L.
2. Analyses in BOLD indicated detected concentrations.
3. Qualifier Summary:
   - J - estimated
   - U/U* - not detected
4. NT - not tested.
# FEASIBILITY STUDY
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
OPERABLE UNIT 10

## TABLE 1

INTERNAL PIEZOMETER AND EXTRACTION WELL DATA (APRIL 2009 AND JANUARY 2010)(UG/L)

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### Parameter

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#### Semi-Volatile Organic Compounds (SVOCs)

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HULL & ASSOCIATES, INC.
BEDFORD, OHIO

JUNE 2010
TER010.600.0010.XLS

PAGE 6 OF 8
## Table 1

**Internal Piezometer and Extraction Well Data (April 2009 and January 2010)**

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**Hull & Associates, Inc.**
**Bedford, Ohio**

**Page 6 of 8**

**June 2010**

**TER010.600 0010.XLS**
# Table 1

**Internal Piezometer and Extraction Well Data (April 2009 and January 2010) (ug/l)**

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<tr>
<td>Metals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>66.7 U</td>
<td>66.7 U</td>
<td>66.7 U</td>
<td>66.7 U</td>
<td>367</td>
<td>131 J</td>
<td>367</td>
<td>131 J</td>
<td>367</td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>5.6 J</td>
<td>6.3 J</td>
<td>8.1 J</td>
<td>1.2 U</td>
<td>1.2 U</td>
<td>1.2 U</td>
<td>1.2 U</td>
<td>1.2 U</td>
<td>1.2 U</td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>7.7 J</td>
<td>2.5 UJ</td>
<td>5.7 J</td>
<td>2.3 J</td>
<td>2.3 J</td>
<td>2.3 J</td>
<td>2.3 J</td>
<td>2.3 J</td>
<td>2.3 J</td>
<td></td>
</tr>
<tr>
<td>Barium</td>
<td>58.1 J</td>
<td>33.1 J</td>
<td>26.9 J</td>
<td>21.8 J</td>
<td>14.8 J</td>
<td>37 J</td>
<td>21.8 J</td>
<td>14.8 J</td>
<td>37 J</td>
<td></td>
</tr>
<tr>
<td>Beryllium</td>
<td>1.7 UJ</td>
<td>0.33 U</td>
<td>0.33 U</td>
<td>0.33 U</td>
<td>0.37 U</td>
<td>0.33 U</td>
<td>0.37 U</td>
<td>0.33 U</td>
<td>0.37 U</td>
<td></td>
</tr>
<tr>
<td>Cadmium</td>
<td>2.5 J</td>
<td>1.3 J</td>
<td>0.54 J</td>
<td>0.33 U</td>
<td>0.33 U</td>
<td>0.46 J</td>
<td>0.33 U</td>
<td>0.46 J</td>
<td>0.33 U</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>1790000</td>
<td>1570000</td>
<td>1560000</td>
<td>501000</td>
<td>424000</td>
<td>2560000</td>
<td>501000</td>
<td>424000</td>
<td>2560000</td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td>0.53 UJ</td>
<td>1.9 U</td>
<td>1.9 U</td>
<td>2.3 J</td>
<td>3.8 J</td>
<td>3 J</td>
<td>2.3 J</td>
<td>3.8 J</td>
<td>3 J</td>
<td></td>
</tr>
<tr>
<td>Cobalt</td>
<td>2.1 J</td>
<td>4.3 J</td>
<td>4.5 J</td>
<td>5.7 J</td>
<td>0.42 U</td>
<td>5.1 J</td>
<td>5.7 J</td>
<td>0.42 U</td>
<td>5.1 J</td>
<td></td>
</tr>
<tr>
<td>Copper</td>
<td>27.5</td>
<td>2 UJ</td>
<td>2 UJ</td>
<td>11.5 J</td>
<td>8.1 J</td>
<td>56</td>
<td>11.5 J</td>
<td>8.1 J</td>
<td>56</td>
<td></td>
</tr>
</tbody>
</table>

Hull & Associates, Inc.
Bedford, Ohio

Page 7 of 8

June 2010

Ter010.000.0010.XLS
<table>
<thead>
<tr>
<th>Sample Location</th>
<th>EW5</th>
<th>IP1</th>
<th>IP2</th>
<th>IP3</th>
<th>IP4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Iron</td>
<td>Lead</td>
<td>Magnesium</td>
<td>Manganese</td>
<td>Mercury</td>
</tr>
<tr>
<td>Value</td>
<td>214000</td>
<td>1.3 U</td>
<td>457000</td>
<td>3100</td>
<td>0.056 UJ</td>
</tr>
<tr>
<td></td>
<td>7220 J</td>
<td>6.1 J</td>
<td>434000</td>
<td>5550</td>
<td>0.13 U*</td>
</tr>
<tr>
<td></td>
<td>6540 J</td>
<td>5.7 J</td>
<td>420000</td>
<td>5960</td>
<td>0.056 UJ</td>
</tr>
<tr>
<td></td>
<td>66.7 U</td>
<td>1.3 U</td>
<td>151000</td>
<td>4070</td>
<td>0.056 U*</td>
</tr>
<tr>
<td></td>
<td>547</td>
<td>1.3 J</td>
<td>6420</td>
<td>22.9</td>
<td>0.056 UJ</td>
</tr>
<tr>
<td></td>
<td>4190</td>
<td>1.8 J</td>
<td>594000</td>
<td>2100</td>
<td>0.056 UJ</td>
</tr>
</tbody>
</table>

