NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID & HAZARDOUS MATERIALS

STATEMENT OF BASIS
FOR
TECUMSEH REDEVELOPMENT INC.
Acid Tar Pit Solid Waste Management Unit Group

FINAL
March 2010

FACILITY: Tecumseh Redevelopment Inc.
Hamburg Turnpike
Lackawanna, NY 14218

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Statement of Basis

Acid Tar Pit Solid Waste Management Unit Group

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1.0 INTRODUCTION

The purpose of this Statement of Basis (SB) is to provide an overview of the selected remedy for the Acid Tar Pits (ATP) located at the former Bethlehem Steel (now Tecumseh Redevelopment Inc.) facility located in Lackawanna, NY. The New York State Department of Environmental Conservation (the "Department") provided a public comment period of forty-five (45) days to comment on the recommendations of the Focused Corrective Measures Study for the Acid Tar Pits Solid Waste Management Unit (SWMU) Group. A public meeting was held on July 16, 2009 that discussed the various options and provided additional opportunity for public input.

Site Location and History

The Tecumseh Redevelopment Inc. (Tecumseh) site is located at the east end of Lake Erie, just south of the City of Buffalo (see Figure 1). Tecumseh owns approximately 1,070 acres of property located along the west side of NYS Route 5, Lackawanna, NY (see Figure 2). The "Tecumseh Property" or "Tecumseh Site" comprises a significant portion of the former Bethlehem Steel Corporation (BSC), Lackawanna facility (the "former BSC Property" or "former BSC Site").

The former BSC Property was used for iron and steel production since the beginning of the 20th century. Steel-making operations were discontinued by the end of 1983, and by the mid-1990s, most of the steel-making facilities on the west side of Hamburg Turnpike (NYS Route 5) had been demolished. In September 2001, BSC's coke oven operation was terminated leaving only a galvanized products mill, located on the east side of Hamburg Turnpike, operating by BSC at the site. The galvanizing facility was shut down in early 2009.

RCRA Corrective Action Program Status

Bethlehem Steel Corporation and the United States Environmental Protection Agency (USEPA) entered into an Administrative Order on Consent in August 1990 (Docket No.
II RCRA-90-3008(h)-0201). Under terms of the 1990 USEPA Order, BSC agreed to perform a RCRA Facility Investigation (RFI) to identify the nature and extent of any releases of hazardous constituents from 104 Solid Waste Management Units (SWMUs) and six (6) watercourses.

As the RFI Report was incomplete when Tecumseh acquired most of the former BSC Property in 2003, Tecumseh initiated efforts to expeditiously complete the RFI. The Final RFI Report,

submitted to USEPA in January 2005, recommended 38 SWMUs and three watercourses (i.e., Smokes Creek, South Return Water Trench, and Blasdell Creek) for further evaluation in a Corrective Measures Study (CMS). In a letter dated May 17, 2006, USEPA identified five additional SWMUs and two additional watercourses for further evaluation in during the CMS phase.

2.0 ACID TAR PIT SWMU GROUP

The Acid Tar Pit SWMU Group consists of three areas where wastes were disposed from the 1950s until the 1970s (see Figure 3). All three are located near Smokes Creek and contain various types and amounts of waste. The Acid Tar Pit SWMUs (S-11 and S-22) and the Agitator Sludge SWMU (S-24) are located adjacent to the Creek (see Figure 4). These three SWMUs (S-11, S-22, and S-24) are collectively referred to as the Acid Tar Pit SWMU Group (ATP SWMU Group) based upon their proximity to each other as well as their similar fill constituents. The ATP SWMU Group has been identified by Tecumseh and NYSDEC as a "high-priority" SWMU group due to the volume and nature of the fill materials as well as their proximity and environmental impact on Smokes Creek. The following is a description of the ATP Group SWMUs.

2.1 SWMU S-11

SWMU S-11 is an elongated surface impoundment approximately 1.4 acres in area and filled with approximately 50,000 cubic yards of waste material byproducts from steel and coke making operations deposited from the 1950s into the early 1970s (see Figure 5). The waste material consists primarily of iron precipitator dust and waste lime, with lesser amounts of coke oven waste extending to a depth of approximately 20 to 30 feet below ground surface (fbgs). The surface consisting of gravel-sized slag with smaller quantities of stone, bricks, and other steel manufacturing debris is relatively level and only half covered with vegetation. Several small mounds of slag exist in the immediate vicinity of the unit.

According to the USEPA 1988 RCRA Facility Assessment (RFA), materials placed within this unit included discarded drums from plant operations containing various wastes, including condensate from burning of foul gas from the coke oven gas sulfur recovery process, oil from several water quality control stations, hydraulic oil, paint residues, paint house filters, solvent cleaning solutions, and various degreasing compounds, including 1,1,1-trichloroethane; open hearth precipitator dust from electrostatic precipitators installed to clean exhaust gases from open-hearth operations; and lime dust collected in a bag house associated with basic oxygen furnace (BOF) steel-making operations. SWMU S-11 is not an engineered containment structure and was constructed without a barrier baseliner and/or final cover system. A dense glacial till unit underlies this SWMU approximately 38 to 52 feet below ground surface which acts as a vertical confining unit to inhibit the downward flow of impacted groundwater. The RFI data concluded the following regarding SWMU S-11:

- Numerous hazardous constituents (VOCs, SVOCs, and several metals) are present in slag/soil/fill and vary in concentration with waste type.

- Materials of high pH [>11 standard units (SU)] are present, although pH levels vary with waste type.
- Due to the nature of the materials within the ATPs and surface topography, a groundwater mound exists in the SWMU.
- RFI soil/slag/fill samples collected did not exhibit hazardous characteristics via Toxic Compound Leaching Protocol (TCLP); however, other soil/slag/fill sampling of SWMU S-11 exhibited hazardous characteristics for benzene.
- VOCs, SVOCs, and several metals were present in groundwater samples collected from both the upgradient and downgradient monitoring wells.

2.2 SWMU S-22

SWMU S-22 is an elongated group of three surface impoundments totaling approximately 1.4 acres in area and filled with approximately 50,000 cubic yards of waste by-products from steel and coke manufacturing deposited from the 1950s into the early 1970s (see Figure 5). The unit is surrounded by an earthen and slag berm approximately 3 to 8 feet high while the surface of the SWMU is approximately 3 to 5 feet below the berm in most areas. The RFI reports the waste profile extends to an approximate depth of 20 to 40 feet below ground surface with groundwater encountered within the fill at 10 to 20 feet below ground surface.

During the RFI, investigatory borings and various analyses identified five major waste types: spent pickle liquor, coal tar, coke oven gas/condensate, waste lime, and iron oxide precipitator dust. These wastes were observed to be co-mingled and partly stratified within the ATPs. All waste types except the lime and iron precipitator dust contained elevated concentrations of benzene ranging from 92 to 29,000 mg/kg. Each waste is described briefly below:

Waste Type	Physical Characteristics	Chemical Characteristics
Spent Pickle Liquor	Pink and olive green silt and fine sand-sized particles, occasional mottling, and exhibiting a pungent acid odor and a strong positive response on the photoionization detector (PID)	Very low pH (2.0 SU)
Coal Tar	Black, sticky, cohesive material often with a naphthalene-like odor (e.g., moth balls) and a strong positive PID response	Elevated concentrations of SVOCs: naphthalene (42,000 mg/kg), phenanthrene (18,000 mg/kg), phenol (1,600 mg/kg), pyrene (9,200 mg/kg); Metals: arsenic (21 mg/kg), barium (65 mg/kg), lead (90 mg/kg), nickel (29mg/kg)
Coke Oven Gas Condensate	Dark grey to black non-sticky material consisting of silt and fine sand-sized particles exhibiting hydrocarbon odors and a strong positive PID response	Elevated concentrations of SVOCs: fluorene (ND to 340 mg/kg), naphthalene (3.7 to 850 mg/kg), phenanthrene (<1 to 180 mg/kg); Metals: lead (12 to 108 mg/kg); Other: BTU content (<1,000 to 6,720 BTU/lb), pH (0.38 to 1.79 SU)

Waste Lime	White to pinkish-grey silt-sized material exhibiting a strong positive PID response	High pH (11 SU)
Iron Precipitator Dust	Brown to reddish-brown silt to fine sand-sized material with a lower positive PID response	High pH (11 SU)

SWMU S-22 is not an engineered containment structure and was constructed without a barrier baseliner and/or final cover system. A dense glacial till unit underlies this SWMU approximately 38 to 52 feet below ground surface which acts as a vertical confining unit to inhibit the downward flow of impacted groundwater. The RFI concluded the following regarding SWMU S-22:

- Several waste fill material samples exhibited hazardous characteristics for benzene and pyridine.
- Numerous hazardous constituents (VOCs, SVOCs, and several metals) are present in waste fill and vary in concentration with waste type.
- Some waste fill samples exhibited a pH less than 2 which is considered a characteristic hazardous waste based upon corrosivity.
- Due to the physical nature of the materials within the ATPs and topography, a groundwater mound exists in the SWMU.
- Hazardous constituents found in both the fill and sand units' groundwater have migrated horizontally from SWMU S-22 toward Smokes Creek.

2.3 SWMU S-24

SWMU S-24 is an oval-shaped disposal pit measuring approximately 1 acre in area, filled with acid tar (agitator) sludge generated from the Benzol Plant (see Figure 6). Agitator sludge found within this unit was generated during benzene processing when the product (benzene) was washed with sulfuric acid to separate impurities. The resulting waste stream was neutralized with a caustic solution, which produced the agitator sludge. The tar-like waste material extends to a depth of approximately 10 feet below ground surface (fbgs) with deeper zones extending to a depth of 20 feet, possibly the result of vertical migration of the tar material. An elongated mound of slag-fill and debris exists in the eastern portion of the SWMU. The surface slopes gently from west to east with areas of no and low vegetative cover. Although this unit is covered with slag, small localized areas of a tar-like substance have occasionally been observed at the surface during the summer months. SWMU S-24 is not an engineered containment structure and was constructed without a barrier baseliner and/or final cover system. Groundwater within the shallow fill unit is approximately 10 to 14 fbgs. The RFI concluded the following regarding SWMU S-24:

- Agitator sludge waste was disposed of in this SWMU from at least 1938 to 1950. Waste fill/slag samples collected after 1993 from the SWMU indicate the presence of 8 VOCs, 23 SVOCs, metals, and cyanide.
- Much of the waste fill material within SWMU S-24 is characteristically hazardous for benzene, pyridine, and nitrobenzene based upon TCLP test results.

- In the 1994 samples, naphthalene was the only compound detected in the Synthesis Precipitation Leaching Protocol (SPLP) extract indicating that it is the only waste fill constituent likely to migrate from the SWMU in groundwater.
- The pH of the waste material was determined to be as low as 0.63 SU indicating that it is a characteristic hazardous waste exhibiting corrosivity.
- Four VOCs, 11 SVOCs, 15 metals, and cyanide were detected in the 2001 surface soil/fill samples.
- A November and December 1996 electrical imaging survey indicated the waste fill extends 5 to 10 fbgs, and in some areas as deep as 20 fbgs.

3.0 FOCUSED CORRECTIVE MEASURES STUDY (Development of Corrective Measures Alternatives)

Tecumseh recently completed an Interim Corrective Measure (ICM) to dredge the lower reach of Smokes Creek to mitigate the expansion of the 100-year flood plain in the City of Lackawanna First Ward and fulfill its maintenance obligations under the State Land Patent Agreement. Much of the dredged creek sediment contains contaminants that are believed to have migrated substantially or at least in part from the ATP SWMU Group located adjacent to the creek (see Figure 3). Hence, in order to avoid recontamination of Smokes Creek sediment after dredging, prompt implementation of measures is needed to mitigate migration of contaminants from the ATP SWMU Group to the creek.

