Superfund Program

Proposed Plan **DRAFT - July 2015**
Allied Paper Landfill
Allied Paper/Portage Creek/Kalamazoo River Superfund Site – Operable Unit 1

INTRODUCTION

This Proposed Plan identifies the Preferred Alternative for cleaning up the contaminated material at Operable Unit 1 (OU1) (commonly referred to as Allied Paper Landfill or Allied Landfill), of the Allied Paper/Portage Creek/Kalamazoo River Superfund site (Site, also referred to as the Kalamazoo River site), and provides the rationale for this preference. This Proposed Plan also includes summaries of other cleanup alternatives evaluated for use at the Allied Landfill and provides basic information about Allied Landfill and the Site. This document is issued by the U.S. Environmental Protection Agency (EPA), the lead agency for site activities. The Michigan Department of Environmental Quality (MDEQ) is the support agency. EPA, in consultation with MDEQ, will select a final remedy for Allied Landfill after it reviews and considers all information submitted during the 60-day public comment period which will run from *DATE* to *DATE*. EPA, in consultation with MDEQ, may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information learned during the comment period or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this Proposed Plan. Members of the public are encouraged to attend and participate in a public meeting at *LOCATION* on *DATE/TIME*.

This Proposed Plan was developed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan relies on a risk-based method for polychlorinated biphenyls (PCBs) under the Toxic Substances Control Act (TSCA) and 40 C.F.R. §761.61(c).

EPA is issuing this Proposed Plan as part of its public participation responsibilities under §117(a) of CERCLA and §300.430(f)(2) of the NCP. This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports and other documents contained in the Administrative Record. The Administrative Record file for this site can be found at the following locations:

Kalamazoo Public Library
315 South Rose
Kalamazoo, MI
(269) 342-9837 (call for hours)

EPA's Region 5 Records Center
77 West Jackson Boulevard
Chicago, IL 60604
Monday - Friday 8am-4 p.m. (central time)
312-353-1063 (call for appointment)

EPA and MDEQ encourage the public to review the RI and FS reports and other documents in the Administrative Record to gain a more comprehensive understanding of the Allied Landfill and the Superfund activities that were conducted to date at the site.

EPA is proposing that Alternative 2D be selected as the remedy for OU1. Alternative 2D involves excavating contaminated soils, sediments, and residuals from the Monarch area of the operable unit (OU) as well

as from commercial and residential areas located around the periphery of the OU, and consolidating those excavated materials into the main body of the landfill area of the OU. Portions of the Landfill area and contaminated materials located along the periphery of the landfill area near Portage Creek and in wetlands adjacent to the landfill would also be consolidated, reducing the footprint of the waste from approximately 49 acres to approximately 27 acres. After consolidation, the landfill area would be covered with an impermeable cap and an active gas collection system would be installed. Excavated and backfilled areas that are not used for flood control would potentially be available for commercial/industrial redevelopment. The capped area would potentially be available for light recreational reuse. Alternative 2D also includes long-term groundwater monitoring to verify the effectiveness of the remedy, institutional controls to protect the remedy and restrict land and groundwater use, and long-term operation and maintenance (O&M). More details regarding the proposed alternative and the other alternatives that were considered are provided later in this Proposed Plan.

SITE BACKGROUND

The Site is located in Allegan and Kalamazoo counties in southwest Michigan. The site includes over 80 miles of the Kalamazoo River and Portage Creek, adjacent floodplains and wetlands, paper-residual disposal areas, and former paper mill properties, all pervasively contaminated with PCBs as the result of the recycling of carbonless copy paper. EPA listed the site on the National Priorities List in 1990 and the State of Michigan posted fish advisory warnings against any consumption of certain Kalamazoo River fish within the site as early as 1977. The fish consumption advisories remain in effect.

Currently, the site is divided into the following operable units:

- OU1: Allied Landfill
- OU2: Willow Boulevard/A-Site Landfill
- OU3: King Highway Landfill
- OU4: 12th Street Landfill
- OU5: Kalamazoo River and Portage Creek
- OU7: Plainwell Mill

This Proposed Plan addresses OU1, commonly referred to as the Allied Landfill, which is located within the City of Kalamazoo, Michigan. The Allied Landfill OU is defined as the areas between Cork Street and Alcott Street where contamination from paper operations is located (Figure 1). Cork Street forms the southern boundary of the OU, and Alcott Street runs along the northern boundary. Portage Creek runs through the property, bisecting the OU. Allied Landfill includes areas that are zoned for residential, commercial, and manufacturing uses. Residential development exists along a portion of the eastern side of the OU, and a railroad corridor forms a portion of the western boundary. Commercial and manufacturing properties are located north and south of Allied Landfill and along portions of the eastern and western sides of the property.

The key risk management goals established for Allied Landfill are associated with exposure to PCBs in soils and sediments. Paper mills were located on or near the Allied Landfill beginning at least as early as the 1870s. From at least the 1950s through the 1970s, as part of the papermaking process, those mills recycled carbonless copy paper that contained PCBs as a carrier for the ink. Wastewater generated in that process was contaminated with PCBs, which adsorbed or adhered to suspended particles such as cellulose and clay in the wastewater.

Paper mills associated with OU1 include mills referred to as the Bryant Mill and the Monarch Mill, both of which were owned and operated by various companies at different times. Millennium Holdings, LLC was the successor to those companies. The Bryant Mill was located on the northern part of OU1 while the Monarch Mill was located east and south of Portage Creek. These mills included carbonless copy paper

recycling in their operations. The portion of the Bryant Mill located south of Alcott Street is a part of OU1. The remainder of the former Bryant Mill located north of Alcott Street is a part of the Site but not a part of OU1.

The mills either discharged contaminated wastewater directly to Portage Creek, to its impounded area referred to as the Bryant Mill Pond, or first dewatered the wastewater in settling lagoons, which were intended to remove some of the suspended particles in the wastewater prior to discharge. Settling lagoons were located at areas of OU1 now referred to as the Bryant Historic Residuals Dewatering Lagoon (HRDL) and Former Residuals Dewatering Lagoons (FRDLs), and the Monarch HRDL (Figure 2).

The Bryant Mill Pond was formed by the damming of Portage Creek at Alcott Street, impounding the creek within the northern part of the OU. The Alcott Street Dam was built in 1895 to provide hydroelectric power and to control water for the Bryant Paper Mills. The RI report for Allied Landfill, completed by MDEQ in 2008, discusses the Bryant Mill Pond in greater detail. In 1976, Allied Paper Company obtained a permit from the Michigan Department of Natural Resources to draw down the reservoir in an effort to reduce contamination impacts through discharge of sediment or groundwater to Portage Creek. Surface water in Portage Creek was lowered 13 feet during the drawdown, which exposed sediments that had accumulated over the many years of mill operations.

Allied Landfill Subareas

In addition to the areas described above, additional areas have come to be contaminated due to site operations. For purposes of managing the Allied Landfill, EPA has organized the contaminated areas into the following areas and subareas (Figure 2):

- **Former Operational Areas**— Consists of Bryant HRDL and FRDLs, Monarch HRDL (including the Former Raceway Channel), and areas referred to as the Former Type III Landfill and the Western Disposal Area. PCBs were introduced to the HRDL and FRDLs through the residual dewatering operations. At times, contaminated residuals from these areas were excavated and disposed of in the Western Disposal Area and the Type III Landfill. Portions of contiguous properties, including the adjacent Panelyte Marsh, Panelyte Property, Conrail Railroad Property, and the State of Michigan's Cork Street Property, are included in the Former Operational Areas due to waste materials that have encroached into these areas from the Western Disposal Area.
- **Former Bryant Mill Pond Area**—Includes the area within the boundary of the Former Bryant Mill Pond, defined by a historical impoundment elevation of 790 feet above mean sea level (AMSL). A portion of the Bryant Mill property south of Alcott Street is included within the area. During operations, the Pond was contaminated through discharge of contaminated wastewater.
- **Residential Properties (Outlying)**—Residential Properties that are part of the site, but are not contiguous with the Former Operational Areas, include the following: Clay Seam Area, East Bank Area, four adjacent residential properties (Golden Age Retirement Community and three single-family residences), and property owned by the Lyondell Environmental Custodial Trust (created during the bankruptcy of MHLLC and other companies) but used by owners of the three single-family residences. These properties are adjacent to the Former Bryant Mill Pond area and were contaminated by the use and flooding of the Pond.
- **Commercial Properties (Outlying)**—Commercial properties that are part of the site, but are not contiguous with the Former Operational Areas, include the Goodwill property, Consumers Power, Former Filter Plant and Alcott Street Parking Lot (both owned by the Lyondell Environmental Custodial Trust,

and the former Bryant Mill property. These properties are adjacent to the Former Bryant Mill Pond area and were contaminated by its use and flooding.

Prior Response Actions

Allied Landfill was designated as a distinct OU within the Site, in part so cleanup activities could proceed on a separate schedule relative to the remedial activities developed for the other OUs. Between 1998 and 2004, a series of actions were completed at the Allied Landfill OU to minimize exposure to PCBs and to stop the ongoing release of PCB contamination from the Former Bryant Mill Pond to Portage Creek and the Kalamazoo River. Those actions are summarized below.

Time-critical Removal Action at the Former Bryant Mill Pond

EPA completed a time-critical removal action (TCRA) at the Former Bryant Mill Pond in 1998 and 1999. The work involved the excavation of 146,000 cubic yards (yd^3) of PCB-containing sediments, residuals, and soils and placement of those materials into the Bryant HRDL and FRDLs.

The TCRA was successful in removing a large, ongoing source of PCB contamination to Portage Creek and the Kalamazoo River. Specifically, the TCRA involved excavating the PCB-contaminated residuals from the Former Bryant Mill Pond up to an elevation of 790 feet AMSL. EPA's action level for the excavation was a PCB concentration of 10 milligrams per kilogram (mg/kg), with a goal of achieving post-excavation PCB concentrations less than or equal to 1 mg/kg. EPA then backfilled the excavated area with an amount of clean fill approximately equal to the volume of materials removed. The thickness of the backfill layer ranged from approximately 1 foot at the upstream end of the Former Bryant Mill Pond to approximately 10 feet near the Alcott Street Dam. EPA graded, seeded, and revegetated the backfilled area with native grasses and plants.

The post-excavation samples EPA collected from the final excavation were equal to or less than the target PCB concentration of 1 mg/kg established for the TCRA in 435 of the 440 samples that were collected. The PCB concentration in the remaining five samples ranged from 1.8 mg/kg to 3.8 mg/kg. Additionally, 410 of the 440 final post-excavation samples were below the 0.33 mg/kg screening-level criterion protective of people eating fish recommended by MDEQ in the RI report.

Interim Response Measures

In the 1990s and early 2000s, MHLLC conducted a series of small-scale Interim Response Measure (IRM) activities to restrict access to Allied Landfill and to provide erosion control and stabilization in certain areas. Additionally, MHLLC removed remnant structures, such as the Filter Plant, from the historical mill operational areas during this time period. The former Bryant Clarifier remains in place (Figure 2).

MHLLC also carried out IRM activities to stabilize the Bryant HRDL and FRDLs after completion of the Bryant Mill Pond TCRA. The measures served to further mitigate the exposure to or transport of PCBs at Allied Landfill. The IRM activities completed at the Bryant HRDL/FRDLs are summarized briefly as follows and described in detail in the RI report:

- Installation of 2600 feet of sealed-joint sheet pile along the Bryant HRDL and FRDLs adjacent to Portage Creek to stabilize the perimeter berms that separate the materials in the Bryant HRDL and FRDLs from the Portage Creek floodplain. The location of the sheet pile wall (Figure 2). This IRM was completed in 2001.

- Removal of several hundred cubic yards of soil containing residuals from locations between the sheet pile wall and Portage Creek and consolidation of those materials into the Bryant HRDL and FRDLs. The material was removed in 2000 and 2003 to minimize the potential for contaminated material releases to Portage Creek.
- Construction of an engineered composite cap for the Bryant HRDL and FRDLs, with its design based on Michigan Act 451, Part 115, solid waste regulations. The cap, which covers the Bryant HRDL and FRDLs, was constructed between 2000 and 2004. The cap was installed to act as a barrier to minimize the potential for direct contact with PCB-containing materials. MDEQ expressed concerns that the flexible-membrane liner (FML) was left exposed for substantial periods of time. During this time period, the cap was repeatedly punctured by wildlife. MHLLC subsequently repaired the cap, rather than replacing it as recommended, to address MDEQ concerns. MDEQ remains concerned about the current cap due to the number and quality of the repairs that were made. As a result of the earlier damage, the current cap may not be fully mitigating the infiltration of precipitation that might form leachate.

Installation and operation of a groundwater extraction system inside the sheet pile wall and beneath the cap. The purpose of the system was to mitigate groundwater mounding behind the sheet pile wall, which might compromise the cap or inundate otherwise unsaturated residuals and increase the potential for migration of PCBs to the creek.

- Removed of approximately 1,700 yd^3 of residuals located in the floodplain on the eastern side of Portage Creek (referred to as the East Bank Area) and PCB-containing soils between the sheet pile wall and the creek (Figure 2). The materials were consolidated into the Bryant FRDLs prior to construction of the cap.

The IRM methods and cleanup targets were similar to those used by EPA during the Former Bryant Mill Pond TCRA. Results of all post-excavation confirmation samples were below the target PCB removal action goal of 1 mg/kg, and the excavation was backfilled with a minimum of one foot of clean fill. Upland areas of the Former Bryant Mill Pond were subsequently seeded and revegetated with native plants.

