Superfund Program **EPA**
Proposed Plan **Region 5**
Allied Paper Landfill
Allied Paper/Portage Creek/Kalamazoo River Superfund Site – Operable Unit 1

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternative for cleaning up the contaminated material at Allied Paper Landfill, Operable Unit 1 (Allied Landfill), of the Allied Paper/Portage Creek/Kalamazoo River Superfund Site and provides the rationale for this preference. This Proposed Plan also includes summaries of other cleanup alternatives evaluated for use at this 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 the Site after it reviews and considers all information submitted during the 30-day public comment period. EPA, in consultation with MDEQ, may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives presented in this Proposed Plan.

Dates to remember:

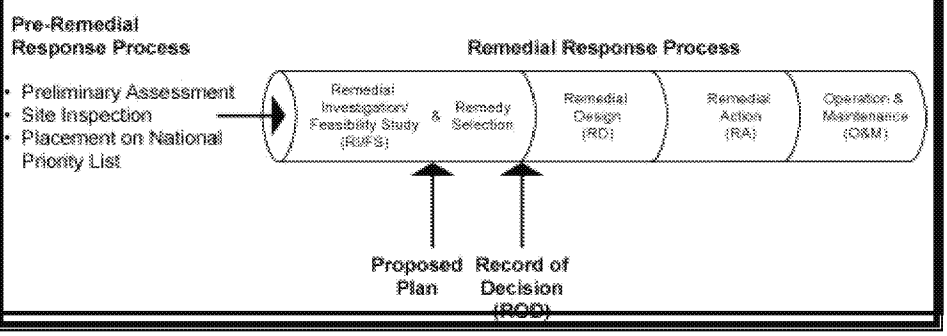
PUBLIC COMMENT PERIOD:
Month XX, 2013 – Month 1, 2013
U.S. EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING:
Month XX, 2013
U.S. EPA will hold a public meeting to explain the Proposed Plan and all the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at the TBD.

For more information, see the Administrative Record at the following locations:
Kalamazoo Public Library at
315 South Rose
Kalamazoo, MI.

EPA's Region 5 office
77 West Jackson Boulevard
Chicago, IL

The Superfund Pipeline



The Proposed Plan was developed in accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

EPA is issuing this Proposed Plan as part of its public participation responsibilities under 40 C.F.R. § 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 Kalamazoo Public Library at 315 South Rose Kalamazoo, MI. and EPA's Region 5 office in Chicago. EPA and MDEQ encourage the public to review these documents to gain a more comprehensive understanding of the Site and Superfund activities that have been conducted at the Site to date.

SUMMARY of PROPOSED ALTERNATIVE

EPA is proposing Alternative 2B, which is summarized below:

• Excavate contaminated soil in impacted neighboring residential areas to the residential remedial action levels (RALs) in Table 2-3 and 2-4 and backfill with clean material;

• Excavate contaminated soil in impacted commercial/industrial areas (such as the Panelyte, Goodwill, Consumers Power and property immediately south of Alcott Street currently owned by Lyondell Trust) to commercial RALs in Table 2-3 and Table 2-4 and backfill with clean material;

• Excavate the entire Monarch Landfill and pull back portions of the Bryant HRDLS/FRDLS, Former Landfill, and Western Disposal Area perimeter to create a setback that will act as a protective buffer along Portage Creek and to enhance long-term slope stability. Set back areas will achieve an RAL of 0.33 ppm PCBs where hydraulically connected to Portage Creek;

• Establish wetlands in the Panelyte Marsh, former Bryant Mill Pond and former Monarch landfill areas;

• Consolidate excavated contaminated material into the Bryant HRDLs/FRDLs, Type III Landfill and Western Disposal Area landfill areas. After consolidations, cover the landfill areas, with an engineered composite landfill cap. The cap will consist of six layers. The layers are (from bottom to top): a non-woven geotextile, a 12-inch-thick (minimum) sand gas venting layer or equivalent, a 30-millimeter polyvinyl chloride FML or equivalent (permeability equal to or less than 10^{-10} cm/sec), 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 consolidation and capping of material in the landfills on site relies on a risk-based method for the disposal of PCB remediation waste under 40 C.F.R. § 761.61(c);

• Fencing of the consolidated landfill areas;

•Restrictive covenants: a) to prohibit interference with caps, concrete, asphalt, containment systems and fences; b) to prohibit on –site groundwater use; to prohibit residential use in commercial/industrial areas; and d) to maintain wetlands areas.

•Groundwater monitoring of upper and lower aquifers to determine if COCs are migrating off-site.

SITE HISTORY

The Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund Site (the Site) is located in Allegan and Kalamazoo counties in southwest Michigan. The Site includes 80 miles of

the Kalamazoo River, adjacent floodplains and wetlands, paper-residual disposal areas, and former paper mill properties, all pervasively contaminated with polychlorinated biphenyls (PCBs) as the result of the recycling of carbonless copy paper. The Site was listed on the National Priorities List in 1990; the State of Michigan posted fish advisories warning against any consumption of certain Kalamazoo River fish within the Site as early as 1977. The advisories remain in effect. Currently, the Site is divided into the following operable units (OUs):

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

This Proposed Plan addresses Allied Landfill which is located within the City of Kalamazoo, Michigan, and is defined as the areas between Cork Street and Alcott Street where contamination, from paper operations, is located. Portage Creek runs through the property bisecting the operable unit (OU). Allied Landfill includes areas that are zoned for residential, commercial, and manufacturing uses (Figure 1). Cork Street forms the southern boundary, and Alcott Street runs along the northern boundary. Residential development exists along a portion of the eastern side, 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.

PCBs were introduced to Allied Landfill through the recycling of carbonless copy paper that contained PCBs as a carrier for the ink. The key risk management goals established for Allied Landfill are associated primarily with exposure to PCBs in the various media.

The deposition of contaminated wastewater was the primary way in which Allied Landfill came to be contaminated. When mills recycled waste paper that included carbonless copy paper, PCBs were present in the wastewater produced from the recycling process. Typically, the wastewater contained large quantities of suspended particles—primarily cellulose and clay. The solid components of the recycling process adsorb or contain concentrations of PCBs. In the 1950s, mills began building clarifiers and dewatering or settling lagoons to remove most of the particles, and the clarified wastewater was discharged to rivers and creeks (in this case, Portage Creek). At Allied Landfill, the legacy of this practice is PCB-containing materials in the Bryant Historic Residuals Dewatering Lagoons (HRDLs) and Former Residuals Dewatering Lagoons (FRDLs), the Monarch HRDL, and the Former Bryant Mill Pond. The PCB-containing materials, referred to in this report as residuals, have been the focus of the investigations conducted at Allied Landfill.