Tecumseh completed a Focused Corrective Measures Study (Focused CMS) to identify potential remedial alternatives for the ATP SWMU Group. The following alternatives were identified and evaluated in the Focused CMS. These alternatives, described in more detail in the subsequent sections, included:

- Alternative 1 - No Action.
- Alternative 2 - Construct Individual In-Place Containment Systems.
- Alternative 3 - Excavate and Dispose Agitator Sludge Off-Site, and Contain In-Place Acid Tar Pits.
- Alternative 4 - Excavate SWMU S-24, Consolidate and Construct Combined In-Place ATP Containment System.
- Alternative 5 - Excavate SWMUs S-11, S-22 & S-24 and Consolidate in On-Site Hazardous Waste CAMU.
- Alternative 6 - Excavate SWMUs S-11, S-22 & S-24, Stabilize, and Dispose Off-Site.

3.1 Description of Alternatives

3.1.1 Alternative 1 - No Action

The No Action alternative is defined as taking no remedial action to address the impacted slag/ soil/fill and groundwater in the ATP and Agitator Sludge SWMUs. The No Action alternative provides a baseline for comparison against the other remedial alternatives and justifies the need

for remedial action. Long-term monitoring of groundwater may be required under this alternative to monitor changes in contaminant concentrations.

3.1.2 Alternative 2 - Construct Individual In-Place Containment Systems

This corrective measure alternative involves designing and constructing two separate containment systems to isolate the Acid Tar Pits (SWMUs S-11 and S-22) and the Agitator Sludge Area (SWMU S-24) in-place to eliminate direct contact with waste fill and to control future contaminant releases to groundwater, Smokes Creek, and the surrounding land. The containment systems would consist of the following three basic components:

- Bentonite/Soil Slurry Walls: Low-permeability vertical subsurface walls would be constructed downgradient of each area to provide lateral containment of waste fill, impacted slag/soil, and groundwater within the SWMUs from the surrounding subsurface environment.
- Groundwater Collection Systems: Groundwater collection systems would be installed to collect leachate and contaminated groundwater and create an inward hydraulic gradient across each slurry wall to further enhance its effectiveness.
- Final Cover Systems: The final cover systems would consist of a geosynthetic clay liner, HDPE geomembrane, geocomposite drainage layer, 18-inch low-permeability barrier soil layer, and 6-inch vegetated soil cover. The final cover system is intended to reduce the infiltration of precipitation, promote storm water run-off, and eliminate the potential for direct contact with the waste fill. The cover system would also incorporate a gas venting system.

3.1.3 Alternative 3 - Excavate and Dispose Agitator Sludge Off-Site, and Contain In-Place Acid Tar Pits

This corrective measure alternative involves excavation of the Agitator Sludge Area waste, on-site stabilization and off-site disposal; and construction of a confined containment system (i.e., slurry wall, groundwater collection and pre-treatment system, and geocomposite cover system) around the Acid Tar Pits (SWMUs S-11 & S-22) to mitigate the continued migration of contaminants to Smokes Creek through the adjacent subsurface soil and groundwater.

All visibly impacted slag and soil/fill located within the Agitator Sludge SWMU (S-24) would be excavated, transported, and disposed off-site at a commercial hazardous waste treatment, storage and disposal facility (TSDF). Some of the waste fill would require dewatering and stabilizing prior to off-site transport. It is estimated that between 23,000 and 35,000 cubic yards of impacted soil/fill would be excavated from SWMU S-24. Based on this estimate, up to 2,100 truckloads would need to leave the site. A minimum of 2 months, with an estimated 100 trips per day, would be required to transport this volume of material to the Chemical Waste Management facility in Model City, NY approximately 30 miles from the site or some other suitable TSDF further away. The trucks would be traveling on high volume local and regional roads through highly populated areas.

The excavation would require at least partial backfilling with clean soil/fill to stabilize the surrounding fill and subsequently, covered with topsoil and seeded to promote vegetative growth. It would take approximately one month to backfill the excavation with clean soil/fill.

The ATP containment systems would consist of the following three basic components:

- Bentonite/Soil Slurry Wall: A low-permeability vertical subsurface wall would be constructed downgradient of the ATP area to provide lateral containment of waste fill, impacted slag/soil, and groundwater within the ATP SWMUs from the surrounding subsurface environment.
- Groundwater Collection System: A groundwater collection system would be installed to collect leachate and contaminated groundwater and create an inward hydraulic gradient across the slurry wall to further enhance its effectiveness.
- Final Cover System: The final cover systems would be the same as Alternate 2 and consist of a geosynthetic clay liner, HDPE geomembrane liner, geocomposite drainage layer, 18-inch low-permeability barrier soil layer, and 6-inch vegetated soil cover. The final cover system is intended to reduce the infiltration of precipitation, promote storm water run-off, and eliminate the potential for direct contact with the waste fill. The cover system would also incorporate a gas venting system.

3.1.4 Alternative 4 - Excavate SWMU S-24, Consolidate, and Construct Combined In-Place ATP Containment System

This alternative includes excavation and consolidation of the Agitator Sludge Area waste to within the combined footprint of SWMUs S-11 and S-22 and construction of a single confined containment system (i.e., slurry wall, groundwater collection, and geocomposite cover system) around the consolidated Acid Tar Pits to mitigate the continued migration of contaminants to Smokes Creek through the adjacent subsurface soil and groundwater (see Figure 7).

All visibly-impacted slag and soil/fill located within the Agitator Sludge (SWMU S-24) would be excavated and transported to the Acid Tar Pits SWMUs (S-11 and S-22) for consolidation. It is estimated that between 23,000 and 35,000 cubic yards of impacted soil/fill would be excavated from SWMU S-24, transported, and consolidated within the combined SWMU S-11 and S-22 footprint. The fill material excavated from SWMU S-24 would be transported using designated on-site trucks and consolidated within the containment cell footprint. Trucks, excavators, or other heavy equipment used to handle contaminated soil/fill from these SWMUs would be decontaminated prior to leaving the Tecumseh Property. Approximately 600 LF of Site Highway 9 would be cordoned off, including the Smokes Creek Bridge on Highway 9, thus restricting traffic and roadway access for project-related travel only during transportation of the agitator sludge fill to the ATP containment cell. This restricted access roadway would be used during transport of materials. Additionally, this access roadway would continue to undergo regular and periodic maintenance, cleaning, and inspection to reduce potential for contaminated run-off impacts. Equipment decontamination facilities and/or methods would be further detailed in design documents.

The containment system that would be designed and constructed to isolate the Acid Tar Pits and consolidated waste from the Agitator Sludge Area would consist of the following three basic components:

- Bentonite/Soil Slurry Wall: A low-permeability vertical subsurface wall to provide lateral containment of waste and groundwater within the cell from the surrounding subsurface environment (see Figure 7).
- Groundwater Collection System: To create an inward hydraulic gradient across the slurry wall to collect leachate/groundwater and further enhance its effectiveness.
- Final Cover System: The cover system would be the same as Alternatives 2 and 3 and consist of a geosynthetic clay liner, HDPE geomembrane liner, geocomposite drainage layer, 18-inch low-permeability barrier soil layer, and 6-inch vegetated soil cover. The final cover system is intended to reduce the infiltration of precipitation, promote storm water run-off, and eliminate the potential for direct contact with the waste fill. The cover system would also incorporate a gas venting system (see Figures 8 and 9).

3.1.5 Alternative 5 - Excavate SWMUs S-11, S-22 & S-24 and Consolidate in On-Site Hazardous Waste CAMU

Corrective Action Management Units (CAMUs) are special units created under the RCRA program to facilitate treatment, storage, and disposal of hazardous wastes managed for implementing cleanup of polluted sites. The original CAMU applications submitted by BSC in November 2000 proposed two separate CAMUs: one unit designated to contain solid, non-hazardous wastes, and a second unit to contain characterized hazardous wastes. The original non-hazardous Solid Waste (SW) and Hazardous Waste (HW) CAMUs were designed to meet the "grandfathered" qualitative design objectives stated in the 1993 Title 6 New York Codes of Rules and Regulations (NYCRR) §373-2.19(a)(3).

The HW CAMU would consist of a lined facility for the storage of the ATP SWMU Group and other hazardous waste materials, one or more leachate storage tanks, and a treatment/process area. The HW CAMU would be up to 10 acres in size with an adjacent treatment area and the capability of containing up to 390,000 cubic yards of material. Key conceptual design elements and performance requirements for the HW CAMU include:

- A composite (low-permeability compacted clay soil over 80-mil HDPE geomembrane) liner system demonstrated to be compatible with the wastes to be placed within it. The base of the liner is to be constructed with a minimum slope of 1% with a minimum separation of 10 feet to groundwater.
- A leachate collection system above the base liner that incorporates a geocomposite drainage layer and 12 inches of permeable (>1x10-2 cm/sec) granular select fill capable of maintaining a maximum head of 1 foot. Leachate generated during and after filling of cells will be pumped to a leachate storage tank, treated, and discharged to the existing sanitary sewer at the Lackawanna POTW.

- A final cover system would be the same as Alternatives 2-4 with a geosynthetic clay liner, an HDPE geomembrane liner, and geocomposite drainage layer covered with 18 inches of barrier protection soil and 6-inch vegetated topsoil. The cover system would also incorporate a gas venting system.
- A static and seismic analysis of the overall landfill site, sub-base, liner and cover systems.
- A groundwater monitoring system capable of detecting leakage and integrated into the Long-Term Groundwater Monitoring Plan.
- Waste pretreatment or stabilization would be implemented in the treatment/process area as necessary, as waste fill is received to render the waste physically and chemically compatible for landfilling.

3.1.6 Alternative 6 - Excavate SWMUs S-11, S-22 & S-24, Stabilize, and Dispose Off-Site

This alternative would entail excavation of the slag/soil/fill from the Acid Tar Pits and Agitator Sludge Area with transport of the excavated materials to and disposal at an offsite commercial hazardous waste TSDF. Some of the waste fill would require dewatering and stabilizing prior to off-site transport.

The RFI estimated that between 128,000 and 135,000 cubic yards of contaminated slag, soil, and fill was placed in the SWMUs. A more realistic excavation volume may be as high as 200,000 cubic yards considering likely lateral and vertical migration of wastes since placement, slope stability, and added volume due to stabilization additives for saturated wastes. Based on this estimate, approximately 12,000 truckloads would need to leave the site. A minimum of 9 months, with an estimated 62 trips per day, would be required to transport this volume of material to the Chemical Waste Management facility in Model City, NY approximately 30 miles from the site or some other suitable TSDF further away. The trucks would be traveling on high-volume local and regional roads through highly populated areas.

The excavation would require at least partial backfilling with clean soil/fill to stabilize the surrounding fill and subsequently, covered with topsoil and seeded to promote vegetative growth. It would take approximately 6-9 months to backfill the excavation with borrow soil/slag fill.

3.2 Evaluation Standards and Criteria

The Alternative Corrective Measures previously identified and developed were evaluated based upon the following standards and criteria.

3.2.1 Remedial Performance Standards

The remedial alternatives were first screened to determine if they met the following three performance standards:

- Attain applicable environmental media cleanup standards and objectives.
- Control source(s) of the release(s).

- Protect human health and the environment.

Remedies that met these performance standards were then evaluated using six balancing criteria to identify the remedy that provides the best relative combination of attributes.

3.2.2 Attain Media Cleanup Standards

This performance standard refers to the ability of the remedial alternative to achieve applicable New York State groundwater quality standards and soil cleanup objectives. It does not necessarily mean removal or treatment of all fill material above specific constituent concentrations is required. Remedial alternatives may attain media cleanup standards through combinations of removal, treatment, engineering and institutional controls. Applicable site-specific engineering controls may include:

- Containment systems such as slurry walls and/or geosynthetic and soil cover systems.
- Groundwater collection systems.
- Groundwater treatment (in-situ or ex-situ) systems.

Applicable institutional controls may include:

- Long-term groundwater monitoring and reporting.
- Environmental easements and restrictive covenants.