During the IRM actions described above, confirmation sampling showed that MHLLC removed most of the contamination exceeding 1 mg/kg. However, PCB concentrations greater than 1 mg/kg exist in areas of the floodplain not addressed by the IRM activities, specifically the seep areas. These areas will be addressed by this proposed remedy.

Public Outreach to Date

EPA has conducted extensive public outreach on Allied Landfill. Since, 2007, EPA has provided updates to the public at site-wide public meetings that are conducted on a quarterly to semi-annual basis. EPA has also held public meetings specifically about Allied Landfill, including two presentations on the FS by the responsible party, MHLLC, in fall 2009, prior to their bankruptcy. In January 2011, EPA presented the array of cleanup alternatives to the public. In 2013, EPA conducted four Allied Landfill tours, the first for the mayor of Kalamazoo, followed by three additional tours for citizen groups prior to publishing the FS in November 2013. EPA presented the FS in two open-house style meetings, one in February 2014 and another in April 2014.

The City of Kalamazoo (City) has previously indicated that total removal of the waste was the only cleanup plan that it would support. Members of the public expressed a similar interest. Starting in April 2014, EPA began meeting with the City with the goal of developing a new cleanup alternative that might address the City and public concerns. The City shared the results of the meetings via a December 2014 press release and a February 2015 public meeting. The City's message was that total removal of the waste may not be

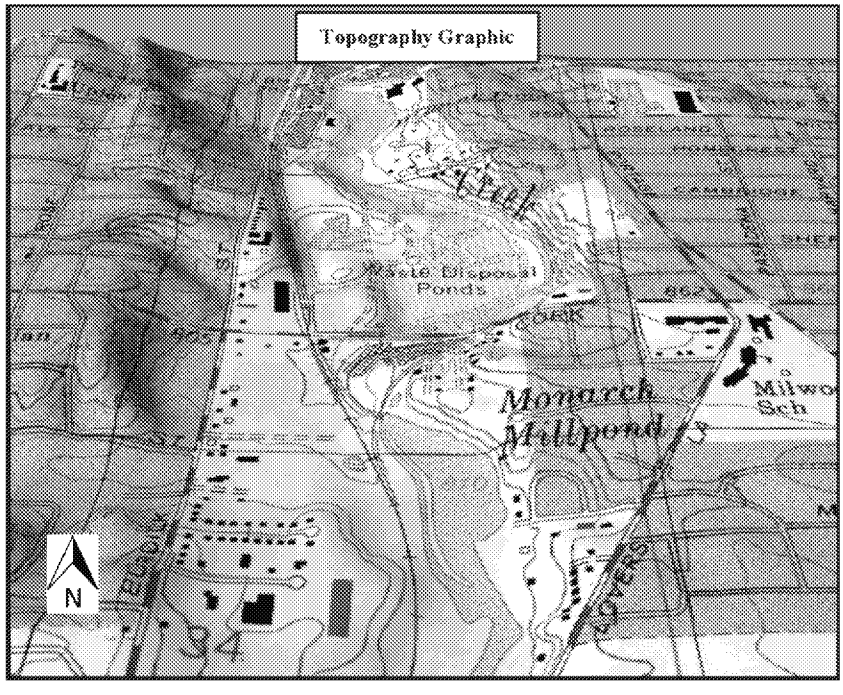
viable and that it could support a consolidation and capping alternative that maximizes reusable space. That alternative is discussed as Alternative 2D in this Proposed Plan and is EPA's Preferred Alternative. EPA shared the new alternative with the public in draft form during an April 2015 public meeting and in final form at a June 2015 public meeting.

SITE CHARACTERISTICS

Allied Landfill occupies 89 acres, including Portage Creek, between Cork and Alcott Streets within the City of Kalamazoo. In 2008, MDEQ concluded an RI report, which EPA approved. EPA then assumed the lead agency role for the remainder of the work at Allied Landfill and completed the FS. Significant findings from the RI are discussed below.

Geology/Hydrogeology

Allied Landfill is situated on the floor of a north-south trending valley drained by Portage Creek. The creek flows northward, emptying into the Kalamazoo River about 2.25 miles to the north. As shown below, the valley is flanked by hills formed from unconsolidated material that rise about 80 feet above creek level to the east and 100 feet above creek level to the west. The graphic below and Figure 3 depict the general topography of the Allied Landfill OU and its environs. Total relief across the site is about 70 feet, with elevations ranging from about 783 feet AMSL at the downstream end of Portage Creek (near the Alcott Street Dam), to about 853 feet AMSL at the highest point of the Monarch HRDL. The land surface of the Allied OU generally slopes toward Portage Creek.



Surface runoff at Allied Landfill is generally directed to Portage Creek. Runoff from the area capped during the IRM (e.g., the Bryant HRDL and FRDLs) is currently managed through a series of engineered drainage ditches and swales, routed to a settling basin, and discharged to Portage Creek through an engineered outlet.

Geology

The geologic layers in the vicinity of the site generally consist of bedrock overlain by overburden. The bedrock underlying the region near the Allied OU consists of the Coldwater Shale formation. The surface of the formation, which near the site is estimated at an elevation of 650 to 700 feet AMSL, slopes downward to the southwest. The formation is greater than 500 feet thick, with bedding dipping toward the northeast. Based on the elevation range provided above, the depth to bedrock beneath the site is estimated to be between 100 and 150 feet.

Classified overburden soils in the region fall primarily into the Oshtemo-Kalamazoo-Glendora complex. The geologic units range from nearly level areas of very poorly-drained Glendora soil along Portage Creek to rolling, well-drained areas of Kalamazoo soil and hilly, well-drained deposits of Oshtemo soil on the upland areas. The Glendora series consists of very poorly-drained soils on flood plains along perennial rivers and streams. The soils formed in sandy alluvium. Layers of this soil are highly variable in sequence and thickness within a horizontal distance of a few feet.

Seven units were identified in the upper sand and gravel aquifer at the Allied OU based on investigatory borings. The units include fill, residuals, peat, sand and gravel, silt, clay, and till. Fill and residuals are not native layers but are the result of site activities. Based on slug test data, the hydraulic conductivity of the upper sand unit varies considerably across the site, ranging between 1.7×10^{-2} to 4.9×10^{-5} centimeters per second (cm/s). As with most clays, the residuals have low permeability when compacted. Based on the results of 10 residuals samples collected from OU1, the measured hydraulic conductivity was approximately 1.3×10^{-7} cm/s.

Figures 4 and 5 identify the locations of representative geologic cross sections of the Allied Landfill. Figure 6 shows cross section B"-B-B'-B"' which runs north-south from the City well field through the Allied OU, as shown in Figure 4. Figure 5 shows the location of two cross sections, B-B' and F-F', which run generally east-west through the landfill; these cross sections are shown in Figure 7 and Figure 8, respectively.

Hydrogeology

The unconsolidated deposits in OU1 vicinity vary from approximately 200 to 400 feet thick. The gravelly or sandy deposits that are present, in the area, have characteristics that allow subsurface water (groundwater) to move through it. The unconsolidated deposits that can transmit water are typically referred to as "aquifers". Material that does not transmit water, such as clayey or silty deposits, are referred to as "aquitards" (limited water flow) or "aquicludes" (no water flow). Taken as a whole, the unconsolidated glacial aquifer materials beneath the OU1 consist of interbedded aquifers, aquitards, and aquicludes throughout its depth.

The hydrogeology at or near OU1 has been evaluated in the RI, a 2009 Supplemental Groundwater Investigation (2009 Study) conducted by MHLLC, and a 2014 groundwater investigation (2014 Investigation) conducted by EPA. Information from OU1 borings was compiled with borings from the neighboring Panelyte and Strebor properties as well as the City of Kalamazoo well fields. The understanding of the regional geologic units, as part of the physical characteristics of the CSM, is shown on Figure 5. The geological units shown at the City's well fields, where the deepest information is available, indicate the presence of relatively consistent materials that form continuous horizontal layers. A more detailed and a larger variety of layers is shown beneath and adjacent to OU1, again in a more or less horizontal layering fashion. However, the presence of a consistent clay or silt aquitard or aquiclude beneath OU1 is not apparent.

The City of Kalamazoo has raised concerns that contamination from Allied Landfill could migrate to the City well field. The CSM was evaluated in the 2009 Study and the 2014 Investigation and the potential for a flow path to the City well field was evaluated.

The 2009 Study included an evaluation of existing data from Allied Landfill, the nearby Strebor facility, and the City wellhead protection model, and also included the collection of a new round of groundwater elevation data. This additional round of groundwater elevations included a comprehensive network of wells from Allied Landfill and the Strebor, Panelyte, and Performance Paper properties, with data collected from all wells concurrently for the first time. The groundwater elevation data supported the conceptual understanding of the following:

- Water is not dropping down to the elevation of the city wells, as there is an upward gradient from the lower regional aquifer upward toward the surficial aquifer.
- Shallow groundwater flow in the area is to the east and not northwest toward the City's well fields. Shallow groundwater from adjacent properties flows to the east and west onto Allied Landfill.
- Portage Creek is the point of discharge for shallow groundwater from Allied Landfill, further directing groundwater away from the City well fields.
- All available data suggest that a flow path from Allied Landfill toward the City's well fields is unlikely. This conclusion is based on the presence of a lateral aquitard (the previously mentioned clay layer) beneath portions of Allied Landfill and an upward vertical hydraulic gradient between the regional aquifer (used by the City for potable purposes) and the shallow aquifer.

The 2014 Investigation included the installation of deeper monitoring wells on OU1 at depths more consistent with the City well fields. While the 2014 Investigation found that a consistent lateral aquitard is not present beneath OU1, the findings were consistent with the CSM for OU1 and the findings of the Supplemental Groundwater Investigation. The general groundwater flow directions established for the CSM were confirmed, with water table flow towards Portage Creek, intermediate and deep zone flows are toward the north-north east and vertical hydraulic groundwater gradients are predominantly upward across OU1 and the neighboring properties.

The results of the 2009 Study and 2014 Investigation support the CSM for OU1, and specifically the conclusion that there is no apparent groundwater migration pathway from Allied Landfill to the City's well fields. The complete 2009 Study report is included as Appendix A to the FS report for the Allied Landfill OU. The 2014 Investigation is a part of the administrative record.

MDEQ generally concurred with the 2009 Study conclusions in an April 16, 2010, letter to EPA, in which MDEQ stated the following:

- Portage Creek appears to be the primary influence on the configuration of the water table surface within Allied Landfill. In the main disposal area of Allied Landfill, shallow groundwater discharges radially to Portage Creek.
- Shallow groundwater is influenced, although not completely captured, by the creek.
- Due to the upward pressure exerted by the groundwater present in the regional aquifer, the downward flow of groundwater from the surficial aquifer monitored at Allied Landfill to the deeper regional aquifer is highly improbable.

Further empirical support for the above conceptual understanding was provided by the analytical results from water samples collected by the City from its own production wells. There have never been detections of PCBs in the City's samples, even at trace levels. This was supported by the 2014 Investigation which identified a single PCB detection in the wells monitored at and around OU1. The well with the detection, MW-8A, is screened immediately below waste material. The detected concentration was below both the GSI and drinking water protection criteria. There were no PCB detections in perimeter samples located outside the extents of waste material. The 2014 Investigation therefore supports the previous findings that PCBs are not migrating offsite in groundwater.

Based on monitoring well data collected during the RI, the 2014 Investigation and water samples collected in the clarifying unit of the currently operating groundwater collection system, EPA believes that impacted groundwater at Allied Landfill does not pose a risk outside of the waste.

Nature and Extent of Contamination

Early investigative efforts recognized that, if the full extent of PCBs was identified and appropriately remediated, then other associated substances at Allied Landfill would be appropriately addressed. The RI, therefore, focused on PCBs for identifying the extent of contamination. In addition to PCBs, several inorganics, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were detected in soils, sediments, and groundwater (Table 3). The RI report concluded the following:

- Target analyte list (TAL) inorganic constituents in soils and sediments that exceed criteria appear to be associated with the PCBs identified at Allied Landfill.
- Soils with inorganic constituents may be acting as a source, resulting in low-level impacts to the groundwater.
- Target compound list (TCL) VOCs in soils, sediments, and groundwater do not appear to be associated with contaminant impact identified at Allied Landfill.
- Detected TCL SVOCs in soils and sediments appear to have a similar distribution to the contaminant impact based on the data set available.
- The groundwater impact of detected SVOCs appears to be much less extensive than the SVOCs in soil at Allied Landfill. There were no SVOC exceedances of the screening criteria in the most recent groundwater sampling event.
- Concentrations of TCL pesticides did not exceed screening criteria.
- TCL pesticides were not present in the groundwater at the time of sampling, which is consistent with the soil and sediment data. One pesticide was detected in a leachate sample below screening criteria, but no exceedances were identified.
- Soils with visual indicators of paper residuals can be expected to have PCB concentrations.
- During the most recent sampling, PCBs were detected in several of the groundwater seep monitoring wells located along Portage Creek near the Former Operational Areas, with PCB detections above the groundwater-surface water interface (GSI) screening criteria in two locations.

PCBs are the primary contaminant of concern and are therefore being used as the primary indicator to define the extent of contamination at Allied Landfill. PCBs are associated with the paper residuals and appear to be the most widespread contaminant at Allied Landfill. They are present in soils and sediments due to the residuals eroding and mixing into the soils and/or sediments near or at the ground surface in certain subareas of Allied Landfill. As described in the RI, most other contaminants of concern (COCs) (inorganics and

SVOCs) appear to be collocated with PCBs in the various media and that addressing the PCB contamination is expected to address the other COCs found at Allied Landfill.. During the removal action at the Former Bryant Mill Pond confirmation samples were not collected for other COCs that were identified in the RI.

