ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

OPERABLE UNIT 5
AREA 2

Allegan County, Michigan

Record of Decision

U.S. Environmental Protection Agency Region 5

77 W Jackson Blvd
Chicago, IL 60604

September 2017

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FIGURES

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APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
AR	Administrative Record
ARARs	applicable or relevant and appropriate requirements
BERA	baseline ecological risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CDM	Camp, Dresser, McKee
cfs	cubic feet per second
CIP	Community Involvement Plan
COC	contaminant of concern
CRP	Community Relations Plan
CSM	conceptual site model
CWA	Clean Water Act
cy	cubic yard
dioxins/furans	polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans
EC	engineering control
EPA	U.S. Environmental Protection Agency
FRG	final remediation goal
FS	feasibility study
GP	Georgia Pacific
HI	hazard index
HQ	hazard quotient
HHRA	human health risk assessment
IC	institutional control
LTM	long-term monitoring
MDCH	Michigan Department of Community Health
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
Millennium	Millennium Holdings, LLC
MNR	monitored natural recovery
NCP	National Contingency Plan
ND	non-detect
NPL	National Priorities List
NREPA	Natural Resources and Environmental Protection Act
O&M	operation and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
ppt	parts per trillion
PRGs	preliminary remediation goals
PRP	potentially responsible party
RA	remedial action
RAL	remedial action level
RAO	remedial action objective

RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RI	remedial investigation
ROD	Record of Decision
SRI	supplemental remedial investigation
SRI/FS	supplemental remedial investigation and feasibility study
State	State of Michigan
SVOCs	semi-volatile organic compounds
SWAC	surface-weighted average concentration
TAG	Technical Assistance Grant
TBERA	terrestrial baseline ecological risk assessment
TCRA	time-critical removal action
TEQ	toxicity equivalence
TOC	total organic carbon
TSCA	Toxic Substances Control Act
µg/L	microgram per liter
UU/UE	unlimited use and unrestricted exposure
VOCs	volatile organic compounds
Weyerhaeuser	Weyerhaeuser Company

Part 1 – Declaration

1.1 Site Name and Location

Allied Paper, Inc./Portage Creek/Kalamazoo River Site
CERCLA SITE ID# MID006007306
Operable Unit 5, Area 2
Allegan County, Michigan

1.2 Statement of Basis and Purpose

This decision document presents the Selected Remedy for Area 2 of Operable Unit 5 (OU5) of the Allied Paper, Inc./Portage Creek/Kalamazoo River Site located in Kalamazoo, Michigan (the Site) (see Figure 1).

OU5 encompasses 77 miles of the Kalamazoo River from Morrow Dam east of Kalamazoo to the river mouth at Lake Michigan, plus a 3-mile stretch of Portage Creek in Kalamazoo (see Figure 2). Area 2 of OU5 is a 1.9-mile stretch of the Kalamazoo River located between the former Plainwell Dam and the Otsego City Dam (see Figure 3).

The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. Section 9601 *et seq.* (CERCLA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300 (NCP). This decision is based on information contained in the Administrative Record file (AR) for OU5 of the Site.

The State of Michigan (State) has indicated that it intends to concur with the Selected Remedy.

1.3 Assessment of Site

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

1.4 Description of Selected Remedy

The primary risks associated with OU5 are to human receptors through consumption of polychlorinated biphenyl (PCB)-contaminated fish and to ecological receptors through exposure to PCB-contaminated soil. The U.S. Environmental Protection Agency (EPA) is selecting Alternative A-5 as the remedy (Selected Remedy) for Area 2 of OU5 to address these risks. The Selected Remedy focuses on PCBs as the primary contaminant of concern (COC) but also addresses polychlorinated dibenzo-*p*-dioxins/polychlorinated dibenzofurans (dioxins/furans) found in Area 2 of OU5.

The cleanup of OU5 is not dependent on response actions at any other Site OUs. Within OU5, the remedial action (RA) for Area 2 is expected to follow the RA for Area 1, which is located immediately upstream of Area 2 and currently in the remedial design (RD) phase.

Alternative A-5: Capping, Bank RAL[1] Excavation, Channel Realignment, Floodplain Soil Excavation, Gun River Excavation, Targeted Excavation of Knife Blade Island, Institutional Controls and Long-Term Monitoring

The major components of the Selected Remedy, which is illustrated on Figure 4, are briefly described as follows:

- Otsego City Dam removal: Removal of the dam will result in the northeast anabranches not conveying water under normal flow conditions. As such, fish will no longer have routine access to these areas with higher PCB concentrations. Dam removal is also desired by the City of Otsego and the State of Michigan for several reasons, including reducing long-term dam maintenance and restoring natural free-flowing conditions to the river.

- Channel realignment: Realigning the river in Area 2 to create a stable single channel with dam removal will prevent the river from regularly forming unstable anabranches, and will protect the floodplain from future erosion due to channel migration. Removing the dam and constructing a single stable channel are believed to be necessary to meet the remedial action objectives (RAOs) for Area 2.

- Bank RAL excavation: Bank soil along the realigned channel will be excavated to a RAL of 5 milligrams per kilogram (mg/kg) total PCBs in a 10-foot swath along the bank. The bank soil excavation will provide a buffer between the newly realigned channel and floodplain soils as a measure of added protection above that provided by the natural channel design to prevent migration of PCBs from floodplain bank soil to the river.

- RD sampling as approved by EPA and targeted removal: Sampling will include the identification of the remedial area footprints, as well as targeting areas near the prior sample locations that exceeded 50 mg/kg PCBs to confirm the presence and extent of such hot spots for targeted removal.

- Excavation of confirmed PCB hot spots in areas to be capped: The footprints of confirmed hot spots exceeding 50 mg/kg on Knife Blade Island and in proposed cap areas will be excavated and backfilled prior to installing caps.

- Excavation of floodplain soil exceeding the 20 mg/kg RAL for PCBs outside the realigned channel footprint: Remedial footprints in the Area 2 floodplain will be

[1] A remedial action level or RAL is a value that triggers cleanup.

identified based on reducing potential exposure to soil for ecological and human receptors, to meet RAOs 3 and 5.

- Capping of the northeast anabranches and Pond G: The northeast anabranches that are cut off from the main channel following Otsego City Dam removal and channel realignment will be capped to prevent ecological exposure. Caps in the floodplain and anabranches will consist of a two-foot-thick soil cap (including topsoil layer) over a geotextile. For Pond G, the subaqueous cap will consist of an 18-inch layer of soil overlain with six inches of sand or gravel.

- Excavation of Gun River sediment and bank soil: Gun River will be modified as part of channel realignment. Additional RD sampling will be conducted to determine the extent of sediment and bank soil excavation required.

- Targeted excavation of soil/sediment with PCB concentrations exceeding 50 mg/kg at Knife Blade Island: Additional RD sampling will be conducted to confirm the hot spot locations and identify any additional hot spot areas to be excavated.

- Institutional controls (ICs): ICs include continuation of fish consumption advisories and warning signage until fish tissue goals are met, and land use restrictions to prevent future residential use and limit human exposure at all properties where contamination is left in place at levels unsuitable for unrestricted residential use (i.e., at concentrations greater than 2.5 mg/kg PCBs).

- Long-term monitoring (LTM) would include visual river bank and channel inspections, and maintenance activities for caps, bank treatments, and/or vegetation restoration, as well as monitoring surface water, fish tissue and sediment until fish tissue levels attain final remediation goals (FRGs), which is estimated at 32 years after ROD issuance.

The Selected Remedy is Alternative A-5, as described in Section 2.12. The time to complete construction will be approximately 5 years, at an estimated cost of $46,400,000. Alternative A-5 includes approximately 28 acres of capping and 29,200 cubic yards (cy) of excavation over a total remedial footprint spanning approximately 38 acres.

1.5 Statutory Determinations

The Selected Remedy set forth in this ROD achieves the statutory and regulatory mandates set forth in CERCLA Section 121 and the NCP. Specifically, the Selected Remedy addresses exposure to PCBs in a manner that is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements (ARARs), is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The Selected Remedy does not satisfy the CERCLA statutory preference for treatment as a principal element of the remedy for the following reasons: no source materials constituting principal threats have

been identified at Area 2 of OU5 of the Site, and the low-level PCB contamination does not lend itself to any cost-effective treatment.

Because this remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure (UU/UE), a statutory review will be conducted within five years after initiation of RA to ensure that the Selected Remedy is, or will be, protective of human health and the environment. Two five-year reviews have already been conducted at the Site, and the Selected Remedy for Area 2 of OU5 will be included in future reviews.

Under the Toxic Substances Control Act (TSCA), EPA finds that the PCBs remaining on Site as part of the Selected Remedy will not pose an unreasonable risk of injury to human health or the environment pursuant to 40 C.F.R. Part 761.61(c).

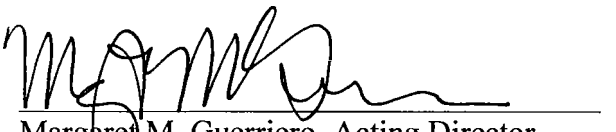
1.6 Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the AR for Area 2 of OU5 of the Site.

Information Item	Section in ROD
Chemicals of concern and their respective concentrations	2.5
Baseline risk represented by the chemicals of concern	2.7
Cleanup levels established for chemicals of concern and the basis for these levels	2.8
How source materials constituting principal threats are addressed	2.11
Current and reasonably-anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD	2.2, 2.6
Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy	2.12
Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	2.9, 2.10
Key factor(s) that led to selecting the remedy (i.e., describe how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision)	2.12

1.7 Authorizing Signature and Support Agency Acceptance of Remedy

EPA, as the lead agency for the Site, formally authorizes this ROD.



Margaret M. Guerriero, Acting Director
Superfund Division
U.S. Environmental Protection Agency
Region 5

September 28, 2017
Date

The State of Michigan Department of Environmental Quality (MDEQ), as the support agency for the Site, has indicated that it intends to concur with the ROD. MDEQ's concurrence letter will be included in the AR upon receipt.

Part 2 – Decision Summary

2.1 Site Name, Location, and Brief Description

Name, Identification Number, Official Site Address, Location

Allied Paper, Inc./Portage Creek/Kalamazoo River Site
CERCLA SITE ID# MID006007306
420 East Alcott Street, Kalamazoo, Michigan 49001

The Site is located in both Allegan and Kalamazoo Counties of southwest Michigan (see Figure 1).

Site Type and Brief Description

The Site was listed on the National Priorities List (NPL) in August 1990 and consists of former disposal areas, former paper mill properties, and contaminated sediments, banks, and floodplains of the Kalamazoo River and Portage Creek.

EPA often divides complex cleanup sites into smaller, more manageable sections called operable units or OUs. The entire site currently comprises six different OUs:

- OU1 – Allied Paper, Inc./Bryant Mill Pond;
- OU2 – Willow Boulevard/A-Site Landfill;
- OU3 – King Highway Landfill;
- OU4 – 12th Street Landfill;
- OU5 – 77 miles of the Kalamazoo River and 3 miles of Portage Creek; and
- OU7 – former Plainwell Paper Mill Property.

OUs 1 through 4 and 7 are source-area OUs located adjacent to the Kalamazoo River or Portage Creek. The RODs for those OUs all have been issued and address contaminated soils and paper-waste residuals in certain mill areas and land-based disposal areas. EPA designated OU6 as a placeholder for certain other source areas at the Site, but that designation is not currently being used for any ongoing activities or geographic areas.

OU5 encompasses 77 miles of the Kalamazoo River from Morrow Dam east of Kalamazoo to the river mouth at Lake Michigan, plus a 3-mile stretch of Portage Creek in Kalamazoo. EPA divided OU5 into seven different areas (see Figure 2). This ROD addresses Area 2.

Area 2 of OU5 is a 1.9-mile stretch of the Kalamazoo River located between the former Plainwell Dam and the Otsego City Dam (see Figure 3). This section of the river flows through forested wetland areas with predominantly recreational land use, and ends at the City of Otsego. The 12th Street Landfill (OU4) is located at the upstream end of Area 2.

Sediments and floodplain soils are the media of concern in Area 2. Groundwater is not a medium of concern (see discussion below in Sections 2.2 and 2.5).

Area 2 has two distinct sections: the upstream, free-flowing anabranched section (approximately 0.7 miles long) and the downstream section influenced by the Otsego City Dam (approximately 1.2 miles long) (see Figure 3).

Lead and Support Agencies and Source of Cleanup Funds

Since the start of the Site investigation effort in 1991, EPA and the State conducted interagency negotiations to determine which government agency should act as the lead agency and which as support agency in the remedial process. The roles of EPA and the State related to the Site and each OU are set forth in a series of Site-wide Memoranda of Understandings, which are part of the AR for the Site. EPA is currently the lead agency for all response actions and enforcement activities at OU5.

EPA has issued general notice letters to multiple potentially responsible parties (PRPs) at the Site. EPA expects the PRPs to fund and/or implement the response actions detailed in this ROD.

2.2 Site History and Enforcement Activities

Site History

As mentioned above, OUs 1 through 4 and 7 consist of several former paper mill properties located along the Kalamazoo River and Portage Creek. These OUs include the disposal areas (landfills and/or lagoons) for wastes generated by those mills, as well as areas in and along the river and creek to which those wastes were discharged or migrated. Since the Site's 1990 NPL listing, several response actions were conducted at many of the Site OUs.

The Site is primarily contaminated with PCBs that were found in the waste streams at paper mills, although other industrial operations also used PCBs along the Kalamazoo River. The former paper mills recycled and/or de-inked and re-pulped carbonless copy paper that contained PCBs as an ink carrier. The mill operators discharged wastewater directly into Portage Creek and the Kalamazoo River and left dewatered wastes, commonly referred to as residuals, in on-site dewatering lagoons or disposed of the PCB-contaminated residuals in upland or wetland areas along the Kalamazoo River and Portage Creek.

Six former hydroelectric dams are located along the Kalamazoo River within the Site boundaries. In the 1970s, the State partially dismantled three dams (Plainwell, Otsego, and Trowbridge). This activity dropped the water level, and the contaminated sediment that was once under water became PCB-contaminated floodplain soil. Lowering of the water levels also increased bank erosion.

Site Investigations and Related Enforcement Activities

The Michigan Department of Natural Resources (MDNR) first became concerned about the presence of PCBs in the Kalamazoo River in 1971, after routine surface water and biota sampling at the mouth of the river indicated that PCBs were discharging from the river into Lake Michigan. During the summer of 1972, MDNR conducted an extensive survey of PCB levels in sediments of the Kalamazoo River. In 1990, EPA listed the Site on the NPL as a Superfund site, and CERCLA site investigations began in 1993.

In February 2007, Georgia-Pacific, LLC (GP) and Millennium Holdings, LLC (Millennium) entered into an Administrative Order on Consent (AOC) with EPA to conduct a series of supplemental remedial investigations and feasibility studies (SRIs/FSs) at OU5.[2]

As described below, various parties – including PRPs, EPA, and the State – collected an extensive body of data from a variety of environmental media over the years. At OU5 (Areas 1 through 7), more than 15,000 samples were collected and analyzed prior to the start of the OU5 SRI work in 2007. The samples were analyzed for various constituents including PCBs, metals, polycyclic aromatic hydrocarbons, and pesticides.

During 2008 and 2009, five quarterly groundwater sampling events were conducted in a network of 15 monitoring wells as part of the Plainwell Impoundment time-critical removal action (TCRA), located in Area 1 of OU5. PCBs were not detected in groundwater.[3]

Sediment data for Area 2 have been collected under various sampling programs, starting with the original remedial investigation (RI) work in 1993/1994. Data from the original RI were used to develop an understanding of spatial and historical PCB trends in sediment in Area 2. These data were supplemented in 2000 by additional sediment sampling. In 2001, as part of a two-phased investigation of Area 2, EPA collected and analyzed additional sediment and soil samples. In 2011, Weyerhaeuser Company (Weyerhaeuser) conducted additional sediment sampling in Area 2. From 2011 through 2012, GP conducted SRI field investigations that added more than 1,000 PCB data points for Area 2 sediment and soil. The primary intent of the SRI work was to address localized data gaps and further define the nature and extent of contamination. Details regarding the Area 2 SRI sampling efforts and results are discussed in the "Nature and Extent of Contamination" portion of Section 2.5, below.

A human health risk assessment (HHRA) for the Site was completed by MDEQ's contractor, Camp, Dresser, McKee (CDM), in May 2003. The HHRA evaluated potential current and future risks to people who may live or engage in recreational activities near

[2] Following its bankruptcy in 2009, Millennium stopped participating in the SRI/FS work.

[3] Based on this information, in conjunction with groundwater information from other site OUs and knowledge of the nature of the PCB contamination at the site, EPA has concluded that groundwater is not a medium of concern at Area 2 of OU5.

the Kalamazoo River and its floodplains along all seven areas of OU5, including risks to subsistence and sport anglers who may consume fish caught from the Kalamazoo River. Additionally, the Michigan Department of Community Health (MDCH) prepared a Health Consultation for the Site in 2002.

GP's contractor, ARCADIS, updated the HHRA in 2012 as part of the Area 1 SRI to reflect the results of additional fish tissue samples collected since the publication of the 2003 HHRA. The updated HHRA provided updated risk and hazard estimates for subsistence and sport anglers associated with exposures to PCBs released into the Kalamazoo River system. GP's current contractor, Amec Foster Wheeler, updated the HHRA in 2015 based upon data collected in 2011 from Area 2 of the river.

As noted above, GP conducted the SRI/FS work for Area 2 under a 2007 AOC. In accordance with the 2007 SRI/FS AOC, GP submitted many reports that it then used to support the development and evaluation of remedial alternatives for sediment and floodplain soil in the FS. The major reports are listed below and included in the AR for Area 2 of OU5.

- Area 2 Supplemental Remedial Investigation/Feasibility Study Work Plan
- Multi-Area FS Documents – To guide the FS process and provide consistency and efficiency across all seven areas of OU5, four Multi-Area FS Planning Documents were prepared as the first step in developing the FS reports.
- Area 2 SRI Report
- Area 2 Alternatives Screening Technical Memorandum
- Area 2 FS Report

EPA approved the Area 2 SRI Report on July 28, 2015, and approved the Area 2 FS Report on March 15, 2017.

Response Actions and Related Enforcement Activities

To date, remediation work along the Kalamazoo River and the adjacent OUs has included PCB source control and elimination activities in upstream Area 1, and most recently in downstream Area 3. These activities, which are described below, have addressed the most significant known sources of PCBs and have helped support reductions in PCB levels in fish tissue.

EPA has conducted or overseen cleanup activities within or along OU5 since 1998, with the goal of controlling PCB sources. These activities have included four TCRAs in upstream Area 1 along Portage Creek and the Kalamazoo River, interim and final remedial actions at former paper mill properties and disposal areas (e.g., at other OUs), and one TCRA in downstream Area 3 of the Kalamazoo River. There have been no interim or final response actions conducted in Area 2 of OU5.

In addition to the enforcement activities discussed above related to the Area 2 SRI/FS, EPA and/or MDEQ have engaged PRPs to conduct work at other Site OUs, as follows:

- Millennium put in place interim remedial measures at the Allied Paper property (OU1) that effectively controlled the OU1 landfill wastes from entering Portage Creek.
- Millennium conducted RI/FS work at the Allied Paper property (OU1) until its bankruptcy, and then EPA took over completion of the FS and issued a ROD in September 2016.
- GP conducted the RD and RA work at the Willow Boulevard/A-Site Landfill (OU2) and the King Highway Landfill (OU3).
- Weyerhaeuser conducted the RD/RA work at the 12th Street Landfill (OU4), and is conducting the RD/RA work at the former Plainwell Mill (OU7).

2.3 Community Participation

After the Site was listed on the NPL in 1990, the State entered into an agreement with EPA, by which MDEQ served as the lead Agency for the Site and EPA acted in a support role. In 1991, MDEQ developed a Community Relations Plan (CRP), held public meetings, and addressed community concerns. In 2002, EPA assumed the role of lead Agency and began its public involvement with a community involvement workshop in March 2002. Subsequently, EPA held various public meetings and issued fact sheets related to various aspects of the Site cleanup. In 2006, EPA finalized its Community Involvement Plan (CIP) for the Site. The CIP replaced the 1991 CRP. It provides background information on the Site, recommends activities for EPA to continue to inform the public and local officials concerning progress at the Site, and encourages community involvement during the Site cleanup.

In 1999, the Kalamazoo River Watershed Council received an EPA Technical Assistance Grant (TAG) of $50,000 to assist in document review relative to all aspects of the Site. The TAG expired in 2008.

Since 2007, EPA has conducted two public meetings per year regarding cleanup activities within OU5. In addition, EPA has distributed fact sheets for all of the public meetings. EPA also conducted site tours for interested stakeholders during various TCRAs conducted in Areas 1 and 3 of OU5. On March 8, 2017, EPA held a public meeting regarding the Area 2 FS report and presented all of the relevant information to the public and answered questions. On July 26, 2017, EPA held a public meeting for the Area 2 Proposed Plan and took comments from the public.

EPA has regularly provided relevant information and written updates to interested Tribes regarding all aspects of cleanup activities at the Site.

2.4 Scope and Role of Operable Unit or Response Action

This Area 2 ROD is the second of seven RODs planned for OU5 of the Site, and is the final ROD for Area 2. The ROD for Area 1 of OU5 was issued in 2015, and SRIs/FSs are ongoing in other areas of OU5. Upstream Area 1 is currently in the RD phase. When the

SRI/FS for each of the remaining areas – Areas 3 through 7 – are completed, EPA plans to select a final remedy for each area. The RA work in Area 2 of OU5 will follow the Area 1 RA, and is not dependent on response actions at any other Site OUs.

EPA has conducted response work in phases, generally working upstream to downstream and utilizing an iterative approach within each area of OU5. This approach is consistent with EPA's policy set forth in OSWER Directive 8258.6-08, "Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites," dated February 12, 2002. Additionally, the NCP states at 300 C.F.R. Section 430(a)(1)(ii):

> "Sites should generally be remediated in Operable Units when...phased analysis and response is necessary or appropriate given the size or complexity of the site..."