Attainment of groundwater cleanup standards typically takes years following implementation of remedial measures. As is often the case, attainment of groundwater cleanup standards for all parameters may not be achievable based on background groundwater quality and other site-specific issues. The fact that other SWMUs requiring corrective measures in the CMS Area also contribute to groundwater quality in the vicinity of the ATP SWMU Group suggests compliance with groundwater quality standards downgradient of the ATP Group may not be readily achievable following implementation of corrective measures. As groundwater is currently not used on-site for potable purposes; abundant public water supply is available on-site; and deed restrictions prohibit use of on-site groundwater, there is no immediate need for on-site groundwater to fully comply with all New York State Groundwater Quality Standards, provided that public health and the environment are protected.

The primary consideration regarding groundwater quality in the vicinity of the ATP SWMU Group is the protection of surface water and sediment quality in adjacent Smokes Creek. The degree of protection can be measured and monitored based on the (reduction in) mass loading (in pounds per day) of constituents of concern in groundwater discharge in the vicinity of the ATP SWMU Group to Smokes Creek. Post-remediation monitoring of surface water and sediment in the creek can also verify adequate protection.

3.2.3 Control the Sources of Releases

Alternative corrective measures are assessed as to what degree they reduce or eliminate further releases of constituents of concern to groundwater and the surrounding environs. This can be

measured and monitored based on the (reduction in) mass loading (in pounds per day) of constituents of concern in groundwater discharge in the vicinity of the ATP SWMU Group to Smokes Creek. Post-remediation monitoring of surface water and sediment in the creek can also verify the effectiveness of source controls.

3.2.4 Protect Human Health and the Environment

This performance standard refers to how remedial alternatives provide human health and environmental protection. The primary public health and environmental routes of exposure for the ATP SWMU Group is direct contact with the waste fill, migration via overland flow (e.g., resulting from stormwater erosion and run-off) and contaminated groundwater flow to the adjacent creek. In this particular situation, the placement of a permanent geosynthetic and soil cover system over the surface of exposed waste fill coupled with the protection of surface water and sediment quality in adjacent Smokes Creek protects humans and wildlife from exposure to site-derived contaminants, thus protecting human health and the environment. The degree of protection can be measured and monitored based on the (reduction in) mass loading (in pounds per day) of constituents of concern in groundwater discharge in the vicinity of the ATP SWMU Group to Smokes Creek. Post-remediation monitoring of surface water and sediment in the creek can also verify adequate protection.

3.3 Balancing Criteria

Remedial alternatives that meet the threshold performance standards above were then evaluated relative to the following six balancing criteria:

- Long-term reliability and effectiveness: The factors to be evaluated include the magnitude of residual risk (measured by standards such as reduction in off-site contaminant loadings and associated risk reduction), and the adequacy and long-term reliability of controls that may be required to manage the risk posed by residual contamination. There is a preference for treatment over containment, where appropriate; however, this criterion does not preclude protective containment remedies.

- Reduction of toxicity, mobility, or volume of wastes: The factors to be evaluated include the treatment or containment process used and constituents of concern; the amount of hazardous materials destroyed, treated, or immobilized; the degree of expected reduction in toxicity, mobility, or volume; the degree to which treatment, containment, or stabilization is irreversible; and the type and quantity of residuals remaining after treatment or containment.

- Short-term effectiveness: This criterion addresses the effects of the alternative during the remedial construction and implementation phase. Each alternative is evaluated with respect to: protection of the community during remedial actions (e.g., transportation-related and fugitive emission risks), protection of workers during remedial actions, environmental impacts (e.g., disturbance of the site or environs), and the time until remedial action objectives are expected to be achieved.

- Implementability: The factors to consider include the ability to construct and operate the technology; the reliability of the technology with regard to technical practicability; ease of undertaking additional corrective measures if necessary; the ability to monitor the effectiveness or the remedy; the coordination with other agencies and the community; the availability of off-site treatment, storage, and disposal services and specialists; and the availability of prospective technologies.

- State and community acceptance: The alternative should consider the current and reasonably anticipated use of that portion of the CMS Site and related zoning and land use plan.

- Cost: This criterion addresses the capital costs; annual operation, maintenance, and monitoring costs (OM&M); and present worth analysis for the anticipated life of the remedy. In comparing remedial alternatives, the less costly remedy that offers equivalent protection can be selected; however, protection cannot be traded for cost.

4.0 EVALUATION OF ALTERNATIVE CORRECTIVE MEASURES

4.1 Performance Standard Analysis

In comparing the six alternative corrective measures to the performance standards outlined in Section 3.2, Alternative 1 – No Action would not be protective of human health and the environment in the near term. Although the No Action Alternative would not be protective of human health and the environment, it has been included for baseline comparison. The five remaining remedial alternatives that do meet the performance standards outlined in Section 3.2 are further evaluated below using the balancing criteria introduced in Section 3.3.

4.2 Balancing Criteria Analysis

4.2.1 Alternative 1 - No Action

Long-term reliability and effectiveness: The No Action alternative provides no measures to remediate soil/fill contaminants, control soil/fill contaminant migration via surface erosion or leaching to groundwater, or to eliminate the potential for direct contact with the waste fill. All current and future environmental and public health risks associated with the ATP SWMU Group would remain unchanged under this alternative.

Reduction of toxicity, mobility, or volume of wastes: This alternative provides no reduction in toxicity, mobility, or volume of Chemicals of Potential Concern (COPCs) in slag/soil/fill or groundwater.

Short-term effectiveness: The No Action Alternative is not effective in reducing or controlling environmental or public health risks in the short-term.

Implementability: No technical implementability issues or action-specific administrative implementability issues are associated with this alternative.

State and Community Acceptance: Taking no action to address the highly contaminated waste within these SWMUs would not be acceptable to the State and community. The No Action Alternative is not consistent with the reasonably anticipated future use of this portion of the CMS Site for passive recreation.

Cost: No capital costs are associated with the No Action Alternative. Continued groundwater monitoring may be required to monitor changes in COPC concentrations. The annual cost for this monitoring is estimated to be $15,000, with a 30-year present worth cost estimated at $231,000.

4.2.2 Alternative 2 - Construct Individual In-Place Containment Systems

Long-term reliability and effectiveness: The highly contaminated slag/soil/fill within SWMU S-11, S-22 and, to a lesser extent, S-24 must be contained (if not removed) to reduce or substantially eliminate continued migration of soluble contaminants in groundwater from the SWMUs to the creek. Due to the immediate proximity of SWMU S-24 to Smokes Creek and the relatively small estimated quantity of waste in SWMU S-24, containment in place is not desirable from a long-term reliability perspective or from a longterm operation and maintenance perspective. Armoring of the creek bank adjacent to SWMU S-24 may be necessary to prevent floodwater erosion into the containment cell, thus protecting it from a structural breach and associated release of waste constituents to the creek and possibly Lake Erie.

Reduction of toxicity, mobility, or volume of wastes: Placement of slurry walls, groundwater collection wells and geocomposite cover systems would significantly reduce the mobility of contaminants due to soil erosion, significantly reduce surface water infiltration and resultant constituent leaching from contaminated fill, and would contain and capture contaminated groundwater/leachate within the SWMUs. Groundwater that has already migrated away from the SWMUs outside the slurry wall would not be affected by this alternative. The toxicity and volume of contaminants would be slowly reduced under this alternative as aqueous phase constituents in groundwater/leachate within the containment are collected and treated on or off-site.

Short-term effectiveness: The proximity to Smokes Creek and estimated depth of waste fill in SWMU S-24 dictates that stormwater management measures and soil/sediment erosion controls be planned and employed during excavation and construction of the slurry wall. The following short-term construction impacts would require mitigation:

- Transport of contaminated stormwater and/or sediment to Smokes Creek.
- Intrusion of creek water into the excavation, especially during storm events or flood conditions.
- Groundwater dewatering, treatment and disposal during excavation of saturated waste fill at depth.
- Smokes Creek bank restoration and post-remediation erosion protection.

- Mitigation of fugitive dust from excavation and material handling

This alternative is estimated to require two or possibly three construction seasons (approximately 19-30 months) to implement, with winter and early spring suspension of construction due to inclement weather.

Implementability: No significant technical implementability issues or action specific administrative implementability issues are associated with this alternative. Armoring of the creek bank adjacent to SWMU S-24 would likely be required to prevent floodwater erosion into the containment cell, thus protecting it from a structural breach and associated release of waste constituents to the creek and possibly Lake Erie.

State and Community Acceptance: Containment of the waste in place would likely be acceptable to the State and community as the hazardous waste remains contained on-site with no additional handling. Passive recreation is the proposed future use for these areas, which is consistent with the final vegetated geocomposite cover systems proposed.

Cost: The estimated capital cost for this Alternative 2 is $4.4 million. Annual OM&M costs for maintenance of the groundwater/leachate collection and pretreatment systems, groundwater monitoring, and cover maintenance are estimated at $155,000, resulting in an overall estimated present worth cost of $6.8 million.

4.2.3 Alternative 3 - Excavate and Dispose Agitator Sludge Off-Site, and Contain In-Place Acid Tar Pits

Long-term reliability and effectiveness: Construction of the geocomposite final cover systems over the ATP areas, SWMUs S-11 and S-22, would prevent soil/fill contaminant migration via surface erosion and prevent direct contact with the highly contaminated soil/fill within them. The slurry wall in conjunction with the internal groundwater collection system would mitigate further lateral subsurface migration of contaminants from SWMUs S-11 and S-22. To provide for long-term permanence of this alternative, regular inspection and maintenance of the soil and vegetative cover would be required to assure cover integrity. Downgradient groundwater monitoring would be required to confirm the effectiveness of the slurry wall and groundwater collection system. The removal of contaminated slag/soil/fill within SWMU S-24 would substantially eliminate continued migration of soluble contaminants in groundwater to the creek.

Reduction of toxicity, mobility, or volume of wastes: Placement of slurry walls and cover systems would significantly reduce and substantially eliminate the mobility of contaminants due to soil erosion, reduced surface water infiltration, and groundwater containment within the ATP SWMUs. Groundwater that has already migrated away from the ATP SWMUs would not be affected by this alternative. The toxicity and volume of contaminants in SWMUs S-11 and S-22 would not be reduced under this alternative. With stabilization of the SWMU S-24 waste, the toxicity and mobility of contaminants would be reduced; however, the volume would be increased due to the material that would be necessary to render the material physically stable for off-site disposal.

Short-term effectiveness: The proximity of SWMU S-24 to Smokes Creek and estimated depth of waste fill dictates that stormwater management measures and soil/sediment erosion controls be planned and employed during excavation and backfill of the agitator sludge. Such measures and controls would be necessary to mitigate the following short-term impacts during construction:

- Transport of contaminated stormwater and/or sediment to Smokes Creek.
- Intrusion of creek water into the excavation, especially during storm events or flood conditions.
- Groundwater management and handling during excavation.
- Smokes Creek bank restoration and post-remediation erosion protection.

Construction workers would be exposed to the contaminated slag/soil/fill and possibly dust during excavation of the agitator sludge from SWMU S-24 and during slurry wall and final cover system construction of the containment cell around the ATPs. These short-term worker exposure risks can be effectively managed through the use of personal protective equipment (PPE) and dust suppression methods. Despite strict adherence to the Health and Safety Plan, transportation of the SWMU S-24 excavated waste off-site poses a potential risk to the community and the environment resulting from spillage or releases from a traffic accident. Material deliveries are not significant relative to the heavy traffic that already exists on NYS Route 5. Noise from heavy equipment used to construct the remedy would not be noticeable at the nearest off-site receptors located over ½-mile from the ATP SWMUs. This alternative is estimated to require two or possibly three construction seasons (approximately 19-30 months) to implement, with winter and early spring suspension of construction due to inclement weather.