Notes:
1. All concentrations presented in ug/l.
2. Analyses in BOLD indicated detected concentrations.
3. Qualifier Summary:
   J - estimated; UJ* - not detected
4. NT - not tested.
TABLE 2

Second Quarter 2016 (April – June) Ground Water Results

(After Haley & Aldrich, 2016)
TABLE 3

Associated costs for each remedial alternative

(After Appendix F, 2011 Feasibility Study, Hull and Associates)
# FEASIBILITY STUDY

**FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE OPERABLE UNIT 10**

## TABLE F-1

RESTRICTED ACCESS/INACTIVE INDUSTRIAL EXPOSURE SCENARIO
COST ANALYSIS FOR REMEDIALSET ALTERNATIVE ALT. OU10-B

<table>
<thead>
<tr>
<th>DESCRIPTION OF WORK</th>
<th>UNIT PRICE</th>
<th>ESTIMATED QUANTITY</th>
<th>ESTIMATED TOTAL</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation &amp; Maintenance Plan Updating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Updating Existing O&amp;M Plan</td>
<td>$10,000</td>
<td>1 Is</td>
<td>$10,000</td>
<td></td>
</tr>
<tr>
<td>Updating of Existing O&amp;M HASP</td>
<td>$5,000</td>
<td>1 Is</td>
<td>$5,000</td>
<td></td>
</tr>
<tr>
<td>Total O&amp;M Plan Updating Costs</td>
<td></td>
<td></td>
<td>$15,000</td>
<td></td>
</tr>
<tr>
<td>Annual Operation &amp; Maintenance Items</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Report of O&amp;M Plan</td>
<td>$1,000</td>
<td>1 Is</td>
<td>$1,000</td>
<td>From Tierra Solutions</td>
</tr>
<tr>
<td>Site Maintenance (Mowing, Fencing)</td>
<td>$300/Event</td>
<td>5 events</td>
<td>$1,500</td>
<td>From Tierra Solutions</td>
</tr>
<tr>
<td>Groundwater Sampling</td>
<td>$8,000/Event</td>
<td>4 events</td>
<td>$32,000</td>
<td>From Tierra Solutions</td>
</tr>
<tr>
<td>Leachate Collection &amp; Disposal</td>
<td>$4,000/Event</td>
<td>10 events</td>
<td>$40,000</td>
<td>From USEPA FS Cost Guidance</td>
</tr>
<tr>
<td>Project Management (10% of Above Items)</td>
<td>$3,500</td>
<td>1 Is</td>
<td>$3,500</td>
<td>From USEPA FS Cost Guidance</td>
</tr>
<tr>
<td>Technical Support (15% of Above Items)</td>
<td>$5,250</td>
<td>1 Is</td>
<td>$5,250</td>
<td>From USEPA FS Cost Guidance</td>
</tr>
<tr>
<td>Total Annual O&amp;M Cost</td>
<td></td>
<td></td>
<td>$83,300</td>
<td></td>
</tr>
<tr>
<td>Periodic Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Five Year Review Report</td>
<td>Every 5</td>
<td>$12,000/Event</td>
<td>$72,000</td>
<td>From USEPA FS Cost Guidance</td>
</tr>
<tr>
<td>Repairs to Shoreline Stabilization System</td>
<td>Every 15</td>
<td>$150,000/Event</td>
<td>$300,000</td>
<td>From Tierra Solutions</td>
</tr>
</tbody>
</table>
FEASIBILITY STUDY
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
OPERABLE UNIT 10

TABLE F-1

RESTRICTED ACCESS/INACTIVE INDUSTRIAL EXPOSURE SCENARIO
COST ANALYSIS FOR REMEDIAL ALTERNATIVE ALT. OU10-B

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Year</th>
<th>Total Cost</th>
<th>Total Cost Per Year</th>
<th>Discount Factor (3.5%)</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost</td>
<td>0</td>
<td>$15,000</td>
<td>$15,000</td>
<td>1.000</td>
<td>$15,000</td>
</tr>
<tr>
<td>Annual O&amp;M Cost</td>
<td>1-30</td>
<td>$2,499,000</td>
<td>$83,300</td>
<td>18.392</td>
<td>$1,532,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>5</td>
<td>$162,000</td>
<td>$162,000</td>
<td>0.822</td>
<td>$133,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>10</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.676</td>
<td>$8,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>15</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.555</td>
<td>$7,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>20</td>
<td>$162,000</td>
<td>$162,000</td>
<td>0.456</td>
<td>$74,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>25</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.375</td>
<td>$5,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>30</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.308</td>
<td>$4,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>$2,886,000</strong></td>
<td></td>
<td></td>
<td><strong>$1,778,000</strong></td>
</tr>
</tbody>
</table>

a. Percentages used to develop costs for this section are based on the accepted percentages found in the U.S. EPA Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA 540-R-00-002, July 2000) and historic operation and maintenance costs.
### TABLE F-2