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 process water for the Bryant Paper Mills. The RI report for Allied Landfill 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 and exposed sediments that had accumulated over the many years of mill operations.

Subareas

Allied Landfill consists of the following areas and subareas based on historical operations, as depicted in Figure 1:

- Former Operational Areas— Consists of Bryant HRDLs and FRDLs, Monarch HRDL (including the Former Raceway Channel), Former Type III Landfill, and the Western Disposal Area. Portions of contiguous properties, including the adjacent Panelyte Marsh, Panelyte Property and the Conrail Railroad Property, and the State of Michigan's Cork Street Property, are included in the Former Operational Areas as a result of 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.

  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 Lyondell Trust (formerly MHLLC) but used by owners of the three single-family residences.
- **Commercial Properties (Outlying)**— Commercial properties that are part of the site but are not contiguous with the Former Operational Areas include Goodwill, Consumers Power, Filter Plant and Alcott Street Parking Lot (owned by Lyondell Trust [formerly MHLLC]) south of Alcott Street), and Former Bryant Mill property.

Prior Response Actions

Allied Landfill was designated as a distinct OU within the Kalamazoo River Site, in part so cleanup activities could proceed on a separate schedule relative to the remedial activities developed for the Site as a whole. Between 1998 and 2004, a series of actions were completed to stop the ongoing contamination of Portage Creek and the Kalamazoo River by the Former Bryant Mill Pond. Cleanup of the Bryant Mill Pond minimized exposure potential by consolidating and capping that portion of the contaminated materials at Allied Landfill. These were the first cleanup actions on the entire site. The primary actions performed to date are summarized in the following subsections.

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 (yd3) of PCB-containing sediments, residuals, and soils and placement of the materials into the Bryant HRDLs and FRDLs. EPA performed the excavation in segments by using stream diversions to expose the sediment and excavate in dry conditions. After excavation, EPA collected confirmation samples, backfilled the area, and then removed stream diversions.

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 790 amsl. EPA's action level for the excavation was a PCB concentration of 10 milligrams per kilogram (mg/kg), and a goal of achieving post-excavation PCB concentrations less than or equal to 1 mg/kg. At locations where initial post-excavation PCB sampling results exceeded this goal, EPA removed an additional 6 inches of material and

collected another post-excavation sample at the final extent. 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 with native grasses and plants the surface of the materials it placed in the Bryant Mill Pond.

The post-excavation samples EPA collected from the final excavation were equal to or below the target PCB concentration of 1 mg/kg established for the TCRA in 435 of the 440 samples. The PCB concentration in the remaining five samples ranged from 1.8 mg/kg to 3.8 mg/kg. A total of 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.

PCBs were the driver for removal at the Bryant Mill Pond. Confirmation samples were not collected for other COCs that were identified in the RI. However, the RI identified that it is expected that COCs are co-located with the PCB residuals, and addressing PCB contamination is expected to address other COCs found at Allied Landfill. In addition, 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 in the excavated areas. The completeness of the TCRA was evaluated in development of the remedial alternatives and consideration of institutional controls.

Interim Response Measures

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. This work began in the early to middle 1990s. 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.

MHLLC carried out IRM activities to stabilize the area the Bryant HRDLs 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 completed at the Bryant HRDLs/FRDLs is summarized briefly as follows and described in detail in the RI report:

- Installation of sealed-joint sheet pile along the Bryant HRDLs and FRDLs adjacent to Portage Creek to stabilize the perimeter berms that separate the materials in the Bryant HRDLs and FRDLs from the Portage Creek floodplain (Figure 1). The response action 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 into the Bryant HRDLs 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 HRDLs and FRDLs with its design based on Michigan Act 451 Part 115, solid waste regulations. The cap, which covers the Bryant HRDLs and FRDLs, was constructed between 2000 and 2004. MDEQ expressed concerns that the flexible-membrane liner (FML) was left exposed for substantial periods of time. MHLLC subsequently repaired the cap, rather than replaced as recommended to address MDEQ concerns. MDEQ remains concerned due to the number and quality of the repairs.

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Commented [GU2]: Yes RC, no sampling outside of seep area

- 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, which might compromise the cap or inundate otherwise unsaturated residuals and increase the potential for migration of PCBs to the creek.

The cap was installed to act as a barrier to minimize the potential for direct contact; however, the FML was left uncovered for an extended period and may not be fully mitigating the infiltration of precipitation that might form leachate.

MHLLC removed approximately 1,700 yd3 of residuals located in the floodplain on the eastern side of Portage Creek (referred to as the East Bank Area—Figure 1) and PCB-containing soils between the sheet pile and the creek as a 2002 IRM. The materials were consolidated into the Bryant FRDLs prior to construction of the landfill cap. The IRM methods and cleanup targets were similar to those used by EPA during the TCRA. Results of all post-excavation confirmation samples were below the target PCB removal criterion of 1 mg/kg, and the excavation was backfilled with a minimum of 1 foot of clean fill. The area was subsequently seeded and revegetated with native plants to restore the existing habitat.

MHLLC removed residuals exceeding 1 mg/kg in the IRM actions. They verified this with confirmation sampling. PCB concentrations above 1 mg/kg exist in areas of the floodplain where the IRM was not performed, specifically the seep areas. The areas will be considered for action in this proposed remedy.

SITE CHARACTERISTICS

Allied Landfill occupies 89 acres including Portage Creek between Cork and Alcott streets within the City of Kalamazoo. In 2008, the Michigan Department of Environmental Quality (MDEQ) summarized the remedial investigations in the 2008 Allied Paper, Inc. Operable Unit Remedial Investigation Report. Upon finalization of the RI report, the EPA assumed the responsibility of lead agency for the remainder of work to be done at Allied Landfill. Significant findings from the Remedial Investigation 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 north of the site. As shown below, the valley is flanked by hills formed of unconsolidated material that rise about 80 feet above creek level to the east and 100 feet above creek level to the west. The graphic/map shown below and Figure 12 depicts the general topography of the Allied 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.

Topography Graphic

Surface runoff at Allied Landfill is generally directed to Portage Creek. Runoff from the area capped during the IRM (i.e., the Bryant HRDL and FRDLs) is currently managed through a series of engineered drainage ditches and swales, routed to a settling basin (at the location of FRDL #2), 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 above mean sea level (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.

Seven geologic units were identified at the site based on site borings. The units include fill, residuals, peat, sand and gravel, silt, clay and till. Permeability is moderate to rapid, runoff is slow to rapid, and available water capacity is low to moderate.