Implementability: No significant technical implementability issues or action specific administrative implementability issues are associated with covering in-place the ATP areas. Some of the waste from SWMU S-24 would likely require stabilization prior to off-site disposal. Technical implementability issues associated with ex-situ stabilization include the need to identify an effective stabilizing agent for the constituents and employ a specialty contractor during the work. Dewatering of SWMU S-24 during excavation will likely be required.
State and Community Acceptance: Containment of the ATP waste in-place is expected to be acceptable to the State and community as the hazardous waste would be contained with minimal disruption within a relatively short period of time. Off-site disposal of the waste from SWMU S-24 would likely be acceptable to the State and community; however, concerns over hauling the wastes off-site may arise. Passive recreation is the proposed future use for the ATP area, which is consistent with the final vegetated geocomposite cover systems proposed. Removal of the agitator sludge from SWMU S-24 would render this area suitable for recreation, commercial or industrial use.

Cost: The estimated capital cost for this alternative is approximately $14.6 million. Annual OM&M costs for maintenance of the groundwater/leachate collection and pretreatment systems, groundwater monitoring, and cover maintenance are estimated at $155,000, resulting in an overall estimated present worth cost of $17.0 million.

4.2.4 Alternative 4 - Excavate SWMU S-24, Consolidate and Construct Combined In-Place ATP Containment System

Long-term reliability and effectiveness: Construction of the vegetated geocomposite cover system over the consolidated ATP containment area surrounding SWMUs S-11 and S-22 would prevent soil/fill contaminant migration via surface erosion and prevent direct contact with the contaminated soil/fill. To provide for long-term permanence of this alternative, regular inspection and maintenance of the soil and vegetative cover would be required to assure cover integrity. Downgradient groundwater monitoring would be required to confirm the effectiveness of the slurry wall and groundwater collection system. Residual groundwater impacts downgradient of the consolidated ATP containment cell may require additional groundwater treatment and/or control measures, if deemed necessary, to protect Smokes Creek water quality.

Reduction of toxicity, mobility, or volume of wastes: Placement of a composite geomembrane and vegetated soil cover system would reduce the mobility of contaminants due to soil erosion and reduced surface water infiltration. The toxicity and volume of contaminants would not be reduced under this alternative. The slurry wall in conjunction with the groundwater collection system around the consolidated wastes in the ATPs would substantially mitigate further subsurface migration of contaminants from the ATP SWMUs.

Short-term effectiveness: The proximity of SWMU S-24 to Smokes Creek and estimated depth of waste fill dictates that stormwater management measures and soil/sediment erosion controls be planned and employed during excavation and backfill of the agitator sludge. Such measures and controls would be necessary to mitigate the following short-term impacts during construction:

- Transport of contaminated stormwater and/or sediment to Smokes Creek.
- Intrusion of creek water into the excavation, especially during storm events or flood conditions.
- Groundwater management and handling during excavation.
- Smokes Creek bank restoration and post-remediation erosion protection.

Construction workers would be exposed to contaminated slag/soil/fill and dust during excavation of the contaminated soil/fill and placement of the soil cap; however, these exposure risks can be managed through the use of personal protective equipment (PPE) and dust suppression methods. No significant risks to the off-site community are anticipated under this alternative as all material remains on-site, far removed from the community. Material deliveries are not significant relative to the heavy traffic that already exists on NYS Route 5. Noise from heavy equipment used to construct the remedy would not be noticeable at the nearest off-site receptors located over ½-mile from the ATP SWMUs. The Remedial Action Objectives would be achieved once the vegetative cover is established (est. 16 months).

Implementability: Similar to Alternatives 2 and 3, no significant technical implementability issues or action-specific administrative implementability issues are associated with this Alternative. Dewatering of these areas during excavation will likely be required.

State and community acceptance: Consolidation of the agitator sludge in the Acid Tar Pits is expected to be acceptable to the community as the hazardous waste would be contained with minimal disruption within a relatively short period of time. In addition, this alternative would result in only one contaminant cell on the south side of Smokes Creek instead of two to three separate units on both sides of the creek as proposed under Alternative 2. It would also substantially reduce the likelihood of recontamination of Smokes Creek that may occur under the substantially delayed consolidation approach in the HW CAMU proposed under Alternative 5. Passive recreation is the proposed future use for the Acid Tar Pits area, which is consistent with the final vegetated cover system proposed.

Cost: The estimated capital cost for this alternative is $3.3 million. Annual OM&M costs for maintenance of the groundwater/leachate collection and pretreatment systems, groundwater monitoring, and cover maintenance are estimated at $140,000, resulting in an overall estimated present worth cost of $5.5 million.

4.2.5 Alternative 5 - Excavate SMWUs S-11, S-22, & S-24 and Consolidate in On-Site Hazardous Waste CAMU

Long-term reliability and effectiveness: Consolidation of the ATP Group waste in the HW CAMU will provide a reliable and effective approach for the long-term protection of human health and the environment. Residual groundwater impacts may remain beneath and downgradient of the excavated SWMUs. Therefore, additional groundwater treatment and/or control may be required following excavation of the waste materials, if deemed necessary, to protect Smokes Creek water quality.

Reduction of toxicity, mobility, or volume of wastes: The HW CAMU will minimize future releases by construction of a geosynthetic liner under and a geosynthetic and vegetated soil cover system over the wastes. The degree of reduction of cover system infiltration and potential leaching to the groundwater and/or surrounding environment will be minimized under this alternative. The toxicity of the hazardous materials may be decreased as pre-treatment of the waste via stabilization may be required prior to consolidation. Depending on the stabilization method used, the volume of waste may increase due to the stabilization materials added. The degree of mobility of waste leachate to groundwater and/or the surrounding environment is significantly reduced under this Alternative as a result of the efficient liner and leachate collection system.

Short-term effectiveness: All activities associated with the HW CAMU would be conducted in accordance with approved Health and Safety and Contingency Plans to control short-term exposure associated with implementation and closure of the units. Construction workers would be exposed to contaminated slag/soil/fill and dust during excavation of the contaminated soil/fill, placement of the waste in the HW CAMU, and placement of the cover system. However, these exposure risks could be managed through the use of personal protective equipment (PPE) and dust suppression methods. No significant risks to the off-site community are anticipated under this alternative as all material remains on-site at great distances from the surrounding community. Despite strict adherence to these plans, excavation and on-site transportation of these hazardous wastes (particularly associated with SWMUs S-11 and S-22) pose a potential

risk to site workers and the environment during the remediation work. The wastes within the three SWMUs would therefore remain in place without control during the time required to complete the CMS, design and construct the CAMU, and excavate and place the material in the CAMU. The estimated timeframe to accomplish all these activities is approximately 5-6 years. Such a prolonged implementation period significantly increases the risk of recontamination of Smokes Creek.

Implementability: It is estimated that a total of approximately 200,000 cubic yards of impacted soil/fill would be excavated from SWMUs S-11, S-22, and S-24. Some of the waste from the Acid Tar Pits would likely require stabilization prior to consolidation. Technical implementability issues associated with this Alternative include: stabilizing and shoring the deep excavation of SWMUs S-11 and S-22; testing and removal of waste and soil, slag and fill contaminated by wastes adjacent to the SWMU; dewatering of the excavation; and treatment of contaminated water removed from the excavation. The implementation of this alternative is complex and uncertain given the time, regulatory requirements, and construction requirements related to the HW CAMU.

State and community acceptance: The final HW CAMU is expected to be acceptable to the community; however, excavation and handling of large volumes of hazardous waste may be viewed as an unnecessary risk to the community, workers, and the environment when other less-risky alternatives are feasible. Passive recreation is the proposed future use for the area proposed for the HW CAMU and surrounding Slag Fill Area (SFA)- Zone 2 lands. Based on the current state of this portion of the site, and in accordance with 6 NYCRR Part 373, SFA- Zone 2 is considered to be the best location for the HW CAMU. The Department has already deemed the HW CAMU application substantially complete.

Cost: The 30-year present worth cost of this remedial alternative is estimated to be $14.5 million, with a projected $13 million for capital expenditures and $100,000 of annual OM&M costs for groundwater monitoring and maintenance of the CAMU cover and leachate collection systems.

4.2.6 Alternative 6 - Excavate SWMUs S-11, S-22 & S-24, Stabilize, and Dispose Off-Site

Long-term reliability and effectiveness: Excavation, stabilization and off-site disposal at a permitted hazardous waste facility of the ATP Group waste will provide a reliable and effective approach for the long-term protection of human health and the environment. Residual groundwater impacts may remain beneath and downgradient of the excavated SWMUs. Therefore, additional groundwater treatment and/or control may be required following excavation of the waste materials, if deemed necessary, to protect groundwater and Smokes Creek surface water quality.

Reduction of toxicity, mobility, or volume of wastes: The ATP Group waste may require stabilization (per federal land disposal restrictions) to reduce leaching potential prior to disposal of the material. This will reduce the potential for future releases to the environment. The minimum technology requirements for construction of permitted disposal facilities will minimize potential for future releases. These requirements include a geosynthetic liner under and a

geosynthetic and vegetated soil cover system over the wastes. The requirements also include leachate collection and treatment. These controls reduce infiltration into the waste and potential leaching to the groundwater and/or surrounding environment. The toxicity of the hazardous materials may be decreased as pre-treatment of the waste via stabilization may be required prior to disposal offsite. Depending on the stabilization method used, the volume of waste may increase due to the stabilization materials added. The degree of mobility of waste leachate to groundwater and/or the surrounding environment is significantly reduced under this Alternative as a result of the efficient liner and leachate collection system.

Short-term effectiveness: All activities associated with excavation, stabilization and off-site disposal of the ATP material would be conducted in accordance with approved Health and Safety and Contingency Plans to control short-term exposure associated with handling the material. Workers would be exposed to contaminated slag/soil/fill and dust during excavation and handling of the ATP material. These exposure risks for workers could be managed through the use of personal protective equipment (PPE), dust suppression and excavation progression controls. This alternative does present exposure potential for the off-site community associated with the transport of ATP material from the site to the off-site disposal facility. (It is estimated that approximately 12,000 truckloads would need to leave the site.)This exposure potential can be reduced through transport controls (tarping/covering, route planning, and queuing restrictions. Despite strict adherence to these plans, excavation/handling and transportation of the ATP group wastes (particularly associated with SWMUs S-11 and S-22) pose a potential risk to site workers and the environment during the remediation work. Despite controls, transport of this material en route to the disposal facility also poses a potential off-site risk to those along the transportation route.

Although this alternative involves a large volume of material (estimated at approximately 200,000 cubic yards), the estimated timeframe to accomplish the excavation activities is approximately 1 year. This timeframe minimizes the risk of recontamination of Smokes Creek. Another 6 to 9 months would also to backfill and restore the excavation areas.

Implementability: It is estimated that a total of approximately 200,000 cubic yards of impacted soil/fill would be excavated from SWMUs S-11, S-22, and S-24. Some of the waste from the ATP SWMU Group would likely require stabilization prior to consolidation. Technical implementability issues associated with this Alternative include: stabilizing and shoring the deep excavation of SWMUs S-11 and S-22; testing and removal of waste and soil, slag and fill contaminated by wastes adjacent to the SWMU; dewatering of the excavation; and treatment of contaminated water removed from the excavation.

State and community acceptance: Off-site disposal of ATP waste is expected to be acceptable to the community; however, excavation and handling of large volumes as hazardous waste may be viewed as an unnecessary risk to the community, workers, the environment, and the public along transport routes when other less-risky alternatives are feasible. Passive recreation is the proposed future use for the area where the ATP SWMUs are located. Removal of the material and off-site disposal minimizes the potential for future use restrictions that could impede recreational opportunities at this area of the site.

Cost: The 30-year present worth cost of this remedial alternative is estimated to be $56.6 million, with a projected $56.4 million for capital expenditures and $230,000 for groundwater monitoring and reporting (at $15,000/year).