**REstricted ACCESS/INACTIVE INDUSTRIAL EXPOSURE SCENARIO**
**COST ANALYSIS FOR REMEDIAL ALTERNATIVE Alt. OU10-C**

<table>
<thead>
<tr>
<th>DESCRIPTION OF WORK</th>
<th>UNIT PRICE</th>
<th>ESTIMATED QUANTITY</th>
<th>ESTIMATED TOTAL</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1 - Waste Characterization and Design Study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste Characterization &amp; Design SI</td>
<td>100,000</td>
<td>1 Is</td>
<td>$100,000</td>
<td></td>
</tr>
<tr>
<td>Sub-Total</td>
<td></td>
<td></td>
<td>$100,000</td>
<td></td>
</tr>
<tr>
<td>Task 2 - Waste Removal and Site Restoration*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health &amp; Safety Monitoring</td>
<td>100,000 est</td>
<td>1 Is</td>
<td>$100,000</td>
<td>Estimate</td>
</tr>
<tr>
<td>Excavation and Loading</td>
<td>8.00 cub yd</td>
<td>40,600 yards</td>
<td>$324,800</td>
<td>Volume from WCC Report</td>
</tr>
<tr>
<td>Waste Characterization</td>
<td>200,000 est</td>
<td>1 Is</td>
<td>$200,000</td>
<td>Estimate</td>
</tr>
<tr>
<td>Transportation &amp; Offsite Incineriation</td>
<td>550 ton</td>
<td>1,300 tons</td>
<td>$715,000</td>
<td>Incineration Estimate, 1.3 tons/yard</td>
</tr>
<tr>
<td>Transportation &amp; Offsite Landfilling</td>
<td>250 ton</td>
<td>51,000 tons</td>
<td>$12,750,000</td>
<td>Landfill Estimate, 1.3 tons/yard</td>
</tr>
<tr>
<td>Imported Fill - Backfilled &amp; Compact</td>
<td>16 cub yd</td>
<td>40,600 yards</td>
<td>$549,600</td>
<td>RSMeans 17 03 0428, Off-Site Clay, 8&quot; L</td>
</tr>
<tr>
<td>Sub-Total</td>
<td></td>
<td></td>
<td>$14,739,400</td>
<td></td>
</tr>
<tr>
<td>Task 3 - Professional/Technical Services♭</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remedial Design (5%)</td>
<td>742,000</td>
<td>1 Is</td>
<td>$742,000</td>
<td>Percentages per USEPA FS Cost</td>
</tr>
<tr>
<td>Project Management (8%)</td>
<td>1,187,000</td>
<td>1 Is</td>
<td>$1,187,000</td>
<td>Guidance</td>
</tr>
<tr>
<td>Construction Management (6%)</td>
<td>890,000</td>
<td>1 Is</td>
<td>$890,000</td>
<td></td>
</tr>
<tr>
<td>Sub-Total</td>
<td></td>
<td></td>
<td>$2,819,000</td>
<td></td>
</tr>
<tr>
<td>Contingency on Design and Construction</td>
<td></td>
<td></td>
<td>$4,415,000</td>
<td>10% Scope + 15% Bid</td>
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<tr>
<td>CAPITAL COST ESTIMATE</td>
<td></td>
<td></td>
<td>$22,073,000</td>
<td></td>
</tr>
</tbody>
</table>

-30/+50% COST RANGE $15,451,000 - $33,110,000
FEASIBILITY STUDY
FORMER DIAMOND SHAMROCK PAINESVILLE WORKS SITE
OPERABLE UNIT 10

TABLE F-2

RESTRICTED ACCESS/INACTIVE INDUSTRIAL EXPOSURE SCENARIO
COST ANALYSIS FOR REMEDIAL ALTERNATIVE ALT. OU10-C

**Annual Operation & Maintenance Items**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Report of O &amp; M Plan</td>
<td>$1,000</td>
<td>1 event</td>
</tr>
<tr>
<td>Site Maintenance (Mowing, Groundwater Sampling)</td>
<td>$300</td>
<td>5 events</td>
</tr>
<tr>
<td>Project Management (10% of Above Items)</td>
<td>$8,000</td>
<td>4 events</td>
</tr>
<tr>
<td>Technical Support (15% of Above Items)</td>
<td>$3,500</td>
<td>1 event</td>
</tr>
<tr>
<td>Total Annual O &amp; M Cost</td>
<td>$43,300</td>
<td></td>
</tr>
</tbody>
</table>

**Periodic Costs**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Five Year Review Report</td>
<td>$12,000</td>
<td>6 events</td>
</tr>
<tr>
<td>Repairs to Shoreline Stabilization</td>
<td>$150,000</td>
<td>2 events</td>
</tr>
<tr>
<td>Total Periodic Costs</td>
<td>$72,000</td>
<td></td>
</tr>
</tbody>
</table>

**PRESENT VALUE ANALYSIS**

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Year</th>
<th>Total Cost</th>
<th>Total Cost Per Year</th>
<th>Discount Factor (3.5%)</th>
<th>Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Cost</td>
<td>0</td>
<td>$22,073,000</td>
<td>$22,073,000</td>
<td>1.00</td>
<td>$22,073,000</td>
</tr>
<tr>
<td>Annual O&amp;M Cost</td>
<td>1-30</td>
<td>$1,299,000</td>
<td>$43,300</td>
<td>18.392</td>
<td>$796,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>5</td>
<td>$162,000</td>
<td>$162,000</td>
<td>0.822</td>
<td>$133,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>10</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.676</td>
<td>$8,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>15</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.555</td>
<td>$7,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>20</td>
<td>$162,000</td>
<td>$162,000</td>
<td>0.456</td>
<td>$74,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>25</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.375</td>
<td>$5,000</td>
</tr>
<tr>
<td>Periodic Cost</td>
<td>30</td>
<td>$12,000</td>
<td>$12,000</td>
<td>0.308</td>
<td>$4,000</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>$23,744,000</td>
<td></td>
<td></td>
<td>$23,100,000</td>
</tr>
</tbody>
</table>

---


b. Percentages used to develop costs for this section are based on the accepted percentages found in the U.S. EPA Guide to Developing and Documenting Cost Estimates During Feasibility Study (EPA 540-R-00-002, July 2000).