Figure 1-2 and 3-4 identify the locations of representative geologic cross sections of the site. Figures 1-3 is a cross section running north-south from the City well field through the site, Figure 3-4 runs east west through the site. <cross-sections>

Hydrogeology

EPA has determined that impacted groundwater at Allied Landfill does not pose a risk outside of the waste. The City of Kalamazoo has raised concerns that contamination from Allied Landfill could migrate to the City well field. In 2009, MHLLC completed a Supplemental Groundwater Study to evaluate whether this pathway exists.

The study included an evaluation of existing data from Allied Landfill, the nearby Strebor facility, and the City wellhead protection model, and the collection of a new round of groundwater elevations at both properties. This additional round of groundwater elevations included a comprehensive network of wells from Allied Landfill and the Strebor, Panelyte, and Performance Paper properties sampled concurrently for the first time. The assessment of existing data supported previous determinations that a groundwater migration pathway from Allied Landfill to the City's Central Well Field 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 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 Central Well Field. 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 Central Well Field.
- All available data suggest that a flow path from Allied Landfill toward the City's Central Well Field is unlikely.

Further empirical support for the conceptual understanding was provided by the analytical results for water samples collected by the City from its own production wells. There have been no detections of PCBs in the City's samples, even at trace levels.

The results of the supplemental groundwater investigation report provide a reasonable basis to determine that it does not appear there is a groundwater migration pathway from Allied Landfill to the City's Central Well Field. The complete report is included as Appendix A to the FS.

MDEQ generally concurred with the study's conclusions in an April 16, 2010 letter to EPA. In it, 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.

Various data (collected over time) illustrate hydraulic disconnection between the surficial aquifer unit and the regional aquifer unit.

NATURE & EXTENT OF CONTAMINATION

Early investigative efforts recognized that if the full extent of PCBs were 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. 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 impacts 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 residual impact 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.

Contaminants of Concern

PCBs are the primary contaminant of concern and therefore are being used as the primary indicator to define the extent of contamination at Allied Landfill. PCBs are associated with the residuals having entered the waste stream during the recycling of carbonless paper and appear to be the most widespread contaminant at Allied Landfill. As previously stated, most other COCs (inorganics and SVOCs) appear to be collocated with PCBs in the various media. PCBs at Allied Landfill are widespread. They are present in the residuals and soils and sediments as a result of the residuals eroding and mixing into the soils and/or sediments near or at the ground surface, in certain subareas of

Allied Landfill, including the Monarch HRDL and Western disposal area.

Figure 1-4 provides the aerial extent of PCB-containing surface soils and residuals. Figure 1-5 provides the aerial extent of PCB-containing subsurface soils and residuals. PCBs are present in concentrations exceeding RALs in the following areas: the soils and sediments in the Former Operations Area, 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 HRDLs/FRDLs; and in seeps in the Former Type III Landfill Area adjacent to the Bryant HRDLs/FRDLs. PCBs were detected in groundwater at isolated locations (3 of 56 monitoring well locations) and seeps (2 of 20 seep locations), all of which were all collocated within or adjacent to borings residuals were observed. As PCBs are not detected in groundwater outside of the waste, EPA does not believe there is a plume of PCBs emanating from Allied Landfill.

The highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures is referred to as the reasonable maximum exposure (RME). PCBs are found in concentrations up to 2,500 ppm, however . the RME for the site soils and sediments is 60 mg/kg. Based upon this exposure scenario and low mobility of PCBs at Allied Landfill, EPA considers PCBs to be a low-level threat waste.

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
- PCB transport in air

PCBs in Residuals

In general, PCBs are generally immobile. They are chemically and thermally stable, fairly inert, have low solubility in water, and have a high affinity for solids making them strongly adhere to residuals. 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 PCB's solubility in water. The coefficient is the ratio of the concentration of PCBs in octanol over the concentration of PCBs in water. PCBs tend to have high Kow indicating they are not very soluble in water. Taken together, the combination of low-water solubility and high Kow values 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.

PCBs at Allied Landfill do not readily migrate out of the paper residuals. The residuals present 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. 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} centimeters per second. 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 high affinity for PCBs to adhere to the residual and the low hydraulic conductivity, it is understood that PCBs do not migrate significantly from the residual material. This finding is supported by the lesser extent of PCB detections in groundwater samples than in soil or sediment.

Groundwater

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

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 residuals. The materials may be transported to the floodplain or sediments in Portage Creek by erosion through the air or surface water runoff.

Direct Discharge

The most significant historical source of PCBs to Portage Creek from Allied Landfill was the discharge of PCB-containing residuals at the Former Bryant Mill Pond. The excavation of PCB-containing sediments, residuals, and soils and subsequent replacement with clean fill in the Former Bryant Mill Pond has isolated the materials from direct contact with surface water, and removed the largest source of PCBs to Portage Creek at Allied Landfill. 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.

SCOPE AND ROLE OF THE RESPONSE ACTION

This response action for Allied Landfill will address paper residuals primarily contaminated with PCBs at the Allied Landfill Property. The other OUs have been or will be addressed with separate remedial actions under separate Records of Decision.

SUMMARY OF SITE RISKS

Exposure to PCBs is the primary risk driver at Allied Landfill. MDEQ completed a *Site-wide Final (Revised) Human Health Risk Assessment* and *Final (Revised) Baseline Ecological Risk Assessment* for the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site. The Human Health Risk Assessment (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
- inhalation of dust and volatile emissions from PCB contaminated materials

The Baseline Ecological Risk Assessment (BERA) quantitatively identified potential risks to various ecological receptors for different exposure pathways. The mink (aquatic) and robin (terrestrial) are used to represent ecological receptors.

EPA has determined that risk to human and ecological receptors exists at the Site based on the

results of the HHRA and BERA. EPA summarized the potential risks posed by PCBs at Allied Landfill in the 2009 "Summarization of Preliminary Remedial Goals Kalamazoo River/Portage Creek OU1." The memo incorporated information from the HHRA, BERA and Michigan Part 201 screening criteria to establish Preliminary Remediation Goals (PRGs) for Allied Landfill. Where available, for contaminants other than PCBs, EPA adopted updated Act 451, Part 201, screening criteria and drinking water maximum contaminant levels as the PRGs. EPA developed and evaluated alternatives in the FS to mitigate the risks. Those alternatives are described below.

As previously discussed, EPA has concluded that identification and appropriate remediation of PCBs will mean that associated chemicals of concern would also be addressed. Therefore the risk assessments focused on PCBs as the risk driver. Other potential contaminants of concern have been identified at Allied Landfill and will need to be considered with PCBs for the remedial action. Contamination has also been identified off-site at residential and commercial properties. The RALs and exposure routes for COCs other than PCBs is in Table 2-4.