4.3 Comparative Analysis of Remedial Alternatives

In this section, the remedial alternatives are compared to one another against each of the balancing criteria. The purpose of this comparison is to identify the relative advantages and disadvantages of each of alternatives. The five remedial alternatives compared are:

- Alternative 2 - Construct Individual In-Place Containment Systems.
- Alternative 3 - Excavate and Dispose Agitator Sludge Off-Site, and Contain In-Place Acid Tar Pits.
- Alternative 4 - Excavate SWMU S-24, Consolidate and Construct Combined In-Place ATP Containment System.
- Alternative 5 - Excavate SWMUs S-11, S-22, & S-24, and Consolidate in On-Site Hazardous Waste CAMU.
- Alternative 6 - Excavate SWMUs S-11, S-22 & S-24, Stabilize, and Dispose Off-Site

Long-term reliability and effectiveness: The proximity of SWMU S-24 to Smokes Creek and the relatively small estimated quantity of waste in SWMU S-24 make Alternative 2 less desirable than the other alternatives from a long-term reliability and effectiveness perspective. Excavation and off-site disposal (Alternative 3), consolidation in the Acid Tar Pits (Alternative 4), and HW CAMU (Alternative 5), and off-site disposal (Alternative 6) will provide reliable and effective approaches for handling these materials in an engineered manner protective of human health and the environment. Residual groundwater impacts may remain beneath and/or downgradient of the excavated or contained SWMUs under alternatives 3, 4, 5, and 6. Groundwater collection from within the containment cells (Alternatives 3 and 4) or CAMU (Alternative 5) and groundwater treatment is planned for these three alternatives. Construction of the final cover systems (Alternatives 2 through 4) would prevent soil/fill contaminant migration via surface erosion and prevent direct contact with the contaminated soil/fill. To assure the long-term reliability and effectiveness of Alternatives 2 through 4, regular inspection and maintenance of the soil and vegetative layers would be required to assure cover integrity. Alternatives 3 and 4 are considered comparable in effectiveness and reliability due to the removal of agitator sludge from S-24 in both cases. Downgradient groundwater monitoring would be required to confirm the effectiveness of the slurry wall (Alternatives 2 through 4) and groundwater/leachate collection systems (Alternatives 2 through 5). Alternatives 5 and 6 are considered comparable to each other, and more reliable and effective in the long-term than the other Alternatives due to the engineered liner and leachate collection systems. However, Alternative 5 would take longer to implement than Alternative 6, and could re-contaminate Smokes Creek. Therefore, Alternative 6 is considered the most reliable and effective over the long-term since the material would be removed from the site in a timely manner and sent for disposal in a properly designed and permitted facility that would include a cover system, liner system and leachate collection/treatment.

Short-term effectiveness: Alternative 2 poses the least short-term impacts of the three on-site management alternatives since the only excavation required is for placement of the slurry wall. Alternative 2 would also require the least time to implement. Alternatives 3 and 4 both require excavation of SWMU S-24 posing a potential risk to site workers, which would be controlled with proper use of PPE and other health and safety measures. Alternative 3 poses a risk to the off-site community and environment as the waste would be transported off-site. Alternative 5 is much less effective in the short term compared to Alternatives 2, 3 and 4 as it will take 5-6 years to implement and, thus, significantly increases the potential to recontaminate the recently dredged Smokes Creek. Alternative 4 is considered comparable to Alternative 2 and slightly better than Alternative 3 in terms of short-term effectiveness due to the fact that no wastes would be transported off site. As such, short-term potential exposure risks to the surrounding community related to the transportation and off-site disposal of agitator sludge (Alternative 3) would be avoided under Alternative 4. Off-site disposal of all ATP waste (Alternative 6) poses significant risk to remediation workers as well as the public along the transport route. It is estimated that approximately 12,000 truckloads would be need to transport the material off-site, with a projected 60+ loads exiting the site per day. Due to these issues, Alternative 6 is the least desirable alternative with respect to short-term effectiveness.

Implementability: All five alternatives are considered technically implementable. Compared to the other alternatives, implementation of Alternative 5 is the most complicated and will take much more time to implement with greater probability of construction issues associated with the CAMU and the massive waste excavation volumes.

Reduction of toxicity, mobility, or volume of wastes: All five alternatives will effectively reduce mobility of the ATP waste. Alternatives 2 and 4 will maintain the current volume of waste. The volume may be slightly increased as a result of pre-treatment, depending on chosen stabilization techniques that may be required for Alternatives 3, 4, 5, an 6 while the toxicity of the hazardous materials will likely decrease from waste stabilization. Alternative 4 is considered comparable to Alternatives 2 and 3 in terms of reduction of toxicity, mobility, and volume of wastes. Alternatives 3 and 4 are considered better than Alternative 2 in terms of reduction of mobility due to the removal of agitator sludge from S-24. Alternative 6 transfers the waste off-site into an engineered containment system. While this engineered system would have technical requirements comparable to Alternative 5, Alternative 6 could be completed within a shorter timeframe, further reducing the time during which contaminants could be leaching to groundwater.

State and community acceptance: Containment of the impacted soil/fill in place (Alternative 2) may be acceptable to the community as the ATP material remains contained on-site with no additional handling. However, a disadvantage of Alternative 2 is that more area of the site will be subject to future use restrictions since there would be no removal or consolidation actions. Consolidation of the agitator sludge waste in the Acid Tar Pits (Alternative 4) would likely be acceptable to the community as the waste is confined to one smaller on-site area with minimal excavation processing. Excavation followed by off-site disposal of the agitator sludge waste and containment of the ATP areas (Alternative 3) would likely be acceptable to the community; however, concerns may be raised over the hauling of some of the waste off site. Passive recreation is the proposed future use for these areas, which is compatible with the same final

vegetated soil and geocomposite cover system proposed for all of the Alternatives. Alternatives 2 through 4, and 6, can be implemented quickly and therefore protect the water quality in Smokes Creek and Lake Erie. Alternatives 5 and 6 may be acceptable to the community; however, excavation and handling of the large volume of hazardous waste may be viewed as an unnecessary risk to the community, workers, and the environment when other less risky alternatives are feasible. The long implementation time frame for Alternative 5 does not protect Smokes Creek and Lake Erie in the near term and is therefore less desirable than the other alternatives.

Cost: The 30-year present worth cost of Alternatives 3, 5 and 6 are estimated at $17.0 million, $14.5 million, and $56.6 million respectively. These alternatives are far more costly than Alternatives 2 and 4, with present worth costs of $6.8 million and $5.5 million, respectively. Alternatives 2 and 4 are both protective of human health and the environment and have similar estimated costs, so they are considered comparable and preferable based on this balancing criterion.

Balancing Criteria - Alternative Ranking Summary						
	Long-term	Short-term	Implementability	Reductions	Acceptance	Cost
Alternative 2	5	1	1	5	5	1
Alternative 3	4	3	3	2	3	3
Alternative 4	2	2	2	3	1	2
Alternative 5	3	4	5	4	2	4
Alternative 6	1	5	4	1	4	5

Note: Relative Ranking: 1=Best --------- 5=Worst

Alternative 4 has the best overall relative ranking position on the balancing criteria prior to consideration of cost. Alternative 4 also ranks well on the cost criterion.

5.0 DESCRIPTION OF SELECTED REMEDIAL ALTERNATIVE

5.1 General

The preferred corrective measures (Alternative 4) to be implemented for the ATP SWMU Group is to remove, transport, and consolidate the waste from the Agitator Sludge Area (SWMU S-24) to within the combined footprint of the Acid Tar Pits (SWMU S-11 and S-22), and construct a containment cell surrounding the consolidated waste deposition area (see Figure 9). A single containment cell at this location is preferable as it is: further from Smokes Creek and out of the flood plain, has more desirable subsurface soil confining conditions, will result in less excavation and handling of hazardous materials than relocation of the combined impacted materials from the ATP SWMU Group to a separate location (e.g., proposed hazardous waste CAMU), can address both impacted soil/fill and groundwater at the Acid Tar Pits, is adjacent to the planned CAMUs in the Zone 2 elevated Slag Fill Area where other solid and hazardous wastes ware expected to be permanently contained in place, and it has a smaller footprint with less cover system area which reduces infiltration and long-term operation and maintenance costs.

This preferred alternative will promptly mitigate migration of contaminants through the adjacent subsurface soil and groundwater into Smokes Creek, thus reducing the groundwater contaminant load to Smokes Creek and Lake Erie and potential recontamination of Smokes Creek sediments. This alternative proposed for the ATP SWMU Group in combination with the recently completed Smokes Creek dredging ICM is anticipated to substantially and permanently address public health and the environment concerns related to these high-priority SWMUs and water bodies under the RCRA Corrective Action Program. A summary of the preferred alternative is provided in the following sections.

5.2 Excavation, Consolidation and Backfill Agitator Sludge SWMU

Approximately 23,000 to 35,000 cubic yards (CY) of impacted soil/fill will be excavated from SWMU S-24, transported, and consolidated within SWMU S-11 & S-22. Storm water management measures and soil/sediment erosion controls will be planned and employed during excavation and backfill. Approximately 600 LF of Site Highway 9 will be cordoned off, including the Smokes Creek Bridge, thus restricting traffic and roadway access for project-related travel only during transportation of the agitator sludge fill to the ATP containment cell. Following completion of excavation of all visibly impacted soil/fill, verification sampling and analysis will be performed to determine residual concentrations of constituents of concern in soil/fill at the base and sidewalls of the excavation. Backfill material will be placed and compacted in approximate 12-inch lifts with a backhoe bucket or other methods approved by the field inspector or resident engineer.

5.3 Combined In-Place Containment System

The containment system that will be designed and constructed will consist of a bentonite/soil slurry wall, groundwater collection system, and a geocomposite vegetated soil cover system (see Figure 5).

In-place lateral containment of the combined and consolidated ATP SWMU Group soil/fill and groundwater will be accomplished by constructing a low-permeability (design specification is $1x10^{-7}$ cm/sec) barrier wall around the perimeter for the entire consolidated waste area. The low-permeability barrier wall will be constructed using off-site borrow soil amended with bentonite and/or other soil amendments (type and weight ratio to be determined during design). The proposed barrier wall will function as a physical and lateral hydraulic barrier to isolate the highly-impacted soil/fill and groundwater within the containment cell from the surrounding groundwater and soil/fill. The base of the barrier wall will be keyed a minimum of two feet into the underlying, native lacustrine clayey-silt soil, which will function as a vertical confining layer.

A network of collection wells and/or sumps will be installed within the containment area at intervals and depths to be determined during design. These wells and/or sumps will be constructed and installed in conjunction with the low-permeability slurry wall and cover system to collect containment cell groundwater and/or leachate for treatment as well as to create an inward hydraulic gradient toward the containment cell. A low-permeability cover system is proposed over the containment cell to reduce the amount of surface infiltration and eliminate direct exposure to impacted soil/fill within the containment cell. The containment cell cover

system will be constructed of a geosynthetic clay liner (GCL), an HDPE geomembrane, and a geocomposite, covered by 18 inches of barrier protection material and a 6-inch vegetative soil layer. Soil and slag fill materials will be placed and graded above the waste materials to promote storm surface water run-off and reduce infiltration. Fill materials within the containment will be disturbed as little as possible.

5.4 Operation, Monitoring and Maintenance

Following construction, several elements of the proposed remedial action will require periodic and/or routine operations and maintenance. An Operation, Monitoring, and Maintenance Manual (OM&M Manual) will be prepared during construction and be submitted to NYSDEC prior to completion of construction. This OM&M Manual will include, but not be limited to, discussion of:

- Operation and maintenance of the groundwater/leachate collection system within the consolidated ATP containment cell.
- Operation, maintenance, and monitoring of the groundwater/leachate pretreatment system (if required).
- Routine groundwater level monitoring and reporting within the contaminated cell.
- Groundwater monitoring upgradient and downgradient of the containment cell.
- Periodic inspection of the cover system.
- Maintenance and repair of the cover system, including repair of erosion and mowing of the vegetative cover.