Figure 1

Diamond Shamrock Site Location and Operable Unit Map

(After Figure 1, 2011 Feasibility Study, Hull and Associates)
FIGURE 2

Site lay out of OU10

(After Figure 2, FS Addendum, Hull and Associates)
FIGURE 3

Aerial conceptual view of OU10

(After Figure 4, 2011 Feasibility Study, Hull and Associates)
Figure 4 – Aerial Conceptual View of the OU10 Landfill System

Native Clayey Soils → MW-5 → OP-2 → Ditch → MW-4 → OP-1 → MW-3

IP-2 → Ditch → IP-1 (damaged) → IP-4 → Ditch

36" Cut-off Wall → MW-6 → Capped Area

Approximate Fill Area

MW-2 → Ditch → Catch Basin

EW-1 → Ditch → EW-2 → EW-3 → EW-4 → EW-5

MW-1 → Recovery System Vault → Ditch

Approximate Scale 1 inch = 80 ft.
FIGURE 4

Current and future exposure scenarios for a landfill maintenance worker

(After Figure 5, 2011 Feasibility Study, Hull and Associates)
FIGURE 5

Site map showing additions to the monitoring program at OU10 and storm water improvements performed at the landfill

(After Drawing OU10-C-200 of the Construction Completion Report, Haley & Aldridge, 2016)
APPENDICES
APPENDIX A

Chemicals Disposed of at OU10

(After Figure 2 – 3B, Woodward-Clyde, 1988)
<table>
<thead>
<tr>
<th>Cell #</th>
<th>Waste Description</th>
<th>Amount</th>
<th>Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell #1</td>
<td>Diox Polyiodide</td>
<td>1,3 drums</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #2</td>
<td>Methyl Chloride</td>
<td>250 lb</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #3</td>
<td>Waste</td>
<td>1100 lb</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #4</td>
<td>Acidic &amp; Base</td>
<td>2 drums</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #5</td>
<td>Methyl Chloride</td>
<td>50 lb</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #6</td>
<td>Methyl Chloride</td>
<td>50 lb</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #7</td>
<td>Epikote 250</td>
<td>3 drums</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #8</td>
<td>Methyl Chloride</td>
<td>100 lb</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #9</td>
<td>Epikote 250</td>
<td>50 lb</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #10</td>
<td>Epikote 250</td>
<td>50 lb</td>
<td>12-22-69</td>
</tr>
<tr>
<td>Cell #11</td>
<td>Epikote 250</td>
<td>25 lb</td>
<td>12-22-69</td>
</tr>
</tbody>
</table>

**Waste Description**

- **Diox Polyiodide**
- **Methyl Chloride**
- **Acidic & Base**
- **Epikote 250**
- **Methyl Chloride**
- **Methyl Chloride**
- **Methyl Chloride**
- **Methyl Chloride**
- **Epikote 250**
- **Epikote 250**
- **Epikote 250**

**Date/Time**

- 12-22-69
- 12-22-69
- 12-22-69
- 12-22-69
- 12-22-69
- 12-22-69
- 12-22-69
- 12-22-69
- 12-22-69
- 12-22-69

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**INVENTORIED SOLID WASTE WITH KNOWN LOCATIONS**

**Woodward-Clyde Consultants**

**ONE - ACRE SITE**

**DIAMOND SHAMROCK CORPORATION**

**INVENTORY DATE**

- 7-7-90
- 7-2-90

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**FILE No.**

- BCCR3602

---

**CHECKS**

- 7-6-90
- 7-2-90
APPENDIX B

Identified cell disposal locations at OU10

(After Figure 2 – 3A, Woodard-Clyde, 1988)
Note: Figure 1-3A shows cell location as defined in a Diamond Shamrock memo dated November 19, 1963.

Figure 1-3B lists the waste type, quantity and date received per cell for the wastes which have known locations. Appendix A shows the complete inventory of the wastes disposed of at the one-acre site. Wastes which locations are not known are listed by the date they were received.
APPENDIX C

1999 Interim Operation and Maintenance (O&M) Plan, as amended in 2014 and 2016

(Tierra Solutions, 2014 and 2016)
March 23, 2016

Mr. Lawrence Antonelli
Site Coordinator, Diamond Shamrock Painesville Works Site
Ohio EPA
Northeast District Office
2110 East Aurora Road
Twinsburg, Ohio 44087

Re: Second Addendum to the Approved One Acre Site Interim Operation and Maintenance Plan, Operable Unit 10, Diamond Shamrock Painesville Works Site, Painesville, Lake County, Ohio, Project ID# 243-000230-097