Current land use at the Allied Landfill property is industrial, although some adjacent residential properties contain residuals. The future land use at the former Allied Paper property is expected to be commercial and recreational and will continue to be neighbored by residential properties.

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 (soil, in the case of OU1), COCs, allowable risk levels, potential exposure routes, and potential receptors.

EPA has identified the following RAOs for the Allied Landfill OU:

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.

PRGs were developed based on the potential exposure pathways, risk assessments and ARARs. The RAOs, remediation goals, and remediation strategies, alternatives address unacceptable risks at the site. In addition to the quantitative PRGs identified, a qualitative remedial goal is also recommended that requires either remedial actions where residuals are visually observed or sufficient sampling to verify the residuals do not contain PCB concentrations above the applicable goals.

The public has indicated a preference for reducing the footprint of the landfills. The preference will be considered as part of the evaluation against EPA's nine criteria.

Remedial action levels (RALS) for PCBs are included in Table 2-3. RALs for COCs other than PCBs will follow the Michigan Part 201 criteria Table 2-4 March 25, 2011.

Commented [MB3]: Jan, Do you think that we need more detail here?

SUMMARY OF REMEDIAL ALTERNATIVES

In the EPA's judgment, the Preferred Alternative (Alternative 2B) identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health,

welfare, and/or the environment from the contaminated material at Allied Landfill.

- Alternative 1—No Further Action
- Alternative 2A—Consolidate Outlying Areas on the Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Areas with the following steps:
  - Excavate Outlying Areas
  - Excavate and pull back perimeter around Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Areas
  - Pull back Monarch HRDL
  - Consolidate excavated material on the Bryant HRDL/FRDL , Former Type III Landfill, and Western Disposal Areas
  - Install cap on Bryant HRDL/FRDL, Former Type III Landfill, Western Disposal Areas, and Monarch HRDL
  - Implement restrictive covenant to limit use in commercial areas
  - Implement restrictive covenant to prohibit interference with the structures, caps, and fences
  - Implement restrictive covenant to prohibit groundwater use
  - Restore wetlands and implement restrictive covenant to maintain wetland areas.
  - Monitor groundwater to verify effectiveness
- Alternative 2B—Consolidate Outlying Areas and Monarch HRDL on Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Areas with the following steps:
  - Excavate Outlying Areas
  - Excavate Monarch HRDL
  - Excavate and pull back perimeter around Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Area
  - Consolidate excavated material on the Bryant HRDL/FRDL , Former Type III Landfill, and Western Disposal Areas
  - Install cap on Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Area
  - Implement restrictive covenant to limit use in commercial areas
  - 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 maintain wetland areas.
  - Monitor groundwater to verify effectiveness
- Alternative 2C—Consolidate materials from Outlying Areas and Monarch HRDL with a PCB concentration of 500 mg/kg or less on Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Areas and offsite incineration of soils/sediment with PCB concentrations above 500 mg/kg with the following steps:
  - Excavate Outlying Areas
  - Excavate Monarch HRDL
  - Excavate and pull back perimeter around Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Area
  - Offsite incineration of material with PCB concentration s above 500 mg/kg
  - Consolidate materials with PCB concentrations of 500 mg/kg or less on Bryant HRDL/FRDL, Former Type III Landfill and Western Disposal Area
  - Install cap on Bryant HRDL/FRDL, Former Type III Landfill, and Western Disposal Area
  - Restore wetlands and implement restrictive covenant to maintain wetland areas
  - Implement institutional controls, where necessary
  - Monitor groundwater to verify effectiveness
- Groundwater monitoring is included in all of the alternatives that leave waste in place or consolidated onsite. Monitoring will include up- and downgradient wells to determine if COCs are migrating offsite. For Alternative 2 options, the following two subalternatives will be considered as noted above:
  - Subalternative (i)—Groundwater collection and treatment, which includes a system of extraction wells or trenches installed

downgradient to capture groundwater before discharge to Portage Creek.
  - Subalternative (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 Offsite Disposal
  - Excavate Outlying Areas and Operational Areas
  - Transport materials above PRGs offsite for disposal
  - 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

- Alternative 4—Encapsulation Containment System
  - Excavate Outlying and Operational Areas and stockpile
  - Line bottom of OU1
  - Place consolidated material within the lined OU1 area
  - Install cap
  - Implement restrictive covenant to limit use in commercial areas
  - 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 maintain wetland areas.
  - Monitor groundwater to verify effectiveness

Common Elements of Alternatives

For all alternatives except Alternative 1 (No Further Action), predesign investigations are required to further delineate the nature and extent of concentrations of PCBs exceeding the relevant PRGs in certain subareas of the site. As discussed in the following list, 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 will be addressed. Confirmation sampling for PCBs and other COCs will be performed during the implementation of the remedial action to verify the assumption.

- **Operational Areas**—The Operational Areas, consisting of Bryant HRDLs and FRDLs, Monarch HRDL, Former Type III Landfill and the Western Disposal Area, are the focus of the FS and are common to each of the alternatives. During the predesign investigation, these areas will be sampled for PCBs to determine the lateral extents of PCBs exceeding the PRG of 10 mg/kg for PCBs. The management of the materials exceeding PRGs will be evaluated in the Remedial Alternatives. Portions of the following subareas are contiguous and evaluated with the Operational Areas due to encroachment of waste material. However, the following subareas are discussed separately due to the PRGs and proposed approach:
  - **Former Raceway Channel**— During the predesign investigation, sediments in this area will be sampled for PCBs. Sediment exceeding the PRG of 0.33 mg/kg will be excavated. After confirmation samples indicate the extents of excavation are less than the PRGs of 0.33 mg/kg for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the excavation will be the wetland will be restored and an environmental covenant will be implemented to maintain the wetlands.
  - **Panelyte Property**—Waste materials are believed to have encroached onto the southern portion of the Panelyte Property from the Western Disposal Area. During the predesign investigation, the area will be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs will be excavated. After confirmation samples indicate the extents of excavation are less than 10 mg/kg for PCBs

or Michigan Part 201 Non-Residential Criteria for other COCs, the excavation will be backfilled with clean material.

- **Panelyte Marsh**—During the predesign investigation, sediments in this area will be sampled for PCBs. Sediment exceeding the PRG of 0.33 mg/kg will be excavated. After confirmation samples indicate the extents of excavation are less than the PRGs of 0.33 mg/kg for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the wetland will be restored and an environmental covenant will 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 will be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg for PCBs will be excavated. After confirmation samples indicate the extents of excavation are less than 10 mg/kg for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the excavation will be backfilled with clean material.