5.5 Cost

The estimated capital cost of preferred Alternative 4 is $3.3 million. The estimated annual operation, maintenance, and monitoring costs are $140,000. The 30-year present worth cost of preferred Alternative 4 is estimated to be $5.5 million.

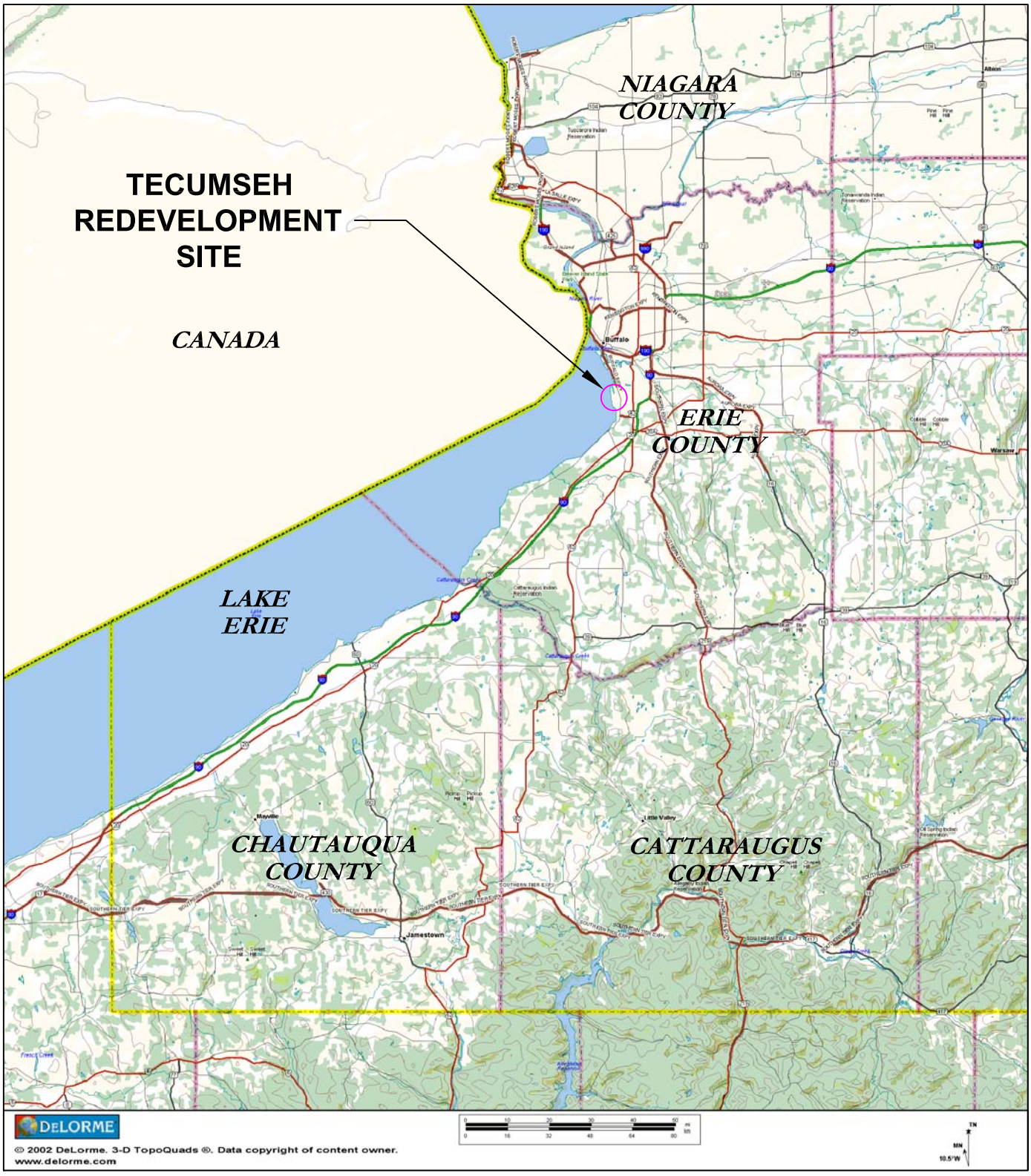
6.0 SCHEDULE FOR IMPLEMENTATION OF SELECTED REMEDY

Two full construction seasons will be necessary to implement this remedy. The first year will focus on building a slurry wall, while the second year will focus on the construction of the containment cell and its final cover system. Major tasks are planned over the two years as follows:

- NYSDEC review/finalize ICM Work Plan (30 days).
- Public comment period (45 days).
- Prepare and execute contract documents, mobilize (30-45 days).
- Construct containment cell slurry wall (5-7 months).
- (Winter 2010 shut down).
- (Spring - Summer 2011) Excavate SWMU S-24, consolidate in containment cell, and backfill S-24 (3 months).

- Final grade containment cell and install cover system (4 months).
- Install groundwater/leachate collection wells and monitoring wells (1 month).
- Downgradient groundwater monitoring in accordance with the NYSDEC-approved Long-Term Groundwater Monitoring Plan (LTGWM Plan) (30 days following final closure).
- Replacement wells, if necessary, installed in accordance with the LTGWM Plan (within 60 days of substantial completion of remedial construction).

FIGURE 1



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FILEPATH

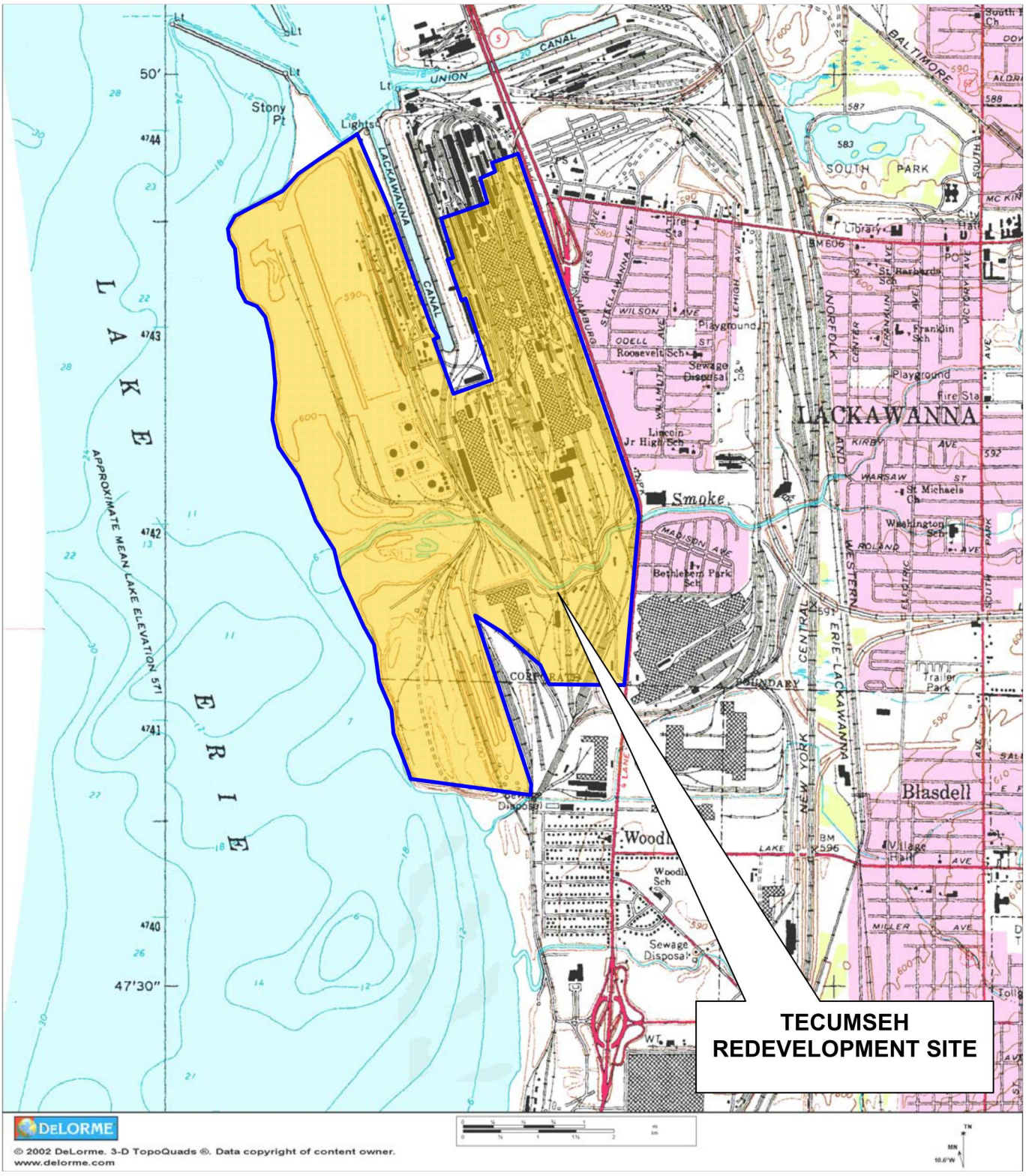
REGIONAL MAP

ACID TAR PITS SWMU GROUP

TECUMSEH REDEVELOPMENT SITE
LACKAWANNA, NEW YORK

PREPARED FOR
ARCELORMITTAL TECUMSEH REDEVELOPMENT, INC.

FIGURE 2



TurnKey Environmental Restoration, LLC

2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NEW YORK 14218
(716) 856-0599

SITE LOCATION AND VICINITY MAP

ACID TAR PITS SWMU GROUP

TECUMSEH REDEVELOPMENT SITE
LACKAWANNA, NEW YORK

PREPARED FOR
ARCELORMITTAL TECUMSEH REDEVELOPMENT, INC.

PROJECT NO.: 0071-009-213
DATE: FEBRUARY 2010
DRAFTED BY: AJZ

FILEPATH(F:\CAD\TurnKey\Tecumseh Redevelopment\RFI-CMS ORDER\ATP - EXPEDITED CORRECTIVE MEASURE WORK PLAN\figure 2\ site location and vicinity map.dwg

STEEL WINDS I BCP
Ñ29 ACRES

SFA ZONE 5
(includes Steel Winds IA
Ñ41.83 ACRES
less Steel Winds IA = Ñ32.50

SFA ZONE 4
(includes Steel Winds I)
Ñ71.30 ACRES
less Steel Winds I = Ñ59.77 ACRES

SFA ZONE 3
(includes Steel Winds I)
Ñ73.00 ACRES
less Steel Winds I = Ñ55.52 ACRES

SFA ZONE 2
Ñ81.71 ACRES

COAL/COKE/ORE STORAGE & COAL HANDLING AREA
Ñ137.11 ACRES

COKE PLANT & BY-PRODUCTS FACILITIES
Ñ45.31 ACRES

TANK FARM AREA
Ñ67.58 ACRES

SWMU S-11
SWMU S-22
SWMU S-24

SFA ZONE 1
Ñ128.96 ACRES

ACID TAR SWMU GROUP AREA

PHASE III BPA
Ñ148.81 ACRES

PHASE I BPA
Ñ101.85 ACRES

PHASE II BPA
Ñ144.11 ACRES

MITTAL STEEL GALVANIZING MILL (Ñ87.4 ACRES)

REPUBLIC ENGINEERED PRODUCTS, INC. (Ñ84.9 ACRES)

MITTAL STEEL GALVANIZING MILL (Ñ82.2 ACRES)

LAKE ERIE

BUFFALO OUTER HARBOR

GATEWAY METROPARK SHIP CANAL

CAZENOVIA CREEK

1000' 0' 1000' 2000'

SCALE: 1 INCH = 1000 FEET
SCALE IN FEET
(approximate)

DATE: MAY 2009
DRAFTED BY: BCH

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JOB NO.: 0071-009-213

CMS SITE WITH ACID TAR PIT SWMU GROUP

ACID TAR PITS SWMU GROUP

TECUMSEH REDEVELOPMENT SITE
LACKAWANNA, NEW YORK

PREPARED FOR
ARCELORMITTAL TECUMSEH REDEVELOPMENT, INC.