Dear Mr. Antonelli

Tierra Solutions, Inc. (Tierra) is submitting this second addendum to the One Acre Site Interim Operation and Maintenance Plan (as modified by the conditional Ohio EPA approval dated October 15, 1999) to add monitoring points installed during the Stormwater and Monitoring Improvements project. Monitoring well CL3-5D/MW-5D, piezometer OP-5, and inclinometers "OU10 East_Incl" and "OU10 West_Incl" were installed in late 2014 as part of this work. Information collected from these new monitoring points was evaluated; the results were submitted to Ohio EPA in the letter Expansion of the Monitoring System within Operable Unit 10 dated December 15, 2015. Ohio EPA approved this letter on February 26, 2016. As described in the December 15, 2015 letter, Tierra proposes to add these new monitoring points to the Interim Operation and Maintenance Plan, specifically:

- Sampling of CL3-5D/MW5-D will be conducted every tenth quarter starting the 2nd quarter of 2018. This sampling frequency will continue to provide monitoring of the deep till and will monitor for seasonal differences until a final monitoring plan is established.
- Incorporate the use of OP-5 in on-going water level measurements under the Interim Operation and Maintenance Plan.
- Incorporate measurement of the inclinometers into the Interim Operation and Maintenance Plan for OU10. The inclinometers will be monitored quarterly and the results reported in the quarterly reports and annual slope stability evaluation.

An updated version of the Interim Operation and Maintenance Plan is attached. The changes are show below in redline-strikeout:

1) Normal Operation:
A) Pump the groundwater extraction wells as needed, depending on well recovery rates, to maintain existing inward groundwater gradient.
B) Measure and record the depth to water in all the wells and piezometers with each groundwater extraction wells pumping operation, but no less than quarterly.

C) Sample the groundwater monitoring wells quarterly. Monitoring well CL3-5D/MW5-D will be sampled every tenth quarter beginning in the 2nd quarter 2016. After the first two years, the results will be evaluated and, if Ohio EPA agrees, the sampling frequency may be adjusted to annual.

D) Maintain the vegetative cover on the OAS cap. Inspect the cap quarterly for sinking, animal burrows, and any other anomalies, and repair as needed.

E) Inspect the existing seawall and bluff below the OAS quarterly. Perform maintenance as needed. Survey the elevations and coordinates of the existing six (6) OAS stability benchmarks set in the earth surface annually/quarterly for movement (compare to previous measurements). Collect inclinometer measurements from the two inclinometers quarterly. Evaluate significant movement to determine if repairs are needed.

F) Evaluate the OAS stability and prepare an annual written report using a Registered Ohio Professional Engineer. Repair as needed.

G) Inspect the OAS for damage after major storm events. Repair as needed.

Tierra has been collecting and evaluating this data since early 2015, right after the new monitoring points were installed. If approved, Tierra will continue to collect and evaluate the data as described in the updated Interim Operation and Maintenance Plan. If you have any questions or concerns, please contact me at (732) 246-6854.

Sincerely,

Nathan Scott
Site Coordinator
On behalf of Occidental Chemical Corporation
(as successor to Diamond Shamrock Chemicals Company)

Enclosures

CC:  Tim Christman, Ohio EPA
     Teri Heer, Ohio EPA

EC:  Derrick Vallance, Maxus Energy Corp
     Lloyd Ross, Hailey & Aldrich
     Teresa Jordan, Tierra Solutions, Inc.
     Rod Beals, Ohio EPA
     Chris Loxterman, LCGHD
Diamond Shamrock Painesville Works Site
One Acre Site Interim Operation and Maintenance Plan

The One Acre Site (OAS) is a securely closed industrial waste landfill which ceased operation in 1970. The OAS has been surrounded with a three foot thick underground soil bentonite slurry wall which is keyed into the underlying bedrock layer, capped using a 60 mil thick HDPE liner and overlain by an engineered three foot thick clay liner and 18 inches of topsoil, and supplied with groundwater extraction wells within the slurry wall perimeter. Monitoring wells and piezometers surround the site.

Groundwater is pumped from within the slurry wall to maintain the water level lower within this wall than outside the wall, ensuring an inward groundwater pressure gradient. Existing operations consist of regularly pumping the groundwater from the groundwater extraction wells into a tank truck for transportation to proper treatment and disposal at a permitted offsite facility, sampling the water quality and levels in the monitoring wells, and recording the water levels in the piezometers. Cap and shoreline conditions are inspected regularly and maintenance activities are performed as appropriate. Site drawings identifying the various OAS features are attached to this document.

1) Normal Operation:
   A) Pump the groundwater extraction wells as needed, depending on well recovery rates, to maintain existing inward groundwater gradient.
   B) Measure and record the depth to water in all the wells and piezometers with each groundwater extraction wells pumping operation, but no less than quarterly.
   C) Sample the groundwater monitoring wells quarterly. Monitoring well CL3-5D/MW5-D will be sampled every tenth quarter beginning in the 2nd quarter 2018. After the first two years, the results will be evaluated and, if Ohio EPA agrees, the sampling frequency may be adjusted to annual.
   D) Maintain the vegetative cover on the OAS cap. Inspect the cap quarterly for sinking, animal burrows, and any other anomalies, and repair as needed.
   E) Inspect the existing seawall and bluff below the OAS quarterly. Perform maintenance as needed. Survey the elevations and coordinates of the existing nine OAS stability benchmarks set in the earth surface quarterly for movement (compare to previous measurements). Collect inclinometer measurements from the two inclinometers quarterly. Evaluate significant movement to determine if repairs are needed.
   F) Evaluate the OAS stability and prepare an annual written report using a Registered Ohio Professional Engineer. Repair as needed.
   G) Inspect the OAS for damage after major storm events. Repair as needed.