Additionally, during the TCRA at the Former Bryant Mill Pond, excavated areas were backfilled with 1 to 10 feet of clean fill and restored with native vegetation, thereby reducing the risk of direct dermal contact and erosion to Portage Creek of any other potential COCs that may have remained in the excavated areas. EPA evaluated the completeness of the TCRA in the FS during the development of the remedial alternatives and consideration of institutional controls.

The red dots on Figure 9 and Figure 10 depict the aerial extent of PCB-containing soils and residuals at the surface and subsurface, respectively, at the Allied Landfill. PCBs are present in concentrations exceeding TSCA and Michigan Part 201 risk-based screening levels in the following areas: the soils and sediments in the Former Operational Areas, the area of the Former Bryant Mill Pond impacted by ongoing seeps, certain Residential Areas east of the former Allied Paper property, and certain neighboring Commercial Areas; in groundwater in the Western Disposal Area and Bryant HRDL/FRDLs; and in seeps in the Former Type III Landfill Area adjacent to the Bryant HRDL/FRDLs. The PCB detections in groundwater (3 of 56 monitoring well locations) and seeps (2 of 20 seep locations) were all co-located within or adjacent to borings that contained residuals. For these reasons, EPA does not believe there is a groundwater plume of PCBs emanating from Allied Landfill.

Soil sample results at the Allied Landfill show isolated areas of PCBs with concentrations as high as 2,500 mg/kg. However the reasonable maximum exposure (RME) for the soils and sediments at the Allied Landfill is 60 mg/kg. This value is the highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures. This was calculated based upon the 95 percent confidence limit on the mean PCB concentration in soil, sediment, and residual samples from Allied Landfill. Therefore, EPA does not consider these wastes to constitute a source material, or principal threat, that requires treatment to reduce the toxicity or mobility of the waste. Because the waste materials exhibit very low mobility and can be reliably controlled in place through consolidation and capping, EPA does not consider the waste materials at Allied Landfill to be principal threat waste. Soil and groundwater data demonstrate that the PCBs at Allied Landfill are not mobile within the waste and do not readily leach into groundwater. Therefore, the PCB contamination at Allied Landfill can be reliably controlled in place.

Fate and Transport

The following PCB fate and transport mechanisms were evaluated at Allied Landfill:

- PCB transport from surface water runoff and soil erosion,
- PCB transport in groundwater,
- PCB transport in Portage Creek, and
- PCB transport in air.

In general, PCBs are relatively immobile. They are chemically and thermally stable, fairly inert, have low solubility in water, and have a high affinity for solids, making them strongly adherent to the paper residuals at Allied Landfill. Typically, the lower the water solubility of a chemical, the more likely it is to be adsorbed onto solids. Adsorption properties are generally characterized by an organic carbon partitioning coefficient denoted by Koc. The Koc values for PCBs are relatively high, which means that PCBs readily adsorb to

organic material in media such as sediments and soils. The octanol water partitioning coefficient, Kow, is a measure of a chemical's solubility in water. The coefficient is the ratio of the concentration of a chemical in octanol over the concentration of the chemical in water. PCBs tend to have a high Kow value, indicating they are not very soluble in water. Taken together, the combination of low water solubility (high Kow) and high adsorption tendency (high Koc) indicates that PCBs have a strong affinity for soils and suspended solids, especially those high in total organic carbon.

In addition to organic content, other soil or sediment characteristics affect the mobility of PCBs. These include soil density, particle size distribution, moisture content, and permeability. Also, meteorological and physical conditions, such as amount of precipitation and the presence of organic colloids (micron-sized particles), can also affect the mobility of PCBs in the environment. PCBs that are dissolved or sorbed to mobile particulates (for example, colloids) may also migrate with groundwater in sediments and soils.

The PCBs at Allied Landfill do not readily migrate out of the paper residuals. The residuals at Allied Landfill are composed primarily of fibrous wood material and clay. PCBs have a high affinity for the residuals due to the high organic content of the residuals. When compacted, the residuals have a low hydraulic conductivity. The hydraulic conductivity of 10 residuals samples collected from Allied Landfill was approximately 1.3×10^{-7} cm/s. As water does not easily flow through the residuals, the opportunities for PCBs to migrate via groundwater are low.

Based on the combined effects of the PCBs' high affinity to adhere to the residuals and low hydraulic conductivity, the PCBs do not migrate significantly from the residual material. This finding is supported by the near absence of PCB detections in groundwater samples at the Allied Landfill.

Surface Water Runoff and Soil Erosion

There are portions of Allied Landfill (primarily in the Former Operational Areas) where PCBs and other COCs are present in surface soils and surface residuals and are, therefore, exposed to the elements. Because these materials are located at the surface, they may be transported to the floodplain or sediments in Portage Creek by erosion or surface water runoff.

Groundwater

PCBs do not appear to be migrating in groundwater beyond the waste areas at OU1. PCBs were detected in 3 of 56 monitoring well locations and 2 of 20 seep locations. Exceedances of groundwater criteria occurred only in wells screened within or immediately adjacent to the residuals. This finding supports the conclusion that PCB transport in groundwater is limited within the landfill.

Direct Discharge to Portage Creek

The most significant historical source of PCBs to Portage Creek from Allied Landfill was the direct or indirect discharge of PCB-containing residuals to Portage Creek and the Former Bryant Mill Pond. The excavation of PCB-containing sediments, residuals, and soils from the Former Bryant Mill Pond and subsequent replacement with clean fill, and the consolidation and capping of those materials in the main body of the landfill, has isolated most of those source materials from direct contact with surface water and removed the largest source of PCBs to Portage Creek. Under current conditions, the remaining potential sources of PCBs to Portage Creek from Allied Landfill are primarily associated with the erosion of contaminated soils and sediments.

Air

Transport of PCBs by air can occur through wind-blown dispersion or volatilization from exposed residuals. An investigation for vapor-phase and particulate-phase PCBs was performed in 1993, when the waste materials in the landfill were not covered by a cap. PCBs were not detected in any of the airborne particulate-phase samples collected at Allied Landfill. Vapor phase PCB concentrations were detected within the OU1 site boundary above background concentrations, but did not exceed criteria. The subsequent completion of the TCRA and IRM activities significantly reduced the area where residuals were exposed at the ground surface, therefore, PCB concentrations in the air are expected to have decreased. Air is not anticipated to be a significant transport mechanism at the site.

SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As noted earlier, a TCRA was conducted at OU1 in 1998-1999 to address the Former Bryant Mill Pond area of the Allied Landfill OU, and a series of IRM activities was conducted in the early 2000s to restrict site access and stabilize the OU. The proposed response action in this Proposed Plan is intended to be the final response action for the Allied Landfill OU. The other OUs of the Kalamazoo River site have been or will be addressed by separate response actions.

SUMMARY OF SITE RISKS

Exposure to PCBs is the primary risk driver at Allied Landfill. MDEQ, as part of its RI activities, completed a *Site-wide Final (Revised) Human Health Risk Assessment* (HHRA) and *Final (Revised) Baseline Ecological Risk Assessment* (BERA) for the Site in 2003.

The HHRA quantitatively identified potential carcinogenic and non-carcinogenic risks to human health through exposure to media impacted with PCBs, including:

- consumption of fish by recreational and subsistence anglers;
- direct contact with PCB-contaminated materials by residents, recreational users, and construction/utility workers; and
- inhalation of dust and volatile emissions from PCB-contaminated materials.

As evidenced by the bulleted items above, the HHRA included an assessment of a variety of land use assumptions, potential receptors, and exposure pathways, including residential scenarios, recreational scenarios, and worker scenarios. Although the HHRA was not conducted specifically for OU1, the assumptions made and the scenarios evaluated apply equally to OU1 and to other OUs of the Kalamazoo River site.

The BERA quantitatively identified potential risks to various ecological receptors for different exposure pathways:

- direct contact with and ingestion of PCB-contaminated soils, sediments, or paper residuals by animals at Allied Landfill and
- ingestion of PCB-contaminated animals by other animals.

In the BERA, the mink (aquatic) and robin (terrestrial) were used to represent ecological receptors.

The PCB-contaminated soils, sediments, and exposed paper residuals at OU1 present a human health risk via the direct contact exposure pathway and an ecological risk via direct contact and ingestion pathways. Exposed soils, sediments and paper residuals currently act as a source to Portage Creek via erosion and may result in increased aquatic risk. Additionally, active groundwater seeps at OU1 discharge low levels of PCBs to Portage Creek, likely through the transport of contaminated solids that the seep liquids encounter as they express. The greatest aquatic risk is to fish, which may consume contaminated sediments, and subsistence anglers that consume these fish.

Although groundwater concentrations within the boundaries of the waste material exceed Preliminary Remediation Goals (PRGs), PCBs have not been detected in groundwater beyond the landfill boundary. For this reason, EPA does not believe the contamination at Allied Landfill poses a significant risk to groundwater. In addition, the shallow aquifer is not utilized for drinking water purposes, and zoning requires all new facilities to receive drinking water from the City of Kalamazoo's water supply.

More details about the risks to human and ecological receptors at the Site are provided in the Allied Landfill FS Report and the Site-wide HHRA and BERA. During the FS, EPA developed and evaluated alternatives to mitigate the risks posed by the Allied Landfill. Those alternatives are described in later sections of this Proposed Plan.

As noted earlier, other potential COCs have been identified at Allied Landfill and will be considered with PCBs during the remedial action. EPA has concluded that identification and appropriate remediation of PCBs will mean that other associated COCs would also be addressed. Similarly, the risk assessments conducted by MDEQ focused on PCBs as the risk driver.

EPA developed Preliminary Remediation Goals (PRGs) for the Allied Landfill OU based on potential exposure pathways, risk assessments, and federal and state applicable or relevant and appropriate requirements (ARARs). The PRGs for the PCBs at the Allied Landfill OU are summarized in Table 1. For contaminants other than PCBs, EPA adopted updated Michigan Act 451, Part 201, screening criteria and federal drinking water maximum contaminant levels (MCLs) as the PRGs. The PRGs and exposure routes for COCs other than PCBs are shown in Table 2. A summary of the frequency of PRG exceedances for COCs other than PCBs is provided in Table 3.

Basis for Taking Action

It is EPA's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are general descriptions of the goals to be accomplished through cleanup activities. RAOs are established by considering/evaluating the medium of concern, COCs, allowable risk levels, potential exposure routes, and potential receptors. EPA has identified the following RAOs to address the risks posed by the Allied Landfill:

- RAO1: Mitigate the potential for human and ecological exposure to materials at Allied Landfill containing COC concentrations that exceed applicable risk-based cleanup criteria.
- RAO2: Mitigate the potential for COC-containing materials to migrate, by erosion or surface water runoff, into Portage Creek or onto adjacent properties.

- RAO3: Prevent contaminated waste material at the Allied Landfill from impacting groundwater and surface water.

In addition to the quantitative PRGs identified in tables 1 and 2, EPA will require that a qualitative performance standard be established under which either (a) all residuals that are visually observed will be removed or (b) sufficient sampling will occur to verify that the residuals do not contain PCB concentrations above the applicable PRGs.

SUMMARY OF REMEDIAL ALTERNATIVES

EPA developed different remedial alternatives to address the potential risks at Allied Landfill. EPA is required to evaluate a "No Action" alternative as a basis of comparison for the other alternatives. In EPA's judgment, the Preferred Alternative (Alternative 2D) identified in this Proposed Plan, or one of the other active remedial alternatives considered in the Proposed Plan, is necessary to protect public health, welfare, and/or the environment from actual or threatened releases of hazardous substances into the environment from OU1. The remedial alternatives that were evaluated in the FS as amended by the recent technical addendum that details alternative 2D, along with their major components, are listed below. A more detailed description of each alternative is provided later in this section of the Proposed Plan.

Alternative 1—No Further Action

- No implementation time required; and
- Net present value cost of $110,000.

Alternative 2A—Consolidation of Outlying Areas on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area. This alternative includes the following major components:

- Excavate Outlying Areas and certain Operational Subareas (see *Common Elements* discussion below for more details);
- Excavate and pull back perimeter around Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Excavate and pull back creek-side edge of Monarch HRDL to achieve non-residential soil PRG of 10 mg/kg PCBs; where hydraulically connected to Portage Creek, set-back areas would achieve 0.33 mg/kg sediment PRG for PCBs to be protective of human consumption of fish;
- Consolidate excavated material on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Backfill Outlying Areas to original grade after excavation with the restoration of paved areas that require removal during the remedial action.
- Install cap on Bryant HRDL/FRDLs, Former Type III Landfill, Western Disposal Area, and Monarch HRDL
- Implement restrictive covenant to limit use in commercial areas;
- Implement restrictive covenant to limit residential use in areas at which PCBs remain above 1 ppm;
- Implement restrictive covenant in capped areas to prohibit interference with the cap and fences and to prohibit groundwater use;
- Restore wetlands and implement restrictive covenant to ensure that the wetland areas are not disturbed in the future;
- Monitor groundwater to verify effectiveness of remedy;
- Implementation time: 2 years; and
- Net present value cost of $44,000,000.