FIGURE 3

SWMU S-11

SWMU S-22

SWMU S-24

SMOKES CREEK

11 HIGHWAY

9 HIGHWAY

LEGEND:

SWMU BOUNDARY

RAILROAD TRACK

NOTES:

1. CONTAMINATED SOIL/FILL FROM SWMU S-24 IS TO BE EXCAVATED/REMOVED AND CONSOLIDATED WITHIN THE FOOTPRINT OF SWMU S-11 AND SWMU S-22.

120' 0' 120' 240'

SCALE: 1 INCH = 120 FEET
SCALE IN FEET
(approximate)

N

DATE: JANUARY 2008
DRAFTED BY: AJZ

726 EXCHANGE STREET
SUITE 624
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(716) 856-0635

TURNKEY ENVIRONMENTAL RESTORATION, LLC

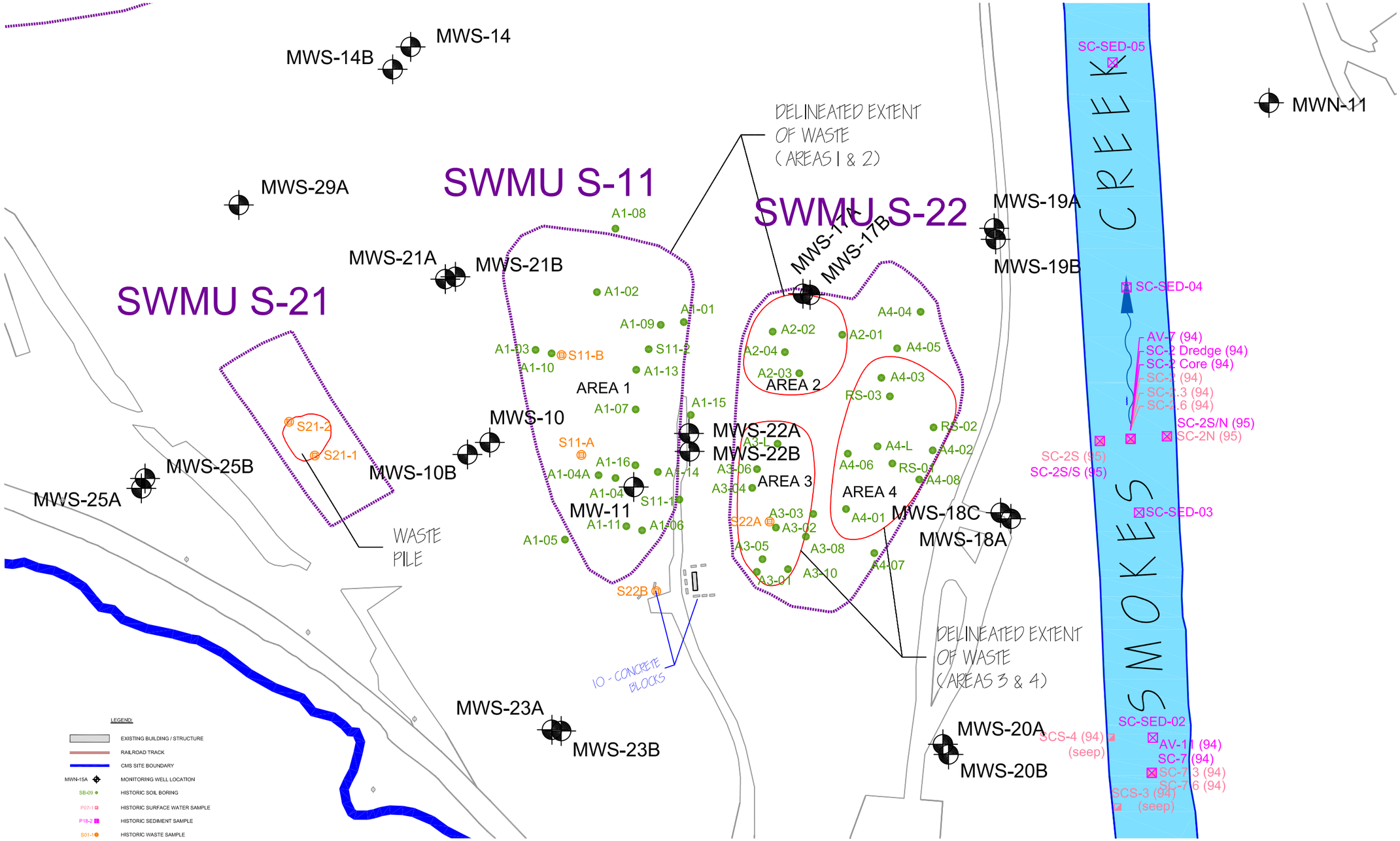
JOB NO.: 0071-007-140

ACID TAR PITS AND AGITATOR SLUDGE LOCATIONS

ARCELORMITTAL TECUMSEH LACKAWANNA SITE
LACKAWANNA, NEW YORK

PREPARED FOR
ARCELORMITTAL TECUMSEH REDEVELOPMENT, INC.

Figure 4



NOTES:

1. Building locations are based on historical surveys and maps, all locations should be considered approximate.
2. All buildings known to exist on site since 1944 are shown, some buildings were expanded or demolished following 1944, maximum building extents are shown.
3. Historic sample locations were either collected during the RFI performed by URS or during pre-RFI investigations by others.

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REVISIONS

NO.	BY	DATE	REMARKS

SEAL

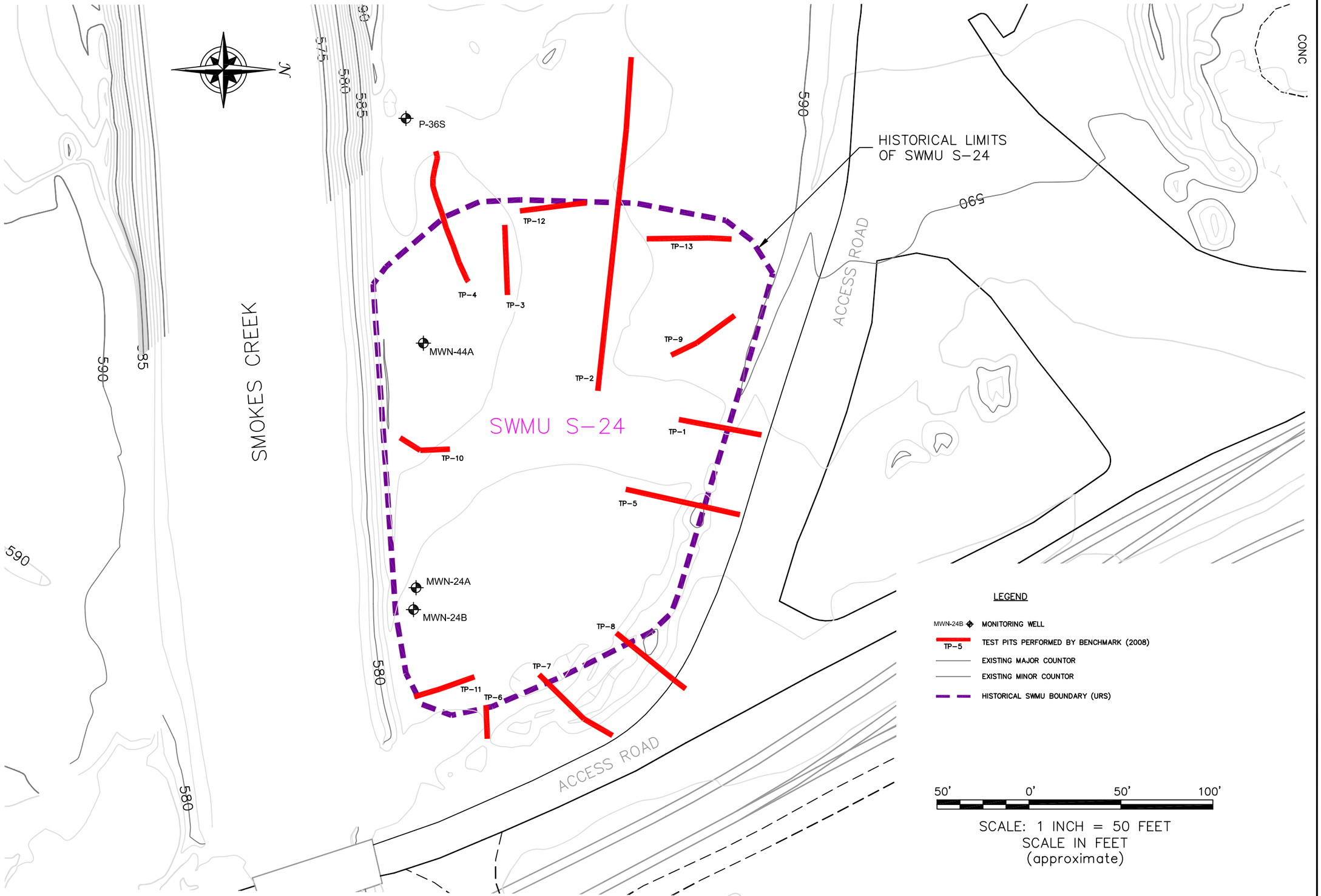
DRAWN BY: AJZ
DATE: SEPTEMBER 2008
CHECKED BY:
APPROVED BY:

ZONES 2 SWMUs AND SMOKES CREEK SAMPLE LOCATIONS

FOCUSED CMS FOR ACID TAR PITS SWMU GROUP
TECUMSEH REDEVELOPMENT SITE
LACKAWANNA, NEW YORK

PREPARED FOR
ARCELORMITTAL TECUMSEH REDEVELOPMENT, INC.

Figure 5



DATE: AJZ
DRAFTED BY:

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RECORD TEST PITS

FOCUSED CMS FOR ACID TAR PITS SWMU GROUP

TECUMSEH REDEVELOPMENT SITE
LACKAWANNA, NEW YORK

PREPARED FOR
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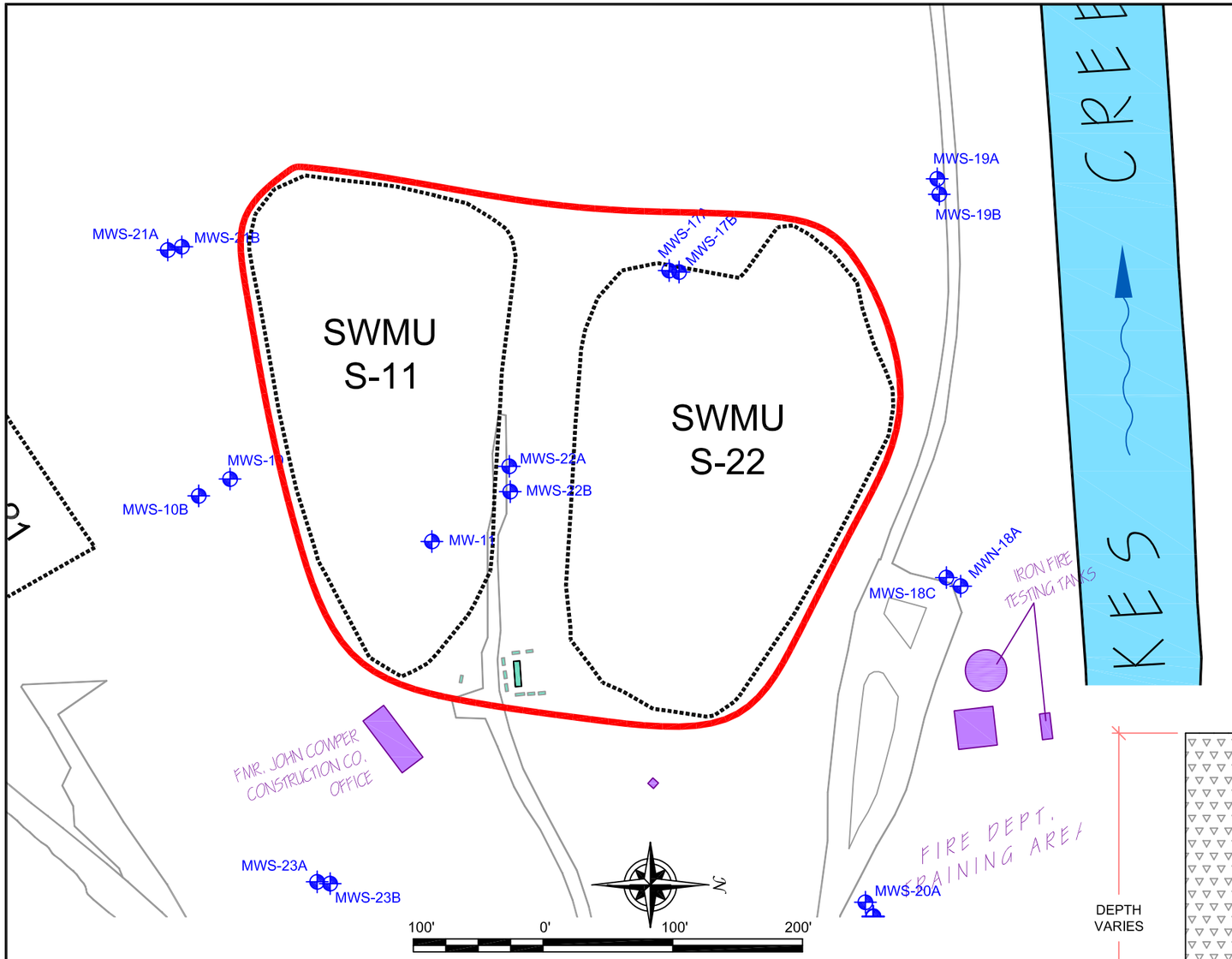
Figure 6

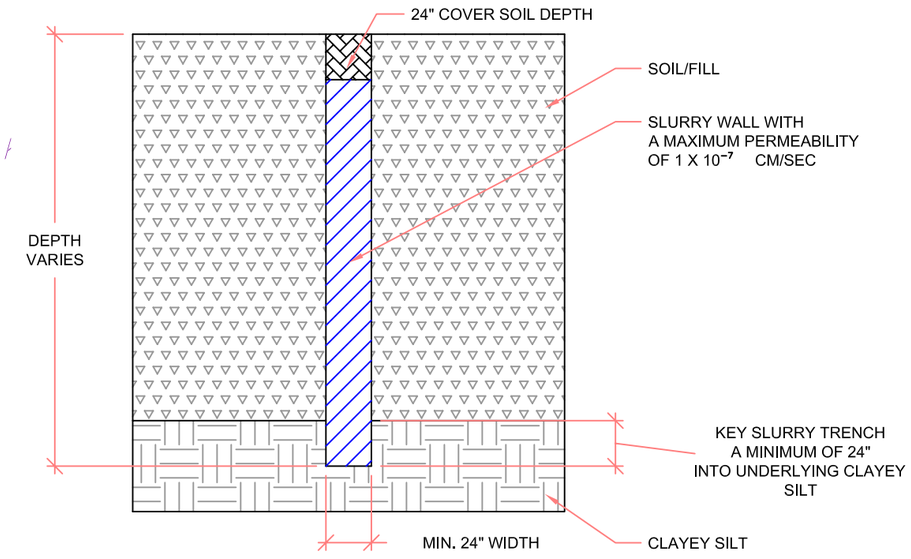


LEGEND:

- EXISTING BUILDING / STRUCTURE
- DEMOLISHED BUILDING AND HISTORICAL SITE FEATURE (see Notes 1 & 2)
- RAILROAD TRACK
- SWMU P-07 — APPROXIMATE LOCATION OF SOLID WASTE MANAGEMENT UNIT (SWMU) - REQUIRES FURTHER ASSESSMENT
- APPROXIMATE BOUNDARY OF SWMU
- MWN-15A — MONITORING WELL LOCATION
- APPROXIMATE SLURRY WALL ALIGNMENT

NOTES:

1. CONTAINMENT CELL DETAILS AND LOCATION ARE CONCEPTUAL AND SUBJECT TO FINAL DESIGN.
2. HISTORICAL BUILDING LOCATIONS ARE ESTIMATED.
3. LOCATIONS OF SWMU WASTE ARE APPROXIMATED AND SUBJECT TO FURTHER INVESTIGATION.



TYPICAL SLURRY WALL DETAIL

NOT TO SCALE

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JOB NO.: 0071-007-140

CONTAINMENT SYSTEM CONCEPTUAL PLAN

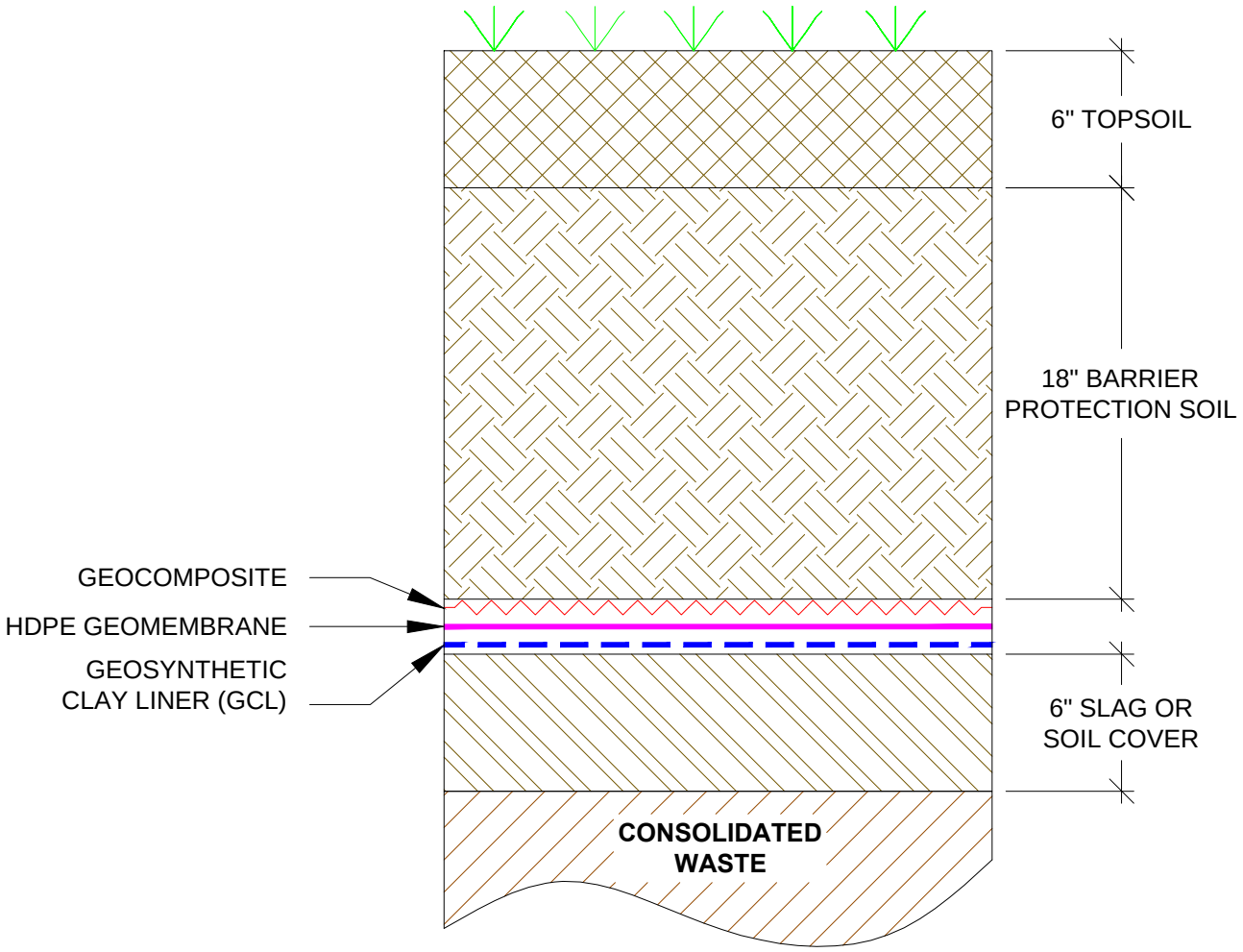
SWMUs S-11/S-22, & S-24 AREA

FORMER BETHLEHEM STEEL LACKAWANNA COKE DIVISION
LACKAWANNA, NEW YORK

PREPARED FOR
TECUMSEH REDEVELOPMENT, INC.

Figure 7

FIGURE 8



COVER SYSTEM DETAIL

NOT TO SCALE

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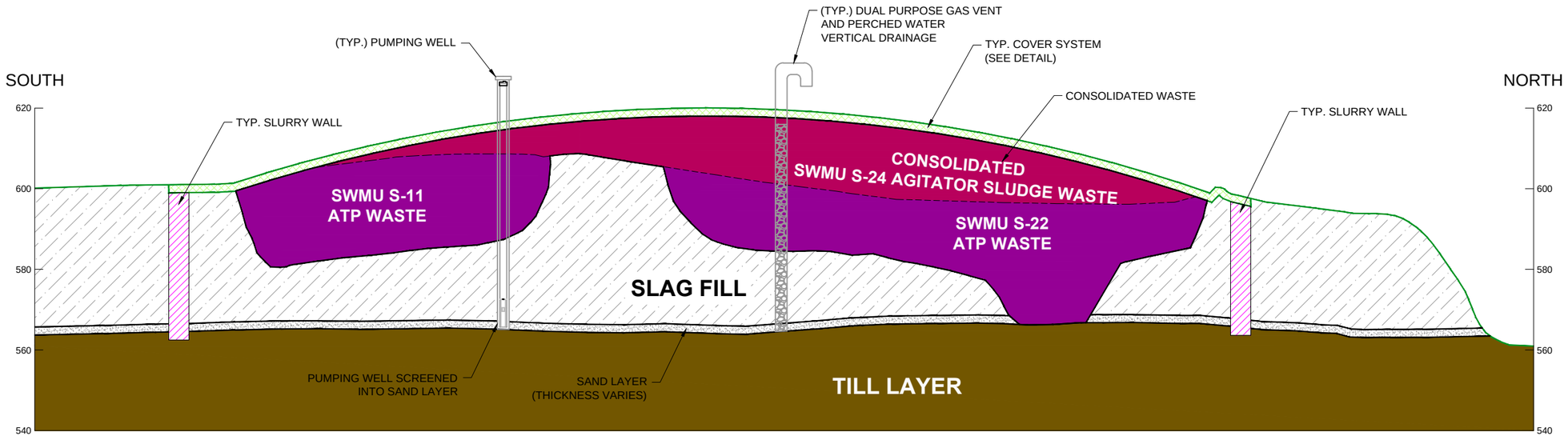
COVER SYSTEM

ACID TAR PITS SWMU GROUP

TECUMSEH REDEVELOPMENT SITE
LACKAWANNA, NEW YORK

PREPARED FOR

ARCELORMITTAL TECUMSEH REDEVELOPMENT, INC.



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JOB NO.: 0071-009-213

CONSOLIDATED ATP SWMU GROUP
CONTAINMENT SYSTEM CONCEPTUAL CROSS-SECTION

ACID TAR PITS SWMU GROUP

TECUMSEH REDEVELOPMENT SITE
LACKAWANNA, NEW YORK

PREPARED FOR
ARCELORMITTAL TECUMSEH REDEVELOPMENT, INC.

Figure 9

DATE: **DATE**
DRAFTED BY: **DRAFTED--BY**