2) Potential Operating problems:
   A) Groundwater extraction well pump failure: A spare groundwater extraction well pump will be maintained in stock on site for use in the event of pump failure. In the event of pump failure, the old pump will be removed from the well and replaced. The failed pump will be repaired or disposed appropriately.
B) Cap maintenance: Commercial fertilizer appropriate to the conditions will be applied as needed. Quarterly inspections will look for significant grade changes which would be filled to re-establish the appropriate grade; however, no sinking areas have been identified since the OAS cap was installed in 1988. Animal burrows will be corrected by smoking the burrow, then filling and seeding.

C) Shoreline/bluff erosion: If significant erosion is identified, Ohio EPA will be notified and a plan to correct the problem will be prepared and submitted to Ohio EPA within thirty days, or other time period as may be appropriate.

3) Routine Monitoring and Laboratory Testing:

A) Well depth monitoring will be performed by measuring and recording the depth to water from benchmarks surveyed on the top of each well casing. Depth to water measurements will be taken in all wells with each batch pumping, but no less than quarterly.

B) Monitoring wells will be sampled as below for the first two years. After the first two years, the results will be evaluated and if Ohio EPA agrees, the sampling frequency may be adjusted to annual.

1) Measure and record the depth to water.
2) Purge the stagnant water from the well and measure the purged water volume. Save the purged water for disposal with the next pumped groundwater batch. Record the volume of purged water.
3) Collect the sample in clean sample containers supplied by the analytical lab with any needed preservative, as appropriate.
4) Package the sample containers with appropriate cooling medium and chain of custody forms. Seal the sample shipment packages and ship them to the analytical lab for arrival within hold times appropriate for the analytical method.
5) Protocols established in the 2007 Quality Assurance Project Plan for Remedial Design/Remedial Action and Supplemental Feasibility Study Sampling and applicable addenda will be followed. All parameters identified in this item will be analyzed as below for the first two years. Three months prior to the end of the initial 2 year period, these analytical parameters will be reviewed and a revised list will be submitted for Ohio EPA review, based on the first two years' experience. Parameters to be analyzed by the lab include:

A) Those parameters identified as present in the RIFS Phase 1 sampling, including methylene chloride, bis (2-ethylhexyl) phthalate, and acetone (all likely lab artifacts). The U.S. EPA TAL metals (although not all are present) and chlorides, all run on filtered samples, will also be analyzed. These parameters will be analyzed quarterly.

B) In addition, parameters identified as present in the groundwater inside the slurry wall at 0.1 PPM or greater will also be analyzed, including 1, 1, 1-trichloroethane, 1, 1-dichloroethane, chloroform, perchloroethylene, carbon tetrachloride, trichlorofluoromethane and total xylenes. These parameters will be analyzed annually.

C) In addition, parameters identified as being sensitive (but not previously present at the OAS at 0.1 PPM or greater) will also be analyzed, including
PCBs, benzene, hexachlorobutadiene, DDT and hexavalent chromium. These parameters will also be analyzed annually.

6) Test the pH of each sample in the field using a calibrated instrument. Record the measurement and the calibration data.

4) Alternate Operation and Maintenance:
Any alternate Interim O & M required will be covered under the existing Interim Remedial Action provisions of the September 1995 Ohio EPA DFFO covering the Diamond Shamrock Painesville Works Site.

5) Safety Plan:
A) Normal maintenance and inspection activities will be conducted with well covers shut and electricity to the well pumps locked out at the pole-mounted circuit breaker. In this case, there is no disposed material exposure potential and only safety requirements applicable to working with physical hazards such as mowers, smoke bombs, seasonal heat and cold, etc. will be required. This work does not require OSHA training specific to the materials disposed at the OAS. Normal maintenance and inspection activities must be scheduled around any work requiring open well covers (see 5.B). In addition, care must be taken to avoid these situations which may be encountered at the OAS:
1) During seawall and bluff inspection, two people will be present at all times. Avoid climbing on the seawall. If such climbing is required for inspection, one person must stay on solid ground at all times in view of the climber in order to send for assistance as needed.
2) While surveying the bank stability markers, take care to avoid running survey lines off the edge of the stable area behind the seawall to prevent falling hazards.
B) Work which must be performed with the well cover(s) open, such as pumping groundwater into a tank truck, measuring the depth to water, and performing maintenance on interior piping and well pumps, may only be performed by personnel with all required OSHA training appropriate to the task. In addition to the general safety requirements above (5.A), work which may require special personal protection includes:
1) If any of the existing six interior groundwater pumping well covers are opened, follow current OSHA guidelines regarding air quality monitoring in the vicinity of the worker's breathing zone. If needed (not required based on past experience), full face respirators equipped with the appropriate combination organic vapors/acid gas/high efficiency cartridge will be used until monitoring shows vapors are reduced to an acceptable concentration.
2) During well pump removal or any other work involving pump wiring, electricity to the well pumps must be locked out at the pole-mounted circuit breaker. Waterproof gloves with a rough gripping surface will be used. Chemical splash goggles will be used. Provisions of 5.B.1 above also apply.