- **State of Michigan Cork Street Property**—Waste materials are believed to have encroached onto the Cork Street Property from the Monarch HRDL. During the predesign investigation, the area will be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs will be excavated. After confirmation samples indicate the extents of excavation are less than 10 mg/kg for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the excavation will be backfilled with clean material.

- **Residential Subarea (Outlying)**—During the predesign investigation, the subarea identified as "Residential Properties" will be sampled for PCBs. Soils exceeding the PRG of 1 mg/kg for PCBs will be excavated. After confirmation samples indicate the extents of excavation are less than the PRGs of 1 mg/kg for PCBs or Michigan Part 201 Residential Criteria for other COCs, the excavation will be backfilled with clean material.

- **Clay Seam and East Bank Area (Outlying)**—Sampling of these areas has demonstrated that they meet a cleanup level below 1 mg/kg PCBs, and thus, no further action is anticipated in these areas.

- **Commercial Properties (Outlying)**—During the predesign investigation, the areas identified as Commercial Properties will be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs will be excavated. After confirmation samples indicate the extents of excavation are less than 10 mg/kg for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the excavation will be backfilled with clean material mg/kg. Subareas achieving PRGs between 1 mg/kg and 10 mg/kg will 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 will be employed that requiring sampling and removal when existing structures are compromised. Parking lots will be investigated and excavated to meet PRGs, as necessary.

  - **Alcott Street Parking Lot (owned by Lyondell Trust [formerly MHLLC]) south of Alcott Street (Outlying)**—This area will be sampled during the predesign investigation. Soils will be excavated to achieve a PRG of less than 10 mg/kg PCBs or Michigan Part 201 Non-Residential Criteria for other COCs. If parking lots or other paved areas are excavated, the area will be restored. A restrictive covenant will be required to prohibit high occupancy use on this area.

  - **Former Filter Plant (Outlying)**—During the predesign investigation, the former Filter Plant area will be sampled for PCBs. Soils exceeding the PRG of 10 mg/kg PCBs will

be excavated. After confirmation samples indicate the extents of excavation are less than 10 mg/kg for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the excavation will be backfilled with clean material.

- **Former Bryant Mill Pond Area (Outlying)**—During the predesign investigation, soils in the Former Bryant Mill Pond will be sampled for PCBs in the area of seeps and sediment in the associated wetland area. Soils exceeding the cleanup level of 10 mg/kg PCBs, floodplain soils exceeding the PRG of 6.5 to 8.1 mg/kg and sediment exceeding 0.33 mg/kg will be excavated. After confirmation samples indicate the extents of excavation are less than the respective PRGs for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the excavation will be backfilled with clean material. Wetlands were previously delineated in the Former Bryant Mill Pond Area and at least 1 acre of wetland will be mitigated for each acre filled. An environmental covenant will be implemented to maintain wetland areas.

- **Wetland Areas**—Known wetland areas have been discussed with the associated subareas. However, if additional wetland areas with suspected PCB impacts are identified within the Outlying or Operational Areas during the predesign investigation, the wetlands will be investigated for PCBs. Sediment exceeding the PRG of 0.33 mg/kg will be excavated. After confirmation samples indicate the extents of excavation are less than 0.33 mg/kg for PCBs or Michigan Part 201 Non-Residential Criteria for other COCs, the wetland will be restored and an environmental covenant will be implemented to maintain the wetlands.

Known floodplain soils within the Outlying or Operational Areas have been discussed with the associated subareas. However, if additional floodplain soils with suspected PCB impacts are identified within the Outlying or Operational Areas during the predesign investigation, the area will be investigated for PCBs. Floodplain soils exceeding the PRG of 6.5 to 8.1 mg/kg for PCBs will be excavated.

The 2,600 linear feet of sealed-joint sheet pile installed in 2001 along the western bank of Portage Creek was installed to stabilize the perimeter berms of the Bryant HRDLs and FRDLs. Except for Alternative 1, partial or complete removal of the existing sheet pile wall has been evaluated as a component of the alternatives.

Alternative 1—No Further Action

The No Further Action alternative is required in the evaluation of remedial options under the National Oil and Hazardous Substances Pollution Contingency Plan and serves as a baseline against which the other potential remedial alternatives can be compared.

No further active remediation would be performed in any portion of Allied Landfill under this alternative. The potential for human and ecological receptors to be exposed to COCs would not be addressed, and there would remain a potential for COCs to erode into Portage Creek over time since 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 in-place containment with erosion control measures including consolidation of the Outlying Areas and portions of the Operational Areas into the Bryant HRDLs/FRDLs and Monarch HRDL. The Bryant HRDLs/FRDLs Area will include the adjacent Former Type III Landfill and Western Disposal Areas. Alternative 2 was developed to present options for addressing the Outlying Areas within

OU1. Three variations of Alternative 2 were developed, Alternatives 2A, 2B, and 2C, to allow for variations in the consolidation of the excavated materials. Alternative 2 includes covering the landfills after consolidation with an engineered composite landfill cap. For the purpose of cost-estimating, it is assumed the cap will consists of six layers as shown in Figure 4Y. 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 NREPA, as amended, Part 115.

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

Portions of the Bryant HRDLs/FRDLs, Monarch HRDL, Former Type III Landfill, and Western Disposal Area perimeter will be excavated/pulled back and consolidated within the onsite disposal areas to create a setback that will act as a protective buffer along the creek and to enhance long-term slope stability. 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 will be implemented to verify the performance of the remedy, demonstrate that groundwater quality conforms to applicable criteria, and to provide for the appropriate management of landfill gas.

The clean set back between the landfill and Portage Creek will allow room for monitoring wells and an optional groundwater collection treatment system. The groundwater monitoring network consisting of existing and new monitoring wells (as needed) will be located outside areas where waste remains in place (Bryant HRDLs/FRDLs 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 will be installed as part of Alternatives 2B and 2C.

Alternative 2 options include subalternatives for hydraulic control of groundwater. For subalternative (i), USEPA would install a groundwater collection and treatment system. The groundwater collection and treatment system would consist of groundwater extraction wells and a series of sumps and lateral drain lines. For subalternative (ii), a grout slurry wall would be installed downgradient of the Bryant HRDLs/FRDLs and Monarch HRDL (if left in place) to contain impacted groundwater located within OU1 as subalternative (ii). 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 will not necessarily key into clay or bedrock—portions of the slurry wall at this depth would still terminate in the upper sand zones. Subalternative (ii) includes the same groundwater collection and treatment system as subalternative (i).

Alternative 2 includes restrictive covenants to prevent exposure of PCBs at depth and prohibit interference with the cap, informational devices, and

access restrictions consisting of perimeter fence with posted warning signs.