The primary objective of this response action is to address the risks to human health and the environment due to contamination in sediments and soil in the Kalamazoo River and watershed. PCB concentrations remain elevated in Kalamazoo River sediments, in the water column, in the fish, and in the floodplain soil. Removal of the PCB-contaminated sediments will result in reduced PCB concentrations in fish tissue, thereby accelerating the reduction in future human health and ecological risks. In addition, by addressing the sediments, the remediation will control a source of PCBs to the water column, which contributes to fish tissue concentrations and transports PCBs into downstream reaches of the river and eventually to Lake Michigan. Finally, by addressing PCB-contaminated floodplain soils, this response action addresses risks to human health and the environment related to direct exposure to PCBs and dioxins/furans.

2.5 Area 2 Characteristics

Physical Characteristics

The physical characteristics of Area 2 are influenced by dams. The remains of the former Plainwell Dam mark the upstream boundary of Area 2, while the Otsego City Dam forms the downstream boundary. The former Otsego City Impoundment was drawn down in 1982 when stop logs were removed from the Otsego City Dam and again in May 1991 when the dam was dismantled to its sill level. These actions are estimated to have lowered water levels by 3 to 5 feet.

Area 2 has two distinct sections, as shown on Figure 3: the upstream, free-flowing anabranched section (approximately 0.7 miles long) and the downstream section influenced by the current Otsego City Dam (approximately 1.2 miles long). Gun River is the only tributary to this section of the Kalamazoo River, entering the north bank approximately one-half mile upstream of the Otsego City Dam. There is a 2.6-acre pond that lies between the Gun River and the Area 2 study boundary. This pond, known here as Pond G, does not typically interact with the Gun River except during flooding events, when the pond drains to the Gun River. A distinctly shaped island, known here as Knife

Blade Island, exists in the center of the former Otsego City Impoundment on the south side of the Kalamazoo River.

Area 2 is densely vegetated. Land use within Area 2 is primarily recreational, with some industrial property near the City of Otsego and a few residential properties bordering the study area.

The river bottom is predominantly sand and gravel with some fine-grained sediment. Fine-grained sediment occurs in areas along the channel margins and in side channels of the anabranched area. The average water depth in Area 2 of the Kalamazoo River ranges from 2 to 6 feet.

Based on groundwater monitoring conducted in Area 1 of OU5 as part of the Plainwell Impoundment TCRA, in conjunction with groundwater monitoring data from other Site OUs and knowledge of the nature of the PCB contamination at the Site, EPA has concluded that groundwater is not a medium of concern at Area 2 of OU5.

Nature and Extent of Contamination

This section summarizes the nature and extent of contamination in the sediment and floodplain soil within Area 2 of OU5. All PCB concentrations are reported as total Aroclors (total PCBs).

As discussed above, significant site-wide sampling efforts took place from 1993 to 2012. The SRI for Area 2 of OU5 focused on data gaps and further defining the nature and extent of contamination. As part of the SRI, 116 sediment cores were collected and yielded 567 sediment samples that were analyzed for PCB Aroclors, with a subset analyzed for total organic carbon (TOC) and grain size. In addition, a subset of samples was analyzed for mercury, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, pesticides, and dioxins/furans. Sediment PCB concentrations ranged from non-detect (ND) to 111 mg/kg. The non-PCB constituents are discussed in the *Contaminants of Concern* discussion below.

Soil cores were collected as part of the Area 2 SRI from 243 locations within the floodplain. Of these, 154 soil cores yielded 762 samples for PCB analysis, with a subset analyzed for TOC and grain size. In addition, a subset was analyzed for mercury, VOCs, SVOCs, metals, pesticides, and dioxins/furans. An additional 89 riverbank soil cores were analyzed for PCBs, with a subset analyzed for TOC, grain size, mercury, SVOCs, VOCs, metals, pesticides, and dioxins/furans. Soil PCB concentrations ranged from ND to 112 mg/kg.

Distribution of PCBs in Sediment

Sediments are defined as materials collected in areas with flowing or standing water. The spatial distribution of PCBs in Area 2 has been significantly influenced by historical

changes in the water level elevation associated with the Otsego City Dam and geomorphology in this segment of the Kalamazoo River.

Area 2 sediment has been divided into 11 subareas based on geomorphic similarities and location (see Figure 5). They are as follows:

- Subarea A: Lower Main Channel
- Subarea B: Lower Anabranches and Unnamed Tributary
- Subarea C: Upper Main Channel
- Subarea C1: Upper Main Channel (Side Channel)
- Subarea D0: Upper Anabranches (Plainwell Dam Spillway)
- Subarea D1: Upper Anabranches (Northern Anabranches)
- Subarea D2: Upper Anabranches (Plainwell Anabranches)
- Subarea E: Cutoff Anabranches
- Subarea F: Lower Gun River
- Subarea F0: Upper Gun River
- Subarea G: Ponded Area

Detailed discussions of the PCB concentrations in each subarea are included in the Area 2 SRI Report. Table 1 presents a summary of the sediment concentrations in each subarea. Overall, 72 percent of sediment samples were ND or less than 0.33 mg/kg, and 82 percent of samples were less than 1 mg/kg. Lower PCB concentrations generally occurred in Subareas A, B, C1, and F0. Subarea B generally had PCB concentrations less than 1 mg/kg. Subarea F0 had concentrations that were ND. Most of Subareas A and C had PCB concentrations less than 1 mg/kg (likely due to flow preventing the settling of PCBs in this segment of the river), with the exception of individual high PCB concentrations mostly located along the river channel edges.

A transect with higher concentrations between 5 and 10 mg/kg is located in Subarea A approximately 100 feet upstream of the Otsego City Dam along the channel edges at the surface. Individual areas of discrete concentrations above 10 mg/kg also occur along the channel edges in Subarea C. Higher concentrations are also observed in Subareas D1, D2, and E throughout the depth profile. The maximum concentrations of PCBs in Area 2 were detected in these anabranch subareas (with the highest concentration being 111 mg/kg). PCB concentrations are also higher in Subareas F and G.

The vertical distribution of PCBs is directly related to the prevalence and thickness of sediment deposits in Area 2. In the upstream subareas where sediment is relatively thin, PCBs are predominantly located in the upper intervals. In the downstream areas, where sediment deposits are thicker, PCBs are detected at higher concentrations at depth.

The horizontal distribution of PCBs appears to be related to the formation of an anabranched region comprised of Subareas D1 and E. These subareas were subjected to significant changes over time resulting from water level management practices. The higher concentrations in Subarea A appear to be influenced by PCB concentrations in adjacent bank soils, as few sediments in the mid-channel exhibit PCB concentrations

greater than 1 mg/kg. River edge sediment samples with elevated PCB concentrations often spatially coincide with bank soils with higher PCB concentrations. Physical processes such as erosion and sloughing, as well as varying water elevations, may explain the spatial distribution of PCBs in Subarea A.

Surface-Weighted Average Concentration of PCBs in Sediment

A surface-weighted average concentration (SWAC) is a method of spatially calculating the mean (average) concentration of a constituent in the sediment surface. Samples are collected throughout the area of concern, representative subareas are generated for each sample location, and a subarea-weighted average concentration is calculated to produce the SWAC. The subareas may be generated using several different methods such as grids or stream tubes. SWACs were generated for the main channel (Subareas A and C) using kriging. Mean concentrations were used rather than SWACs for the remaining subareas due to the often limited number of samples. The methodology for calculating SWACs is described in Appendix H of the Area 2 SRI Report, which is included in the AR. Table 2 presents a summary of the sediment SWACs and mean concentrations in each subarea.

Based on the data collected during the SRI, SWACs in the main channel are less than 0.33 mg/kg. The anabranch subareas (Subareas D1, D2 and E) showed some of the highest average PCB concentrations in the top six inches, ranging from 3.91 to 7.84 mg/kg, indicating that the anabranch areas are a source of PCB contamination to the river.

Distribution of PCBs in Floodplain Soil

Soils are defined as materials collected in areas without standing water, and along the riverbank represent the area above the water line under normal flow conditions.

The floodplain areas within Area 2 were split into 11 geomorphic categories based on their physical characteristics and surface elevations in relation to historical water levels over time (see Figure 6). These floodplain subareas are as follows:

- Lower Terrace
- Lower Terrace-Gun River
- Medium Terrace
- Medium Terrace-Buffered
- Medium Terrace-Gun River
- Previous Channel
- Previous Main Channel
- Previous Main Channel-Anthropogenic
- Upland Area
- Upper Terrace
- Upper Terrace-Buffered

Detailed discussions of the PCB concentrations in floodplain soils are included in the Area 2 SRI Report. Table 3 presents a summary of the floodplain soil concentrations in

each subarea. PCB concentrations are less than 10 mg/kg throughout the soil profile in the Medium Terrace-Gun River, Upland Area, and Upper Terrace-Buffered landforms. These areas have been protected from dispersion of PCB-laden sediments by dense vegetation and/or higher elevations.

Historical higher water elevations and flood events have dispersed higher concentration, PCB-containing sediments over the now-exposed floodplain next to the Otsego City Dam and in anabranched subareas. These areas are designated as Medium Terrace, Upper Terrace, Lower Terrace, Lower Terrace-Gun River, Previous Channel, Previous Main Channel, and Previous Main Channel-Anthropogenic. The maximum PCB concentrations in floodplain soils were found in the anabranched subareas (with the highest, 112 mg/kg, found in the Lower Terrace subarea). Multiple sampling events between 1993 and 2012 demonstrated variability in the results for various floodplain areas. This is a result of both flooding events redistributing sediment and channel movement in the anabranched area. As a result, there is uncertainty regarding the PCB distribution in floodplain soils. This was discussed in detail in Section 4.2.2.4 of the SRI Report. Pre-design sampling may be conducted to further delineate the distribution of PCBs in floodplain soils prior to remedial action.

Contaminants of Concern

PCBs are the primary COC for Area 2 of OU5. The available data indicate that exposure to PCBs will drive risks at the site, and that management of risks due to PCB exposure will also address risks associated with other non-PCB constituents.

During the investigation of Areas 1 and 2 of OU5, samples collected from various media and biota in and along Portage Creek and the Kalamazoo River, including soil, sediment, surface water, and fish tissue, were selectively analyzed for non-PCB constituents. Samples were analyzed for metals, VOCs, SVOCs, pesticides, and dioxins/furans. Many non-PCB constituents were detected in all media, likely from multiple point and non-point sources in the industrialized portions of the watershed (and general anthropogenic deposition throughout the watershed), and may not be directly linked to the PCB releases.

On April 2, 2015, EPA approved the *Area-Wide Non-PCB Constituent Screening Evaluation.* Sediment and soil samples collected in Areas 1, 2, and 3 and analyzed for non-PCB constituents were pooled to produce a statistically relevant data set for this evaluation. The evaluation compared the sample results for non-PCB constituents in soil and sediment to background concentrations and human health and ecological screening values, and resulted in the non-PCB constituents being screened out. The evaluation demonstrated that total PCBs will drive risk-management and remedial decisions for sediment and soil in Area 2.

In addition, dioxin-like PCBs and dioxin/furans were further addressed through a collocation mapping exercise in the *Technical Memorandum - Collocation Mapping of PCB Dioxin-Like Compound TEQs, Dioxins/Furans, and Total PCBs*, which was submitted to EPA and MDEQ on April 16, 2015. The collocation mapping showed that

concentrations of dioxin-like PCBs and dioxins/furans would be included within the PCB remediation footprint. As a result, EPA believes that Area 2 risk-management and remedial decisions based on total PCBs will address dioxin-like PCBs and dioxins/furans.

Conceptual Site Model

A conceptual site model (CSM) was developed for Area 2 of OU5 based on site characteristics and results from the SRI investigations. The CSM helps to tells the story of how and where the PCB contamination moved and what impacts such movement may have had upon human health and the environment.

As described in the Area 2 CSM, PCBs are the primary COC. Site data shows that exposure to PCBs will drive risks at the site, and that the management of risks due to PCB exposure will also address risks associated with other non-PCB constituents. PCB levels in fish are linked to concentrations in sediment and surface water through the food chain. Risks to humans and aquatic ecological receptors are driven by the consumption of PCB-contaminated fish. Human health risk estimates show concentrations of PCBs in fish tissue result in exceedances of EPA target levels for both cancer and non-cancer risks; this will be further discussed below in Section 2.7.

The primary transport mechanism is PCB uptake through the food chain via PCB-contaminated sediment that already exists in the river and that continues to enter the river by erosion of PCB-contaminated bank material. External sources of PCBs to Area 2, including background sources of PCBs from areas upstream of Area 1 (which have mean PCB background sediment concentrations of 0.31 mg/kg), are expected to sustain low levels of PCBs in fish tissue in the long term, even with control of known potential source areas associated with historical papermaking operations.

The media of concern in Area 2 are sediments and floodplain soils. PCB-contaminated sediments and bank soils both can lead to PCB uptake in fish. The targeted remediation areas in Area 2 are localized PCB deposits along the main channel, the anabranch channels, floodplain soils exceeding ecological risk criteria, bank soils, Knife Blade Island, Gun River, Pond G, and two private parcels extending into the study area. As noted earlier, the calculated SWACs in the main channel are less than 0.33 mg/kg total PCBs. The anabranch channels have the highest average PCB sediment concentrations in Area 2 and are targeted for remediation.

2.6 Current and Potential Future Land and Resource Uses

Area 2 is a densely vegetated 1.9-mile stretch of the Kalamazoo River located between the former Plainwell Dam and the Otsego City Dam. This stretch of the river flows through forested wetland areas with predominantly recreational land use, and ends at the City of Otsego. Land use within Area 2 is primarily recreational, with some industrial property near the City of Otsego and a few residential properties bordering the study area. There is no known active tribal land use. Appendix B of the Area 2 SRI report describes the current and future land use assessment. MDEQ has designated the Kalamazoo River

as a "Natural River" as that term is defined in the State's Natural River Act (Part 305 of P.A. 451 of 1994). The potential future uses of Area 2 are expected to remain the same.

As noted earlier, groundwater is not a medium of concern in Area 2 of OU5 so is not addressed by this ROD.

2.7 Summary of Site Risks[4]

This section summarizes the risks to human health and the environment that are posed by the contamination.

Human Health Risk Assessment

Risks to humans are driven by the consumption of PCB-contaminated fish. In addition to fish consumption by anglers, several other potential exposure pathways were described in the 2003 HHRA that are relevant to Area 2, as follows:

- *Consumption of turtles:* Although this pathway was evaluated qualitatively as a potential exposure pathway, the HHRA concluded that the overall exposure and risks to receptors ingesting turtles would be less than that of anglers. The analytical data that exist for turtle tissue indicate that PCB concentrations are less than that for smallmouth bass and carp fish tissue;
- *Consumption of waterfowl*: This exposure pathway was considered in the HHRA. However, because of data limitations with waterfowl samples, CDM did not complete a qualitative evaluation or quantify risk estimates for this exposure pathway;
- *Direct contact with river sediment (by swimmers or waders):* Direct contact exposures to river sediment during recreational activities (e.g., swimming, wading) were determined not to be an important means of exposure to PCBs, based on the Health Consultation prepared by the MDCH. As a result, such exposures were not evaluated further in the HHRA;
- *Exposure to in-stream surface water (by swimmers or waders):* Due to the relatively low ingestion rates of surface water, the low solubility of PCBs in water, and the low dermal absorption of PCBs, the HHRA concluded that this pathway could be assumed to be without risk;
- *Exposure to air:* Inhalation of particulates and volatile emissions from exposed floodplain soil and sediment were quantitatively evaluated in the HHRA, but inhalation of volatile emissions from surface water was not quantitatively evaluated; and
- *Direct contact with floodplain soil and exposed sediment:* Two residential developments exist adjacent to the floodplains in Area 2. The HHRA quantitatively evaluated direct contact pathways (dermal contact and incidental

[4] Risks related to dioxins/furans at the Site were not evaluated in either the HHRA or the BERA, so this section of the ROD does not discuss risks associated with dioxins/furans found in Area 2. The SRI for Area 2, however, did evaluate dioxins/furans and determined that dioxins/ furans are found within the remedial footprint of Area 2 of OU5. The FS for Area 2 concluded that dioxins/furans are a COC at Area 2 and, as such, this ROD establishes a remediation goal for dioxins/furans found in floodplain soils

ingestion) that may be relevant to residents (the most highly-exposed receptor group) or recreational visitors.

Fish Advisory

MDCH has issued a fish advisory for parts of Portage Creek and the Kalamazoo River, extending from Morrow Lake Dam to Lake Michigan. For the river area from Morrow Lake Dam to the Allegan Dam (which is located in Area 6), and on Portage Creek downstream of Monarch Mill Pond (which is located just upstream of OU1), the advisory currently recommends that the general population not consume carp, catfish, suckers, smallmouth bass or largemouth bass from these areas. Between Allegan Dam and Lake Michigan, the advisory recommends that the general public not consume carp, catfish, or northern pike. Healthy adult males are advised to eat no more than one meal per week of all other species. For women of childbearing age and children under 15 years of age, no consumption of any species is recommended for fish caught above Allegan Dam, including Area 2.

MDCH's fish consumption advisory is only a recommendation, is not legally binding, and has limited effectiveness in protecting human anglers from Kalamazoo and Allegan Counties. A survey from 1994 showed that anglers ate on average two meals per month of various species taken from contaminated reaches of the river, including bass, catfish, panfish, bullheads, and carp. More than 10 percent of anglers ate more than one meal per week of these various species. This survey confirmed that the Kalamazoo River is an important recreational resource and may serve as an important source of food for certain human populations.

HHRA Conclusions

The likelihood of any kind of cancer resulting from exposure to carcinogens at a Superfund site is generally expressed as an upper bound incremental probability, such as a "1 in 10,000 chance" (expressed as 1×10^{-4}). In other words, for every 10,000 people exposed to the site contaminants under reasonable maximum exposure conditions, one extra cancer may occur as a result of site-related exposure. This is known as an "excess lifetime cancer risk" because it would be in addition to the risk of cancer individuals face from other causes such as smoking or too much sun. The risk of cancer from other causes has been estimated to be as high as one in three. The potential for non-cancer health effects is evaluated by comparing an exposure level over a specified time period (such as a lifetime) with a "reference dose" derived for a similar exposure period. A reference dose represents a level that is not expected to cause any harmful effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An $HQ < 1$ indicates that the dose from an individual contaminant is less than the reference dose, so non-cancer health effects are unlikely. The hazard index (HI) is generated by adding the HQs for all COCs that affect the same target organ (such as the liver). An $HI < 1$ indicates that, based on the sum of all HQs from different contaminants and exposure routes, non-cancer health effects from all contaminants are unlikely. An $HI > 1$ indicates that site-related exposures may present a risk to human health. EPA's acceptable risk range is defined as a cancer

risk range of 1 x 10^{-6} to 1 x 10^{-4} and an HI < 1. Generally, remedial action at a site is warranted if cancer risks exceed 1 x 10^{-4} and/or if non-cancer hazards exceed an HI of 1.

The HHRA for the Site (including Area 2) presented estimated cancer risks and non-cancer hazards for several populations of anglers consuming fish from the Kalamazoo River and for residential and recreational receptors exposed to floodplain soil adjacent to the former Plainwell, Otsego, and Trowbridge Impoundments.

Risk characterization for anglers was performed for three potential populations: central tendency sports anglers, high-end sports anglers, and subsistence anglers.[5] Two exposure scenarios for the three angler populations were included in the HHRA: the first assumed a diet of 100 percent pelagic (non-bottom feeding) fish species and the second assumed a mixed species diet (76 percent pelagic species and 24 percent bottom-feeding species).

The HHRA for Area 2 showed that potential excess cancer risks and non-cancer hazards exceeded acceptable levels for the fish ingestion pathway for all three angler populations. Cancer risks and non-cancer hazards were highest for the subsistence angler (4 x 10^{-4} and an HI of 18, respectively). Cancer risks and non-cancer hazards were lowest for the central tendency sport angler (5 x 10^{-5} and an HI of 2, respectively). Adverse health effects associated with PCB exposure include increased risk of liver cancers and reproductive and immunological impairment.

The HHRA for Area 2 did not update floodplain risk information provided in the 2003 HHRA, as risk estimates for the fish ingestion pathway were approximately 60- to 70-fold greater than risk estimates for floodplain soil pathways for residents and recreational receptors. The 2003 HHRA evaluated the floodplain areas around the former Plainwell and Plainwell 2 impoundments, the Otsego Dam, and the Trowbridge Dam. Estimated risks for residents exposed to average floodplain surface soil concentrations were within EPA's acceptable risk range but were greater than MDEQ's cancer risk threshold of 1 x 10^{-5}. Excess cancer risk estimates exceeded the acceptable risk range when the maximum detected concentration for each area was used.

For residential receptors exposed to floodplain soil via multiple routes (i.e., ingestion, dermal contact, and inhalation of fugitive dust), HIs for the reproductive endpoint exceeded 1 for all three areas when maximum concentrations were used, but were less than 1 using average floodplain soil concentrations. HIs for immunological endpoints exceeded 1 for all three areas using both average and maximum floodplain soil concentrations.

Excess cancer risks and non-cancer hazards for recreationists exposed to average floodplain surface soil concentrations were within EPA's acceptable risk range and less than MDEQ's cancer risk threshold of 1 × 10^{-5} in all three areas evaluated. When the maximum floodplain soil concentration was used, potential cancer risks were within

[5] Central tendency sports anglers were estimated to consume an average of 0 015 kg fish tissue/day (24 half-pound meals/year). High-end sports anglers were estimated to consume 0.078 kg fish tissue/day (125 half-pound meals/year). Subsistence anglers were estimated to consume 0.11 kg fish tissue/day (179 half-pound meals/year).