6) Equipment necessary to the OAS O & M Plan:
The only mechanical equipment needed for OAS operation are the well pumps, aside from contractor supplied surveying equipment, safety supplies identified above, and well sampling equipment. Pumping rates are followed roughly by comparing pumping rates (rate of well water level drop) from one pumping batch to the next for each individual well. If a significant drop in pumping rate is observed, the pump may need replacement
soon. Present experience with these pumps is very good: In the nine years the pumps have been operating, only 2 wells have had pumps needing replacement. All six of these groundwater pumps are permanently mounted in the individual wells, with individual electrical cables and discharge hoses connected to individual fixed discharge piping. No electrical cable, discharge hose or piping has failed to date.

7) Annual OAS O & M Budget:
   This data is not required for this interim O & M Plan.

8) Records and Reporting Mechanisms Required:
   Note that this is a closed facility, and so there are no daily operations at the OAS.
   A) The following OAS operating data sheets are attached:
      1) Pumping Record Log Sheet - generated with each batch pumping, currently about ten times per year.
      2) Well Depth to Water Measurements Log Sheet - generated after each batch pumping, currently ten times per year, but no less than quarterly.
      3) Site Inspection Log sheet - generated quarterly.
   B) Laboratory records and data packages will be generated in a CLP-like format. Required analyses which are not part of the 2007 QAPP analytical suite will be generated in a manner acceptable to Ohio EPA and close to the CLP-like format. Field pH instrument calibration record copies will be submitted with the field pH measurements.
   C) Emergencies at the OAS will be reported directly to Ohio EPA's Mr. Lawrence Antonelli at (330) 963 - 1127. The phone call will be followed by a confirmatory letter within five working days.
   D) Operating records, consisting of copies of the log sheets in item 8.A and any laboratory records in item 8.B with a brief written operation summary will be submitted to Ohio EPA on a quarterly basis. These reports will be submitted to Ohio EPA within thirty (30) days of the end of the three (3) month period covered by the report.
   E) The Registered Ohio Professional Engineer's OAS stability report will be submitted annually with the annual surveyor's OAS stability marker survey results.
APPENDIX D

Ohio EPA correspondence to the PRP Group approving changes to the monitoring and sampling protocols at OU10
February 26, 2016

Mr. Nathan Scott  
Tierra Solutions, Inc.  
Two Tower Center Blvd., 10th Floor  
East Brunswick, NJ 08816

Re: Diamond Shamrock Painesville  
Remediation Response  
Project Records  
Remedial Response  
Lake County  
243000230091

Subject: Expansion of Monitoring System at Operable Unit 10 (OU10), Former Diamond Shamrock Painesville Works Site, Project ID # 240-000230-091

Dear Mr. Scott:

The Ohio Environmental Protection Agency (Ohio EPA) is in receipt of the proposal to expand the monitoring at OU10, which would incorporate ground water sampling of the newly installed deep well MW-5D, quarterly ground water elevation measurements in outside piezometer OP-5, and taking quarterly readings from the two (2) inclinometers to evaluate potential rotational movement of the northern OU10 slope. With respect to sampling of well MW-5D, it is proposed to sample this well every 10th quarter starting with the second quarter of 2018.

Ohio EPA approves the expanded monitoring at OU10. Please update the Interim Operation and Monitoring Plan incorporating this additional monitoring, and submit it to Ohio EPA.

If there are any questions, please call me at (330) 963-1127.

Sincerely,

Lawrence Antonelli, Site Coordinator  
Division of Environmental Response and Revitalization

cc: Derrick Vallance, Maxus  
    Nathan Scott, TSI  
    Teresa Jordan, TSI  
    Tim Christman, DERR, CO  
    Lloyd Ross, Haley & Aldrich, Inc.  
    Rod Beals, DERR, NEDO  
    Todd Davis, Hemisphere  
    Teri Heer, DERR, NEDO  
    Chris DeJarlais, Boulder Environmental
April 20, 2016

Mr. Nathan Scott
Tierra Solutions, Inc.
Two Tower Center Boulevard
10th Floor
East Brunswick, NJ 08816

Re: Diamond Shamrock Painesville Remediation Response Plans Remedial Response
Lake County
24300230

Subject: Approval of the Second Addendum to the One Acre Site (OAS) Interim Operation and Maintenance Plan, Operable Unit 10, Diamond Shamrock Painesville Works Site, Lake County, Ohio, ID# 243-000230-091

Dear Mr. Scott:

The Ohio Environmental Protection Agency (Ohio EPA) has reviewed the Second Amendment to the Operable Unit 10 (OU10) Interim Operation and Maintenance (O&M) Plan received on March 24, 2016. After review of this document, Ohio EPA approves the O&M amendment for OU10.

The amendment includes monitoring of additional components installed during the Storm Water and Monitoring Improvement project. Specifically, the inclusion of deep monitoring well CL3-5D/MW5-D will be sampled every tenth quarter beginning with the second quarter of 2018. This well is intended to evaluate ground water quality of the deeper till, and also to provide information on any seasonal variations for development of a final O&M plan for OU10. Also, this well was approved to be sampled by use of a bailer due to insufficient recharge in accordance with SOP F3008, which has been incorporated into the current QAPP for RD/RA activities and supplemental Feasibility Study (FS) sampling at Diamond Shamrock.

Water level measurements in newly installed outside piezometer OP-5 will also be collected to verify hydraulic gradients, and documented in the quarterly reports. Finally, measurements of the two inclinometers installed will be performed quarterly, compared to baseline readings, and presented in the quarterly reports. The quarterly inclinometer measurements will also be included as part of the annual slope stability evaluation report.