Alternative 2B—Consolidation of Outlying Areas and Monarch HRDL on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area. This alternative includes the following major components:

- Excavate Outlying Areas and certain Operational Subareas (See *Common Elements* discussion below for more details);
- Excavate Monarch HRDL to achieve non-residential soil PRG of 10 mg/kg PCBs; areas hydraulically connected to Portage Creek would achieve 0.33 mg/kg sediment PRG for PCBs to be protective of human consumption of fish;
- Excavate and pull back perimeter around Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Consolidate excavated material on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Backfill Outlying Areas to original grade after excavation with the restoration of paved areas that require removal during the remedial action.
- Install cap on Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Implement restrictive covenant to limit use in commercial areas;
- Implement restrictive covenant to limit residential use in areas at which PCBs remain above 1 ppm;
- Implement restrictive covenant in capped areas to prohibit interference with the cap and fences and to prohibit groundwater use;
- Restore wetlands and implement restrictive covenant to ensure that the wetland areas are not disturbed in the future;
- Monitor groundwater to verify effectiveness of remedy;
- Implementation time: 2 years; and
- Net present value cost of $43,000,000.

Alternative 2C—Consolidation of materials from Outlying Areas and Monarch HRDL with PCB concentrations of 500 mg/kg or less on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area, and off-site incineration of excavated soils/sediments with PCB concentrations greater than 500 mg/kg. This alternative includes the following major components:

- Excavate Outlying Areas and certain Operational Subareas (See *Common Elements* discussion below for more details);
- Excavate Monarch HRDL to achieve non-residential soil PRG of 10 mg/kg PCBs; areas hydraulically connected to Portage Creek would achieve 0.33 mg/kg sediment PRG for PCBs to be protective of human consumption of fish;
- Excavate and pull back perimeter around Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Transport all excavated materials with PCB concentrations greater than 500 mg/kg off site for incineration;
- Consolidate excavated materials with PCB concentrations of 500 mg/kg or less on Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Backfill Outlying Areas to original grade after excavation with the restoration of paved areas that require removal during the remedial action.
- Install cap on Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area;
- Implement restrictive covenant to limit use in commercial areas;
- Implement restrictive covenant to limit residential use in areas at which PCBs remain above 1 ppm;
- Implement restrictive covenant in capped areas to prohibit groundwater use and fences as necessary to protect remedy components;
- Restore wetlands and implement restrictive covenant to ensure that the wetland areas are not disturbed in the future;

- Monitor groundwater to verify effectiveness of remedy;
- Implementation time: 2 years; and
- Net present value cost of $70,000,000.

Alternative 2D—Consolidation of Outlying Areas, Monarch HRDL and Portions of the Operations Areas into a Reduced Footprint on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area. This alternative includes the following major components:

- Excavate the Outlying Areas, the Monarch HRDL, and portions of the Bryant HRDL/ FRDLs, Former Type III Landfill, and Western Disposal Area to achieve non-residential soil PRG of 10 mg/kg PCBs; areas hydraulically connected to Portage Creek would achieve 0.33 mg/kg sediment PRG for PCBs to be protective of human consumption of fish. (See *Common Elements* discussion below for more details);
- Consolidate excavated material into a reduced footprint within the onsite disposal areas to create a protective setback and developable area along the creek;
- Backfill Outlying Areas to original grade after excavation with the restoration of paved areas that require removal during the remedial action. Backfill excavated areas in the Operations Area to 1 foot above the water table and revegetate to prevent erosion of these areas;
- Implement a restrictive covenant to prevent disturbance of contaminated material under building foundations without EPA approval.
- Install cap over the consolidated materials;
- Implement restrictive covenant to limit use in commercial areas;
- Implement restrictive covenant to limit residential use in areas at which PCBs remain above 1 ppm;
- Implement restrictive covenant in capped areas to prohibit groundwater use and fences as necessary to protect remedy components;
- Restore wetlands and implement restrictive covenant to ensure that the wetland areas are not disturbed in the future;
- Monitor groundwater to verify effectiveness of remedy;
- Implementation time: 3 years; and
- Net present value cost of $63,000,000.

Note regarding Alternatives 2A, 2B, 2C and 2D: Groundwater monitoring is included in all of the alternatives that leave waste in place and/or consolidated onsite. Monitoring would include upgradient and downgradient wells to determine if COCs are migrating offsite. Additionally, for each of the Alternative 2 options, the following two sub-alternatives were considered:

- Sub-alternative (i)—Groundwater collection and treatment, which includes a system of extraction wells or trenches installed downgradient to capture groundwater before discharge to Portage Creek.
- Sub-alternative (ii)—Slurry wall installed downgradient of groundwater flow along with extraction wells or trenches to prevent groundwater mounding behind the slurry wall.

Alternative 3—Total Removal and Off-site Disposal

- Excavate Outlying Areas and All Operational Areas to achieve appropriate PRGs;
- Transport off site for disposal all materials above PRGs;
- Backfill the excavation to above water table elevations in Operational Areas and to original grade in the Outlying Areas;
- Implement restrictive covenant to limit use in commercial areas;
- Implementation time: 5 years; and
- Net present value cost of $238,000,000.

Alternative 4—Encapsulation Containment System

- Excavate Outlying and All Operational Areas and stockpile the excavated materials;

- Line bottom of OU1 with a 3-foot compacted clay liner (or geosynthetic equivalent) beneath two 40-mil flexible membrane liners. A leachate collection and monitoring system would be constructed between the FML layers;
- Place excavated materials within the lined OU1 area;
- Install cap on consolidated materials within the lined OU1 area;
- Implement restrictive covenant to limit use in commercial areas;
- Implement restrictive covenant to limit residential use in areas at which PCBs remain above 1 ppm;
- Implement restrictive covenant in capped areas to prohibit interference with the cap and fences and to prohibit groundwater use;
- Restore wetlands and implement restrictive covenant to ensure that the wetland areas are not disturbed in the future;
- Monitor groundwater to verify effectiveness of remedy;
- Implementation time: 10 years; and
- Net present value cost of $159,000,000.

Common Elements of Alternatives

For all alternatives except Alternative 1 (No Further Action), pre-design investigations are required to further delineate the nature and extent of PCBs exceeding the relevant PRGs in certain subareas of the site. As discussed below, each alternative includes excavation of soil and sediment above respective PRGs in Outlying Areas and in certain subareas of the Operational Area. Based on the RI, it is assumed that by addressing PCBs, other COCs also would be addressed. Confirmation sampling for PCBs and other COCs would be performed during the implementation of the remedial action to verify that respective PRGs have been achieved.

Certain Operational Subareas

Portions of the following subareas are contiguous and listed with the Operational Areas due to encroachment of waste material. However, the following subareas are discussed separately from the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area, due to the PRGs and proposed approach envisioned for Alternatives 2 through 4:

- **Former Raceway Channel**—During the pre-design investigation, sediments in this area would be sampled for PCBs. Sediments exceeding the PRG of 0.33 mg/kg PCBs would be excavated. After confirmation samples indicate the 0.33 mg/kg PCB PRG and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs have been achieved, the wetland would be restored and an environmental covenant would be implemented to maintain the wetlands.

- **Panelyte Property**—Waste materials are believed to have encroached onto the southern portion of the Panelyte Property, including Panelyte Marsh from the Western Disposal Area. During the pre-design investigation, this area would be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs would be excavated. After confirmation samples indicate the 10 mg/kg PCB PRG and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs have been achieved, the excavation would be backfilled with clean material. A restrictive covenant would be required to prohibit high occupancy use, as defined by TSCA, of this area.

- **Panelyte Marsh**—During the predesign investigation, sediments in this area would be sampled for PCBs. Sediments exceeding the PRG of 0.33 mg/kg PCBs would be excavated. After confirmation samples indicate the 0.33 mg/kg PCB PRG and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs have been achieved, the wetland would be restored and an environmental covenant would be implemented to maintain the wetlands.

- **Conrail Property**—Waste materials are believed to have encroached onto the eastern portion of the Conrail Property from the Western Disposal Area. During the predesign investigation, the area would be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs would be excavated. After confirmation samples indicate the 10 mg/kg PCB PRG and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs have been achieved, the excavation would be backfilled with clean material. A restrictive covenant would be required to prohibit high occupancy use of this area.
- **State of Michigan Cork Street Property**—Waste materials are believed to have encroached onto the Cork Street Property from the Monarch HRDL. During the pre-design investigation, the area would be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs would be excavated. After confirmation samples indicate the 10 mg/kg PCB PRG and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs have been achieved, the excavation would be backfilled with clean material. A restrictive covenant would be required to prohibit high occupancy use of this area.
- **Residential Properties (Outlying)**—During the pre-design investigation, the subarea identified as "Residential Properties (Outlying)" would be sampled for PCBs. Soils exceeding the PRG of 1 mg/kg PCBs would be excavated. After confirmation samples indicate the 1 mg/kg PCB PRG and the appropriate Michigan Part 201 Residential Criteria PRGs for other COCs have been achieved, the excavation would be backfilled with clean material.
- **Commercial Properties (Outlying)**—During the pre-design investigation, the areas identified as Commercial Properties would be sampled for PCBs. This includes the Alcott Street Parking Lot, Former Filter Plant, Goodwill property, former Bryant Mill property, and Consumers Power property. Soils exceeding the PRG of 10 mg/kg PCBs would be excavated. After confirmation samples indicate the 10 mg/kg PCB PRG and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs have been achieved, the excavation would be backfilled with clean material. Subareas achieving PCB concentrations between 1 mg/kg and 10 mg/kg would require restrictive covenants preventing high occupancy use. Where there are buildings that serve to mitigate direct contact and hinder the ability to remove impacted materials, restrictive covenants would be employed that would require sampling and removal when existing structures are compromised. Parking lots would be investigated and excavated to meet PRGs, as necessary.
- **Former Bryant Mill Pond Area (Outlying)** — Soils in the Former Bryant Mill Pond, and sediment in the associated wetland area may have been impacted by the PCB contaminated seeps. During the pre-design investigation, this area would be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs, floodplain soils exceeding the PRG of 6.5 to 8.1 mg/kg PCBs, and sediments exceeding the PRG of 0.33 mg/kg PCBs would be excavated. After confirmation samples indicate the respective PRGs for PCBs and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs have been achieved, the excavation would be backfilled with clean material. Wetlands were previously delineated in the Former Bryant Mill Pond Area and at least 1 acre of wetland would be mitigated for each acre filled. An environmental covenant would be implemented to ensure that the wetland areas are not disturbed in the future.
- **Wetland Areas**—Known wetland areas were discussed above with the associated subareas. However, if additional wetland areas with suspected PCB impacts are identified within the Outlying areas discussed above or Operational Areas during the pre-design investigation, the wetlands would be investigated for PCBs. Sediments exceeding the PRG of 0.33 mg/kg PCBs would be excavated. After confirmation samples indicate the 0.33 mg/kg PCB PRG and the appropriate Michigan Part 201 Non-Residential Criteria PRGs for other COCs were achieved, the wetland would be restored and an environmental covenant would be implemented to maintain the wetlands.
- **Floodplain Soils**—Known floodplain soils within the Outlying or Operational Areas were discussed with the associated subareas. However, if additional floodplain soils with suspected PCB impacts are identified within

the Outlying or Operational Areas during the pre-design investigation, the area would be investigated for PCBs. Floodplain soils exceeding the PRG of 6.5 to 8.1 mg/kg PCBs would be excavated and then backfilled.

- **Sheet Pile Wall**—Except for Alternative 1, the partial or complete removal of the existing sheet pile wall along the western bank of Portage will be evaluated as a component of each alternative.
- **Groundwater Monitoring**—Alternatives 2A, 2B, 2C, 2D, and 4 include a robust groundwater monitoring program to measure remedy performance, including monitoring wells located between the border of Allied Landfill and the City's drinking water well field. EPA would use this groundwater monitoring to determine whether the remedy effectively prevents the contaminated waste materials from impacting any groundwater leaving Allied Landfill. If the groundwater monitoring data indicates that the remedy is not effective and a groundwater plume has developed, EPA would develop and implement a separate groundwater remedy for Allied Landfill if appropriate. There is, however, no reason to believe at this time that a future groundwater remedy will be needed.
- Post-removal confirmatory sampling and analysis would be performed at the excavation areas.

Description of Alternatives

Alternative 1—No Further Action

The NCP requires EPA to evaluate a No Further Action alternative when evaluating remedial options. The No Further Action alternative serves as a baseline against which the other potential remedial alternatives are compared. Under this alternative, no further active remediation would be performed in any portion of Allied Landfill. The potential for human and ecological receptors to be exposed to COCs would not be addressed, and a potential would remain for COCs to erode into Portage Creek over time because there would be no maintenance of the existing fence, cap, soil cover, or the other engineered control systems. Operation of the groundwater collection/treatment system would be discontinued.

Alternative 2—Consolidation and Capping

The primary element of Alternative 2 is the excavation of contamination above PRGs from certain areas of the OU and in-place containment of the excavated materials on other portions of the OU. The Residential Properties (Outlying), the impacted portion of the Former Bryant Mill Pond, and Commercial Properties (Outlying) would be excavated as would portions of the Former Operational Areas. The excavated materials would be consolidated on the Bryant HRDL/FRDLs area, the Former Type III Landfill area, and Western Disposal Areas, and/or for Alternative 2A, the Monarch HRDL area. The areas used for consolidation would be covered with an engineered composite landfill cap. The cap would be constructed with appropriate erosion controls and other measures to protect against flood events and other natural or human-induced incidents that might otherwise threaten the integrity of the disposal areas. As discussed below, three variations of Alternative 2 were developed to allow for variations in the material excavated and consolidation locations and methods.