EPA's acceptable risk range but were greater than MDEQ's cancer risk threshold. HIs were greater than 1 when maximum soil concentrations were used.

As noted earlier, fish advisories are currently in place to address risks to humans from consumption of fish. There are currently no restrictions in place to control human exposures to sediment, soil, or surface water.

In summary, the fish ingestion pathway poses unacceptable risks and hazards to anglers. Additionally, potential exposure to maximum floodplain soil concentrations may pose unacceptable risks and hazards to residents and recreationists. The HHRAs made assumptions using best professional judgment and available scientific literature on risk assessments.

Baseline Ecological Risk Assessment

As part of the original RI, CDM prepared a baseline ecological risk assessment (BERA) for OU5 that identified terrestrial and aquatic receptors and exposure pathways. During the Area 1 SRI, an updated terrestrial BERA (TBERA), covering terrestrial birds and mammals, was conducted. The methods and approaches incorporated in the Area 1 TBERA built on the information in the BERA and the CSM. The TBERA also accounted for updated risk assessment guidance and scientific research, additional sampling results, a December 2008 peer review panel report, two completed TCRAs in Area 1, and source control activities completed or underway at the former mill properties and landfill OUs in Area 1 since the BERA was completed. The Area 1 TBERA did not revisit the aquatic portion of the BERA but carried forward those associated conclusions. As part of the Area 2 SRI, the TBERA was updated to incorporate recent Area 2 data.

The BERA was conducted to evaluate potential adverse effects to terrestrial and aquatic ecological receptors associated with PCB exposures in surface water, sediment, surface soil, and biota. Representative ecological receptors included aquatic plants, aquatic macroinvertebrates, game fish, forage fish, rough fish, terrestrial invertebrates, small burrowing omnivorous mammals, semi-aquatic herbivorous mammals, small semi-aquatic carnivorous mammals, and top mammalian and avian predators. The BERA evaluated complete exposure pathways that included the following:

- Surface water – direct contact, uptake, ingestion, or ingestion of prey;
- In-stream sediment/interstitial water – direct contact, ingestion, or ingestion of prey; and
- Surface soil/floodplain sediment and soil – direct contact, ingestion, or ingestion of vegetation/prey.

The BERA concluded the following:

- Most aquatic biota, such as invertebrates and fish, are not expected to be adversely affected by direct contact with and ingestion of surface water because of relatively low PCB toxicity to most aquatic biota.

- PCB contamination of surface water and streambed sediment may adversely affect sensitive piscivorous predators, such as mink, through the consumption of PCB-contaminated fish.
- Terrestrial and semi-aquatic biota are potentially at risk from floodplain sediment and surface soil, depending on life cycle characteristics (e.g., foraging behavior, diet, mobility) and predicted sensitivity to PCBs.

The updated Area 2 TBERA builds upon the prior OU5 BERA and the Area 1 TBERA. The updated Area 2 TBERA for terrestrial birds and mammals is included as Appendix M of the Area 2 SRI Report. The methods, inputs, and approaches incorporated in the updated Area 2 TBERA are the same as those employed in the Area 1 TBERA. The updated Area 2 TBERA incorporates current Agency guidance, current science, and new data collected to support the SRI activities. Representative receptors were selected as the most highly-exposed species likely to inhabit Area 2. The representative receptors included insectivorous birds (house wren), vermivorous mammals (short-tailed shrew), vermivorous birds (American robin and American woodcock), carnivorous mammals (red fox), and carnivorous birds (red-tailed hawk).

The Area 2 TBERA conclusions are summarized as follows:

- Overall, the Area 2 TBERA found no unacceptable risk to moderate or low-sensitivity insectivorous (e.g., house wren) or vermivorous (e.g., American robin, American woodcock) birds in Area 2.
- Possible, but unlikely, risk was identified for high-sensitivity insectivorous (e.g., gray catbird, European starling) and vermivorous birds, if present. (Note: no highly-exposed, high-sensitivity vermivorous birds have been documented at the Site, although these species could potentially occur at the Site.) Many of these species have not been classified based on their sensitivity to PCBs or dioxin-like compounds. As a result, there is a possibility that high-sensitivity vermivorous birds, if they occur at the Site, may have a potential for risk.
- The TBERA did not address aquatic receptor uptake when the floodplains are inundated by flooding because the frequency and duration of flooding is not of sufficient duration.
- While possible risk was identified for vermivorous mammals (e.g., short-tailed shrew), it is unlikely due to the low frequency of possible home ranges with high HQs. These areas correspond to geomorphic categories of Medium and Upper Terraces in the east portion of Area 2 (among the anabranches) and Lower Terrace areas in the northwest portion of Area 2, north of the main river channel approaching the Otsego City Dam.

Because there is potential risk to ecological receptors exposed to PCB-contaminated floodplain soils, remedial alternatives to protect ecological receptors were developed and evaluated.

2.8 Remedial Action Objectives

RAOs are goals for protecting human health and the environment. RAOs are developed to address the contaminant levels and exposure pathways that present unacceptable current or potential future risk to human health and the environment. During the FS, the development of RAOs and cleanup levels, known as preliminary remediation goals (PRGs) until final cleanup levels or FRGs are selected in a ROD, is the first step in identifying and screening remedial alternatives for addressing the COCs and media of concern.

Remedial Action Objectives for Area 2

The following five RAOs were developed for PCB-containing media and biota in Area 2:

- **RAO 1: Protect people who consume Area 2 Kalamazoo River fish from exposure to PCBs that exceed protective levels.** This RAO is expected to be progressively achieved over time by meeting the following targets for fish tissue and sediment:
  - Reduction in fish tissue to the Michigan fish advisory level for smallmouth bass to two meals per month (0.11 mg/kg total PCB concentration) within 30 years[6];
  - Achievement of a non-cancer HI of 1 and a 10^{-5} cancer risk within 30 years for the high-end sport angler (100 percent bass diet; 125 meals/year)[7]; and
  - The above fish tissue goals for bass will be achieved by protecting fish from exposure to sediment PCB SWACs above 0.33 mg/kg in Area 2 following completion of the remedial action.

- **RAO 2: Protect aquatic ecological receptors from exposure to concentrations of PCBs in sediment that exceed protective levels for local populations.** This RAO is designed to protect fish-eating birds and mammals by reducing fish tissue PCB concentrations to levels that do not harm the sustainability of local populations of these receptors[8].

- **RAO 3: Protect terrestrial ecological receptors from exposure to concentrations of PCBs in soil that exceed protective levels.** This RAO is intended to protect local populations of birds and mammals by reducing PCB concentrations in soil to levels that do not harm the sustainability of local populations of these receptors.

- **RAO 4: Reduce transport of PCBs from Area 2 to downstream areas of the Kalamazoo River and Lake Michigan.** This RAO includes reducing the potential for erosion and downstream migration of PCB-impacted sediment and riverbank soil.

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[6] This specific target is a goal of the remedial action, but it is not an FRG.

[7] The non-cancer and cancer risk levels described here are what drive the FRGs for RAO 1.

[8] See the FRG table on page 30.

- **RAO 5: Protect people that reside in Area 2 from exposure to COCs that exceed protective levels.** This RAO is intended to protect local residents from exposure to COC concentrations that may cause a carcinogenic risk greater than 10^{-5} or an HI greater than 1.

Final Remediation Goals/Cleanup Levels

This ROD establishes the final remediation goals and/or cleanup levels for Area 2 of OU5. The PRGs that were included in the Proposed Plan have become the FRGs. FRGs are also used to define the extent of contaminated media requiring remedial action, and are the targets for the analysis and selection of long-term remedial goals.

The HHRA developed a series of risk-based concentrations (RBCs) for total PCBs in fish, sediment, and floodplain soil intended to be protective of anglers, recreationists, and residents, while the BERA and TBERA developed RBCs for sediment and floodplain soil intended to be protective of sensitive wildlife receptors. The RBCs are calculated, chemical-specific concentrations below which no significant health effects are anticipated for a receptor. For human receptors, Area 2 RBCs correspond to a target risk for carcinogenic effects of 1×10^{-5} and a target HI of 1 for non-carcinogenic effects. For ecological receptors, RBCs correspond to a target HQ of 1. RBCs for ecological receptors represent a risk range based on "No Observed Adverse Effects Level" and "Lowest Observed Adverse Effects Level" risk estimates for each receptor group.

Selection of Fish Tissue Final Remediation Goals

The selection of a fish tissue FRG was a multi-step process that considered the RBC_{fish} values generated for each receptor, the likely exposure scenario to be frequently encountered, and the background levels of PCBs in fish tissue. Although a subsistence angler scenario was included in the calculation of RBC_{fish}, this pathway represents a worst-case scenario that is not expected to be frequently encountered compared to sport anglers. The RBC_{fish} would likely reflect a diet that is weighted toward the 100 percent smallmouth bass consumption scenario (over a mixed carp and bass species scenario) because the smallmouth bass is a popular sport fish on the Kalamazoo River. The range of RBC_{fish} for sport anglers is from 0.042 mg/kg to 0.187 mg/kg (non-lipid corrected). The upper end of this range is similar to the mean background concentration in smallmouth bass fillets in Morrow Lake immediately upstream of Area 1 (0.23 mg/kg). Another background reference area further upstream of Area 1 (Ceresco) had mean smallmouth bass fillet concentrations of 0.03 mg/kg. The upper end of this range is also protective of women of childbearing age and young children consuming one half-pound meal per month from the Site.

For RAO 1, the fish tissue FRGs for total PCBs are 0.042 mg/kg for carcinogenic effects (based on a risk of 1×10^{-5}) and 0.072 mg/kg for non-carcinogenic effects (based on an HI of 1). These FRGs are based on risk estimates to sport anglers and sensitive populations, and take into account background considerations.

For RAO 2, the fish tissue FRG for total PCBs is 0.6 mg/kg, which is protective of mink (the most sensitive ecological receptor).

Selection of Sediment FRGs

The selection of a sediment FRG for total PCBs considered the human health RBC_{sed} values associated with the human receptors who consume fish. MDEQ conducted an independent evaluation and has recommended a sediment FRG of 0.33 mg/kg. MDEQ concluded that this FRG value is appropriate for sediment because it is sufficiently protective of the high-end sport angler. This FRG value also corresponds to MDEQ's historical PCB detection limit that has previously been used as a sediment screening and target level in Michigan under Michigan's Natural Resources and Environmental Protection Act of 1994 (NREPA), Part 201. Further, this FRG is close to the mean background sediment concentration of 0.31 mg/kg.

An FRG of 0.33 mg/kg for total PCBs is protective of both human and ecological receptors. Sediment concentrations below 0.33 mg/kg are not likely to bioaccumulate in fish tissue to levels that present unacceptable risks and hazards to human populations and will promote the achievement of the fish tissue RAOs over time.

Selection of Floodplain Surface Soil FRGs

The selection of a floodplain surface soil FRG was based on the range of site-specific RBC_{soil} values calculated for human recreationists and ecological receptors, with the ecological RBC_{soil} values driving the selection of the FRG because they were much lower than the values for human receptors. Although ecological risk was predominantly associated with high-sensitivity insectivorous and vermivorous birds and vermivorous mammals in the Area 2 TBERA, a range of RBC_{soil} was calculated based on the protection of multiple wildlife receptors. The uncertainty associated with the TBERA RBCs is summarized in the Area 2 FS Report.

A floodplain soil FRG of 11 mg/kg for total PCBs is based on protectiveness of 1-acre home ranges for maximum exposed mammals. Based on the analysis presented in the Area 2 FS Report, an FRG of 11 mg/kg is expected be protective of 99.5% of the possible 1-acre home ranges for maximally exposed mammalian receptors (i.e., the shrew). An FRG of 11 mg/kg PCBs is also assumed to be protective of avian receptors as it represents a balance between risk and uncertainty associated with the various methodologies and assumptions used in the TBERA to calculate risk to avian receptors.[9] Therefore, the FRG of 11 mg/kg in floodplain soil is protective of the various ecological receptors.

[9] An FRG of 11 mg/kg is below the dietary high-sensitivity RBCs calculated for the house wren and American robin and within the mid-range and high-sensitivity dietary RBCs calculated for the American woodcock. An FRG of 11 mg/kg falls between the egg-based RBCs for mid-range and high-sensitivity avian receptors.

A floodplain soil FRG of 11 mg/kg for total PCBs is also protective of human recreational receptors. However, for floodplain surface soil in current or potential residential use areas, an FRG of 2.5 mg/kg will be used to protect residential receptors.

For the reasons noted above in the *Contaminants of Concern* discussion in Section 2.5, EPA believes that risk management decisions based on total PCBs will also address risks associated with other non-PCB constituents. However, in the event that dioxins/furans are found in floodplain surface soils in current or potential residential use areas located outside the PCB remediation footprint, an FRG of 50 parts per trillion (ppt) will be used to protect residential receptors, based on current EPA Regional Screening Levels.

Summary of FRGs

The table below summarizes the various FRGs for Area 2. The ability to meet the various risk-based fish tissue FRGs will be evaluated during the five-year review process following the Area 2 remedial action. These reviews will consider factors identified during LTM that may limit overall fish tissue and sediment recovery (e.g., fish tissue or sediment concentrations approaching background levels, which include atmospheric deposition and/or other non-site sources of PCBs to the river system).

FRGs/Cleanup Levels for Area 2 of OU5	
Media/Biota	**FRG for Total PCBs**
Fish Tissue	0.042 mg/kg (RAO 1, cancer risk of 1 x 10^{-5}) 0.072 mg/kg (RAO 1, non-cancer HI of 1) 0.6 mg/kg (RAO 2, ecological receptors)
Sediment	0.33 mg/kg (SWAC in each river section)
Floodplain Soil	11 mg/kg (all areas except residential) 2.5 mg/kg (residential areas)
Media	**FRG for Dioxin/Furans (if needed)**
Floodplain Soil	50 ppt (residential areas)

2.9 Description of the Alternatives

For purposes of developing potential remedial alternatives, the FS identified the various sediment and floodplain areas that would require remediation based on the RAOs and PRGs (now FRGs) for Area 2.

Remediation Areas

The PCB SWAC analysis was used as a screening tool to evaluate the distribution of PCBs in sediment and to identify potential sediment remediation locations in Area 2. The SWACs provide predictions of the average exposure concentration in a specified area.

Area 2 is unique within the Kalamazoo River system because it includes anabranches with average sediment PCB concentrations above the sediment FRG of 0.33 mg/kg and a main channel with sediment SWACs below this FRG. The other areas of OU5 that have been investigated to date (Areas 1, 3, and 4) have main channel sediment SWACs above 0.33 mg/kg and require (or may require) remediation in the main channel. These other areas do not have anabranches to the same extent as Area 2, but rather are single-channel reaches. The highest average SWAC in an Area 2 main channel interval is 0.16 mg/kg. Because the sediment FRGs are currently being met in the main channel but fish tissue concentrations are elevated, it is likely that fish migrate to and from the anabranches where they are exposed to soil/sediment containing higher PCB concentrations. Therefore, the remedial alternatives that were evaluated for Area 2 sediment focused on remediation of the anabranches rather than the main channel.

The remedial alternatives evaluated in the FS for floodplain soil focused on locations that exceed ecological or human exposure PRGs, and on bank soil that could contribute, via erosion, to the transportation of PCBs to downstream areas.

Single Channel Design

Potential remediation areas were identified based on the evaluation of the Area 2 sediment and soil PCB data. An important consideration for selecting the remedial areas is the future river location following the removal of the Otsego City Dam. Dam removal is desired by the City of Otsego and the State of Michigan for several reasons, including reducing long-term dam maintenance and restoring natural free-flowing conditions to the river. Removal of the dam would result in the anabranches not conveying water under normal flow conditions (1,000 cubic feet per second (cfs)). As such, fish would no longer have routine access to these areas with higher PCB concentrations. However, with the dam removed, the bed slope in Area 2 would increase, and the main channel would likely erode, becoming more entrenched in the floodplain and unstable. In addition, during high flow events the anabranches would continue to erode PCB-contaminated material and transport it downstream into the river.

Due to the unique circumstances in Area 2 described above, EPA believes that removing the dam and constructing a single stable channel are necessary to meet the RAOs. Therefore, options for realigning the river in Area 2 to create a stable single channel with dam removal were evaluated for inclusion in the remedial alternatives to prevent the river from regularly forming unstable anabranches, and to protect the floodplain from future erosion due to channel migration. The goal would be to create a channel that conveys the bankfull flow of a 1.2-year return period (approximately 2,500 to 2,700 cfs), maintains adequate shear stress to convey the bedload of the river, and remains in a fixed location over time. Such a stable channel would maintain the applicability of the soil FRG in the dam-out floodplain across Area 2.

Channel realignment would be accomplished using modern natural channel design and restoration approaches to promote a stable channel and ecosystem that is self-sustaining over time. Such design features include energy dissipation structures, main channel

bank/bed erosion protection, bank and riparian zone vegetation/restoration, and connectivity with the natural floodplain. Beneficial reuse of materials removed for channel realignment may include sediment, soil, vegetation, and woody debris.

Three channel realignment options were evaluated, and details about the three different options are provided in the Area 2 FS Report. Channel Option 3 (Figure 7) was selected for incorporation into the remedial alternatives that were developed for Area 2. In Option 3, the upstream half of Area 2 is provided with two meander curves, natural bank treatments with point bars, floodplain connection, and benches in the former impoundment at the bankfull flow elevation. The second meander curve in Option 3 serves as additional buffer for Knife Blade Island, allowing further deposition within and isolation of this island, to prevent the PCB contamination at Knife Blade Island from eroding into the river. Following the meandering section, the downstream layout closely follows the northern bank of the existing channel to the current dam location. Channel Option 3 was selected as the basis for remedial alternative development because it balances the effort and cost to achieve a stable single channel for remedial alternative development by providing a larger buffer area for Knife Blade Island than the other two options while also following the existing channel bed in the downstream reach. The actual design for channel realignment will likely be different in some respects from that shown in Figure 7 based on additional data collection and evaluation during the RD. However, general elements of the design should include protection of Knife Blade Island and a designed meander in the upstream portion to maintain a stable single channel through the currently anabranched area.

Construction of Channel Option 3 includes an estimated cut and fill volume of 144,000 and 62,000 cy, respectively, encompassing 59.1 acres. The total cost of channel realignment is $26,000,000 and the total cost to remove the Otsego City Dam is estimated at $3,840,000. Therefore, the total combined cost of Otsego City Dam removal and construction of Channel Option 3 is $29,840,000.

Remedial Areas for Evaluation

The remedial footprints selected for the comparative evaluation of remedial alternatives during the FS were based on the data collected during the SRI. These remedial footprints represent approximate areas for comparative evaluation of remedial alternatives and were based on PCB concentrations greater than 50 mg/kg, maximum PCB concentrations at any depth, and the 0- to 24-inch natural neighbor interpolation for floodplain soils. The actual remedial footprints to be addressed by the Selected Remedy will be refined during the RD as determined by additional sampling.

The remedial areas are depicted on Figure 8 and include the following portions of Area 2 (some of which are labeled on Figure 3):

- main river channel
- northeast anabranches
- Gun River

- Pond G
- Knife Blade Island
- banks soils
- floodplain soil exceeding human health and ecological FRGs

Common Elements

Section 121(d) of CERCLA requires that Superfund remedial actions meet ARARs. A complete listing of ARARs can be found in Appendix 1. The location-specific ARARs common to each response action evaluated here establish restrictions on dredging and grading activities and pertain to the management of waste or hazardous substances in specific protected locations, such as riverbeds, wetlands, floodplains, historic places, and sensitive habitats.

The action-specific ARARs are technology-based or activity-based requirements or limitations on actions taken with respect to remediation. These requirements are triggered by particular remedial activities that are selected to accomplish the remedial objectives. The action-specific ARARs indicate the way in which the selected alternative must be implemented, as well as specify levels for discharge.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that establish concentration or discharge limits, or a basis for calculating such limits, for particular substances, pollutants, or contaminants.

Sediment cleanup levels are subject to Michigan's NREPA, Part 201. Part 201 also applies to concentrations of COCs in sediment that can adversely affect biota and their habitats. While Part 201 does not include generic sediment cleanup criteria, Part 201 allows development of site-specific cleanup levels if such criteria better reflect best available information concerning the toxicity or exposure risk posed by the hazardous substance or other factors, and to meet the other requirements of Part 201, including, but not limited to, the risk standards set forth at Michigan Compiled Law 324.20120a and 20120b.

PCB-contaminated sediments removed as part of the RA must be handled in accordance with storage and disposal requirements set forth in the TSCA regulations at 40 C.F.R. Part 761. TSCA regulations at 40 C.F.R. Part 761.61 further provide cleanup and disposal levels for PCBs in soil that either remain in place or are removed from Area 2 during remedial action.

The Clean Water Act (CWA) establishes effluent standards for contaminants such as PCBs in navigable waters of the United States and regulates quality standards for surface waters. The ambient water quality criterion for navigable waters is 0.001 microgram per liter (µg/L) total PCBs (40 C.F.R. Part 129.105 - Toxic Pollutant Effluent Standards). The PCB water quality criteria established by the CWA for protection of aquatic life for continuous concentration (chronic) is 0.014 µg/L and for protection of human health is 0.000064 µg/L in freshwater.