The Ohio EPA authorizes the PRP Group to proceed with and continue to collect the monitoring data proposed in the updated O&M Plan for OU10.
If there are any questions, please contact me at (330) 963-1127.

Sincerely,

Lawrence Antonelli  
Site Coordinator  
Division of Environmental Response and Revitalization

LA:cla

cc: Derrick Vallance, Maxus

ec: Rod Beals, Ohio EPA, NEDO, DERR  
    Teri Heer, Ohio EPA, NEDO, DERR  
    Tim Christman, Ohio EPA, Central Office, DERR  
    Teresa Jordan, TSI  
    Todd Davis, Hemisphere  
    Chris DeJarlais, Boulder Environmental
May 6, 2014

Mr. Nathan Scott
Tierra Solutions, Inc.
Two Tower Center Boulevard
10th Floor
East Brunswick, NJ 08816

Re: Approval of First Addendum to the Approved One Acre Site Interim Operation Plan, Operable Unit 10 (OU10), Diamond Shamrock Painesville Works Site, Lake County, Project ID # 243-000230-097

Dear Mr. Scott:

I have reviewed the proposed change in laboratory analytical methods for quarterly ground water sample analysis, during the approved interim Operations and Maintenance (O&M) activities at OU10. Currently, ground water samples are analyzed in accordance with the 1997 Quality Assurance Project Plan (QAPP), using Contract Laboratory Program (CLP) protocols and methods. The transition to analysis specified in the approved 2007 QAPP for Remedial Design/Remedial Action and Supplemental Feasibility Study Sampling by SW-846 Methods, ASTM Methods, Standard Methods, and U.S. EPA protocols is approved for use at OU10 for ground water analysis.

Also, included in the April 17, 2014, letter were the changes shown in redline-strikeout, and an updated version of the Interim O&M Plan, reflecting the changes from CLP to SW-846 Methods for future analysis.

Please contact me at (330) 963-1127, if there are any questions.

Sincerely,

[Signature]

Lawrence Antonelli, Site Coordinator
Division of Environmental Response and Revitalization

cc: Teresa Jordan, Tierra Solutions, Inc.
    Lloyd Ross, Haley & Aldrich

cc: Mike Eberle, NEDO, DERR
    Rod Beals, NEDO, DERR

Chris DeJarlais, Boulder Environmental
Javier Gonzales, Maxus Energy Corporation
Teri Heer, NEDO, DERR

Northeast District Office • 2110 East Aurora Road • Twinsburg, OH 44087-1924
www.epa.ohio.gov • (330) 963-1200 • (330) 487-0769 (fax)
May 9, 2016

Re: Diamond Shamrock Painesville Remediation Response Plans Remedia Response Lake County 24300230091

Mr. Nathan Scott
Tierra Solutions, Inc.
Two Tower Center Boulevard
10th Floor
East Brunswick, NJ 08816

Subject: Approval to use Analytical Methods Specified in the 2007 Quality Assurance Project Plan (QAPP) for Ground Water Samples at Operable Unit 10 (OU10), Former Diamond Shamrock Painesville Works Site, Lake County, Ohio, Project ID # 243-000230-091

Dear Mr. Scott:

The Ohio Environmental Protection Agency (Ohio EPA) has reviewed your letter dated May 2, 2016, regarding the analytical methods used by the laboratory, and reporting lists for quarterly ground water sampling conducted at OU10. Tierra contacted Ohio EPA in response to detecting discrepancies in the analytical methods used and parameters reported by the laboratory, Eurofins Lancaster Laboratories Environmental, LLC. The discrepancies were observed during analysis of the Fourth Quarter 2015 ground water samples.

The source of those discrepancies was determined to be related to the First Addendum to the Approved One Acre Site Interim Operation and Maintenance (O&M) Plan, dated April 17, 2014. That addendum changed the laboratory analytical methods for ground water analysis from the original 1999 Interim O&M Plan which consisted of Contract Laboratory Program (CLP) protocols to those defined in the 2007 Quality Assurance Project Plan (QAPP) for Remedial Design/Remedial Action (RD/RA) and Supplemental Feasibility Study Sampling. The 2007 QAPP for the project specifies the use of SW-846 analytical methods for sample analysis by the laboratory.

The parameters of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and metals (including mercury and cyanide), which were previously analyzed by CLP methods, were modified to SW-846 methods, and approved by Ohio EPA in a letter dated May 6,
2014. Other parameters such as hexavalent chromium, ORP, TDS, pH, and chlorides were not modified from CLP to SW-846 methods.

For purposes of decision making at the site and consistency of data quality, Ohio EPA is in agreement that the laboratory should begin to routinely analyze ground water samples from OU10 in accordance with the 2007 QAPP methodologies referenced above.

If there are any questions, please contact me at (330) 963-1127.

Sincerely,

Lawrence Antonelli
Site Coordinator
Division of Environmental Response and Revitalization

LA/nvr

cc: Derrick Vallance, Maxus

ec: Rod Beals, Ohio EPA, NEDO, DERR
    Regan Williams, Ohio EPA, NEDO, DERR
    Tim Christman, Ohio EPA, Central Office, DERR
    Teresa Jordan, TSI
    Todd Davis, Hemisphere
    Chris DeJarlais, Boulder Environmental