Alternative 2A—Consolidation of Outlying Areas on HRDL/FRDL and Monarch HRDLs

Under Alternative 2A, the excavated material from the Outlying Areas and certain perimeter areas of the Operational Area would be consolidated on the Bryant HRDLs/FRDLs and Monarch HRDL. These areas targeted for excavation and consolidation are shown in Figure X. After consolidation, each landfill would be covered with the engineered cap as described above.

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

Under Alternative 2B, the excavated material from the Outlying Areas and certain perimeter areas of the Operational Area would be consolidated on the Bryant HRDLs/FRDLs Landfill. The Monarch HRDL would also be excavated and consolidated on the Bryant HRDLs/FRDLs Landfill. The areas targeted for excavation and consolidation are shown in Figure Y. The subsequent capping of the Bryant HRDLs/FRDLs would be conducted as described above.

Alternative 2C—Consolidation of Outlying Areas and the Monarch HRDL on HRDL/FRDL with Offsite Incineration of Excavated Materials with PCBs Greater than 500 mg/kg

The extents of excavation and the consolidation areas are the same for Alternative 2C as described under Alternative 2B and are shown in Figure Y. Excavated materials with PCB concentrations above 500 mg/kg would be transported for offsite incineration. Remaining materials with PCB concentrations of 500 mg/kg or less would be consolidated on the Bryant HRDLs/FRDLs and subsequently capped.

The design investigation will be used to identify hot spots within the area to be consolidated with PCB concentrations greater than 500 mg/kg. For the purpose of the feasibility study, it is assumed that approximately 5 percent of the soils excavated from the pullback near the Western Disposal Area and Former Type III Landfill would require offsite incineration. Approximately 2 percent of soils excavated from Outlying Areas, Monarch HRDL, and the setback between Portage Creek and Bryant HRDLS/FRDLs would require offsite incineration. The assumptions are based on the cumulative distribution functions performed in a statistical evaluation by the USEPA Field Environmental Decision Support (FIELDS) Team using the existing data sets.

Alternative 3—Total Removal and Offsite Disposal

The primary element of Alternative 3 is the excavation and offsite disposal of all areas. The excavation areas include the following:

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

Materials will be excavated and transported directly to offsite commercial landfills. Materials with PCB concentrations of 50 mg/kg or greater

would be transported to and disposed of in approved offsite 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.

Post-removal confirmatory sampling and analysis would be performed at the excavation areas. 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 maintain wetlands areas will be required.

In addition, part of this alternative would include the removal of 2,600 linear feet of sealed-joint sheet pile along the western bank of Portage Creek to the extent feasible. The 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 is developed with the intent of removal of 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 exceedances remain. Monitoring would be performed as described in Alternative 2 options and 4. Institutional controls (for example, restrictive covenants and enforcement tools) would be implemented for the areas where COCs may be 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 RALs as described for Alternative 3
- Construct a landfill bottom liner in previously excavated former landfill areas
- Place excavated materials on the newly constructed landfill liner
- Excavate and consolidate other onsite areas with PCB-containing materials in the new landfill areas
- Construct a landfill cap over the new landfill areas (same construction as Alternative 2)
- Some materials could be volumetrically displaced and would be disposed of in offsite commercial landfills

The same areas identified in Alternative 2 are targeted for excavation in Alternative 4.

In the Outlying Areas, 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 area. The Panelyte Marsh and Former Monarch Raceway Channel would be backfilled to existing grades and restored to promote the re-establishment of 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.

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 HRDLs/FRDLs, then the Former Type III Landfill.
- Repeat the above process for the western half of the Western Disposal Area, but do not construct 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 is 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 (consisting of a geonet that is heat-bonded on each side to a non-woven needle-punched geotextile) 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} centimeters per second, 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 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 (as described above), 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 (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 offsite 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 offsite outlying areas would be volumetrically displaced, which means that more than 500,000 yd^3 of materials would have to be transported offsite for disposal.

The materials would be transported to and disposed of in offsite landfills. Materials with PCB concentrations of 50 mg/kg or greater would be transported to and disposed of in approved offsite 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 will 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.

Part of this alternative would include removal of 2,600 linear feet of sealed-joint 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 will be further evaluated in the design should this alternative be selected. The potential for groundwater mounding behind the wall will be included as part of the evaluation. The 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 groundwater monitoring system as described for Alternative 2.

EVALUATION OF ALTERNATIVES

EPA uses 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 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.

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

The overall protectiveness to human health and the environment is similar for each active remedial alternative as long as all elements of the remedy, including O&M and monitoring, are properly maintained, RAOs 1 through 3 would be achieved for Alternatives 2, 3, and 4, the significant difference being that with increasing complexity of remedy, there are increased short-term risks.

Alternatives 2, 3, and 4 are each expected to be effective long-term remedies for Allied Landfill. Under these alternatives, the three RAOs would be achieved and ARARs would be met. The primary exposure pathways at Allied Landfill are associated with the following:

- Consumption of PCB-containing fish
- Direct contact with exposed materials with COCs above PRGs
- Inhalation of dust and volatile emissions from floodplain soils and consolidated residuals
- Ingestion of or direct contact with groundwater impacted above PRGs

Transport mechanisms that may result in completed exposure pathways include the following:

- Transport of groundwater impacted by contaminated material
- Surface water runoff
- Wind dispersion of exposed materials with COCs above PRGs
- Erosion of contaminated materials to Portage Creek and Kalamazoo River System

The sources of PCBs and relevant COCs to groundwater, surface water, air, and sediments will be reduced by addressing PCBs in soils and

sediments, because the PCBs are bound to the paper waste, which is found in isolation and intermixed into soils and sediments. PCBs are located in the surface and subsurface soils and sediments onsite and in outlying areas. Alternatives 2, 3, and 4 each achieve protectiveness through excavation of exposed contaminated soils with consolidation onsite beneath a landfill cap or offsite disposal to prevent direct contact and transportation by erosion. Alternative 2C has an offsite incineration component for the most contaminated excavated soils. 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. Capping will prevent infiltration of surface water through the consolidated soils. The groundwater and seep samples with elevated PCB concentrations were generally located in areas of Allied Landfill that were not addressed by IRM activities. The areas would be addressed in each of the Alternatives 2 through 4. Alternative 3 includes complete removal and offsite disposal to eliminate the potential for leaching and colloidal transport.

As stated, 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. Therefore, EPA believes that Alternatives 2, without additional groundwater components (i and ii) are protective. Addition of collection systems i and ii would not significantly increase the overall protectiveness of Alternatives 2.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

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. There are three different types of regulatory requirements: chemical-specific ARARs, action-specific ARARs, and location-specific ARARs.