Eight remedial alternatives were evaluated during the FS. Components that are common to Alternatives A-3 through A-7 are presented here as a group in order to limit redundancy in the subsequent discussion of the individual alternatives. The common components of Alternatives A-3 through A-7 are:

- Identification and confirmation of the remedial area footprints through additional sampling during the RD;
- RD sampling at SRI sample locations that exceeded 50 mg/kg PCBs to confirm the presence and extent of such hot spots for targeted removal;
- An LTM program and maintenance of ICs and engineering controls (ECs) until long-term goals are achieved. The LTM program would confirm the ongoing effects of natural processes and document the continued declines in PCB concentrations in various media, resulting in reductions in risk and ecological exposures. It is anticipated that the monitoring program would be designed to supplement the current program that includes fish and water column monitoring. The final components of the LTM program would be defined during the RD. For purposes of developing cost estimates, it was assumed that the LTM program would include the following activities:
    - Fish monitoring twice every 5 years during the LTM period. Fish samples would be collected in Area 2 and the reference/background areas. The actual sampling locations would be specified during the RD. Smallmouth bass and carp would be collected at each sampling location. Adult carp and both adult (fillet) and young-of-year (whole-body) smallmouth bass would be collected and analyzed for total PCBs and lipid content.
    - Surface water quality monitoring annually for the first five years, then once every five years for the remainder of the LTM period to support EPA's periodic five-year reviews. Surface water monitoring stations for OU5 are currently located at the upstream and downstream ends of Area 2 (in Areas 1 and 3, respectively). Surface water samples would be analyzed for total PCBs.
    - Sediment samples would also be collected to support EPA's five-year reviews by monitoring ongoing recovery conditions and natural attenuation in Area 2.
    - Visual inspections of riverbank erosion along the newly-constructed channel and cap erosion and/or damage in any capped areas annually for the first five years after dam removal, then once every five years for the remainder of the LTM period. Additional inspections would be conducted after major storm/flooding events, as necessary.
- Site-specific fish consumption advisories established and publicized by the State of Michigan would continue to manage risks posed to anglers and their families from consumption of PCB-containing fish.[10] These advisories, which include warning signage posted along the river, are already in place for Area 2, and the

[10] The fish consumption advisories issued by MDCH are only a recommendation, are not legally binding, and have limited effectiveness in protecting human health. Fish advisories, alone, would not be an appropriate remedial alternative.

advisory for each fish type would remain in effect until fish tissue PCB concentrations achieve RAOs for the fish specified. The advisories would be reviewed and verified annually as a component of the site ICs;

- In addition to fish consumption advisories, other ICs would be implemented and maintained. Land use restrictions to prevent future residential use and limit human exposure to recreational scenarios may be implemented where concentrations greater than 2.5 mg/kg will remain in the floodplain soil. In addition to the two private parcels in the northeast portion of Area 2, there are industrial-zoned and recreational parcels along the downstream portion (some owned by the City of Otsego and Otsego Township) for which ICs may be required.
- Use of a RAL for PCBs of 20 mg/kg for floodplain soil. The RAL value of 20 mg/kg is based on an assessment of the following factors: the incremental risk reduction that would be achieved; the desire to protect 95% to 100% of the receptors (i.e., shrew, wren, and robin); and the incremental area and soil volume associated with each potential RAL value that was evaluated during the FS. A RAL of 20 mg/kg will provide the largest incremental risk reduction in the impounded floodplain area.

Remedial Alternatives

A-1: No Action

Estimated Capital Cost: $0
Estimated O&M Cost: $0
Estimated Present Worth Cost: $0
Estimated Total Cost: $0
Estimated Construction Timeframe: None

Regulations governing the Superfund program require that the "no action" alternative be evaluated generally to establish a baseline for comparison. The No Action remedial alternative, A-1, would rely on natural recovery processes ongoing in the river, as a result of completed and ongoing remedial actions in Area 1 and other upstream OUs. Ongoing natural recovery processes include deposition of cleaner sediment from the watershed and mixing of surface and cleaner sediment. No active remediation or monitoring would be conducted under this alternative. The time to reach protective levels and compliance with FRGs is estimated to be a minimum of 35 years, but no monitoring would be conducted to document progress toward achievement of FRGs. No cost is associated with this alternative.

A-2: Monitored Natural Recovery, Institutional Controls, and Long-Term Monitoring

Estimated Capital Cost: $4,900,000
Estimated O&M Cost: $7,600,000
Estimated Present Worth Cost: $7,580,000

Estimated Total Cost: $12,500,000
Estimated Construction Timeframe: 2 years

This alternative includes the removal of the Otsego City dam followed by MNR, ICs and LTM. It relies on natural processes ongoing in the river, including reduced PCB loading from upstream sources as a result of completed and ongoing remedial actions in Area 1 and the other upstream OUs. Ongoing natural recovery processes include deposition of cleaner sediment from the watershed and mixing of surface and cleaner sediment. The LTM program for MNR would be robust to confirm stability of PCB deposits and to measure and track recovery in Area 2 PCB-impacted media/biota. The time to reach protective levels and compliance with FRGs under Alternative A-2 is estimated to be a minimum of 35 years after ROD issuance. The estimated cost of this alternative is $12,500,000.

A-3: Capping, Channel Realignment, Gun River Excavation, Targeted Excavation of Knife Blade Island, ICs and LTM

Estimated Capital Cost: $41,080,000
Estimated O&M Cost: $2,720,000
Estimated Present Worth Cost: $34,900,000
Estimated Total Cost: $43,800,000
Estimated Construction Timeframe: 5 years

The components of Alternative A-3 are discussed in detail below. In summary, Alternative A-3 includes:

- Otsego City Dam removal
- Channel realignment (Option 3)
- RD sampling as approved by EPA
- Excavation of confirmed PCB hot spots in areas to be capped
- Capping of the northeast anabranches, Pond G, and floodplain soil exceeding the 20 mg/kg RAL for PCBs outside the realigned channel footprint
- Excavation of Gun River sediment and bank soil
- Targeted excavation of soil/sediment with PCB concentrations exceeding 50 mg/kg at Knife Blade Island
- ICs (as discussed above in the *Common Elements* section)
- LTM and maintenance (as discussed above in the *Common Elements* section)

Alternative A-3 includes approximately 33 acres of capping and 12,900 cy of excavation over a total remedial footprint spanning approximately 36 acres.

Cap soil is assumed to mostly consist of clean cut material recovered from the channel realignment. Prior to placement of the cap, a non-woven geotextile layer would be placed over the existing ground surface to serve as a demarcation layer. To support habitat restoration, a topsoil layer would be created by entraining organic material (e.g., chipped vegetation, peat, and other organic detritus) recovered during clearing and channel

realignment activities into the top six inches of fill. Caps in floodplain and anabranches would consist of a two-foot-thick soil cap (including topsoil layer) over a geotextile. For Pond G, the subaqueous cap would consist of an 18-inch layer of soil overlain with six inches of sand or gravel.

Some excavation at the interface between the anabranches and the main channel would occur prior to capping as part of channel realignment activities. RD sampling would be used to confirm locations of potential hot spots with PCB concentrations greater than 50 mg/kg identified during the SRI sampling. Footprints of confirmed hot spots exceeding 50 mg/kg PCBs on Knife Blade Island and in proposed cap areas would be excavated and backfilled prior to installing caps.

Gun River would be modified as part of channel realignment. Due to the uncertainty regarding the extent of current PCB contamination in Gun River, a cost range representing excavation of half of the channel sediment and along the left bank to the full width of the channel and both banks was considered. A mid-point cost has been included in the cost estimate for this alternative.

The LTM program for this alternative includes visual inspections, fish sampling, and maintenance activities for caps, bank treatments, and/or vegetation restoration. This alternative would reach FRGs for smallmouth bass within 32 years after ROD issuance. The time to complete construction would be approximately 5 years. The estimated cost of this alternative is $43,800,000.

A-4: Capping, Bank RAL Excavation, Channel Realignment, Gun River Excavation, Targeted Excavation of Knife Blade Island, ICs and LTM

Estimated Capital Cost: $41,660,000 to $42,410,000
Estimated O&M Cost: $2,740,000 to $2,790,000
Estimated Present Worth Cost: $35,400,000 to 36,000,000
Estimated Total Cost: $44,400,000 to $45,200,000
Estimated Construction Timeframe: 5 years

Alternative A-4 is the same as A-3 with the addition of excavation of bank soil along the realigned channel path that exceeds a RAL of either 5 or 10 mg/kg total PCBs.

The components of Alternative A-4 are discussed in detail below. In summary, Alternative A-4 includes:

- Otsego City Dam removal
- Channel realignment (Option 3)
- Bank RAL Excavation
- RD sampling as approved by EPA
- Excavation of confirmed PCB hot spots in areas to be capped
- Capping of the northeast anabranches, Pond G, and floodplain soil exceeding the 20 mg/kg RAL for PCBs outside the realigned channel footprint
- Excavation of Gun River sediment and bank soil

- Targeted excavation of soil/sediment with PCB concentrations exceeding 50 mg/kg at Knife Blade Island
- ICs (as discussed above in the *Common Elements* section)
- LTM and maintenance (as discussed above in the *Common Elements* section)

Alternative A-4 includes approximately 33 acres of capping and 16,900 to 22,300 cy of excavation over a total remedial footprint spanning approximately 38 acres.

Bank soil along the realigned channel would be excavated to a RAL of either 5 or 10 mg/kg total PCBs in a 10-foot swath along the bank. This additional bank soil excavation would provide an additional buffer between the newly-realigned channel and floodplain soils as a measure of added protection – above that provided by the natural channel design – to prevent migration of PCBs from floodplain/bank soil to the river. While bank treatment alone would protect the bank and floodplain soils, excavation to the bank soil RAL in the 10-foot swath would allow additional time to respond to maintenance concerns before bank failure could potentially occur.

Bank soil RALs for PCBs of both 5 mg/kg and 10 mg/kg were analyzed in the FS for additional protection along the realigned channel. Both RALs have been estimated to be protective. The cost range for performing bank excavation to a RAL of 10 or 5 mg/kg was estimated to be $570,000 to $1,330,000, respectively, based on an estimated 4,000 cy to 9,400 cy of excavation (including contingency and management costs). The cost range for this alternative reflects the difference in cost between a bank RAL for PCBs of 10 mg/kg and 5 mg/kg.

This alternative would reach FRGs for smallmouth bass within 32 years after ROD issuance. The time to complete construction would be approximately 5 years. The estimated cost range of this alternative is $44,400,000 to $45,200,000.

***A-5: Capping, Bank RAL Excavation, Channel Realignment, Floodplain Soil Excavation, Gun River Excavation, Targeted Excavation of Knife Blade Island, ICs and LTM* (EPA'S SELECTED ALTERNATIVE)**

Estimated Capital Cost: $42,920,000 to $43,670,000
Estimated O&M Cost. $2,680,000 to $2,730,000
Estimated Present Worth Cost: $36,400,000 to $37,000,000
Estimated Total Cost: $45,600,000 to $46,400,000
Estimated Construction Timeframe: 5 years

Alternative A-5 is the same as A-4, except that the floodplain soil areas exceeding the RAL of 20 mg/kg for PCBs would be excavated instead of capped.

The components of Alternative A-5 are discussed in detail below and shown on Figure 4. In summary, Alternative A-5 includes:

- Otsego City Dam removal
- Channel realignment (Option 3)

- Bank RAL Excavation
- RD sampling as approved by EPA
- Excavation of confirmed PCB hot spots in areas to be capped
- Excavation of floodplain soil exceeding the 20 mg/kg RAL for PCBs outside the realigned channel footprint
- Capping of the northeast anabranches and Pond G
- Excavation of Gun River sediment and bank soil
- Targeted excavation of soil/sediment with PCB concentrations exceeding 50 mg/kg at Knife Blade Island
- ICs (as discussed above in the *Common Elements* section)
- LTM and maintenance (as discussed above in the *Common Elements* section)

Alternative A-5 includes approximately 28 acres of capping and 23,800 to 29,200 cy of excavation over a total remedial footprint spanning approximately 38 acres.

Remedial footprints in the Area 2 floodplain were identified based on reducing potential exposure to soil for ecological and human receptors to meet RAOs 3 and 5. The RAL evaluation in the FS was performed based on the 0- to 6-inch and 0- to 24-inch natural neighbor PCB concentrations to determine remedial action levels necessary to improve home range protectiveness. Details of the full evaluation can be found in Appendix C of the Area 2 FS.

The floodplain soil RAL evaluation consisted of identifying areas with natural neighbor interpolated concentrations in the 0- to 6-inch and 0- to 24-inch intervals including the anabranch sediment exceeding the selected RAL value. The concentrations in these areas were then replaced with a backfill value to represent conditions after excavation or capping. A backfill PCB concentration of 0.078 mg/kg was used to represent the measured average in off-site backfill as documented during implementation of the Area 1 TCRAs. Following backfill replacement, the moving window analysis was repeated for the four home range scenarios (2 acres for the 0- to 6-inch interval, and 1, 2, and 11 acres for the 0- to 24-inch interval), and the home-ranges-protected percentages for that RAL were calculated. A RAL of 20 mg/kg for PCBs was initially selected as this would also be protective of human recreational receptors (the PRG for recreational exposure is 23 mg/kg PCBs). At the RAL of 20 mg/kg, 99.5 to 100% of home ranges for the four receptor scenarios were protected by achieving the FRG of 11 mg/kg. Based on this result, it was not necessary to evaluate other RALs. The RAL soil footprint was then identified by combining the 0- to 6-inch and 0- to 24-inch natural neighbor areas exceeding 20 mg/kg PCBs.

This alternative would reach FRGs for smallmouth bass within 32 years after ROD issuance. The time to complete construction would be approximately 5 years. The estimated cost range of this alternative is $45,600,000 to $46,400,000.

A-6: Capping, Bank RAL Excavation, Channel Realignment, Anabranch Excavation, Gun River Excavation, Targeted Excavation of Knife Blade Island, ICs and LTM

Estimated Capital Cost: $64,400,000 to $65,150,000
Estimated O&M Cost: $2,500,000 to $2,550,000
Estimated Present Worth Cost: $53,900,000 to $54,500,000
Estimated Total Cost: $66,900,000 to $67,700,000
Estimated Construction Timeframe: 5 years

Alternative A-6 is the same as A-4, except that the anabranch areas would be excavated instead of capped.

The components of Alternative A-6 are discussed in detail below. In summary, Alternative A-6 includes:

- Otsego City Dam removal
- Channel realignment (Option 3)
- Bank RAL Excavation
- RD sampling as approved by EPA
- Excavation of confirmed PCB hot spots in areas to be capped
- Excavation of the northeast anabranches
- Capping of Pond G and floodplain soil exceeding the 20 mg/kg RAL for PCBs outside the realigned channel footprint
- Excavation of Gun River sediment and bank soil
- Targeted excavation of soil/sediment with PCB concentrations exceeding 50 mg/kg at Knife Blade Island
- ICs (as discussed above in the *Common Elements* section)
- LTM and maintenance (as discussed above in the *Common Elements* section)

Alternative A-6 includes approximately 8 acres of capping and 124,900 to 130,300 cy of excavation over a total remedial footprint spanning approximately 38 acres.

The remediation footprint selected in the region of the northeast anabranches comprises the anabranch subareas D0, D1, D2 and E. The area in and around the D1 Subarea has the largest number of samples in Area 2 with maximum PCB concentrations above 50 mg/kg widely distributed at various depths in the soil and sediment along the banks of the various anabranches. Data in Subareas D0, D2, and E is less dense, with both high and low concentrations distributed throughout. RD sampling would be required to refine and further define the final remedial footprint in these areas. Excavation would occur in these anabranch areas, followed by backfilling to restore grade and riparian habitat restoration.

This alternative would reach FRGs for smallmouth bass within 32 years after ROD issuance. The time to complete construction would be approximately 5 years. The estimated cost range of this alternative is $66,900,000 to $67,700,000.

A-7: RAL-Based Excavation in Remedial Areas, Channel Realignment, Gun River Excavation, Targeted Excavation of Knife Blade Island, ICs and LTM

Estimated Capital Cost: $72,100,000 to $72,850,000
Estimated O&M Cost: $2,400,000 to $2,450,000
Estimated Present Worth Cost: $60,100,000 to 60,700,000
Estimated Total Cost: $74,500,000 to $75,300,000
Estimated Construction Timeframe: 5 years

The components of Alternative A-7 are discussed in detail below. In summary, Alternative A-7 includes:

- Otsego City Dam removal
- Channel realignment (Option 3)
- Bank RAL Excavation
- RD sampling as approved by EPA
- Excavation of the northeast anabranches, Pond G, floodplain soil exceeding the 20 mg/kg RAL for PCBs outside the realigned channel footprint, and soil with PCB concentrations exceeding 2.5 mg/kg on one of the two private parcels in the northeast corner of Area 2
- Targeted excavation of soil/sediment with PCB concentrations exceeding 50 mg/kg at Knife Blade Island
- ICs (as discussed above in the *Common Elements* section)
- LTM and maintenance (as discussed above in the *Common Elements* section)

Alternative A-7 includes 162,100 to 167,500 cy of excavation over a total remedial footprint spanning approximately 42 acres.

This alternative would include excavation of the northeast anabranches, Pond G, floodplain soil exceeding the 20 mg/kg RAL outside the realigned channel footprint, and soil exceeding 2.5 mg/kg on one of the two private parcels in the northeast corner of Area 2.[11] After excavation, backfilling would occur to restore grade and riparian habitat restoration would be performed.

This alternative would reach FRGs for smallmouth bass within 32 years after ROD issuance. The time to complete construction would be approximately 5 years. The estimated total cost range of this alternative is $74,500,000 to $75,300,000.

A-8: Area-Wide Aggressive Excavation, ECs, ICs, and LTM

Estimated Capital Cost: $322,200,000
Estimated O&M Cost: $2,800,000
Estimated Present Worth Cost: $227,000,000

[11] The owner of the second private parcel is amenable to implementing a restrictive covenant prohibiting residential use of the impacted portion of the property, which is used for recreational activities

Estimated Total Cost: $325,000,000
Estimated Construction Timeframe: 10 years

The components of Alternative A-8 are discussed in detail below. In summary, Alternative A-8 includes:

- Otsego City Dam removal
- Area-wide excavation throughout Area 2 of sediment and floodplain soil with PCB concentrations exceeding 0.33 mg/kg, backfilling to restore the floodplain with grading for drainage to the post-dam main channel, and restoration of floodplain areas as riparian habitat
- ECs including erosion controls for rebuilt banks along the main channel
- RD sampling as approved by EPA
- ICs (as discussed above in the *Common Elements* section)
- Access agreements including rental and/or purchase of property
- LTM and maintenance (as discussed above in the *Common Elements* section)

Alternative A-8 includes 1,260,000 cy of excavation over a total remedial footprint spanning approximately 250 acres.

Aggressive excavation would include an area-wide removal of sediment and floodplain soil exceeding 0.33 mg/kg. Although the dam would be removed, there would be no channel realignment. The goal of this alternative would be to achieve the sediment PRG throughout the floodplain and allow the river to migrate and meander without LTM or maintenance of bank treatments, soil, or sediment.

Excavated floodplain areas would be backfilled to pre-excavation grade, banks would be rebuilt (using ECs), and the area would be vegetated to restore the destroyed riparian habitat. The LTM program for this alternative would include visual inspections, fish sampling, and verification of ICs.

The extended construction timeframe and aggressive excavation work would mean invasive floodplain-wide impacts to habitat. Habitat and wildlife recovery times would be lengthy. The potential of invasive species to propagate may make a full recovery unlikely.

This alternative would reach FRGs for smallmouth bass within 40 years after ROD issuance. The time to complete construction would be approximately 10 years. The estimated cost of this alternative is $325,000,000.

2.10 Comparative Analysis of Alternatives

Section 121(b)(1) of CERCLA presents several factors that EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the NCP articulates nine evaluation criteria to be used in assessing the individual remedial alternatives. The purpose of this evaluation is to promote consistent identification of the relative advantages and disadvantages of each alternative, thereby guiding selection of

remedies offering the most effective and efficient means of achieving site cleanup goals. While all nine criteria are important, they are weighed differently in the decision-making process depending on whether they evaluate protection of human health and the environment or compliance with federal and state ARARs (threshold criteria), consider technical or economic merits (primary balancing criteria), or involve the evaluation of non-EPA reviewers that may influence an EPA decision (modifying criteria).

Each of the nine evaluation criteria are described and discussed below with respect to the alternatives under consideration for this RA. In addition, Table 4 provides a qualitative summary of how the cleanup alternatives compare against the nine criteria. The first two criteria are "threshold criteria" that must be met by the selected remedy. The next five criteria deal with the technical and economic merits of the alternatives under consideration and are known as "primary balancing criteria." The last two criteria consider the views of non-EPA reviewers that may influence an EPA decision, and are known as "modifying criteria." More details regarding the evaluation and comparison of the cleanup alternatives against the nine criteria can be found in the Area 2 FS Report.

Overall Protection of Human Health and the Environment

This criterion addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed by the site are eliminated, reduced or controlled through treatment, engineering, or institutional controls.

Alternatives A-1 and A-2 are not protective of human health and the environment. These alternatives would not improve, reduce, or control risk to human health or ecological receptors beyond that initiated by the remedial work completed in the river to date. Although FRGs might be met in 35 years, no monitoring would occur with Alternative A-1, so any recovery rates and the achievement of protective levels would not be documented. Alternatives A-1 and A-2 would not address RAO 4, as they would not reduce the transport of PCBs from Area 2 to downstream areas of the Kalamazoo River and Lake Michigan. Sediment in the anabranch areas containing high concentrations of PCBs would continue to erode and migrate downstream with floods above the normal surface water elevation. Fish would then continue to be exposed to PCBs in or from the anabranch sediment. Dam removal may also increase the possibility of bed and bank erosion, especially in the short term.

Alternatives A-3 through A-7, which include removal of the Otsego City dam and realignment of the river channel, are protective of human health and the environment. These alternatives would immediately disconnect the anabranched sections from the main channel, eliminating exposure of fish to anabranch sediment and downstream migration of PCBs in anabranch sediment. Alternatives A-3 through A-5 would also include capping the former anabranches, which would raise their elevation further with respect to the main channel, cutting flow off at even higher water elevations. In addition to precluding contact with receptors, the capped elevation would reduce flood frequency, inundation time, and depth, as well as floodplain soil erosion. Alternatives A-6 and A-7 would include excavating the former anabranches to remove any possibility of PCBs

from these areas entering the river system. Alternatives A-3 through A-7 all would achieve the FRGs in 32 years.