Additionally, portions of the Bryant HRDL/FRDLs, Monarch HRDL, Former Type III Landfill, and Western Disposal Area perimeter would be excavated and excavated materials consolidated within the remaining portion of those areas to create a setback that would act as a protective buffer along the creek and enhance long-term slope stability. All of the Alternative 2 options include long-term inspections and maintenance of the existing and newly-installed, engineered landfill caps and the remaining sheet pile. A long-term monitoring program would be implemented to verify the performance of the remedy, demonstrate

that groundwater quality conforms to applicable criteria, and provide for the appropriate management of landfill gas.

For the purpose of cost-estimating, it was assumed the cap would consist of six layers as shown in Figure 11. The layers are (from bottom to top): a non-woven geotextile, a 12-inch-thick (minimum) sand gas venting layer, a 30-millimeter polyvinyl chloride FML or equivalent (permeability less than 1×10^{-10} centimeters per second), a geosynthetic drainage composite layer, a 24-inch-thick (minimum) drainage and soil protection layer, and a 6-inch-thick (minimum) vegetated, topsoil layer. The proposed cap design contains the landfill cap components required under Michigan's Natural Resources and Environmental Protection Act (NREPA), as amended, Part 115.

The existing sheet pile wall would be evaluated during design to determine whether it can be removed completely or is required to stabilize the base of the consolidation area on the side closest to Portage Creek. If the wall is required for stabilization, the wall would be cut off at ground surface and, if necessary, individual panels may be removed to allow groundwater flow to the creek, eliminating the need for the existing collection system, which will be removed.

The setback between the consolidation area and Portage Creek would allow room for groundwater monitoring wells. In addition, the setback would allow for a groundwater collection and treatment system if deemed necessary based on the results of future sampling. The groundwater monitoring network consisting of existing and new monitoring wells would be located outside the areas where waste remains in place (Bryant HRDL/FRDLs, Former Type III Landfill and Western Disposal Area and or/Monarch HRDL areas). The groundwater monitoring plan would also evaluate upgradient groundwater concentrations for determination of local background conditions. For the purposes of the cost estimates, it was assumed that 24 monitoring wells would be installed for monitoring in Alternative 2A, and 20 monitoring wells would be installed as part of Alternatives 2B, 2C and 2D.

All of the Alternative 2 options include sub-alternatives for hydraulic control of groundwater. For sub-alternative (i), a groundwater collection and treatment system would be installed. The groundwater collection and treatment system would consist of groundwater extraction wells and a series of sumps and lateral drain lines. Sub-alternative (ii) would include the same groundwater collection and treatment system as sub-alternative (i), but in addition would include a grout slurry wall. The grout slurry wall would be installed downgradient of the Bryant HRDL/FRDLs and Monarch HRDL (if left in place) to contain impacted groundwater located within OU1. The slurry wall would extend approximately 40 feet below ground surface based on current sheet pile wall design. It is assumed that the slurry wall would not necessarily key into clay or bedrock; portions of the slurry wall at this depth would still terminate in the upper sand zones.

Alternative 2 includes restrictive covenants to prevent exposure of PCBs after consolidation and prohibit interference with the cap. Alternative 2 also includes informational devices, and access restrictions consisting of a perimeter fence for Alternatives 2A, 2B, and 2C with posted warning signs. More limited fencing would be present at Alternative 2D

Alternative 2A—Consolidation of Outlying Areas on Bryant HRDL/FRDLs and Monarch HRDL

Under Alternative 2A, the excavated material from the Outlying Areas and certain perimeter areas of the Operational Areas would be consolidated on the Bryant HRDL/FRDLs and Monarch HRDL and portions of the Former Type III Landfill and Western Disposal Area. These areas targeted for excavation and consolidation are shown in Figure 12. After consolidation, each consolidation area would be covered with an engineered composite landfill cap.

Alternative 2B—Consolidation of Outlying Areas and the Monarch HRDL on Bryant HRDL/FRDLs

Under Alternative 2B, the excavated material from the Outlying Areas and certain perimeter areas of the Operational areas would be consolidated on the Bryant HRDL/FRDLs and portions of the Former Type III Landfill and Western Disposal. The Monarch HRDL would also be excavated and consolidated on the Bryant HRDL/FRDLs landfill. The areas targeted for excavation and consolidation are shown in Figure 13. After consolidation, the Bryant HRDL/FRDLs landfill would be covered with an engineered composite landfill cap.

Alternative 2C—Consolidation of Outlying Areas and the Monarch HRDL on Bryant HRDL/FRDLs, with Off-site Incineration of Excavated Materials with PCB Concentrations Greater than 500 mg/kg

The extent of excavation and the consolidation areas are the same for Alternative 2C as described under Alternative 2B and are shown in Figure 13. Excavated materials with PCB concentrations greater than 500 mg/kg would be transported off site for incineration. Remaining materials with PCB concentrations of 500 mg/kg or less would be consolidated on the Bryant HRDL/FRDLs and subsequently covered with an engineered composite landfill cap.

A pre-design investigation would be used to identify materials exceeding 500 mg/kg PCBs within the areas to be excavated. For cost-estimating purposes, the feasibility study assumed that approximately 5 percent of the soils excavated from the pullback area near the Western Disposal Area and Former Type III Landfill would require off-site incineration, and that approximately 2 percent of soils excavated from the Outlying Areas, Monarch HRDL, and the setback between Portage Creek and Bryant HRDL/FRDLs would require offsite incineration. These assumptions were based on a statistical evaluation of the existing data sets.

Alternative 2D—Consolidation of Outlying Areas, Monarch HRDL and Portions of the Operations Areas into a Reduced Footprint on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area

Alternative 2D includes the excavation of material above PRGs from the Outlying Areas, the Monarch HRDL, and portions of the Bryant HRDL/ FRDLs, Former Type III Landfill, and Western Disposal Area and consolidation into an onsite landfill encompassing 27 acres as shown in Figure 14. The resulting height of the landfill is estimated at an additional 41 feet above existing grade. The landfill will have side slopes of 4:1 with slopes on top ranging from 6:1 to 10:1. After consolidation, the landfill would be covered with an engineered composite landfill cap as described above.

A pre-design investigation would be performed and would include a geotechnical investigation to evaluate the COC-containing materials that are currently in place or will be consolidated. Features for stabilization of the landfill materials and slopes would be included in the design, as necessary, based on the investigation results. For cost estimating purposes, stormwater management and erosion control measures are assumed to consist of two bench drains, riprap, culverts, and piping before discharging to two 1-acre stormwater detention ponds. An active landfill gas collection system would be included to collect landfill gasses to prevent migration or accumulation of landfill gases that could compromise the cap.

The areas subject to excavationwould potentially be available for redevelopment after implementation of the remedy. Placement of additional fill to reach desired grade for redevelopment or other enhancements to promote redevelopment, are not included within this remedy. Provided that additional material is placed upon the required soil protection layer, the landfill may be available for some recreational reuse.

Alternative 3—Total Removal and Offsite Disposal

The primary element of Alternative 3 is the excavation and off-site disposal of all contaminated areas of OU1. The excavation areas would include the following:

- All Outlying Areas other than the portion of the Goodwill property that may be covered by buildings, and
- Former Operational Areas—The Monarch HRDL, the Former Type III Landfill, the Western Disposal Area, and the Bryant HRDL/FRDLs, along with portions of contiguous properties where waste materials are suspected to have encroached from the Western Disposal Area, including portions of Panelyte Marsh, Panelyte Property, the Conrail Railroad Property and the State of Michigan's Cork Street Property.

Materials would be excavated and transported directly to off-site commercial landfills. Materials with PCB concentrations of 50 mg/kg or greater would be transported to and disposed of in approved off-site landfills permitted to receive TSCA-regulated wastes. Materials with PCB concentrations less than 50 mg/kg would be transported to and disposed of at other permitted and approved landfills, as appropriate. Excluded from removal at this time are the PCB-containing materials that may be located under existing buildings on the Goodwill property.

Once cleanup goals have been achieved, the excavated areas would be backfilled with clean material, graded to mitigate ponding, and revegetated or otherwise restored to match the surrounding areas. The Panelyte Marsh, the Former Monarch Raceway Channel, and other wetland areas would be backfilled to existing grades and restored to promote the re-establishment of wetland vegetation. The excavated and backfilled area would extend across approximately 65 acres. Restrictive covenants to ensure that the wetland areas are not disturbed in the future would be required.

This alternative would include the removal of the sheet pile along the western bank of Portage Creek to the extent feasible. The existing groundwater treatment system would be decommissioned and removed, and the network of groundwater extraction trenches, sumps, and wells currently in place behind the sheet pile wall would be removed and disposed.

This alternative was developed with the intent of removing all material containing COCs above OU1 PRGs. However, if it is not feasible to remove some of the material, groundwater monitoring would be performed in areas where materials remain above cleanup levels. Monitoring would be performed as described in Alternatives 2 and 4. Institutional controls (for example, restrictive covenants and enforcement tools) would be implemented for any areas where COCs are left in place.

Alternative 4—Encapsulation Containment System

The primary element of Alternative 4 is the full encapsulation of impacted materials onsite, including the following:

- Excavate approximately 1,600,000 yd^3 of soil and/or sediment containing PCBs above the relevant PRGs;
- Construct a landfill bottom liner in excavated former landfill areas. For costing purposes, the base of the liner would consist of a 3-foot compacted clay liner (or geosynthetic equivalent) beneath two 40-mil FMLs. A leachate collection and monitoring system would be constructed between the FML layers;

- Place excavated materials on the newly-constructed landfill liner;
- Consolidate the excavated PCB-containing materials in the newly-lined landfill areas;
- Construct an engineered composite landfill cap over the new landfill areas (same type of landfill cap as Alternative 2); and
- Depending on the capacity of the new landfill areas, some materials may need to be disposed of at off-site commercial landfills.

In the Outlying Areas, once excavation has been completed, the excavated areas would be backfilled with clean material, graded to mitigate ponding, and revegetated or otherwise restored to match the surrounding area. The Panelyte Marsh and Former Monarch Raceway Channel would be backfilled to existing grades and restored to promote the re-establishment of native wetland vegetation. All excavated materials would be sequentially stockpiled onsite during construction of a series of landfill containment cells, constructed onsite in the locations of the current Former Operational Areas.

For purposes of illustration, this work in the Former Operational Areas could potentially be carried out in the following manner:

- Excavate soils from the Monarch HRDL and temporarily stage the soils in the Western Disposal Area. Backfill the Monarch HRDL with approximately 10 feet of imported clean fill to establish the base liner 4 feet above the water table for the disposal cell. Construct the base liner, transport approximately 75 percent of the excavated Monarch HRDL soils back to the Monarch cell, place/grade/compact the soils, and construct the final cap. The remaining 25 percent of soils volumetrically displaced would be transported offsite for disposal.
- Repeat the above process for the Bryant HRDL/FRDLs, then the Former Type III Landfill.
- Repeat the above process for the western half of the Western Disposal Area, but without constructing the final cover system.
- Complete the process for the eastern half of the Western Disposal Area, and then construct the final cover system over the entire Western Disposal Area.

The containment system disposal cells would be designed and built to include a double composite base liner system constructed a minimum distance of 10 feet above the groundwater table and graded to a minimum slope of 2 percent to promote drainage. For the purposes of cost estimating, it was assumed the base liner system would consist of the following components, from top down: a 40-mil primary FML, underlain by a geosynthetic clay liner (GCL), a leachate collection system consisting of a geosynthetic drainage composite (GDC) layer draining to a pumpable sump system, a leak detection system, a secondary 40-mil FML, and a secondary 3-foot compacted clay liner (or geosynthetic equivalent). The GCL would have a maximum hydraulic conductivity of 1×10^{-7} cm/s, and the GDC would have a minimum transmissivity of 3×10^{-4} square meters per second.

The removed materials would be placed within the disposal cells with a cover liner system (e.g., cap) sloped to grades of no less than 4 percent and consisting of the following components, from top down: a 6-inch vegetative soil layer, a 24-inch protective soil layer, a GDC, a 40-mil FML, a GCL, a non-woven needle-punched geotextile, a minimum 12-inch gas-venting layer with gas vents at appropriately spaced intervals, a basal non-woven needle-punched geotextile, and a soil grading layer. The cap would be constructed with appropriate erosion controls and other measures to protect against flood events and other natural or human-induced incidents that might otherwise threaten the integrity of the disposal areas. The final cover system would cover approximately 50 acres.

Excess excavated materials that do not fit in the landfill containment cells (because the height of the cells is limited due to the need to attain the desired side-slope grade) would be transported to and disposed of in appropriately-permitted, off-site landfills. Approximately 25 percent of the soils targeted for excavation and re-emplacement in the Former Operational Areas and all of the soils excavated from the various Outlying Areas would be volumetrically displaced, which means that more than 500,000 yd^3 of materials would have to be transported off-site for disposal. Such materials with PCB concentrations of 50 mg/kg or greater would be transported to and disposed of in approved off-site landfills permitted to receive TSCA-regulated wastes. Materials with PCB concentrations less than 50 mg/kg would be transported to and disposed of at other permitted and approved landfills as appropriate. Excluded from removal are the PCB-containing materials that may be located under existing buildings on the Goodwill property. Excavated areas would be backfilled with clean material, graded, and revegetated or otherwise restored to match the surrounding areas. The excavated and backfilled area would extend across approximately 65 acres.