Under Alternative 1, the requirements to reduce exposure or associated risk to acceptable levels, achieve an acceptable degree of protectiveness, and appropriately manage/operate disposal areas would not be achieved. The relevant action and location-specific ARARs vary among Alternatives 2, 3, and 4. Alternatives 2, 3 and 4 achieve the self-implementing on-site cleanup levels in the Outlying Residential and Commercial areas under 40 C.F.R. § 761.61(b). Under Alternative 2, the consolidation and capping of material in the landfills on site meets the risk-based method for the disposal of PCB remediation waste under 40 C.F.R. § 761.61(c);

Implementation of Alternatives 3 and 4 would result in the achievement of the identified ARARs. Under Alternatives 2, 3 and 4, compensatory wetland mitigation will be provided in accordance with the Section 404(b)(1) guidelines, 40 C.F.R. § 230.10(a) for any wetlands that are or have been filled during remediation. Under Alternatives 2 and 4, groundwater monitoring will 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 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. Groundwater samples will be collected and analyzed from the shallow and lower aquifer in accordance with NREPA Part 201 and 40 C.F.R. Section 761.75(b).

Commented [GU4]: As we use 0.33, we are also using a risk-based cleanup number too.

Commented [JC5]: ORC management will weigh in on this..

Balancing Criteria

3. Long-term Effectiveness and Permanence

This criterion evaluates the effectiveness of the alternatives in protecting human health and the environment when the cleanup is complete. It also considers the effectiveness of the cleanup over the long term.

With the exception of Alternative 1, each of the remaining alternatives would be expected to meet RAOs 1 through 3 and provide long-term effectiveness and permanence once the RAOs are met. The active 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 onsite containment of the material with COCs above RALs as a primary component of the remedy, 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 does not significantly increase the long-term effectiveness of the remedy through incineration of excavated material with PCB concentrations greater than 500 ppm, because capping prevents direct contact exposure and erosion/transport exposure route.

Capping is an effective mechanism to prevent infiltration through materials containing PCBs. Currently PCBs have not been detected outside the waste in the groundwater. The installation of a cover system will serve to further mitigate the potential for infiltration and migration of PCBs out of the waste via groundwater. The addition of groundwater subalternatives i or ii do not significantly increase the long-term protectiveness of Alternative 2.

Alternative 3 would achieve long-term effectiveness and permanence by removing all material with COC exceedances from Allied Landfill and disposing of it at offsite solid waste landfills and TSCA facilities. Alternative 4 would achieve long-term effectiveness and permanence by placing the PCB material into containment cells constructed onsite with O&M, monitoring, and institutional controls.

Under Alternative 3, no long-term O&M or monitoring would be required onsite with the exception of areas where waste is left in place because of the proximity to buildings. Materials with COC concentrations above relevant RALs would be excavated and disposed of offsite. The large-scale removal and offsite disposal of materials presented in Alternatives 3 provides an added degree of permanence at Allied Landfill through removal.

Alternative 2 options are proven technologies that meet the requirements for effectiveness and permanence. Alternative 3 provides the greatest long-term effectiveness and permanence by removing the materials from the site. Alternative 4 provides an added level of protectiveness because wastes are ultimately disposed of in lined containment cells. The main difference between Alternatives 3 and 4 is that the waste is moved and managed offsite in Alternative 3. The long-term monitoring and maintenance components to be implemented in conjunction with institutional controls under Alternative 2 options, or 4 would provide the necessary mechanisms to verify that each remedy is performing as anticipated over time. As a result, Alternative 2 options and 4 are also expected to provide effective, permanent remedies. Given the site conditions, Alternative 4 may not be significantly more protective than Alternative 2.

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

This criterion addresses the preference for selecting remedial actions that use treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible encapsulation, or reduction of total volume of contaminated media.

Treatment is not a component of any of the remedial alternatives carried forward except Alternative 2C. However, Section 300.430(a)(iii)(B) of the NCP contains an expectation that engineering controls, such as containment, will be used for waste that poses a relatively low long-term threat where treatment is impracticable. Alternative 1 does not reduce the toxicity, mobility, or volume of COC-impacted materials. Alternatives 2A, 2B, and 4 would reduce the mobility of COCs through isolation and containment. Alternative 2C is the only alternative that would result in a reduction of toxicity or volume by treatment with the offsite incineration of a portion of excavated soils. However, due to the nature of the materials, the PCBs do not appear to be mobile at Allied Landfill, regardless of concentration.

5. Short-term Effectiveness

This criterion examines the effectiveness of the alternatives in protecting human health and the environment during the cleanup until the cleanup is complete. It also considers protection of the community, workers, and the environment during the cleanup.

The evaluation of short-term effectiveness criterion are 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 6-2.

With the exception of Alternative 1, all the alternatives with active remedial components would have some short-term impacts 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. Alternative 2 options require the least amount of disturbance and shortest construction time. The impacts can be effectively addressed 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. Alternative 2C is less effective than 2A and 2B due to the potential for dispersion or erosion of excavated materials during characterization and segregation for incineration. Alternative 2C also incurs increased risks associated with offsite transport. Due to the limited number and location of TSCA permitted incineration facilities, transport for Alternative 2C is significantly greater distances than in Alternatives 3 or 4. The addition of subalternatives i or ii do increase the short term impacts of implementing Alternative 2 options, with subalternative ii having the greater impact.

Alternatives 3 and 4 present greater short-term impacts because of the amount of materials required to be moved and the increased construction duration. The project duration for the alternatives is longer than Alternative 2 options, increasing both construction-related and exposure risks to workers. The additional volume of materials to be handled in Alternatives 3 and 4 also result in an increase in truck traffic in the vicinity of Allied Landfill during the project. During the implementation of Alternative 3, there would be an

average of 115 truck trips per day, 5 days per week, year-round, for approximately 5 years. 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 offsite outlying areas to the onsite disposal cells, to bring in clean fill, and to haul displaced materials to offsite disposal locations. During the approximately 5 years of the project when excavation and filling work would be the focus, there would be an average of 90 trucks per day in and out of OU1. The increase in truck traffic results in an increased risk for vehicular accidents.

There are additional qualitative impacts to the local community, such as noise and dust, for a period of 5 years (Alternative 3) to 10 years (Alternative 4), which will place an increased burden on the community. 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 materials containing COCs above the PRGs.

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.

The primary remedial components of Alternative 2 options, 3, and 4 are proven, readily implementable, have been used successfully as part of other environmental cleanup projects, and they 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 be met.

In addition, Alternative 2 options, 3, and 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.