Alternative A-4 would provide additional protection compared to Alternative A-3 with the addition of bank excavation to a 5 or 10 mg/kg RAL for PCBs, as an additional buffer to the bank treatments installed along the realigned channel.

Alternative A-5 would provide protection comparable to Alternative A-4, with floodplain soils exceeding the 20 mg/kg RAL for PCBs excavated and disposed off site instead of capped.

Alternative A-6 would provide protection comparable to Alternatives A-4 and A-5, with the anabranches excavated and disposed off site instead of capped.

Alternative A-7 would provide protection comparable to Alternatives A-3 through A-6, with all remedial areas exceeding RALs excavated and disposed off site.

Alternative A-8 would be protective, as aggressive excavation would be performed throughout Area 2 to remove sediment and soil with PCB concentrations exceeding 0.33 mg/kg. This alternative would take the longest to achieve FRGs (40 years), with achieving protection hampered by the long construction period (10 years). The extensive construction activities could negatively impact wildlife habitat and make full recovery unlikely.

Compliance with Applicable or Relevant and Appropriate Requirements

This criterion addresses whether a remedy will meet the applicable or relevant and appropriate federal and state requirements, known as ARARs.

Alternatives A-1 and A-2 might eventually meet most ARARs through natural recovery. Since no monitoring would be conducted under Alternative A-1, compliance with ARARs under that alternative would not be documented.

Alternatives A-3 through A-7 would meet ARARs but would require a risk-based disposal equivalency demonstration for compliance with TSCA ARARs. Appropriate control measures would be implemented during construction such that the substantive requirements of the action- and location-specific ARARs would be achieved.

Alternative A-8 would comply with ARARs, but it would take longer to meet them (compared to Alternatives A-3 through A-7) due to the longer construction period.

Long-term Effectiveness and Permanence

This criterion addresses expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met.

Alternative A-1 would not provide for tracking or confirmation of future achievement of RAOs, so long-term effectiveness would not be demonstrated or documented.

Alternative A-2 might eventually meet FRGs but would not be effective, as the downstream migration of PCBs would continue through erosion of PCB materials from the river banks and anabranched area after dam removal.

Alternatives A-3 through A-7 would be effective in the long term and permanent, and all would have a relatively comparable degree of long-term effectiveness and permanence. All of these alternatives include removing the Otsego City dam and realigning the channel. Alternatives A-3 through A-5 include capping the former anabranches, which would prevent contact by receptors, prevent erosion of floodplain soil, sediment, and bank soil, and reduce flooding frequency, inundation depth and time in the former anabranches for the long term. Alternatives A-6 and A-7 include excavating the former anabranches instead of capping them, which would remove this PCB contamination from the river system. Alternative A-7 has less long-term maintenance than Alternatives A-3 through A-6 due to the excavation of all the remedial areas as opposed to capping some of them. For Alternatives A-3 through A-7, channel realignment and bank treatments would prevent erosion or exposure to remaining PCB deposits in the banks and floodplain soil for the long term. Alternatives A-4 through A-7 would provide somewhat greater long-term effectiveness than Alternative A-3 due to the 10-foot bank excavation buffer associated with these alternatives, which would provide additional protection from PCB release into the river should bank erosion occur. Alternatives A-3 through A-7 would achieve fish tissue FRGs for smallmouth bass within 32 years. LTM and ICs would remain in place until fish tissue FRGs are achieved.

Alternative A-8 would have a high degree of long-term effectiveness and permanence, as all sediment and floodplain soil exceeding 0.33 mg/kg total PCBs would be removed. The time to achieve the fish tissue FRGs for smallmouth bass is longer than the other alternatives, estimated at 40 years, due to the long construction timeframe. However, short-term and long-term impacts to habitat would be substantial and may outweigh the benefits of PCB removal.

Reduction of Toxicity, Mobility, or Volume through Treatment

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

None of the alternatives employ treatment technologies to reduce the toxicity, mobility or volume of the contaminated materials. However, Alternatives A-3 through A-8 would

remove significant volumes of PCB-contaminated sediment and soil from Area 2, thereby reducing the ability of the PCB-contaminated sediment to be mobilized into the river in the future. Due to the nature of the contamination, the PCB-contaminated sediment and soil does not lend itself to cost-effective treatment.

Short-term Effectiveness

This criterion addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction of the remedy until cleanup levels are achieved. This criterion also considers the effectiveness of mitigative measures and time until protection is achieved through attainment of the RAOs.

Alternatives A-1 and A-2 would have no adverse short-term impacts, as no active construction work is associated with these alternatives. However, the time to achieve RAOs is also considered as part of the short-term effectiveness criterion, and neither of these alternatives would achieve all of the RAOs. For this reason, Alternatives A-1 and A-2 are not considered effective in the short term.

Alternatives A-3 through A-5 would have the same relative degree of short-term effectiveness. Dam removal and channel realignment would immediately disconnect the anabranches from the main river channel, eliminating fish exposure to anabranch sediment. These alternatives would prevent contact to receptors immediately upon completion. Erosion prevention, as well as reductions to flooding frequency, and inundation depth and time in the anabranches would also be immediate. Temporary, reversible, and limited impact would occur to habitat areas where the cap is applied and in support areas such as staging areas and construction roads. These would be addressed by revegetating the disturbed areas to initiate habitat recovery. Risks to workers during construction activities would be controlled through safe work practices and training. The implementation period for Alternatives A-3 through A-5 would be approximately 5 years.

Alternative A-6 includes dam removal and channel realignment which would provide similar short-term benefits as mentioned for Alternatives A-3 through A-5. However, Alternative A-6 is less protective in the short term as it includes excavation and restoration of the anabranches which would result in a lower ground surface elevation than capping. The lower ground surface would immediately increase frequency of flooding, inundation depth, and the potential for soil erosion. The large footprint for excavation in this alternative yields a more extensive short-term impact to habitat and wildlife than Alternatives A-3 through A-5. The implementation period for Alternative A-6 is the same as for Alternatives A-3 through A-5, approximately 5 years.

Alternative A-7 would have a somewhat greater degree of potential short-term adverse impacts than Alternatives A-3 through A-6 due to the larger volume of material to excavate and transport off site. The implementation period for Alternative A-7 would be the same as Alternatives A-3 through A-6, approximately 5 years.

Alternative A-8 would have the greatest degree of short-term impacts because of the long construction period, estimated at 10 years, and the extensive excavation work throughout Area 2. Compared to the other alternatives, Alternative A-8 requires extensive and invasive floodplain-wide excavation and habitat impact. Potential PCB migration during excavation work would be increased under Alternative A-8. Risks to workers during construction activities would be controlled through safe work practices and training.

Implementability

This criterion addresses the technical and administrative feasibility of a remedy from design through construction, including the availability of services and materials needed to implement a particular option and coordination with other governmental entities.

Alternatives A-1 and A-2 could be easily implemented. No active measures are associated with Alternative A-1, and Alternative A-2 would include only LTM and inspections.

Alternatives A-3 through A-7 are all readily implementable.

Alternative A-3, which includes the construction of access roads and staging areas, capping and excavation work, channel realignment, and dam removal, is readily implementable using standard construction techniques. Negotiations with property owners for access agreements for remedial activity and channel realignment would be required spanning Area 2. Although the on-site remedial action work would not be subject to the permit approval process, the remedial action would need to meet the substantive requirements of otherwise applicable permits for dam removal, channel realignment, and capping in the floodplain. Floodplain elevation changes would need to be evaluated against the post-dam removal and realigned channel water elevations and flooding potential. Work would be performed using conventional, readily available equipment and practices. Transport of dewatered material for disposal to approved landfills would be required. Cap placement in hard-to-access and swampy areas would be a concern. However, cap placement would be much easier using application methods such as broadcasting via an air or water slurry. These methods would reduce handling difficulties, time, and costs as well as the impact to habitat.

Alternative A-4 would be somewhat more difficult to implement than Alternative A-3, as the additional river bank buffer excavation would increase the volume of material requiring dewatering, transport and disposal.

Alternative A-5 would be slightly more difficult to implement than Alternatives A-3 and A-4, as in addition to the additional river bank buffer excavation, floodplain soils exceeding the 20 mg/kg PCB RAL would be excavated. This would increase the volume of material requiring dewatering, transport and disposal.

Alternative A-6 would be somewhat more difficult to implement than Alternatives A-3 through A-5 since this alternative requires excavation of the northeast anabranches. This would increase the volume of material requiring dewatering, transport and disposal.

Alternative A-7 would be somewhat more difficult to implement than Alternatives A-3 through A-6 since this alternative requires excavation of all remedial areas. This would increase the volume of material requiring dewatering, transport and disposal.

Alternative A-8 would be the most difficult to implement. This alternative requires an extensive network of access roads and staging areas as well as a significant volume of material to be dewatered, transported, and disposed. A significant volume of borrow or imported material would be required for backfill. Negotiations with private parcel owners would be more intensive due to the extent and invasive nature of the remediation. It is possible that rental or purchase of properties may be required to gain access and implement this alternative. Floodplain changes would need to be evaluated against the post-dam removal water elevations and flooding potential. Work would be performed using conventional, readily available equipment and practices, but the implementation time would be lengthy. Additionally, parcel owners may be unwilling to allow substantial destruction of their property.

Cost

This criterion considers the estimated capital costs, annual O&M costs, and the net present value of the capital and O&M costs, including long-term monitoring.

The estimated total costs for each alternative are FS-level cost estimates that have an expected accuracy of +50% to -30%. Costs for the alternatives range from zero to $325 million, as listed below. A 7% discount factor was used to develop the cost estimates.

Alternative A-1	$0
Alternative A-2	$12,500,000
Alternative A-3	$43,800,000
Alternative A-4	$44,400,000 to $45,200,000
Alternative A-5	$45,600,000 to $46,400,000
Alternative A-6	$66,900,000 to $67,700,000
Alternative A-7	$74,500,000 to $75,300,000
Alternative A-8	$325,000,000

Alternative A-8 is the highest cost alternative because 1,260,000 cy of sediment and soil would be removed throughout Area 2 and transported for off-site disposal. The estimated costs for Alternatives A-3 through A-7 are an order of magnitude lower than the cost for Alternative A-8. Alternatives A-3 through A-5 are similar in cost. The costs of Alternatives A-6 and A-7 are significantly higher than Alternatives A-3 through A-5 due to the increase volume of excavated materials associated with those alternatives. Other than the "no action" alternative, Alternative A-2 is the least costly alternative because the

only remedy components that have associated costs are dam removal, LTM and inspections.

As noted earlier, Alternatives A-3 through A-7 all include removal of the Otsego City Dam and channel realignment. The estimated cost of channel realignment (Option 3) is $26,000,000 and the estimated cost of dam removal is $3,840,000, making the total combined cost of these common components of Alternatives A-3 through A-7 an estimated $29,840,000.

The final cost estimate for the selected remedy will be developed and refined during the RD.

State Agency Acceptance

This criterion considers whether the state support agency supports the preferred alternative presented in the Proposed Plan and concurs with the selected remedy.

The State has indicated that it intends to concur with the Selected Remedy for Area 2 of OU5. MDEQ's concurrence letter will be included in the AR upon receipt.

Community Acceptance

This criterion addresses the public's general response to the remedial alternatives and the preferred alternative presented in the Proposed Plan.

During the public meeting and in comments submitted during the public comment period, the community expressed acceptance of Alternative A-5. A full response to public comments is included in this ROD in Part 3 - Responsiveness Summary.

2.11 Principal Threat Wastes

The principal threat concept is applied to the characterization of "source material" at a Superfund site. Source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contaminants to groundwater, surface water or air, or acts as a source for direct exposure. EPA has defined principal threat wastes as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

EPA has not identified any principal threat wastes at OU5 of the Site. The PCB-contaminated soil and sediment throughout OU5 are re-worked and re-deposited materials that were mixed with water, soil, and sediment throughout Area 2. The concentrations of PCBs at OU5 are considered to be low-level threat wastes.

2.12 Selected Remedy

Description of the Selected Remedy

The selected sediment and floodplain soil remedy for Area 2 of OU5 is **Alternative A-5: Capping, Bank RAL Excavation, Channel Realignment, Floodplain Soil Excavation, Gun River Excavation, Targeted Excavation of Knife Blade Island, ICs and LTM.**

The Selected Remedy consists of the following main components and is illustrated on Figure 4:

- Otsego City Dam removal: Removal of the dam will result in the northeast anabranches not conveying water under normal flow conditions (1,000 cfs). As such, fish will no longer have routine access to these areas with higher PCB concentrations. Dam removal is also desired by the City of Otsego and the State of Michigan for several reasons, including reducing long-term dam maintenance and restoring natural free-flowing conditions to the river.

- Channel realignment (Option 3): Realigning the river in Area 2 to create a stable single channel with dam removal will prevent the river from regularly forming unstable anabranches, and will protect the floodplain from future erosion due to channel migration. Removing the dam and constructing a single stable channel are believed to be necessary to meet the RAOs for Area 2. The goal is to create a channel that conveys the bankfull flow of a 1.2-year return period (approximately 2,500 to 2,700 cfs), maintains adequate shear stress to convey the bedload of the river, and remains in a fixed location over time. This stable channel would therefore maintain the applicability of the soil FRG in the dam-out floodplain across Area 2. Channel Option 3 balances the effort and cost to achieve a stable single channel for remedial alternative development by providing a larger buffer area for Knife Blade Island and by following the existing channel bed in the downstream reach. The design for channel realignment will likely be modified from that shown as Option 3 (in Figure 7) based on additional data collection and evaluation during the RD.

- Bank RAL excavation: Bank soil along the realigned channel will be excavated to a RAL of 5 mg/kg total PCBs in a 10-foot swath along the bank. This additional bank soil excavation will provide an additional buffer between the newly realigned channel and floodplain soils as a measure of added protection above that provided by the natural channel design to prevent migration of PCBs from floodplain bank soil to the river. While bank treatment alone would protect the bank and floodplain soils, excavation to the bank soil RAL in the 10-foot swath allows additional time to respond to maintenance concerns before bank failure could potentially occur.

  Bank soil RALs for PCBs of both 5 mg/kg and 10 mg/kg were analyzed for additional protection along the realigned channel. Both RALs have been estimated to be protective. The cost difference between implementing the different RALs is small ($570,000 vs $1,330,000) relative to the total cost of the remedy. Given the

uncertainty of the natural channel design (particularly in upstream reaches of Area 2), as well as the uncertainty in the RAL calculations, EPA believes the RAL of 5 mg/kg is most appropriate for long-term effectiveness and permanence of the remedy and ensuring that a clean buffer exists between the river and the floodplain.

- RD sampling as approved by EPA and targeted excavation: Sampling will include the identification of the remedial area footprints, as well as targeting the SRI sample locations that exceeded 50 mg/kg PCBs to confirm the presence and extent of such hot spots for targeted removal.

- Excavation of confirmed PCB hot spots in areas to be capped: The footprints of confirmed hot spots exceeding 50 mg/kg on Knife Blade Island and in proposed cap areas will be excavated and backfilled prior to installing caps.

- Excavation of floodplain soil exceeding the 20 mg/kg RAL for PCBs outside the realigned channel footprint: Remedial footprints in the Area 2 floodplain will be identified based on reducing potential exposure to soil for ecological and human receptors to meet RAOs 3 and 5. A RAL of 20 mg/kg for PCBs will be protective of human recreational receptors (the FRG for recreational exposure is 23 mg/kg), and will protect an estimated 99.5 to 100% of home ranges for the four receptor scenarios at the FRG of 11 mg/kg. The 20 mg/kg RAL soil footprint will combine the 0- to 6-inch and 0- to 24-inch natural neighbor areas exceeding 20 mg/kg total PCBs.

- Capping of the northeast anabranches and Pond G: The northeast anabranches that are cut off from the main channel following Otsego City Dam removal and channel realignment will be capped to prevent ecological exposure. Cap soil is assumed to mostly consist of clean cut material recovered from the channel realignment. Prior to placement of the cap, a non-woven geotextile layer will be placed over the existing ground surface to serve as a demarcation layer. To support habitat restoration, a topsoil layer will be created by entraining organic material (e.g., chipped vegetation, peat, and other organic detritus) recovered during clearing and channel realignment activities into the top six inches of fill. Caps in the floodplain and anabranches will consist of a two-foot-thick soil cap (including topsoil layer) over a geotextile. For Pond G, the subaqueous cap will consist of an 18-inch layer of soil overlain with six inches of sand or gravel.

- Excavation of Gun River sediment and bank soil: Gun River will be modified as part of channel realignment. Due to the uncertainty regarding the extent of current PCB contamination in Gun River, a cost range representing excavation of half of the channel sediment and along the left bank to the full width of the channel and both banks was considered. A mid-point cost was included in the cost estimate.

- Targeted excavation of soil/sediment with PCB concentrations exceeding 50 mg/kg at Knife Blade Island: Additional RD sampling will be conducted to confirm the hot spot locations and identify any additional hot spot areas to be excavated.

- ICs: The ICs for Area 2 include continuation of fish consumption advisories and warning signage until fish tissue goals are met, and land use restrictions to prevent future residential use and limit human exposure at all properties where contamination is left in place at levels unsuitable for unrestricted residential use (i.e., at concentrations greater than 2.5 mg/kg). Site-specific fish consumption advisories established and publicized by the State of Michigan will continue to manage risks posed to anglers and their families from consumption of PCB-containing fish. These advisories are already in place for Area 2, and the advisory for each fish type will remain in effect until fish tissue PCB concentrations achieve RAOs for the fish specified. The advisories will be reviewed and verified annually as a component of the site ICs.

- Long-term monitoring: LTM in Area 2 will include visual river bank and channel inspections, and maintenance activities for caps, bank treatments, and/or vegetation restoration, as well as monitoring surface water, fish tissue and sediment until fish tissue levels attain FRGs, which is estimated at 32 years after ROD issuance.

The estimated time to complete construction is approximately 5 years, at an estimated cost of $46,400,000. Alternative A-5 includes approximately 28 acres of capping and 29,200 cy of excavation over a total remedial footprint spanning approximately 38 acres.

Summary of the Rationale for the Selected Remedy

EPA believes that Alternative A-5 provides the best balance of the evaluation criteria among all the alternatives. Alternative A-5 is protective of human health and the environment, meets all federal and state ARARs, achieves the RAOs for this remedial action, is straightforward in its implementation, and is effective in the long term and permanent.

Alternative A-5 provides long-term and permanent protection against exposure to contaminated materials by removing the Otsego City Dam and realigning the channel consistent with Option 3 described above. This will reduce fish access to the northeast anabranches and reduce erosion of PCB soil downstream. The construction of the 10-foot buffer along the realigned channel will provide an additional measure of protection above that provided by the natural channel design to prevent migration of PCBs from floodplain bank soil to the river. In addition, Alternative A-5 includes excavating approximately 29,200 cy of PCB-contaminated sediment and soil and capping approximately 28 acres, reducing potential exposure to soil for ecological and human receptors to meet RAOs 3 and 5. Alternative A-5 includes capping of the northeast anabranches and Pond G, and excavating floodplain soil exceeding the 20 mg/kg PCB RAL, Gun River and hot spot areas exceeding 50 mg/kg. These remedial activities along with natural recovery processes, in conjunction with ICs and LTM, will ensure the FRGs and RAOs are achieved over time.

Alternative A-5 is effective in the short term, as it prevents contact to receptors immediately upon completion. Erosion prevention, as well as reductions to flooding

frequency and inundation depth and time in the anabranches, will also be immediate. Alternative A-5 is administratively and technically implementable and can be completed within 5 years, while posing easily manageable risks to workers and the local community during implementation.

Alternative A-5 is cost-effective because it has less extensive impact on habitat and is significantly less costly compared to Alternatives A-6, A-7 and A-8. Alternative A-5 will achieve FRGs for smallmouth bass within 32 years, which is the same timeframe as Alternatives A-3, A-4, A-6 and A-7, but 8 years sooner than Alternative A-8. Alternative A-5 is slightly more expensive but comparable in cost to Alternatives A-3 and A-4, but incorporates an additional 10-foot buffer along the realigned channel for added protection and removes additional PCB contaminated floodplain soil.

Alternative A-5 does not reduce the toxicity, mobility or volume of the contamination through treatment, as the relatively low-level PCB contamination that is present in Area 2 of OU5 does not lend itself to any cost-effective treatment.

Expected Outcomes of the Selected Remedy

The Selected Remedy will reduce the risks to human health and the environment by reducing PCB concentrations in smallmouth bass fish tissue to levels within EPA's acceptable risk range, and reducing PCB exposure to ecological receptors. This will be accomplished by removing the Otsego City Dam and realigning the channel, capping the northeast anabranches and Pond G, and excavating floodplain soil exceeding the 20 mg/kg PCB RAL, Gun River and hot spot areas exceeding 50 mg/kg. These remedial activities, along with natural recovery processes, in conjunction with ICs and LTM, will ensure the FRGs and RAOs are achieved over time. The time to reach fish tissue FRGs is approximately 32 years. The ecological risk FRG will be met in 99.5 to 100% of home ranges immediately upon completion of construction. The land use within Area 2 of OU5 is expected to remain the same. As noted earlier, groundwater is not a media of concern and is not addressed by this ROD.

Cost of the Selected Remedy

The estimated cost of implementing the selected remedy is $46,400,000. The information in the cost estimates is based on the best available information regarding the anticipated scope of the remedial alternatives. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design and remedy implementation. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

2.13 Statutory Determinations

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative

treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

Protection of Human Health and the Environment

The Selected Remedy provides overall protection of human health and the environment from impacted soils and sediments. This remedy reduces overall PCB exposure risk to humans and ecological receptors and supports the reduction in PCB concentrations in fish tissue over time.