This alternative would include evaluation of the removal of the sheet pile along the western bank of Portage Creek. The need to leave portions of the sheet pile wall in place for landfill slope and bank stability would be further evaluated in the design. The potential for groundwater mounding behind the wall would be considered as part of the evaluation. The existing groundwater treatment system would be decommissioned and removed, and the network of groundwater extraction trenches, sumps, and wells currently in place behind the sheet pile wall would be removed and disposed.

Under Alternative 4, EPA would establish the same type of groundwater monitoring system as described for Alternative 2.

EVALUATION OF ALTERNATIVES

The NCP requires EPA to use nine criteria to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan evaluates each alternative against the nine criteria and notes how each compares to the other options under consideration. More details regarding this evaluation can be found in the FS Report.

The nine criteria are divided into three groups: threshold, balancing, and modifying criteria. Alternatives that do not meet the threshold criteria are not considered further.

Threshold Criteria

1. Overall Protection of Human Health and the Environment

This criterion assesses how well the alternatives achieve and maintain protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Alternative 1 would provide no improved protection over the current conditions, would provide no risk reduction, would not be protective of human health or the environment, and would not achieve RAOs.

Alternatives 2, 3, and 4 would all be protective of human health and the environment and would be effective long-term remedies for Allied Landfill as long as all elements of the remedy, including O&M

and monitoring, are properly maintained. These alternatives would also achieve all three RAOs that have been established for the remedial action.

Alternatives 2, 3, and 4 each achieve protectiveness through excavation of contaminated soils with consolidation onsite beneath a landfill cap and/or offsite disposal to prevent direct contact and transportation. Of these, Alternative 2D features the largest setback from Portage Creek, and therefore having the lowest potential, amongst Alternatives 2 and 4, for recontamination of Portage Creek if there were to be a failure of the landfill. Alternative 2C includes an offsite incineration component for the most-contaminated excavated soils, thus incorporating treatment into the remedy. Alternative 3 includes complete removal and offsite disposal to eliminate the potential for exposure.

Under current conditions, PCBs are not migrating outside the waste via groundwater. Alternatives 2 and 4 each further mitigate the potential for groundwater transport through capping, which would prevent infiltration of surface water through the consolidated soils. Alternative 4 includes the installation of a bottom liner beneath the waste materials. However, gHowiven the site conditions (impermeability of the waste and upward flow of groundwater), Alternative 4 may not be significantly more protective than Alternative 2.

The groundwater and seep samples collected during the RI that had elevated PCB concentrations were generally located in areas of Allied Landfill that were not addressed by IRM activities. These areas would all be addressed by Alternatives 2, 3, and 4. Alternative 3 includes complete removal and offsite disposal to eliminate the potential for transport through seeps and groundwater.

As noted earlier, EPA has analyzed groundwater data collected at and around Allied Landfill and has concluded that PCBs at concentrations that pose a risk are not migrating off-site via groundwater or surface water. For this reason, EPA believes that groundwater sub-alternatives (i) and (ii) are not necessary for the Alternative 2 options to be protective, because the addition of groundwater collection systems under sub-alternatives (i) and (ii) would not significantly increase overall protectiveness.

2. Compliance with Applicable or Relevant and Appropriate Requirements

This criterion assesses how the alternatives comply with regulatory requirements. Federal and state regulatory requirements that are either applicable or relevant and appropriate are known as ARARs. Only state requirements that are more stringent than federal requirements are ARARs. ARARs for OU1 are identified in the FS and FS addendum.

Alternative 1 would not prevent stormwater or venting groundwater discharges to Portage Creek, in violation of Parts 31 and 201 of Michigan's Natural Resources and Environmental Protection Act (NREPA).

Alternatives 2, 3, and 4 would all meet ARARs, as discussed below.

Alternatives 2 and 4 would rely on a risk-based method to address PCBs under TSCA and 40 C.F.R. §761.61(c). Alternatives 2 and 4 would not pose an unreasonable risk of injury to human health or the environment pursuant to 40 C.F.R. §761.61(c) for the following reasons: a) they would meet the PCB PRGs set forth in Table 1 for surface soils, subsurface soils, sediment, and groundwater; b) a cap would be constructed over the landfill areas to eliminate direct contact hazards and minimize infiltration[1] of

[1] The landfill cap for Alternative 2 and Alternative 4 includes a polyvinyl chloride FML or equivalent with a permeability less than 1×10^{-10} cm/s.

precipitation through the landfill and subsequent migration of residuals or leachate from the landfill into the adjacent areas; c) they include restrictive covenants for caps, fences, and low occupancy areas required by 40 C.F.R. §761.61(b)(8); and d) they would achieve the RAOs.

Alternative 3 would also meet TSCA and 40 C.F.R. §761.61.

Alternatives 2, 3, and 4 comply with wetlands ARARs because compensatory wetland mitigation would be provided, as necessary, in accordance with the Federal Mitigation Rule set forth at 40 C.F.R. §230.94(c)(2-14) for any wetlands that are or were filled during remediation.

Under Alternatives 2 and 4, groundwater monitoring would be conducted to confirm that site COCs meet Michigan Part 201 GSI criteria in groundwater venting from the shallow aquifer into Portage Creek. Further, Alternatives 2 and 4 include groundwater monitoring in both the shallow and lower aquifer to confirm that site COCs are not impacting the lower aquifer. Safe Drinking Water Act Maximum Contaminant Limits (MCLs) are not considered ARARs at this time because EPA believes that site COCs are not migrating off-site and do not reach the lower aquifer. However, groundwater samples would be collected and analyzed from the shallow and lower aquifer under Alternatives 2 and 4.

Balancing Criteria

3. Long-term Effectiveness and Permanence

This criterion evaluates the effectiveness of the alternatives in protecting human health and the environment over the long term, once the cleanup is complete, including the adequacy and reliability of controls.

With the exception of Alternative 1, each of the alternatives would be expected to meet all three RAOs and provide long-term effectiveness and permanence once the RAOs are met. Each of the other alternatives are combinations of proven and reliable remedial processes, and the potential for failure of any individual component is low.

Alternatives 2 and 4 would achieve long-term effectiveness and permanence through on-site containment of the contaminated materials, with O&M, monitoring, and institutional controls to collectively ensure and verify the permanence of the remedy. Capping is a proven method of preventing direct contact and erosion of material containing PCBs. Alternative 2C, which includes off-site incineration of excavated materials with PCB concentrations greater than 500 mg/kg, would not significantly increase the long-term effectiveness of the remedy, because capping prevents direct contact exposure and the erosion/transport exposure route. Alternative 2D would require additional O&M for the active landfill gas collection system and for additional slope stabilization measures due to the increased height of the landfill. However, the reduced footprint of Alternative 2D decreases the area requiring O&M as a part of the remedy.

The long-term effectiveness and permanence of Alternative 2D is enhanced by the increased width of the clean set back (significantly larger than the other alternatives that leave waste in place) between the consolidation area and Portage Creek . The large set back reduces the potential for erosion of COC-containing materials into Portage Creek to help achieve RAO 2. The increased setback and stabilized stream banks will also reduce the potential for Portage Creek to undermine the base of the landfill. Also,

the long-term effectiveness and permanence of Alternative 2D is enhanced by the anticipated long-term stewardship at OU1 due to reuse of the uncapped and capped portions of the property.

Amongst the capping alternatives (Alternatives 2 and 4), Alternative 2D would likely have the greatest reliability of controls, (e.g. institutional controls, access control and maintenance of engineered barriers). This would be due to the long-term stewardship, resulting from the anticipated reuse of uncapped and capped portions of the OU. An active presence or ownership at the site would likely increase the likelihood of effective implementation of restrictive covenants. Active management of the site, due to reuse, would involve active access control (e.g. preventing trespass and associated activities that can damage the physical components of the remedy). The long-term stewardship also increases the long-term effectiveness of the remedy by facilitating the monitoring and maintenance of the cap. Monitoring and maintenance activities associated with the reuse of the property can inform the maintenance of the landfill cap. Productive reuse of a site and stakeholder support of the property's reuse increases the effectiveness of the remedy. For example, more active management of the property means that problems with the remedy, such as vandalism or damage to remedy components, will likely be identified earlier than they would otherwise.

Capping is an effective mechanism to prevent infiltration through materials containing PCBs. At Allied Landfill, PCBs have not been detected in groundwater outside the waste, even though some of the current disposal areas are not currently capped. The installation of an engineered composite cover system would serve to further mitigate the potential for infiltration and migration of PCBs out of the waste via groundwater. Groundwater sub-alternatives (i) or (ii) do not significantly increase the long-term effectiveness or permanence of Alternative 2.

The Alternative 2 options include proven technologies that would provide long-term effectiveness and permanence. Alternative 4 provides an added level of protectiveness because wastes are controlled in lined, on-site containment cells. Alternative 3 provides the greatest degree of long-term effectiveness and permanence by removing the materials from Allied Landfill. The main difference between Alternatives 3 and 4 is that the waste is moved and managed offsite in Alternative 3, versus being managed on-site in Alternative 4 in lined containment cells.

Alternative 3 would achieve long-term effectiveness and permanence by removing all contaminated materials with COC exceedances from Allied Landfill and disposing of those materials at off-site solid waste landfills and TSCA facilities.

Under Alternative 3, materials with COC concentrations above relevant cleanup levels would be excavated and disposed of offsite. No long-term O&M or monitoring would be required under this alternative, with the possible exception of certain limited areas where waste may be left in place because of the proximity to buildings. The large-scale removal and off-site disposal of materials under this alternative provides an added degree of permanence through removal of the materials from Allied Landfill.

Alternative 4 would achieve long-term effectiveness and permanence by placing the contaminated materials into containment cells constructed onsite, with O&M, monitoring, and institutional controls in place to ensure protectiveness over time.

The long-term O&M and monitoring components that would be implemented in conjunction with institutional controls under Alternative 2 options and Alternative 4 would provide the necessary

mechanisms to verify that the remedy is performing as anticipated over time. As a result, Alternative 4 and the Alternative 2 options are also expected to provide effective, permanent remedies.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

This criterion evaluates the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternatives 1, 2A, 2B, 3, and 4 do not include treatment as a component of the remedy and therefore would not reduce the toxicity, mobility, or volume of contamination at Allied Landfill. The only remedial alternative that includes treatment as a component of the remedy is Alternative 2C. Alternative 2C would treat a very small percentage of the waste at the site through off-site incineration of excavated soils that exceed 500 mg/kg, so would not significantly reduce the toxicity, mobility, or volume of contamination at Allied Landfill.

5. Short-term Effectiveness

This criterion examines the length of time needed to implement the alternatives and the effectiveness of the alternatives in protecting human health and the environment during construction of the remedy. It considers any adverse impacts that may be posed to the community, workers, and the environment during the cleanup.

For Allied Landfill, the evaluation of short-term effectiveness is primarily related to the area and volume of COC-containing materials addressed in each alternative, the time necessary to implement the remedy, potential risks to workers, and potential impacts to the community during construction. Short-term effectiveness is summarized in Table 4.

With the exception of Alternative 1, all the alternatives with active remedial components would have some short-term impacts during construction, including increased noise from construction vehicles, the potential for airborne dust releases, increased traffic in the vicinity of Allied Landfill, increased wear on local roads, increased potential for workers to come in contact with PCB-containing materials, and other risks associated with construction work. Potential adverse impacts can be minimized through implementing a project-specific health and safety plan, keeping excavation areas properly wetted, planning truck routes to minimize disturbances to the surrounding community, and other standard best management practices, but the impacts cannot be eliminated.

For the alternatives with active remediation, the Alternative 2 options require the least amount of materials to be disturbed and the shortest construction time (2-3 years). Alternatives 2A, 2B, and 2C would likely take 2 years to implement, while Alternative 2D has an increased construction duration (estimated at 3 years) due to the additional excavation and consolidation volume. Alternative 2D also has increased short-term impacts as it involves the excavation and consolidation of significantly more material than the other Alternative 2 options. An estimated 39,000 truck trips would be required to implement Alternative 2A, and more than 49,000 truck trips would be required to implement Alternative 2B. Alternative 2C incurs additional short-term impacts associated with offsite transport. It is estimated that an additional 1,000 truck trips (to what is required by 2B) would be required to haul the most highly-contaminated materials approximately 40 miles to an intermodal facility where they would be loaded onto railcars for transport to an incineration facility. Due to the limited number and location of TSCA-permitted incineration facilities, the rail transport distance for the contaminated materials could be 1,200

miles or more. Alternative 2D would require 70,000 truck trips to implement due to the amount of soil needed to backfill excavated areas.

Alternative 2C also has greater short-term impacts than Alternatives 2A and 2B due to the potential for dispersion or erosion of excavated materials during characterization and segregation for incineration. The addition of sub-alternatives (i) or (ii) increase the short-term impacts of the Alternative 2 options, with sub-alternative (ii) having greater short-term impacts than sub-alternative (i).

Alternatives 3 and 4 present greater short-term impacts than the Alternative 2 options because of the increased volume of materials that would be disturbed and moved as well as the increased construction duration (5 years and 10 years, respectively). Because the project duration for Alternatives 3 and 4 is longer than the Alternative 2 options, they pose greater construction-related and exposure risks to workers. The additional volume of materials to be handled in Alternatives 3 and 4 also results in an increase in truck traffic in the vicinity of Allied Landfill during the project. An estimated 150,000 truck trips to and from OU1 would be necessary to implement Alternative 3. During the excavation and backfilling work under Alternative 4, more than 116,000 truck trips would be necessary to transport excavated material from the Outlying Areas to the on-site disposal cells, to bring in clean fill, and to haul displaced materials to off-site disposal locations. Any increase in truck traffic carries with it an increased risk of vehicular accidents.