Alternatives 2C, 3 and 4 are more difficult to implement due to different constraining conditions. For Alternative 2C, there is limited availability of TSCA permitted incinerators. For Alternative 3, the availability of solid waste and/or TSCA landfills to accept the volume of materials to be disposed of offsite would 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 Alternative 3 and 4 in which a large volume of PCB- and other COC-containing material would be disposed of offsite. It is also possible that the combined disposal capacity in all of the nearby solid waste facilities and TSCA landfills would be insufficient for the large volumes of PCB-containing material proposed for disposal under Alternative 3. The result could be increased

transport distances for offsite disposal, and consequentially increased risks and costs.

Construction of the Containment Cells

Additional implementability challenges associated with the construction of the containment cells in Alternative 4 include sequencing and space constraints, developing a plan for excavating 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 will be available onsite for staging of clean materials and temporary storage of COC-containing materials. Eventually, onsite capacity will be depleted, and a substantial volume of material will have 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 offsite areas would be volumetrically displaced, resulting in more than 500,000 yd^3 of materials being transported offsite for disposal, which would have a significant impact on both the implementation and cost of this alternative. The control and management of surface water runoff from the temporarily stored COC-containing materials also will become increasingly challenging as less area is available for the operations under Alternative 4.

There are no technical or administrative implementability issues associated with Alternative 1 because no active remediation would take place.

7. Cost

This criterion evaluates the capital and operation and maintenance 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 subalternatives presented in this Proposed Plan are summarized in Table 6-3. The cost estimates are consistent with FS-level of estimation, with an accuracy of +50 to -30 percent. Alternative 1 has no associated capital or O&M costs since there would be no further actions taken, but does require 5-year reviews as shown with periodic costs.

TABLE 6-3
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	$0	$0
Alternative 2A	$36 million	$7.4 million	$120,000	$43 million
Subalternative (i)	$1.6 million	$3.1 million		$4.6 million
Subalternative (ii)	$10 million	$3.1 million		$13.0 million
Alternative 2B	$36 million	$5.5 million	$120,000	$41 million
Subalternative (i)	$1.5 million	$3.1 million		$4.5 million
Subalternative (ii)	$8.6 million	$3.1 million		$11.7 million
Alternative 2C				
Alternative 3	$188 million	$0 million	$120,000	$189 million
Alternative 4	$131 million	$5.5 million	$120,000	$136 million

Note: Costs for subalternatives (i) and (ii) are the same for Alternative 2B and 2C.

Modifying Criteria

8. 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.

The State of Michigan supports EPA's preferred alternative, Alternative 2B.

9. Community Acceptance

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

SUMMARY OF THE PREFERRED ALTERNATIVE

The preferred alternative for addressing contamination at Allied Landfill is Alternative 2B **(Consolidation of Outlying Areas and the Monarch HRDL on HRDL/FRDL)**. Alternative 2B is preferred over the other alternatives because once implemented it would:

- immediately prevent human and ecological exposure to contaminated materials at Allied Landfill;
- prevent erosion and off-site migration of contaminated materials from Allied Landfill; and
- prevent contaminated material at Allied Landfill from impacting groundwater or surface water emanating from Allied Landfill.

The preferred alternative is the appropriate remedy for Allied Landfill given site conditions. The alternative would achieve the performance goals within a reasonable time frame more cost-effectively than other alternatives and requires minimal effort to maintain protectiveness over the long-term. Alternative 2B 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 and modifying criteria.

Based on the information available at this time, EPA and the State of Michigan believe that the preferred alternative will be protective of human health and the environment, comply with regulatory criteria, be cost-effective, and use permanent solutions. 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 2-3
Summary of Remediation Action Levels Proposed by EPA for PCBs

Allied Landfill Feasibility Study Report—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site			
Medium	Pathway		PCB PRG
Soils	Human Health	Residential	1.0mg/kg
		Commercial	10mg/kg
		Recreational	23 mg/kg
	Ecological	Aquatic (Mink)	0.5–0.6 mg/kg
		Terrestrial (Robin)	6.5–8.1 mg/kg
Subsurface Soils	Human Health	Residential	1.0mg/kg
		Commercial	10mg/kg
		Recreational	23 mg/kg
	Ecological	Terrestrial (Robin)	6.5–8.1 mg/kg
Surface and Subsurface Sediments	Human Health	Fish Consumption	0.33 mg/kga
	Ecological	Aquatic (Mink)	0.5–0.6 mg/kg
Groundwater (including seeps)	Human Health	Direct Contact	3.3 µg/Lb
	Groundwater-Surface Water Interface (GSI)		0.2 µg/Lc
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 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).
bGroundwater for use as drinking water is not considered a complete pathway so the Part 201 Drinking Water criteria of 0.5 microgram per liter (µg/L) was not used. The Part 201 direct contact criteria were used for protection of human health due to the presence of seeps.
cThe Michigan Part 201 GSI (criteria protective of surface water) is a PRG,
mg/kg = milligrams per kilogram, µg/L = micrograms per liter, N/A = not applicable
Source: CH2M HILL 2009

TABLE 1-1

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	

TABLE 1-1

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]

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 6-2
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	42 acres	316,000 yd^3	Approximately 2 years	Least of the active alternatives; managed by health and safety plan.	Associated with dust, noise, and truck traffic.
Alternative 2B	42 acres	486,000 yd^3	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	42 acres	486,000 yd^3	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 3	52 acres	1,575,500 yd^3	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 40 trips daily in and out of Allied Landfill for the duration of the project. Greatest number of miles driven due to volume transported to disposal facilities with limited locations.
Alternative 4	52 acres	1,575,500 yd^3	10 years	Greater than Alternatives 2 and 3 given the	Greater than Alternatives 2 and 3; associated with noise

TABLE 6-2
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
				area/volume of targeted material and significantly increased project duration.	and dust over the longest project duration. Slightly more truck trips than Alternative 3, but 1/3 of the miles outside Allied Landfill due to decreased volume transported to disposal facilities.

Table 2-4
Summary of Proposed Remediation Action Levels for COCs

Allied Landfill Feasibility Study Report—Allied Paper, Inc. / Portage Creek / Kalamazoo River Superfund Site

Commented [JC6]: Add Commercial/industrial direct contact

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

aOnly the data from the 2002–2003 groundwater and seep samples are summarized to reflect conditions after removal.

bDioxin and furans were only sampled in 1998.

cBackground 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
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 6-1

Comparative Analysis of Alternatives

Allied Landfill Feasibility Study Report—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.	$0
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 most ARARS.	Effective.	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.	$36 million
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 most 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.	$35 million
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 Allied Landfill. 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 Allied Landfill.	$238 million
Alternative 4	Encapsulation Containment System	Protective. Little advantage achieved by construction of the liner. Compacted waste can achieve $10E^{-7}$ 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.	$139 million

Commented [b7]: Will update