Alternative A-5, which includes removal of the Otsego City dam and realignment of the river channel, will immediately disconnect the anabranched sections from the main channel, eliminating exposure of fish to anabranch sediment and downstream migration of PCBs in anabranch sediment. The selected remedy also includes capping the former anabranches and Pond G, and excavating floodplain soil exceeding the 20 mg/kg PCB RAL, Gun River and hot spot areas exceeding 50 mg/kg. This will raise the anabranch elevation further with respect to the main channel, cutting flow off at even higher water elevations. In addition to precluding contact with receptors, the capped elevation would reduce flood frequency, inundation time, and depth, as well as floodplain soil erosion. The selected remedy will achieve the fish tissue FRGs in 32 years, and be protective of 99.5 to 100% of ecological receptor home ranges immediately following construction.

Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedy is expected to comply with the federal and state ARARs that are specific to this RA. The ARARS for this action are discussed above in Section 2.10 and can be found in Appendix 1.

Cost-Effectiveness

In EPA's judgment, the selected remedy is cost-effective and represent a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP Section 300.430(f)(I)(ii)(D)). The Selected Remedy is cost-effective because it has less extensive impact on habitat and is significantly less costly compared to Alternatives A-6, A-7 and A-8. Alternative A-5 will achieve FRGs for smallmouth bass within 32 years, which is the same timeframe as Alternatives A-3, A-4, A-6 and A-7, but 8 years sooner than Alternative A-8. Alternative A-5 is slightly more expensive but comparable in cost to Alternatives A-3 and A-4, but incorporates an additional 10-foot buffer along the realigned channel for added protection and removes additional PCB contaminated floodplain soil.

Preference for Treatment as a Principal Element

The Selected Remedy does not reduce the toxicity, mobility, or volume of the contamination through treatment because the relatively low-level PCB contamination is not considered by EPA to be a principal threat waste, and the contamination does not lend itself to any cost-effective treatment.

Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

Alternative A-5 provides long-term and permanent protection against exposure to contaminated materials by removing the Otsego City Dam and realigning the channel consistent with Option 3 described above. This will reduce fish access to the northeast anabranches and reduce erosion of PCB soil downstream. The construction of the 10-foot buffer along the realigned channel will provide an additional measure of protection above that provided by the natural channel design to prevent migration of PCBs from floodplain bank soil to the river. In addition, Alternative A-5 includes excavating approximately 29,200 cy of PCB-contaminated sediment and soil and capping approximately 28 acres, reducing potential exposure to soil for ecological and human receptors to meet RAOs 3 and 5. Alternative A-5 includes capping of the northeast anabranches and Pond G, and excavating floodplain soil exceeding the 20 mg/kg PCB RAL, Gun River and hot spot areas exceeding 50 mg/kg. These remedial activities along with natural recovery processes, in conjunction with ICs and LTM, will ensure the FRGs and RAOs are achieved over time.

Alternative A-5 is effective in the short term, as it prevents contact to receptors immediately upon completion. Erosion prevention, as well as reductions to flooding frequency and inundation depth and time in the anabranches, will also be immediate. Alternative A-5 is administratively and technically implementable and can be completed within 5 years, while posing easily manageable risks to workers and the local community during implementation.

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for UU/UE, statutory review of the remedy protectiveness will be conducted every five years until the PCB concentration in fish

tissue meets the remediation goals set forth in this ROD. Two five-year reviews have already been conducted at the Site, and Area 2 of OU5 will be included in future five-year reviews.

2.14 Documentation of Significant Changes

The Proposed Plan for Area 2 of OU5 was issued for public comment on June 30, 2017. The Proposed Plan identified Alternative A-5 as the Preferred Alternative. The Proposed Plan public comment period ran from July 1, 2017 through August 30, 2017. CERCLA Section 117(b) and NCP Section 300.430(f)(5)(iii) require an explanation of any significant changes from the remedy presented in the Proposed Plan that was published for public comment. Based upon its review of the written and oral comments submitted during the public comment period, EPA has determined that no significant changes to the remedy, as originally identified in the Proposed Plan, are necessary or appropriate.

Part 3 - Responsiveness Summary

In accordance with CERCLA Section 117, 42 U.S.C. Section 9617, EPA released the Proposed Plan and AR on June 30, 2017, and the public comment period ran through August 30, 2017, to allow interested parties to comment on the Proposed Plan. EPA held a public meeting regarding the Proposed Plan on July 25, 2017, at the Otsego Library, Otsego, Michigan. Approximately 70 people attended the meeting. Representatives from EPA, MDEQ, and MDNR were present at the public meeting. A written transcript from the public meeting is available in the AR.

The AR index is attached as Appendix 2 to this ROD. EPA, in consultation with MDEQ, carefully considered all information found in the AR prior to selecting the remedy documented in this ROD. Complete copies of the Proposed Plan, AR, and other pertinent documents are available at:

The Kalamazoo Public Library 315 South Rose Kalamazoo, MI 49007	EPA Region 5 Superfund Division Records Center 77 West Jackson Boulevard Chicago, IL 60604

EPA is not required to reprint the comments of each commenter verbatim and may paraphrase where appropriate. In this responsiveness summary, EPA has included large segments of the original comments. However, persons wishing to see the full text of the comments should refer to the commenters' submittals to EPA, which are included in the AR. The comments and EPA's responses are summarized below.

3.1 Comments Received During Public Comment Period and EPA's Responses:

1. Comment from Char Troost:

I want the Kalamazoo River cleaned up, but we have spent thousands/millions of dollars doing this. At what point will it be done? You will always find something else to do there. I say enough is enough. It doesn't have to be drinkable.

Response:

A release of hazardous substances to the environment has occurred and continues to occur at Area 2 of OU 5 of the Site, due to the disposal of contaminated waste water into and along the Kalamazoo River, erosion of contaminated riverbank and floodplain soils, and migration of contaminated instream sediments. This contamination poses a risk to human health and the environment and requires addressing.

EPA is working with the PRPs to clean up the Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund Site in an expeditious fashion. Work remains to be completed at Allied Landfill and throughout the 77 miles of the Kalamazoo River from Morrow Dam to Lake Michigan. It is difficult to estimate when the work will be completed. Once all of the remedies for the seven areas of the Kalamazoo

River have been completed the work can be considered finished. However, long-term monitoring will continue until fish tissue levels meet cleanup goals.

2. Comment from R.J. Peterson:

The cleanup of the Kalamazoo River Superfund Site is long overdue. Compared to other Areas of Concern and Superfund sites around the Great Lakes Region, the Kalamazoo River Site seems to be one of the last to get started. Based on the proposed cleanup alternatives the following are my concerns:

(1) The realignment of the Kalamazoo River channel, removal of the Otsego City Dam, lowering of the water level of the river, and exposing raw shoreline will have an increased negative effect downstream. The cause and effect of channelizing any parts of the river upstream will result in the transport of sediment arising to a negative outcome on Kalamazoo Lake and the communities of Saugatuck and Douglas. This increased flow will intensify erosion and the transport of sediment traveling downstream to Kalamazoo Lake. It will not matter if the sediment is clean or contaminated, the increase of any sediment fallout deposited in Kalamazoo Lake will greatly have negative effects on the communities' economy. For over 25 years the communities of Saugatuck/Douglas have financed the extra cost associated with removing and disposing contaminated dredged material. The existing dredged material disposal site (financed by the lower river communities) can no longer be used. It is understood this cleanup effort will have short-term effects in Area 2, however the cleanup efforts will have long-term detrimental effects on downstream Kalamazoo Lake.

Response:

The removal of the Otsego City Dam and realignment of the Kalamazoo River will not result in an increased volume of sediment being transported downstream near Kalamazoo Lake. Area 2 is approximately 50 miles upstream of Lake Kalamazoo, and Lake Kalamazoo is well outside the hydraulic influence of the dam removal. The realignment of the river channel will create a wider and more stable channel with constructed riffle features to slow flow velocity. This will result in less erosion in the main channel and prevent the downstream migration of contaminated sediment from the anabranch areas being transported downstream.

Comment, continued

(2) The realignment of the Kalamazoo River channel will cut off valuable access to existing wetlands in Area 2. The wetlands are natural areas to absorb sediments, clean contaminated waters and absorb and slow heavy water flows during flood events. This will increase the volume of water flowing downstream causing greater erosion and [the eroded sediments] will ultimately settle in Kalamazoo Lake.

Response:

The new realigned channel will be constructed using appropriate width/depth dimensions to make it more stable, and will use natural channel design features. An important component of the realigned channel is retaining the connectivity to

the floodplain and protecting wetland areas. During flood events greater than approximately a 2-year flood, water will leave the channel and flood onto the adjacent floodplain areas including the capped anabranches. This will maintain the important floodplain connectivity for the ecosystem and prevent channelized erosional flow in the main river channel.

Comment, continued

(3) The lower Kalamazoo River communities use the river and lake in a very different way than citizens up river. This lower area's economy revolves around a 100-day seasonal market which is vital to the permanent residents and businesses of Saugatuck and Douglas. Their economy is largely based on tourism, recreation, and boating. Without the lake/harbor both communities would not financially survive. The PCBs, dioxin, and arsenic found in the lake are not only a health risk to residents, but a costly burden for the disposal of contaminated dredged materials from a Superfund site and Area of Concern.

Response:

EPA understands with your concerns and will continue to work with the Saugatuck/Douglas area to assist with the sedimentation problem that is occurring in Kalamazoo Lake. Kalamazoo Lake is located in Area 7 of Operable Unit 5 of the Site which will be the final area of the Superfund cleanup to be addressed. Supplemental remedial investigation work is currently planned to begin in Area 7 in 2020. Based on the information currently available to EPA, there is no health risk associated with direct contact with water or sediment while recreating throughout the Kalamazoo River or in Kalamazoo Lake. However, risk does exist from fish consumption, and fish consumptions advisories exist throughout the river. MDCH has developed www.michigan.gov/eatsafefish to better explain the fish consumption restrictions and associated risks throughout the State of Michigan.

Comment, continued

(4) From previous meetings I have attended with the EPA and MDEQ, it was stated that the cleanup efforts in Kalamazoo Lake would not start until all cleanup efforts upstream were completed. Both Agencies have indicated this time frame may be 30-50 years from present date. This concept is not acceptable. In theory, this approach may seem practical, but in reality, it is not feasible. How many residents are going to suffer the health risks associated with living and working in a Superfund site for this period of time? There is a need for an interim solution to make the lake healthy for residents, to correct the water flow through the harbor to eliminate the constant need for dredging, and to ease the burden of any financial stress placed on the communities of Saugatuck and Douglas. It is imperative to address these critical issues. The PRPs are obligated in helping the communities of Saugatuck and Douglas and providing solutions and financial relief measures for the downriver region of the Superfund site.

Response:
As discussed above in response to your third concern, EPA understands your concerns and will continue to work with the Saugatuck/Douglas area to assist with the sedimentation problem that is occurring in Kalamazoo Lake. The remedial investigation work in Area 7, which includes Kalamazoo Lake, is scheduled to begin in 2020. EPA has used both Superfund removal and remedial authorities to conduct cleanup work throughout the Kalamazoo River. The data that have been collected to date indicate that there are low levels of PCBs in Kalamazoo Lake, and those low levels would not warrant an expedited removal action. Should future data suggest otherwise, that situation may change. EPA will continue to work with the PRPs to conduct the work required under the current Administrative Order on Consent to determine the nature and extent of contamination and select cleanup remedies in an expeditious fashion.

Comment, continued
(5) The economic references above are based on the "Economic Impact Analysis Saugatuck Harbor," conducted using the on-line Boating Economic Impact Model developed by Dr. Ed Mahony, Dr. Dan Stynes and Yue Cui of the Recreation Marine Research Center of Michigan State University. November 15, 2010.

Response:
Thank you for the reference.

3. Comment from Samuel Johnson:
As part of EPA's recommendation in the Superfund Task Force Report published in July 2017 to utilize state-of-the-art PCB remediation technology, I would like to call your attention to the NASA-designed SPEARS technology. Our organization, ecoSPEARS, licenses the SPEARS technology which has shown 75% success in removing PCBs from contaminated sediments in the past. It is our hope you and your partners at the EPA will see this technology and our organization as a potential partner for the continued cleanup of Area 2 along the Kalamazoo River. I sent you an email on August 4, 2017, with documents outlining the SPEARS technology, our organization, and an abstract proposal of how you will be able to utilize ecoSPEARS at the Kalamazoo River cleanup.

Response:
EPA reviewed the ecoSPEARS information and it will be evaluated and considered when developing the RD for Area 2.

4. Comment from Stephen Hamilton, Kalamazoo River Watershed Council:
As President of the Kalamazoo River Watershed Council, I wish to convey our comments on the proposed cleanup of Area 2. I and two members of our board were present at the 25 July meeting, and our board member Robert Whitesides participated in earlier discussions about this location. Furthermore, Dr. Kornheiser and I are both quite familiar with the ecology and hydrology of the site. The Kalamazoo Watershed Council finds the preferred alternative denoted as A-5 to be acceptable. We think that EPA has thoroughly evaluated the options and done its due diligence to arrive at this recommendation. We

understand the financial and logistical compromises that come into play in these matters. We are happy to see a full cleanup with dam removal in this reach and we look forward to accompanying the cleanup and seeing the new ecosystem that develops as a result.

Response:
EPA appreciates the input and support of the Kalamazoo River Watershed Council and looks forward to working with the Council in Area 2 and other reaches of the Kalamazoo River as we work towards cleaning up the river.

5. Comment from Claus Globig:
I live in Kalamazoo. I have studied the PCB issue for 20 years. I am introducing into the public records two items. The first one is a lecture about PCBs which I presented at the Western Michigan College of Engineering. The second item is an open letter to the residents of Kalamazoo. The lecture is available on the internet. If you mention my name and PCBs, you will find it. Now, in the interest of public free speech, I have a few copies left for you. Not many, but if you are interested, I think it will be illuminating. So here are some copies, you can pick them up at your convenience.

Response:
Your attachments have been placed in the AR. It is EPA's position that PCBs are probable human carcinogens and that PCB contamination in Area 2 of OU5 does, in fact, present an unacceptable risk to human health and the environment. EPA believes that Alternative A-5 is protective of human health and the environment, meets ARARs, is implementable, and is cost-effective. Removal of the dam and realigning the river channel will produce a clean buffer along the river corridor, allowing for interconnectivity between the river and floodplain, yet preventing the continued migration of PCB-contaminated material downstream. Part 2 of this ROD details EPA's rationale for selecting Alternative A-5.

6. Comment from Lois Heuchert:
I just wanted to make sure that as you're doing the redevelopment, if you could please include some recreation access outlets or sites. This may have to be planned with the communities or whomever. Instead of putting up the banks and not having access to the river, it would be nice if we could have that coordinated in advance.

Response:
As EPA moves forward in the development and implementation of the cleanup we will work with the PRPs, MDNR, MDEQ, the U.S. Fish and Wildlife Service, and the City of Otsego to consider increased recreational access within Area 2.

7. Comment from Dayle Harrison:
I'm the president of the group called the Kalamazoo River Protection Association. For history buffs, this is our 40th anniversary. We're trying to get the river cleaned up and restored and have clean fish to eat, holding the polluters and the companies responsible for the cost of the cleanup, and trying to get EPA to get more invigorated. It has been quite an interesting four decades. As far as the proposed plan, I do have some concerns

about the selected remedy. Those gray shaded areas that you call anabranches – I would like to see you come in when it's time, and I don't think you should be doing it until you do further work downstream. But when it's time to go in and use some of the natural resource damages funds, Fish and Wildlife might be able to help you with that, to restore those areas. Excavate them and then restore them. I think that would be a good step forward.

But I really want to talk about the impact that this site has on downstream areas. By devoting time and energy and money from the companies to clean up this site that we're talking about tonight above the City of Otsego, we're really sacrificing the benefits we would gain from cleaning up the PCBs along the banks of the Trowbridge area and then moving down to the City of Allegan. Then once that's done, move back up here and finish the job here above the City of Otsego. It's unbelievable, the bank of sediments, you can see them. If you canoe the river, many of you have, from Otsego down to the township dam downstream to the Trowbridge, you see the banks literally saturated with PCB waste from the paper companies. We need to get that isolated and removed, like you're doing, at the Trowbridge. That should be the top priority and then at a later date think about coming forward after you do the City of Allegan impoundment and Lake Allegan and then come back up here and do something up here. We'll be submitting more written documents regarding this proposal in more detail.

I like the plan. I'm still concerned about that area from the Knife Blade downstream. It seems like at the Otsego impoundment you had a wall that you sort of shuffled around and excavated one side in the design process, and then we clean up that side, you went back over and rerouted the river to one side and then you cleaned up the other side. That would reduce a lot of the soil sediment, the so-called clean sediment from moving downstream and creating problems in our floodplain and wildlife habitats. I would like to see some of the data that we haven't seen that goes below the four feet depth of the core samples. I know at the Trowbridge impoundment there are areas where we have three or four feet of clean sediment that's covering up the contaminated sediment. That's been documented by the U.S. Fish and Wildlife Service and the U.S. Geological survey folks.

So thanks for the opportunity to say a few words. Hope you can get moving on it. Thanks for the work that you do do.

Response:
EPA evaluated various remedial approaches for the anabranch areas and determined that Alternative A-5, which includes realigning the river channel, creating a clean buffer and capping the anabranches, is the most appropriate, protective and cost-effective remedy. In the future, should the natural resource trustees or other party decide to fund additional restoration and/or excavation efforts, EPA will take it into consideration.

EPA is conducting cleanup along the Kalamazoo River consistent with EPA's contaminated sediment remediation guidance and principles. As such, work is generally being conducted from upstream to downstream. EPA has worked with

GP to complete the RI sampling in the Trowbridge Impoundment and is evaluating the data, as well as potential cleanup options, which includes both remedial and removal options.

EPA will work closely with the PRPs to ensure contaminated materials are not transported downstream when the Otsego City dam is removed. Further, the amount of any clean materials that may be transported downstream as a result of the dam removal will be conducted consistent with any State requirements. You can review all of the sampling data in the Area 2 RI Report.

8. Comment from Judith Alfano, Lead Administrative Trustee:

The purpose of this letter is to provide EPA with the comments of the Kalamazoo River Trustee Council from a Natural Resource Damage Assessment and Restoration (NRDAR) perspective. The Trustee Council consists of MDEQ, MDNR, the Michigan Attorney General, the U.S. Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration.

The goals of NRDA are to restore the natural resources and the services they provide to the condition they would have been in had the release of hazardous substances not occurred and to compensate the public for the interim lost services that would have been provided by natural resources until such time as restoration to baseline is achieved.

Based on the description of alternatives for River Area 2 of the Kalamazoo River in the EPA June 2017 fact sheet and the Proposed Plan, the trustees understand that the EPA preferred remedy is Alternative A-5. A-5 includes capping, bank excavation, floodplain soil excavation, channel realignment, Gun River excavation, and targeted excavation on Knife Blade Island, institutional controls, and long-term monitoring. EPA considers this alternative to have less impact to habitat and surrounding properties than other options, protects against erosion and would help maintain flow in the river channel.

The Trustee's support the selection of Alternative A-5 as the preferred remedial action and agree with EPA that remedial Alternative A-5 is the most practicable alternative, providing the best balance of EPA's remedial evaluation criteria among the alternatives presented in the Proposed Plan. Foremost, the Trustees value practicable elimination of source material from the river, banks, and floodplains to allow more natural channel design and riverine functions. Considering the dynamic nature of rivers and uncertainties in natural channel design, the Trustees agree that it is prudent to incorporate an additional (10-ft) buffer along the bank of the realigned channel to provide an added measure of protection for the aquatic environment while also removing additional PCBs from the floodplain. Similarly, the Trustees agree that it is prudent to apply the 5 mg/kg RAL for removal of PCBs from the buffer area, which would result in an FS-projected average bank residual PCB concentration that would provide a greater degree of long-term effectiveness with a relatively small increase in cost. The Trustees consider that the excavation of floodplain soil exceeding the RAL of 20 mg/kg also increases the overall protectiveness and long-term effectiveness and permanence of Alternative A-5.

The long-term stability and effectiveness of the river channel along with maintenance of floodplain connectivity are inherent in achieving the long-term goals of the remedial action to keep the channel in place and prevent additional PCB loading into the river. The Trustees appreciate the revisions incorporated in the April 28, 2017 Final Feasibility Study that recognize the merits of maintaining floodplain connection and flood capacity along the new channel for the proposed alternative. Having sufficient bankfull floodplain capacity reduces the risk of potential future channel erosion and increases the likelihood that bank treatments will remain stable over the long term. Dissipating flood energy within Area 2 would also minimize the transfer of energy downstream that otherwise could result in erosion downstream in Area 3.

Concomitantly, future climate scenarios predict increasing severity of storm events in this region, so long-term effectiveness will require a Natural Channel Design that can withstand anticipated future precipitation events and reasonably expected hydraulic stresses. These considerations will be imperative in ensuring that the RD meets the intent of the remedy to keep the channel in place and prevent additional PCB loading to the river.

Overall, the Trustees agree that the proposed alternative, with the noted design considerations, presents a balanced remedy that will achieve considerable progress towards the NRDA goal of returning the natural resources and natural resource services to the condition they would have been in had the hazardous substances not been released. To ensure that the baseline restoration goal is fully achieved and to resolve the NRDA goal of compensating the public for the interim lost services that would have been provided by natural resources until the cleanup goals are met and baseline is achieved, the Trustees will work with the PRPs to develop restoration actions adjunct to the remedial actions.

The Trustees appreciate the opportunity to comment on the Area 2 Proposed Plan. We look forward to working with EPA to address these issues as part of an integrated effort to protect the public and protect and restore the Kalamazoo River environment for the long-term benefit of the public.

Response:
EPA appreciates the technical support and input it has received from the Natural Resource Trustees in developing a cleanup remedy that addresses environmental concerns as well as those of the Trustees and other stakeholders. EPA understands the importance of the natural channel design, a clean buffer between the river and the floodplain, and the need for connectivity between the river and the floodplain. EPA will continue to work with the Natural Resource Trustees while working with the PRPs on the remedy design.