Besides the impacts discussed above, there are additional adverse impacts to the local community during construction (e.g. potential for noise and dust). Such impacts could occur over a period of 2 years (Alternatives 2A, 2B, or 2C), 5 years (Alternative 3), or 10 years (Alternative 4), which would place an increased burden on the local community over time. Although traffic impacts associated with Alternative 4 are primarily limited to 5 years, the overall construction duration (with the potential for noise and dust) is estimated at 10 years due to the onsite management and emplacement of excavated materials.

There are no short-term impacts associated with construction or implementation for Alternative 1; however, since existing measures in place to control access to Allied Landfill would not be maintained, there could be an increased risk of direct exposure over the short term to individuals who trespass and come into contact with surficial contaminated materials.

6. Implementability

This criterion assesses the technical and administrative feasibility of an alternative and the availability of required goods and services. *Technical feasibility* considers the ability to construct and operate a technology and its reliability, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of a remedy. *Administrative feasibility* considers the ability to obtain approvals from other parties or agencies and the extent of required coordination with other parties or agencies.

There are no technical or administrative implementability issues associated with Alternative 1 because no active remediation would take place. The primary remedial components of the Alternative 2 options, Alternative 3, and Alternative 4 are proven, readily implementable, have been used successfully as part of other environmental cleanup projects, and are expected to be reliable over the long term. All the alternatives are administratively implementable, and although no permits would be required, the substantive applicable requirements of federal and state regulations would need to be identified and would be met.

The Alternative 2 options, Alternative 3, and Alternative 4 could all be completed using readily-available conventional earth-moving equipment, and most of the necessary services and construction

materials are expected to be readily available. Qualified commercial contractors with experience at other areas of the Kalamazoo River Superfund site are available locally to perform the work.

Compared to Alternatives 2A and 2B, Alternatives 2C, 2D, 3, and 4 would be more difficult to implement due to different constraining conditions. For Alternative 2C, there is limited availability of TSCA permitted incinerators. Alternative 2D is more difficult to implement than Alternatives 2A, 2B, and 2C due to the reduced landfill footprint and increased excavation and consolidation volumes. Additional stabilization measures may be required for the underlying soils prior to consolidation and slope stabilization measures and settlement monitoring may be required due to the increased height of the landfill. For Alternative 3, the availability of solid waste and/or TSCA landfills to accept the volume of materials to be disposed of offsite could be a limiting factor in terms of construction progress and overall cost. The limited staging area available for excavated materials during construction of the containment cells would be a limiting factor for Alternative 4.

Landfill Availability

There are few solid waste landfills in southwest Michigan that are available to accept PCB-containing material, regardless of whether that material meets solid waste regulatory requirements. The facilities commonly have limits on disposal capacity and disposal rates that may affect the timely completion of Alternatives 3 and 4 in which a large volume of PCB- and other COC-containing material would be disposed of offsite. If capacity at local solid waste facilities and TSCA landfills is exhausted, use of facilities outside of southwest Michigan could increase transport distances for off-site disposal, and consequentially increase risks and costs.

Construction of the Containment Cells

Additional implementability challenges associated with construction of the containment cells in Alternative 4 include sequencing and space constraints, developing a plan for excavating nearly 1,600,000 yd^3 of COC-containing materials, constructing the full-encapsulation disposal cells, and replacing the excavated materials in the cells. As each containment cell is sequentially constructed, a successively smaller area would be available onsite for staging of clean materials and temporary storage of COC-containing materials. Eventually, on-site capacity would be depleted, and a substantial volume of material would need to be disposed of offsite. Approximately 25 percent of the soils targeted for excavation and placement in the Former Operational Areas and all of the soils excavated from the Outlying Areas would be volumetrically displaced, resulting in more than 500,000 yd^3 of materials being transported offsite for disposal. This has a significant impact on both the implementability and cost of this alternative. The control and management of surface water runoff from the temporarily-stored COC-containing materials would also become increasingly challenging as less area was available for the operations under Alternative 4.

6. Cost

This criterion evaluates the capital and O&M costs of each alternative. Present-worth costs are presented to help compare costs among alternatives with different implementation times.

The costs for the range of alternatives and sub-alternatives presented in this Proposed Plan are summarized in the table below. The cost estimates are consistent with an FS-level of estimation, with an accuracy of +50 to -30 percent. While Alternative 1 has no associated capital or O&M costs since there would be no further actions taken, five-year reviews would be required and those periodic costs are reflected in the table below.

Summary of Remedial Alternative Costs
Allied Landfill—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund site

Alternative	Estimated Capital Cost	Estimated O&M Cost	Estimated Periodic Cost	Total Present-worth Cost
Alternative 1	$0	$0	$110,000	$110,0000
Alternative 2A	$38 million	$6.7 million	$110,000	$44 million
Subalternative (i)	$1.7 million	$2.7 million	$0	$4.4 million
Subalternative (ii)	$11 million	$2.7 million	$0	$14 million
Alternative 2B	$38 million	$5.0 million	$110,000	$43 million
Alternative 2C	$65 million	$5.0 million	$110,000	$70 million
Alternative 2D	$57 million	$5.8 million	$110,000	$63 million
Subalternative (i)	$1.5 million	$2.7 million	$0	$4.3 million
Subalternative (ii)	$9.2 million	$2.7 million	$0	$12 million
Alternative 3	$238 million	$0 million	$110,000	$238 million
Alternative 4	$154 million	$5.0 million	$110,000	$159 million

Note: The costs for the sub-alternatives under the Alternative 2 options would be in addition to the cost of each respective option.

A summary of the comparative analysis of alternatives with respect to the threshold and balancing criteria is presented in Table 5.

Modifying Criteria

7. State/Support Agency Acceptance

This criterion considers the state's preferences among or concerns about the alternatives, including comments on regulatory criteria or proposed use of waivers.

EPA collaborated with MDEQ and the City of Kalamazoo in developing the concepts upon which alternative 2D are based. Amongst the waste-in-place alternatives, Alternative 2D has the most support from the City of Kalamazoo. The City has held a public meeting to discuss this alternative. The State of Michigan also supports EPA's preferred alternative, Alternative 2D

8. Community Acceptance

This criterion considers the community's preferences or concerns about the alternatives. Community acceptance of the preferred alternative will be fully evaluated after the public comment period ends and will be described in the Record of Decision.

SUMMARY OF THE PREFERRED ALTERNATIVE

EPA's preferred alternative for addressing the contamination at Allied Landfill is Alternative 2D—Consolidation of Outlying Areas, Monarch HRDL and Portions of the Operations Areas into a Reduced Footprint on the Bryant HRDL/FRDLs, Former Type III Landfill, and Western Disposal Area. Alternative 2D meets the threshold criteria, offers a high degree of long-term effectiveness and permanence, and represents the best balance of tradeoffs among the other alternatives with respect to the balancing criteria by achieving the best balance of long-term and short-term effectiveness, implementability, and cost. Alternative 2D would meet the RAOs because it would:

- prevent human and ecological exposure to contaminated materials at OU1;
- prevent erosion and off-site migration of contaminated materials from OU1, the most significant route of exposure; and
- prevent contaminated material at OU1 from impacting groundwater or surface water emanating from OU1.

EPA believes that Alternative 2D is the appropriate remedy for OU1 given the immobility of the contamination as evidenced by both soil and groundwater data. The fact that contamination is not migrating to groundwater at levels that pose a risk to human health or the environment demonstrates that the waste can be reliably contained in place. Alternative 2D would achieve the RAOs within a reasonable timeframe of three years. While Alternative 2D would pose more short-term adverse impacts than Alternatives 2A, 2B, and 2C, it would have significantly greater long-term effectiveness and permanence due to the anticipated long-term stewardship at the site and the size of the buffer between the waste and Portage Creek. Implementation of Alternative 2D would also require a shorter timeframe than total removal or encapsulation. The shorter construction duration for Alternative 2D also would result in fewer short-term adverse impacts to the local community than the alternatives that would require a longer timeframe to implement, and would not incur the higher risks associated with exposing and handling all of the waste that would be associated with Alternatives 3 or 4.

While Alternatives 2A, 2B, 2C, 2D, 3, and 4 would all be protective of human health and the environment and comply with regulatory requirements, Alternative 2D is projected to cost more than Alternatives 2A and 2B, it is still cost-effective due to its higher long-term effectiveness and permanence. Alternatives 3 and 4 are not cost-effective as they cost orders of magnitude greater than Alternative 2D without a significantly greater reduction in risk. Alternatives 2C and 2D have similar cost, and short-term effectiveness, but Alternative 2C may be more difficult to implement and would lack the features that lead to the higher long-term effectiveness and permanence of Alternative 2D.

EPA also believes that amongst the Alternative 2 options, 2D will have the greatest amount of public support.

Based on the information available at this time, the lead agency believes that the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to balancing and modifying criteria. EPA and the State of Michigan believe the preferred alternative, Alternative 2D, to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The preferred alternative does not include a treatment component, so it does not satisfy the statutory preference for treatment as a principal element. EPA does not consider the wastes at Allied Landfill to be

principal threat wastes because they do not appear to act as a source material and can be reliably contained in place due to their immobility. The preferred alternative may change in response to public comment or new information.

COMMUNITY PARTICIPATION

EPA and MDEQ provide information regarding the cleanup of Allied Landfill to the public through public meetings, the Administrative Record file for the site, the site Information Repository at the Kalamazoo Public Library, and announcements published in the XXX. EPA and MDEQ encourage the public to gain a comprehensive understanding of the site by reviewing this Proposed Plan and the information available at the public repository.

The dates for the public comment period, the date, location, and time of the public meeting and the locations of the Administrative Record files are provided on the front page of this Proposed Plan.

TABLE 1

Summary of Preliminary Remediation Goals Established by EPA for PCBs

OU1 Feasibility Study Report—Allied Paper, Inc./ Portage Creek/Kalamazoo River Superfund site

Medium	Pathway		PCB PRG	Basis
Soils	Human Health	Residential	1.0 mg/kg[a]	40 CFR § 761.61(a)(4)
		Non-Residential	10 mg/kg[b]	40 CFR § 761.61(a)(4)
		Recreational	23 mg/kg[c]	HHRA
	Ecological	Aquatic	0.5–0.6 mg/kg	BERA
		Terrestrial	6.5–8.1 mg/kg	BERA
Subsurface Soils	Human Health	Residential	1.0 mg/kg[a]	40 CFR § 761.61(a)(4)
		Non-Residential	10 mg/kg[b]	40 CFR § 761.61(a)(4)
Surface and Subsurface Sediments	Human Health	Recreational	23 mg/kg[c]	HHRA
		Terrestrial	6.5–8.1 mg/kg	BERA
		Fish Consumption	0.33 mg/kg[c,d]	HHRA
	Ecological	Aquatic	0.5–0.6 mg/kg	BERA
Groundwater (including seeps)	Human Health	Direct Contact	3.3 µg/L[e]	MI Part 201 direct contact criteria
		Groundwater-Surface Water Interface (GSI)	0.2 µg/L[f]	MI Part 201 GSI criteria
Residuals	N/A	Qualitative: Where a removal is proposed, all visible residuals are to be removed unless analytical data are available to confirm PCBs (if present) are below applicable criteria.		

Notes:

[a] Based on high-occupancy cleanup level (without conditions) set forth in 40 CFR § 761.61(a)(4).

[b] Based on 40 CFR § 761.61(a)(4) with restrictive covenant prohibiting high occupancy use.

[c] Based on recreational exposure as developed in HHRA.

[d] Default sediment criteria of 0.33 mg/kg will be applied to shallow soil in areas of periodic inundation due to the potential runoff of shallow soils into surface water. Evaluation of contaminated soil runoff to surface water required under R299.5728(f).

[e] Groundwater for use as drinking water is not considered a complete pathway so the Part 201 Drinking Water criteria of 0.5 microgram per liter (µ g/L) was not used. The Part 201 direct contact criteria were used for protection of human health due to the presence of seeps.

[f] The groundwater criteria protective of surface water is a PRG where the GSI is present (MCL 324.20120e and Part 31).