9. Comment from Shannon D. Johnson, Senior Manager, Georgia-Pacific LLC:
GP has reviewed the above referenced documents and supports EPA's overall selection of the preferred remedial alternative as presented in the July 2017 Proposed Plan. GP

comments regarding selected numeric action levels and remedial goals identified in the Proposed Plan are discussed below.

(1) Bank Soil RAL of 5 mg/kg:
EPA selected a RAL of 5 mg/kg in the Proposed Plan. EPA justified selection of 5 mg/kg based on inherent uncertainty in the historical data and evaluation. EPA also justified selection of the 5 mg/kg RAL by noting that the cost difference was small compared to the overall cost of the remedy and added additional assurance to the remedy by selecting the lower RAL.

- Bank soil RALs of 5 and 10 mg/kg PCBs were evaluated in the Area 2 FS. This evaluation showed that RALs of 5 and 10 mg/kg are both adequately protective. The current overall, average bank soil concentrations throughout Area 2 were estimated at 0.9 mg/kg PCBs. A RAL of 5 or 10 mg/kg lowers the average PCB concentration in the banks of the re-aligned channel to 0.2 and 0.3 mg/kg, respectively. Both estimates are at or below the PRG for sediment of 0.33 mg/kg.
- The RAL analysis represents an extreme condition where all of the banks catastrophically and simultaneously fail and produce new sediment with no dilution. The 10-foot buffer and bank treatments already provide reasonable erosion protection and time to identify and repair erosion problems before the river would encounter higher floodplain concentrations. The assumption of catastrophic and simultaneous bank failure is extremely conservative and more than compensates for uncertainty in the historical data or RAL evaluation. EPA justified selection of a RAL of 5 mg/kg over 10 mg/kg based on the idea that $760,000 was not a significant amount of money. The amount of money estimated to implement a RAL is not sufficient evidence or justification for its selection.

The selection of a RAL of 5 mg/kg over 10 mg/kg PCB is neither justified technically nor monetarily and represents a poor use of funds in protecting the environment. GP strongly urges EPA to select a remedial goal of 10 mg/kg for bank soil.

Response:
EPA evaluated the RAL analysis of both 5 mg/kg and 10 mg/kg PCB in the Area 2 FS. As EPA indicated in previous comments on the FS and in the Proposed Plan there is uncertainty associated with the calculations of both the current and future estimated average bank soil concentrations throughout Area 2. EPA and other stakeholders have also indicated the need for a clean buffer between the realigned channel and the floodplain. The 5 mg/kg PCB RAL provides the best balance of risk and uncertainty associated with the RAL, and ensures that if bank failure was to occur that there would be adequate time to complete the bank repair and there would not be increased risk to the environment. Finally, although the increased cost of implementing the RAL of 5 mg/kg PCB vs 10 mg/kg PCB is significant, EPA believes it is a necessary component to ensure long-term protectiveness of the $46 M remedy.

Comment, continued
(2) PRG of 50 ppt for dioxins/furans and dioxin-like compounds on residential parcels:

The EPA selection of a residential soil remediation goal of 50 ppt (or picograms per gram) for dioxins/furans and dioxin-like PCBs did not follow EPA guidance in that a site-specific goal using site-specific inputs was not developed. Nor was MDEQ's residential value of 90 ppt (Part 201) considered.

The 50 ppt is a risk-based screening level based on default residential assumptions. Screening levels are intended to aid in the selection of constituents of potential concern and not to serve as goals for remediation. Per EPA guidance, the recommended approach for developing remediation goals is to identify screening levels at scoping, modify them as needed based on site-specific information from the baseline risk assessment, and ultimately select remediation goals in the ROD. The value of 50 ppt does not incorporate site-specific exposure assumptions including reduced dermal exposure and reduced outdoor exposures due to snow cover. Additionally, the value of 50 ppt assumes dermal skin absorption at a rate of 3 percent. However, the amount of organic material influences the dermal absorption rate of dioxins from soil, with scientifically determined rates ranging from 1.9 percent to 0.24 percent for low and high organic soils, respectively. The value of 50 ppt also assumes that dioxins/furans and dioxin-like PCBs are 100 percent bioavailable from soil. Recent studies conducted at other sites found that the relative bioavailability of these compounds was much lower than 100 percent. The selection of a 50 ppt remedial goal does not account for these important and well documented risk assessment inputs. For these reasons, the residential remedial goal for dioxins and furans and dioxin-like PCBs should not be selected until site-specific information on bioavailability, the organic content of soil, site-specific exposure parameters, and regional background are carefully considered, along with MDNR residential standards.

There are currently only two residential parcels in the northeast portion of the anabranches that appear in the study boundary. The largest landowner in this area owns most of the land in the anabranched area, which is currently used for recreational purposes only. This landowner has verbally indicated a desire to sign a deed restriction to keep that parcel recreational. The portion of the remedial footprint in the second parcel is also currently recreational. Therefore, a residential remedial goal, even if identified, will not be relevant in Area 2.

Response:
Cleanup decisions must comply with CERCLA and the NCP. As lead agency, in order to comply with the NCP, EPA is required to set remedial action goals that establish acceptable exposure levels that are protective of human health and the environment. Generally, EPA sets those goals by considering applicable or relevant and appropriate requirements under federal environmental or state environmental laws. When ARARs are not available or not sufficiently protective, EPA uses a 10^{-6} risk level as a point of departure for determining remediation goals for known carcinogens such as dioxin.

In the FS Report for Area 2 of OU5, GP identified dioxins and furans as contaminants of interest in relation to Michigan's Part 201 regulations. Michigan's Part 201 regulations set the direct contact cleanup level for dioxin at residential properties at 90 ppt. EPA's guidance for risk assessment of dioxin at Superfund sites sets a soil screening level of 50 ppt for dioxin and states that the screening level can be used as a PRG. After multiple discussions with the State of Michigan, EPA decided to set the PRG for dioxin at the more stringent level of 50 ppt instead of Michigan's 90 ppt level. EPA's June 27, 2017, letter to MDEQ, which is part of the AR, documents the discussions with the State of Michigan on this issue.

As described in the FS and Proposed Plan, although dioxin was detected in some soil areas it falls within the PCB remediation footprint. Therefore, Alternative A-5 will address both the PCB and non-PCB risk and is the appropriate remedy for Area 2. As GP notes in its comment, there are only two residential parcels in the remedial footprint of Area 2 of OU5, and it may turn out that ICs to restrict land use will be used instead of cleaning up the land for residential use. If EPA determines during the remedial design that ICs will be the only remedial action implemented on the two residential parcels, additional cleanup to address dioxins will not be necessary. However, in the event that dioxins are found in floodplain surface soils in current or potential residential use areas located outside the PCB remediation footprint, a PRG of 50 ppt will be used to protect residential receptors, based on current EPA regional screening levels and EPA guidance.

10. Comment from Dayle Harrison, President, Kalamazoo River Protection Agency:

Please include these comments on behalf of the Kalamazoo River Protection Association (KRPA) in the official record of the EPA's Proposed final remedy for Area 2. The KRPA, now in our 40th year of advocating for the restoration of the river, appreciates this opportunity to comment.

I have reviewed the Feasibility Study for Area 2 of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site as well as previous RI/FS technical documents. The KRPA is of the opinion that Preferred Cleanup Alternative 5A, although not as protective of human health and the environment as we would prefer (see Alternative 8), is acceptable given the magnitude of the remediation needed downstream. Alternative 5 appears to be cost-effective and should provide long-term protection of human health and the environment, provided actions are taken downstream to minimize erosion within the Trowbridge impoundment.

Although technically not related to Area 2, the implementation of the proposed remedy there, along with dam removal, poses serious risks for areas immediately downstream within the MDNR Trowbridge impoundment. As you know, increased velocity of the river flow due to dam removal at the Plainwell impoundment, MDNR Otsego impoundment, and now the City of Otsego dam will certainly increase erosion of the banks of the Trowbridge impoundment. This will be exacerbated by any storm events and

is of serious concern. Removal of the Otsego City Dam should be placed on hold until remedial action is completed at the Trowbridge impoundment, similar to progress being made at the MDNR Otsego impoundment. The so called "upstream-downstream" approach has its obvious drawbacks, particularly as it impacts the Trowbridge impoundment. EPA and the PRP should not take remedial actions upstream that would result in increased releases of the toxic PCB contaminated sediment downstream. As I stated at the Public Hearing held in Otsego on July 25, 2017, remedial actions should be undertaken as soon as possible at the Trowbridge Impoundment. This could be done concurrently with proposed cleanup efforts continuing at Area 2, except for dam removal which can be accomplished later.

Finally, the KRPA, along with the thousands of other stakeholders in the river's future are deeply concerned about the slow pace of the cleanup. The cost of adequate restoration of the river is likely to exceed one billion dollars. With the PRP only spending 10 to 25 million annually, the cleanup will take over 100 years at present value dollars. EPA has the legal authority, under CERCLA, to mandate that the PRPs provide the financial assurances and commitment to implement acceptable cleanup plans downstream including Lake Allegan. Should the PRP fail to do so, EPA should initiate remediation at the Trowbridge impoundment with the 50 million dollars available from the Lyondell L. L.C., Bankruptcy. As you know, EPA has the statutory authority to pursue treble damages against PRPs for EPA's cost of remediation where the PRPs fail to take appropriate action.

Response:
The removal of the Otsego Dam and the realigned river channel will not promote increased erosion in the Trowbridge impoundment, or promote the transport of PCB-contaminated materials downstream. The new channel will be constructed with the appropriate width/depth ratio to make it more stable. In addition, riffle features will be constructed to reduce river flow velocities. Finally, the new channel will be constructed to ensure connectivity between the river and floodplain to dissipate energy during flood events. Alternative A-5 will reduce the current erosion and transportation of PCB-contaminated materials downstream.

EPA understands your concerns related to the pace of cleanup and is taking all actions to move in an expeditious fashion. EPA disagrees with your conclusion that it will take 100 years to clean up the Site. EPA currently anticipates that cleanup work on the entire Kalamazoo River will be complete in 2035, although long-term monitoring will be required to confirm fish tissue recovery. Regarding expediting cleanup in the Trowbridge impoundment, EPA has worked with GP to complete the RI sampling in the Trowbridge Impoundment and is evaluating the data, as well as potential response actions, which includes both remedial and removal options.

11. Comment from Robert M. Always, Commissioner, Otsego Planning Commission:
EPA currently recommends Alternative A-5 for the cleanup of the Kalamazoo River. This plan, as well as several other possible plans, includes a substantial amount of geographic modification for excavation, capping and channel realignment.

(1) The City of Otsego and civic organizations have long-term plans to develop the river front in downtown Otsego. These plans include the expectation of pedestrian and bicycling access parallel to the Kalamazoo river channel over the intercity distances. Currently, the City of Otsego maintains a "Riverwalk" along the south side of the Kalamazoo River. The Riverwalk starts on Farmer Street at the Otsego Historical Museum, runs past the Otsego Dam, slated for removal as part of the cleanup, and terminates at Jewel Street. The Riverwalk allows two-way pedestrian and cycling traffic as well as including a pedestrian/bicycling bridge. Another example of an appropriately designed recreational pathway is the Kalhaven Trail Linear Park.

I am requesting that the EPA work with the City of Otsego and civic organizations such as the Otsego Main Street organization and Otsego Downtown Development Authority to include a recreational trail along the new Kalamazoo River channel.

Response:
EPA will work with the City of Otsego, its civic organizations and its citizens, along with the PRPs, the MDNR, and the Natural Resource Trustees, to consider pedestrian and recreational pathways along the Kalamazoo River, if appropriate, during remedial design.

Comment, continued:
(2) My understanding is that laboratory testing has been done with zero valent (metallic uncombined) iron to remove chlorine from organic compounds as a remediation process. The testing was on solvent materials in less dilute form than the halogenated compounds containing Kalamazoo River soils. However, the addition of zero valent iron, sized to allow settling through sediment over a period of decades, under capped areas may be useful for the long-term remediation of contaminated soils. Care should be taken to avoid iron alloys that would create more contamination such as machineable lead containing alloys.

Response:
EPA is not aware of any such laboratory testing being conducted by the PRPs using zero valent iron for treatment of PCB-contaminated sediment or soil. The remedy selected in the ROD does not include use of iron alloys or any treatment alternatives that would create more contamination. Capping in the anabranch areas will include a soil cover. None of the alternatives in the Proposed Plan include treatment of the PCB-contaminated materials, as the nature of the reworked sediment and soil are not conducive to cost-effective treatment. Excavated PCB-contaminated soil and sediment will be disposed at a commercial landfill permitted to handle such materials.