BERA = baseline ecological risk assessment; HHRA = human health risk assessment; mg/kg = milligrams per kilogram;

N/A = not applicable

Source: CH2M HILL 2009

TABLE 2
Summary of Preliminary Remediation Goals for COCs other than PCBs
Allied Landfill—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund site

		Soils/Sediments (µg/kg)				Groundwater and Seeps [a] (µg/L)	
Analyte	Statewide Default Background Level	Residential Drinking Water Protection Criteria & RBSLs	Groundwater Surface Water Interface Protection Criteria and RBSLs	Residential Direct Contact Criteria & RBSLs	Non-Residential Direct Contact Criteria & RBSLs	Residential Drinking Water Criteria & RBSLs	Groundwater Surface Water Interface Criteria & RBSL
SVOCs							
4-methylphenol	N/A	7,400	1,000	11,000,000	36,000,000	370	30
PCDD/PCDF [b]							
Total TCDD Equivalent(O)	N/A	NLL	NLL	0.09	0.99	N/A	
Inorganics							
Aluminum (B)	6,900,000	1,000	N/A	50,000,000	370,000,000	50	N/A
Antimony	N/A	4,300	94,000	180,000	670,000	6	130
Arsenic	5,800	4,600	4,600	7,600	37,000	10	10
Barium (B)	75,000 [c]	1,300,000	660,000 (G)	37,000,000	130,000,000	2,000	1,000 (G)
Cadmium (B)	1,200 [c]	6,000	3,000 (G)	550,000	2,100,000	5	2.5 (G)
Chromium	N/A	30,000	3,300	2,500,000	9,200,000	100	11
Cobalt	6,800	800	2,000	2,600,000	9,000,000	40	100
Copper	32,000 [c]	5,800,000	100,000 (G)	20,000,000	73,000,000	1,000	18 (G)
Cyanide	390	4,000	100	12,000	250,000	200	5.2
Iron (B)	12,000,000	6,000	N/A	160,000,000	580,000,000	300 (E)	N/A
Lead (B)	21,000 [c]	700,000	2,500,000 (G)	400,000	900,000	4	14 (G)
Magnesium (B)	N/A	8,000,000	N/A	1,000,000,000	1,000,000,000	400,000	N/A
Manganese (B)	440,000	1,000	26,000 (G)	25,000,000	90,000,000	50	1,300 (G)
Mercury	130	1,700	50	160,000	580,000	2	0.0013
Nickel	20,000 [c]	100,000	100,000 (G)	40,000,000	150,000,000	100	100 (G)
Selenium	410	4,000	400	2,600,000	9,600,000	50	5
Zinc	47,000 [c]	2,400,000	230,000 (G)	170,000,000	630,000,000	2,400	235 (G)

[a] Only the data from the 2002–2003 groundwater and seep samples are summarized to reflect conditions after removal.
[b] Dioxin and furans were only sampled in 1998.
[c] Background value used in RI as screening criteria, lowest risk-based level highlighted used for COC comparison.
N/A = Not Applicable, NLL= Not likely to leach, RBSL = risk-based screening level, µg/kg = micrograms per kilogram
(B) Background, as defined in R 299.5701(b), may be substituted if higher than the calculated cleanup criterion.

(E) Criterion is the aesthetic drinking water value, as required by Section 20120a(5) of the Natural Resources and Environmental Protection Act 1994 PA 451, as amended by the Natural Resources and Environmental Protection Act of 1994
(G) Calculated value dependent on ph, hardness
(O) The concentration of all polychlorinated and polybrominated dibenzodioxin and dibenzofuran isomers present at a facility, expressed as an equivalent concentration of 2,3,7,8-tetrachlorodibenzo-p-dioxin based upon their relative potency, shall be added together and compared to the criteria for 2,3,7,8- tetrachlorodibenzo-p-dioxin.
Highlighted cells = lowest applicable criteria
Source: Non-Residential Part 201 Generic Cleanup Criteria and Screening Levels; Part 213 Tier 1 Risk-Based Screening Levels, document release date March 25, 2011.

TABLE 3

Summary of VOCs, SVOCs, Pesticides, PCDD/PCDF, and Inorganic Exceedances

OU1 Feasibility Study Report—Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site

Analyte	Surface Soils	Subsurface Soils	Surface Sediments	Subsurface Sediments	Groundwater[a]	Seeps[a]
VOCs						
Carbon Tetrachloride		1/54				
Acetone			1/2			
SVOCs						
Acenaphthene			1/2			
Carbazole			1/2			
Dibenzofuran			1/2			
Phenanthrene		1/54				
4-methylphenol		12/54				
Naphthalene		1/54	1/2			
Pentachlorophenol		1/54	1/2			
Pesticides						
None						
PCDD/PCDF[b]						
Total TCDD Equivalent	1/8					
Inorganics						
Aluminum	1/2	26/55			5/72	1/37
Antimony		7/55				
Arsenic	1/2	9/54	1/2		23/72	10/37
Barium		23/55	1/2	1/1	4/72	4/37
Cadmium		5/55				
Chromium	2/2	53/55	2/2	1/1	1/72	
Cobalt		6/55				
Copper		23/55		1/1		
Cyanide		21/54			4/72	3/37
Iron	1/2	8/55	1/2	1/1	64/72	31/37
Lead	1/2	20/55	1/2	1/1	1/72	
Magnesium		13/55				
Manganese		4/55			66/72	36/37
Mercury		20/55		1/1		
Nickel		1/55		1/1	4/72	1/37
Selenium		10/55	1/2	1/1		
Silver				1/1	2/72	
Sodium					4/72	
Vanadium					1/72	1/37
Zinc		28/45	1/2	1/1	7/72	

Note:
x/y = number of samples (x) exceeding screening level criteria out of number of samples (y)
[a] Only the data from the 2002/2003 groundwater and seep samples are summarized to reflect conditions after removal
[b] Dioxin and furans only sampled in surface soils in 1998
PCDD = polychlorinated dibenzodioxins, PCDF = polychlorinated dibenzofurans

TABLE 4
Summary of Short-term Effectiveness Considerations
Allied Landfill—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund site

Alternative	Total Area Addressed	Total Volume of COC-Containing Materials Excavated	Duration	Worker Risks	Community Impacts
Alternative 1	No areas addressed	No volume of impacted PCB-containing materials addressed	No time period to implement	No worker risks from implementation as no action is taken.	Potential offsite migration of COC-containing materials.
Alternative 2A	65 acres, 48 acre cap	350,000 yd3	Approximately 2 years	Least of the active alternatives; managed by health and safety plan.	Associated with dust, noise, and truck traffic.
Alternative 2B	65 acres, 42 acre cap	479,000 yd3	Approximately 2 years	Slightly increased due to moving Monarch HRDL; managed by health and safety plan.	Slight increase; associated with dust, noise, and truck traffic.
Alternative 2C	65 acres, 42 acre cap	479,000 yd3	Approximately 2 years	Greater than 2A and 2B due to potential exposure during characterization and transportation.	Greater than 2A and 2B due to additional management for characterization and offsite transport.
Alternative 2D	65 acres, 27 acre cap	920,000 yd3	Approximately 3 years	Greater than 2A, 2B, or 2C due to increased excavation and consolidation volume.	Greater than 2A, 2B, and 2C due to longer construction duration and transport of backfill materials.
Subalternative (i)	N/A	N/A	Concurrent with Alternative 2 Options, but indefinite O&M	Risks are easily managed by health and safety plan. Continued risks present with operation and maintenance of treatment system.	Slight increase over Alternative 2 options during construction due to well installation and treatment system construction.
Subalternative (ii)	N/A	N/A	Concurrent with Alternative 2 Options, but indefinite O&M	Greater risks than subalternative (i) due to construction of slurry wall. Similar O&M risks.	Slight increase over Alternative 2 options during construction due to well installation and treatment system construction. Greater than subalternative (i) due to slurry wall construction.

TABLE 4
Summary of Short-term Effectiveness Considerations
Allied Landfill—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund site

Alternative	Total Area Addressed	Total Volume of COC-Containing Materials Excavated	Duration	Worker Risks	Community Impacts
Alternative 3	65 acres	1,600,000 yd3	5 years	Greater than Alternative 2 given the area/volume of targeted material; Increased travel for disposal and increased project duration.	Greater than Alternative 2; associated with noise, dust, and particularly increased truck traffic, which would average 115 trips daily in and out of OU1 for the duration of the project. Greatest number of miles driven due to volume transported to disposal facilities with limited locations.
Alternative 4	65 acres, 48 acre landfill	1,600,000 yd3	10 years	Greater than Alternatives 2 and 3 given the area/volume of targeted material and significantly increased project duration.	Greater than Alternatives 2 and 3; associated with noise and dust over the longest project duration. Slightly fewer truck trips than Alternative 3, but 1/3 of the miles outside OU1 due to decreased volume transported to disposal facilities.

TABLE 5

Comparative Analysis of Alternatives

Allied Landfill*—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund site*

Alternative	Description	Overall Protection	Compliance with ARARs	Long-term Effectiveness	Reduction of Toxicity, Mobility or Volume through Treatment	Short-term Effectiveness	Implementability	Cost
Alternative 1	**No action**	Not protective. No action would be taken.	Would not meet ARARs	Not effective. Site conditions would remain the same.	No reduction of toxicity, mobility, or volume.	No worker risks. No action to be taken.	Implementable as no action would be taken.	$110,000
Alternative 2	Consolidation and capping							
2A	Construct caps on both Monarch and Operations areas	Protective. Remaining exposed contamination would be covered and contained. Infiltration of surface water would be minimized.	Meets ARARS	Effective. Larger landfill footprint requiring O&M than Alternatives 2B, 2C and 2D.	No reduction of toxicity, mobility, or volume would be achieved.	Implementation over 2-year period, most effective of active alternatives. Worker risk associated with dermal contact, inhalation, and ingestion. Risks are controllable. Community impacts associated dust, noise, and traffic.	Proven technology that has been implemented at similar OUs.	$44,000,000
2B	Consolidate Monarch within Operations areas	Protective. Remaining exposed contamination would be covered and contained. Consolidation of the Monarch HRDL within the operations area would reduce the amount of monitoring required.	Meets ARARS	Effective	No reduction of toxicity, mobility, or volume would be achieved.	Implementation over 2-year period, slightly longer than 2A. Worker risk associated with dermal contact, inhalation, and ingestion. Risks are controllable. Community impacts associated dust, noise, and traffic.	Proven technology that has been implemented at similar OUs. Combining Monarch on the Operations Area would reduce the footprint of contamination.	$43,000,000
2C	Consolidate Monarch within operations areas and transport excavated soils with PCBs >500 mg/kg offsite for incineration	Protective. Remaining exposed contamination would be covered and contained. Consolidation of the Monarch HRDL within the operations area would reduce the amount of monitoring required. Offsite incineration of some of the highest PCB concentrations would be slightly more protective.	Meets ARARs	Effective	Reduction of toxicity and volume through treatment of a portion of the material.	Implementation over 2-year period, slightly longer than 2A and 2B. Worker risk associated with dermal contact, inhalation, and ingestion due to increased management with characterization and segregation. Risks are controllable. Community impacts associated with dust, noise, traffic, and offsite transportation of contaminated materials.	Proven technology that has been implemented at similar OUs. Combining Monarch on the operations area would reduce the footprint of contamination. TSCA-permitted incinerators are limited quantity. Identifying, segregating and shipping, make 2C more difficult to implement.	$70,000,000
2D	Consolidate Monarch and portions of Operations Areas under an approximate 27 acre cap.	Protective. Remaining exposed contamination would be covered and contained.	Meets ARARs	Effective. Increased O&M requirements over Alternatives 2B and 2C. Community stewardship may help facilitate the monitoring and maintenance of the cap and effectiveness of controls. Provides larger clean buffer along Portage Creek.	No reduction of toxicity, mobility, or volume would be achieved.	Implementation over 3-year period is longer than 2A, 2B, or 2C resulting in increases to worker risk associated with inhalation and ingestion. Community impacts associated with dust and noise during construction and increased traffic associated with trucking backfill materials.	Proven technology that has been implemented at similar OUs. Implementability challenges are increased due to the consolidation on a smaller footprint resulting in a taller landfill. Additional stabilization measures may be required.	$63,000,000

TABLE 5

Comparative Analysis of Alternatives

Allied Landfill—*Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund site*

Alternative	Description	Overall Protection	Compliance with ARARs	Long-term Effectiveness	Reduction of Toxicity, Mobility or Volume through Treatment	Short-term Effectiveness	Implementability	Cost
Subalternative (i)	Groundwater collection and treatment system	Protective. Achieves RAO 3 with collection and treatment of potentially impacted groundwater.	Meets ARARs	Effective	Provides some reduction of volume through treatment of PCBs in groundwater. However, minimal contaminant mass is present in the groundwater.	Manageable risk associated with the installation of wells and construction of treatment system.	Proven technology.	$4,400,000 for Alternative 2A $4,300,000 for Alternative 2B, 2C or 2D
Subalternative (ii)	Groundwater collection and treatment system with slurry wall	Achieves RAO 3 with collection and treatment of potentially impacted groundwater, but may create mounding or otherwise alter groundwater flow.	Meets ARARs	Effective	Provides some reduction of volume through treatment of PCBs in groundwater. However, minimal contaminant mass is present in the groundwater.	Increased short-term risks to construction worker and environment over subalternative (i) during installation of the slurry wall. Community impacts from dust, noise and traffic associated with the slurry wall construction.	Proven technology. Implementation may result in groundwater mounding or short-circuiting around the barrier if operation of the groundwater treatment system ceased.	$14,000,000 for Alternative 2A $12,000,000 for Alternative 2B, 2C or 2D
Alternative 3	**Total Removal and Offsite Disposal**	Protective. Contamination would be disposed of at an approved landfill facility both hazardous and non-hazardous.	Meets ARARS	More effective than Alternative 2 due to removal from OU1. No cover maintenance or source for potential groundwater impacts.	No reduction of toxicity, mobility, or volume would be achieved. Volume may be increased if soils require dewatering by addition of cement.	Implementation over 5-year period. Worker risk associated with dermal contact, inhalation and ingestion would occur over a longer period of time. Risks are controllable. Community impacts associated dust, noise, and traffic.	Proven technology, landfill space in the area could be limited requiring the hauling of waste a significant distance from OU1.	$238,000,000
Alternative 4	**Encapsulation Containment System**	Protective. Little advantage achieved by construction of the liner. Compacted waste can achieve 1×10^{-7} centimeters per second hydraulic conductivity on its own limiting groundwater flow through the material.	Meets ARARS	More effective than Alternative 2. The source material is fully encapsulated further minimizing potential for groundwater impacts.	No reduction of toxicity, mobility, or volume would be achieved.	Implementation over 10-year period. Worker risk associated with dermal contact, inhalation, and ingestion would occur over a longer period of time. Risks are controllable. Community impacts associated dust, noise is the least short-term effective alternative.	Proven technology.	$159,000,000