FIGURES

Figure 1: Allied Paper, Inc./Portage Creek/Kalamazoo River Site

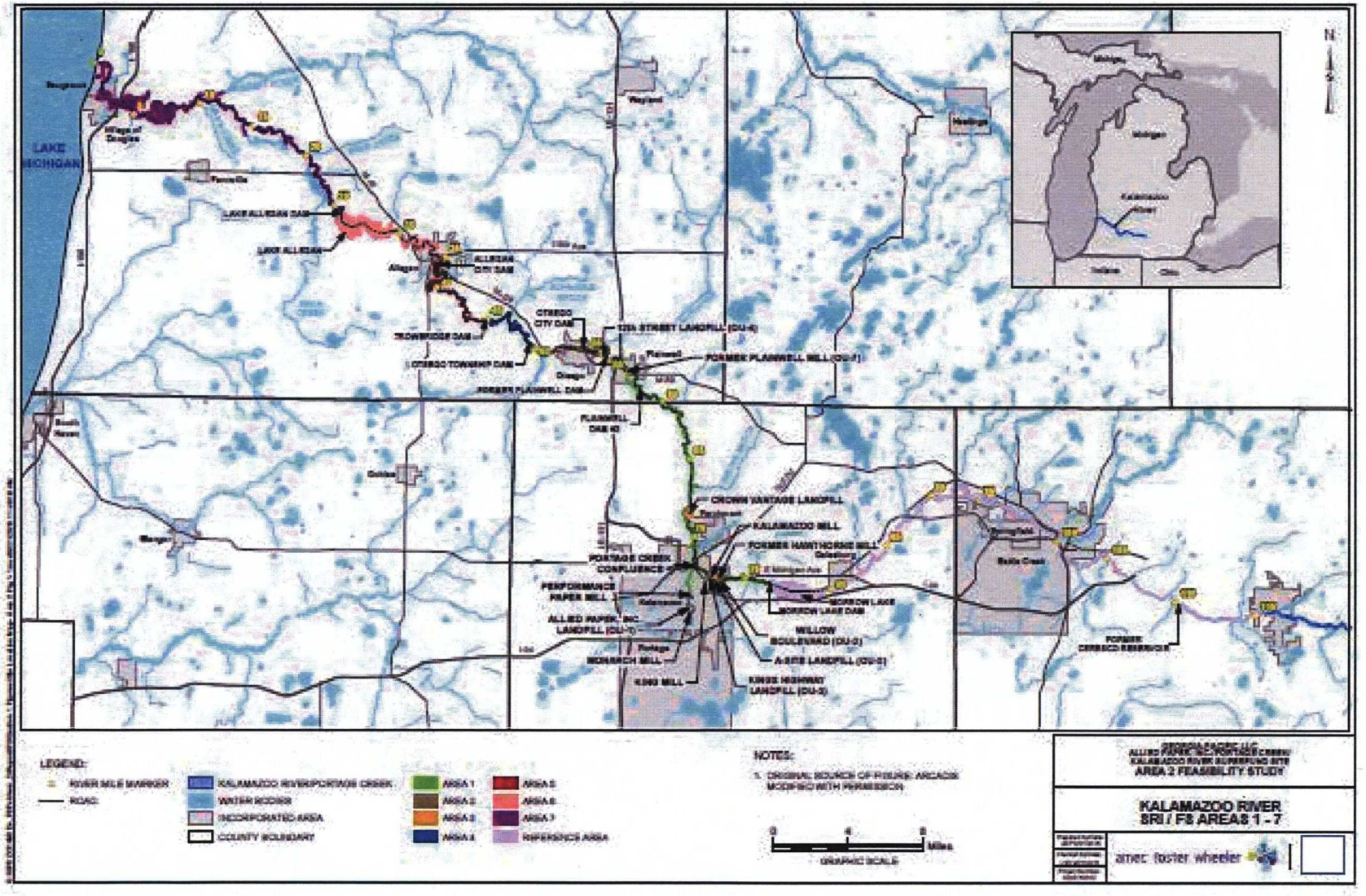


Figure 2: Operable Unit 5

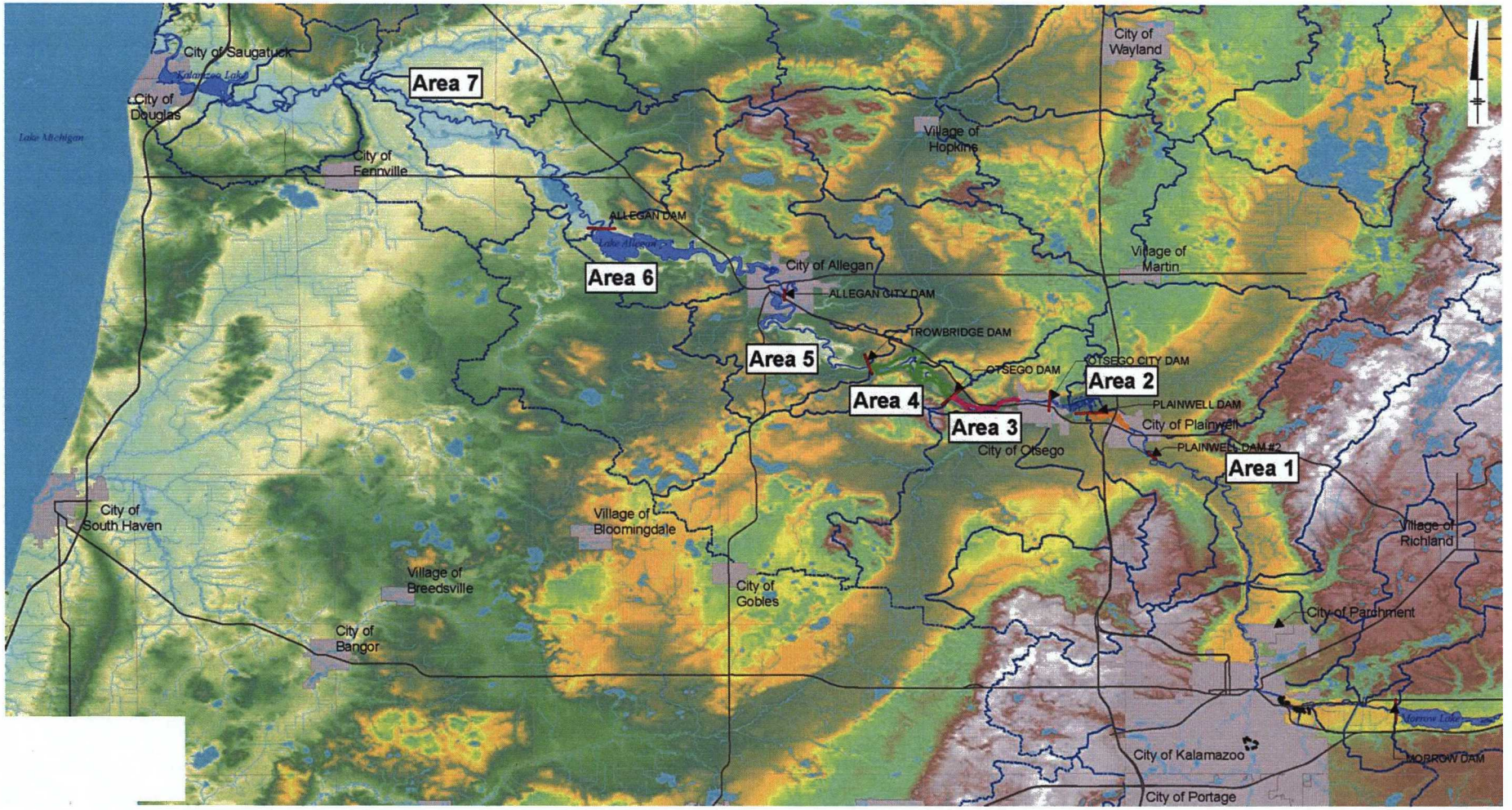


Figure 3: Area 2 of Operable Unit 5

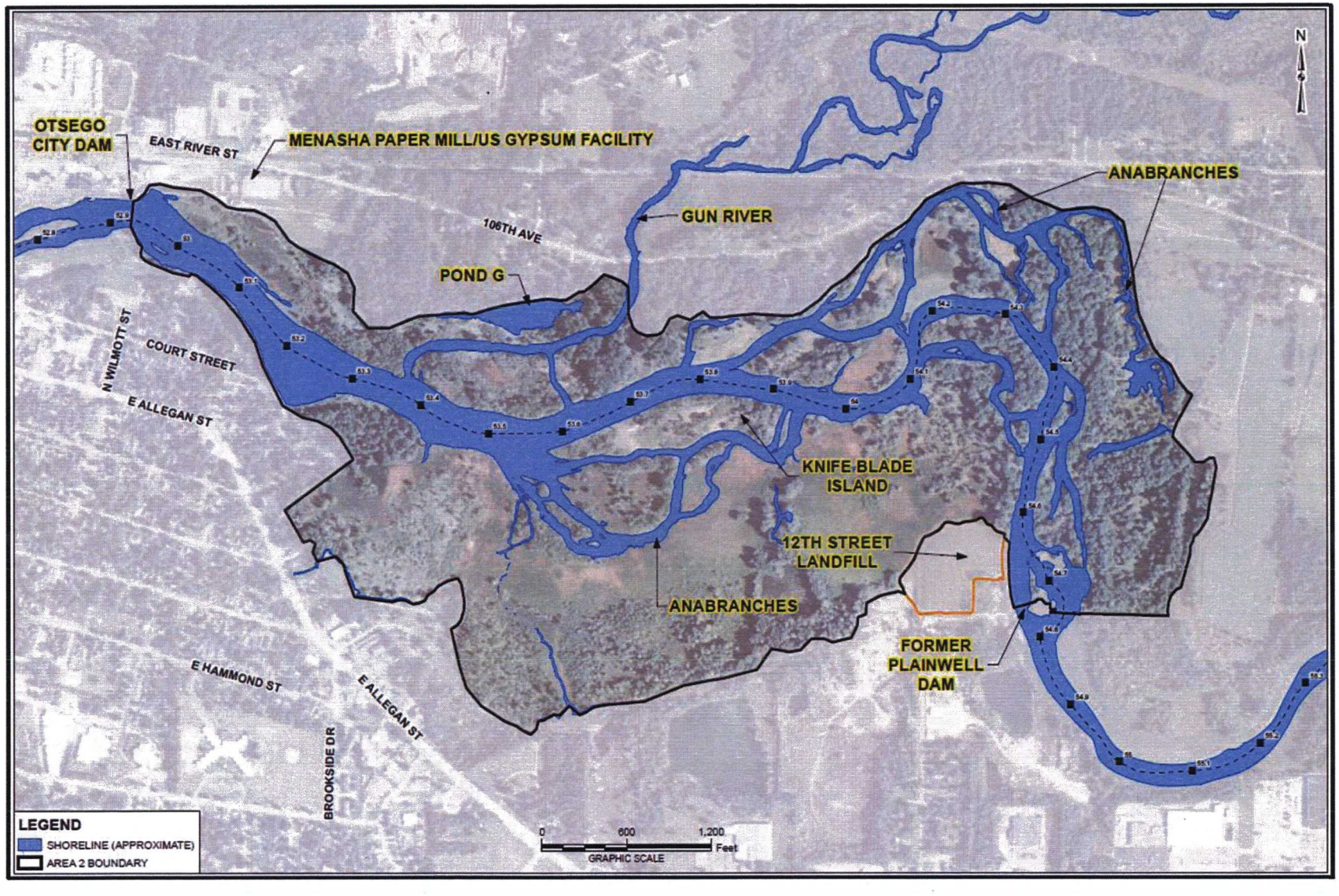


Figure 4: EPA's Selected Remedy Alternative A-5

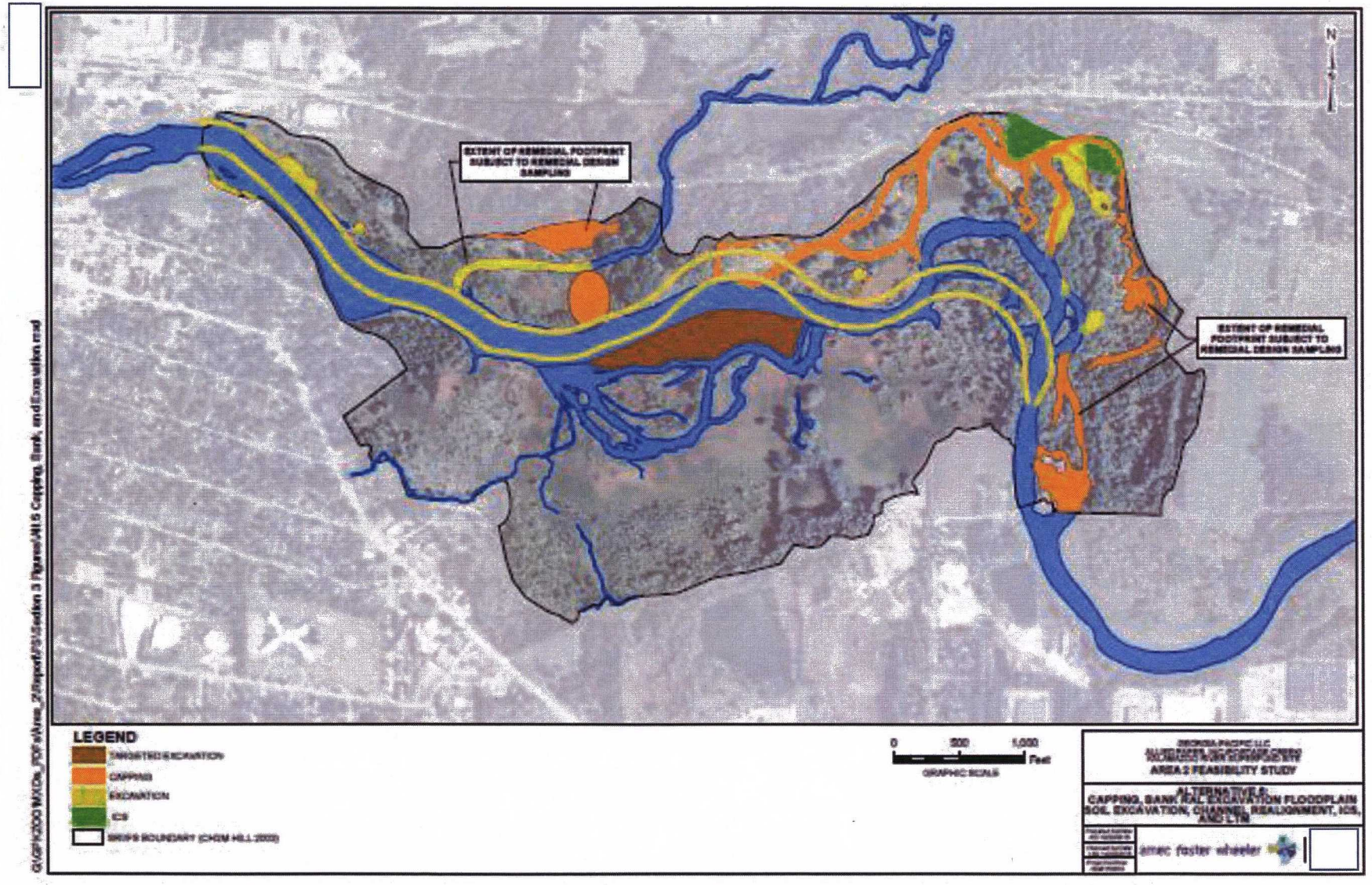


Figure 5: Area 2 Sediment Subareas

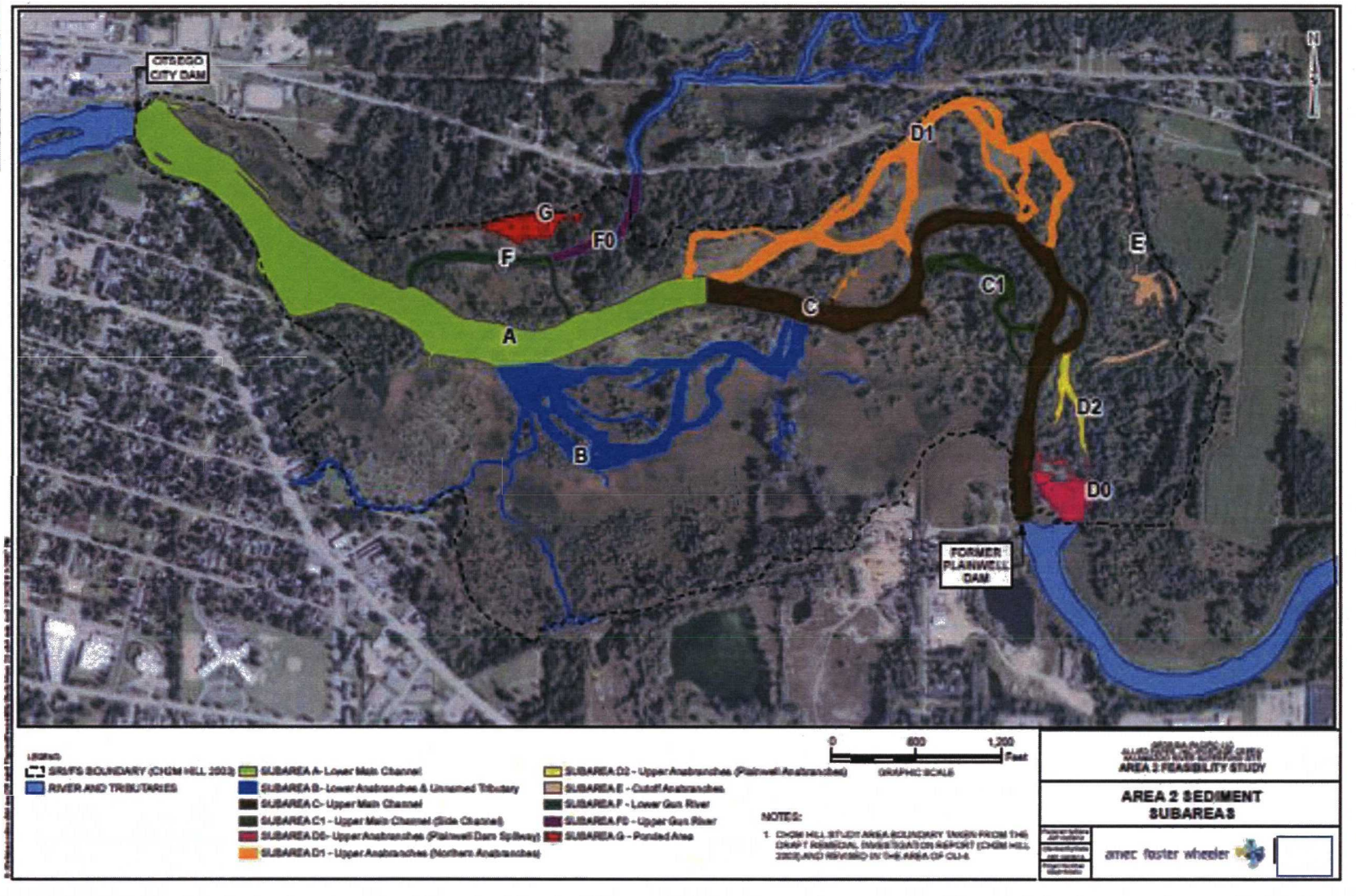


Figure 6: Area 2 Floodplain Soil Subareas

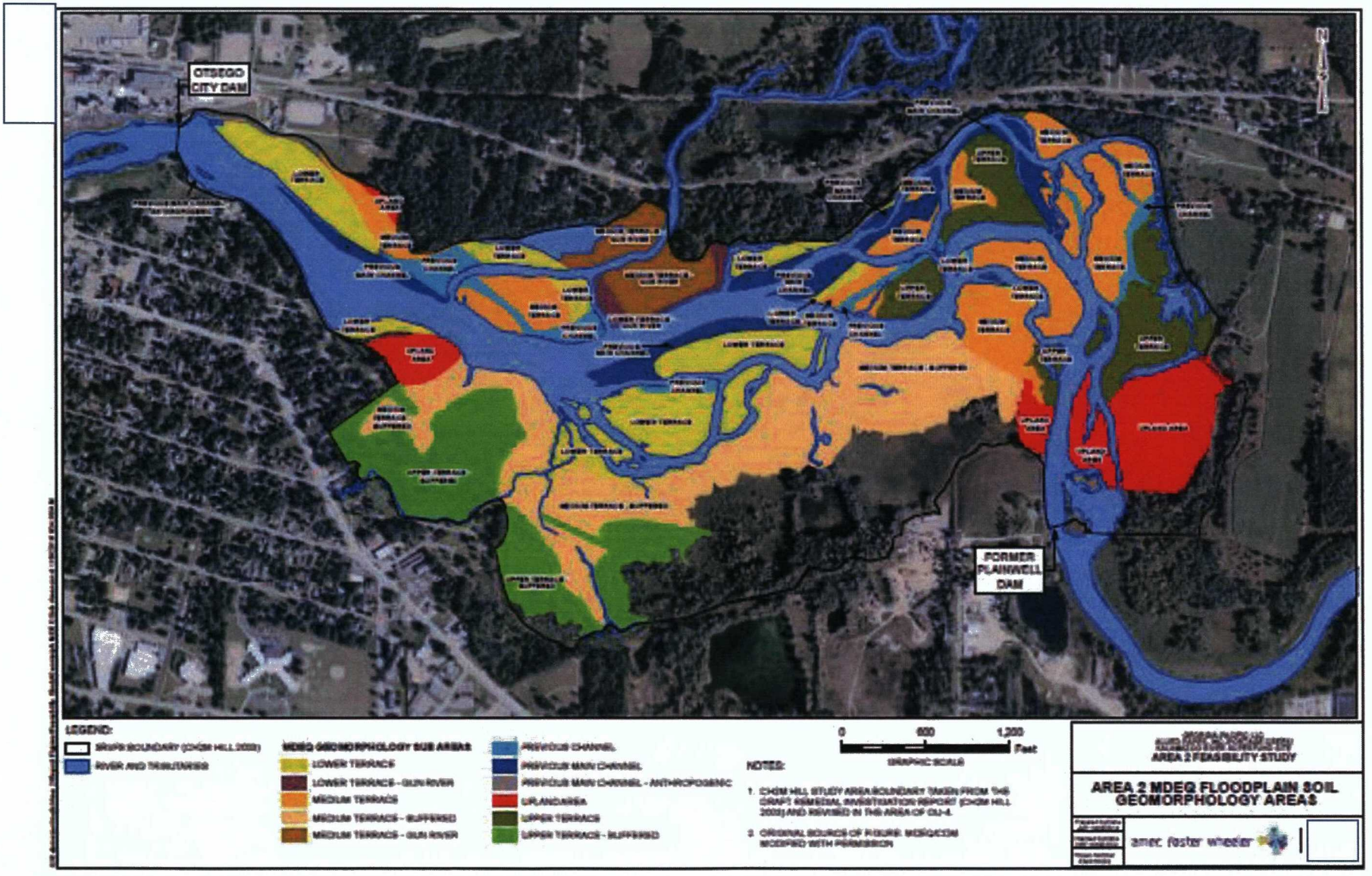


Figure 7: Channel Realignment Option 3

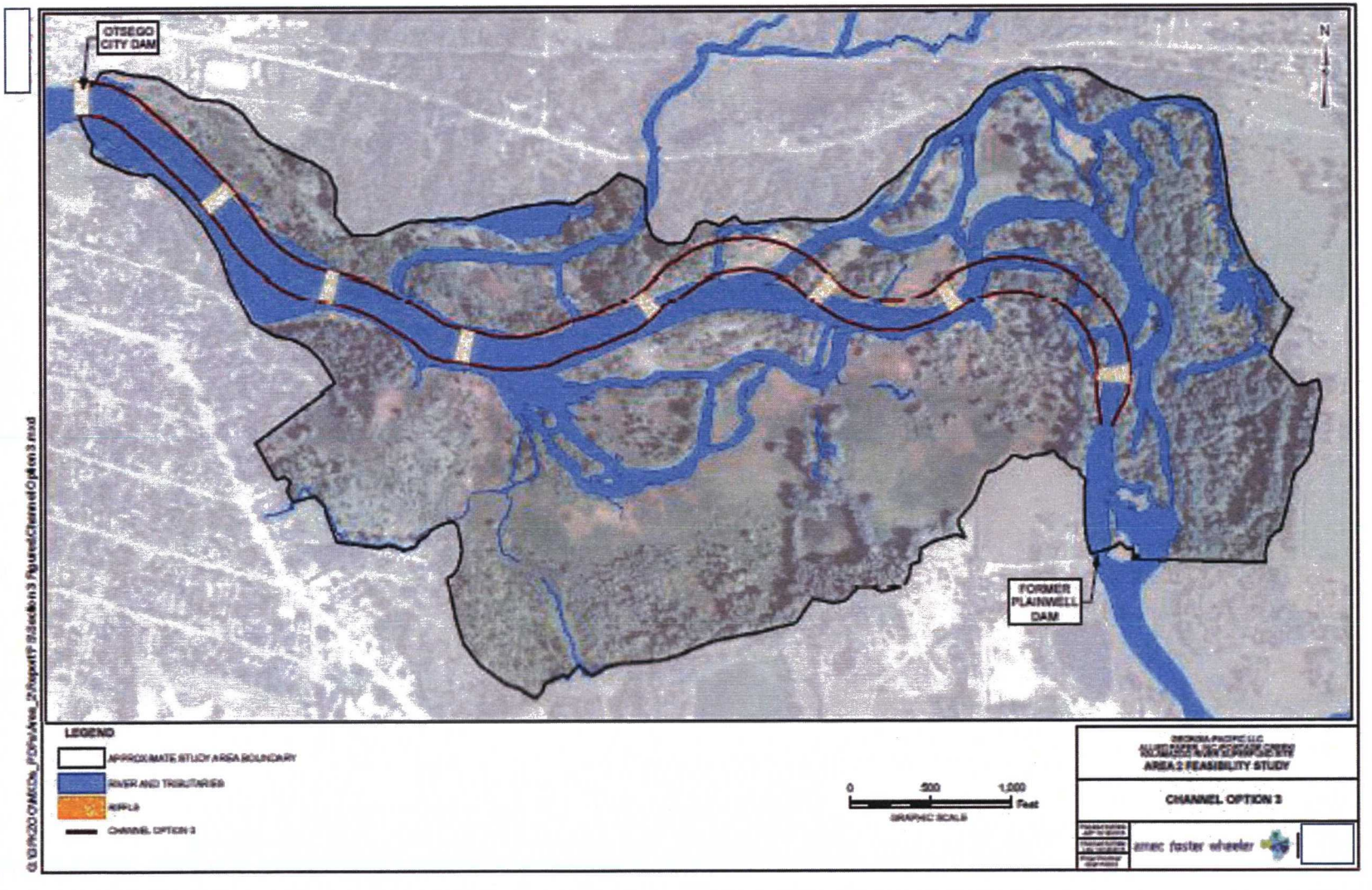
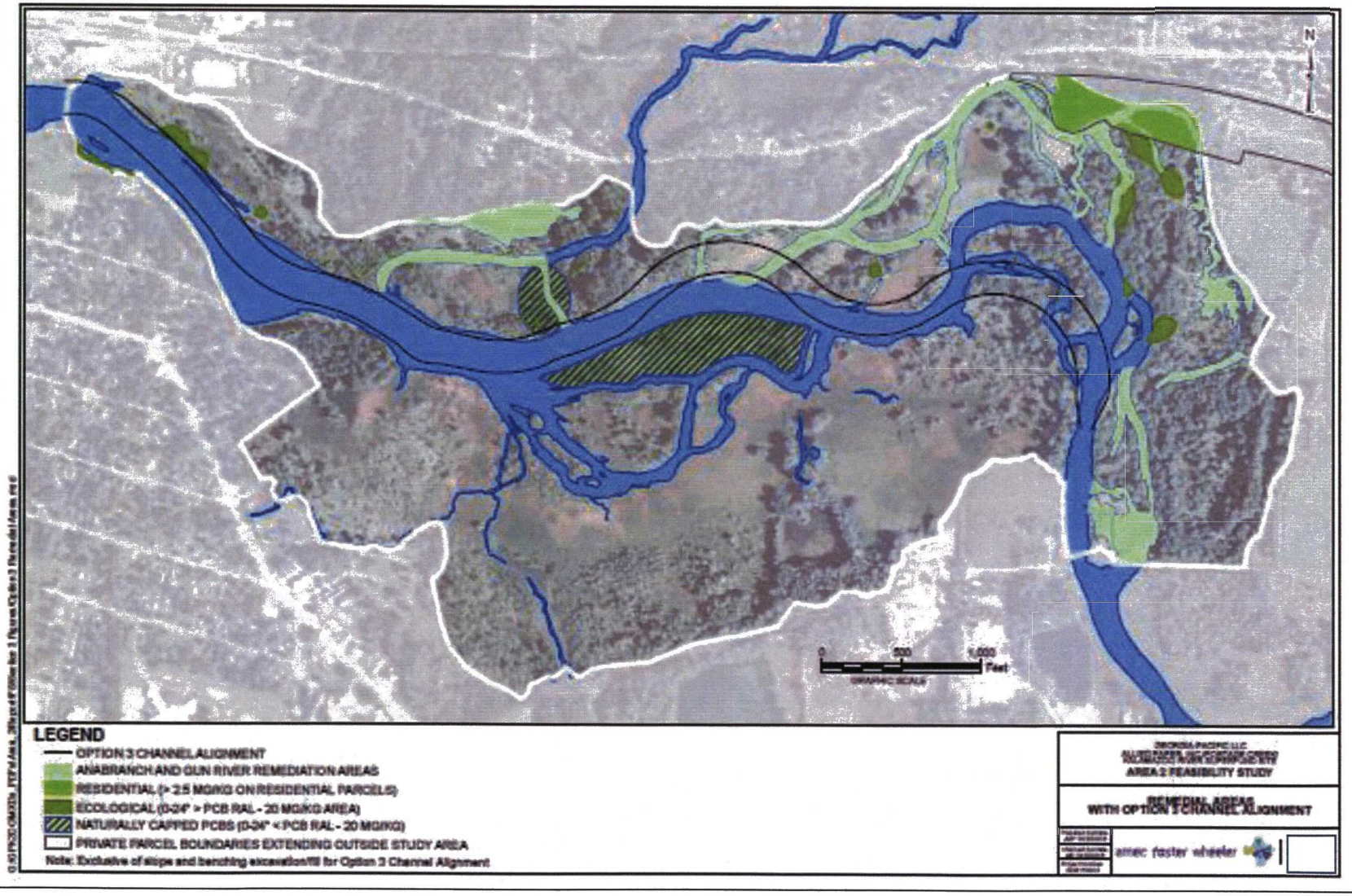


Figure 8: Area 2 Remedial Areas



TABLES

Table 1: PCB Concentrations by Sediment Subarea

Sediment Subareas	PCB Concentration (mg/kg)	
	Minimum	Maximum
Sediment Area A	0.009	94
Sediment Area B	0.011	3.07
Sediment Area C1	0.025	14.03
Sediment Area C	0.018	59
Sediment Area D0	0.05	17.5
Sediment Area D1	0.021	111
Sediment Area D2	0.081	27.8
Sediment Area E	0.018	73.5
Sediment Area F0	0.039	0.047
Sediment Area F	0.018	85
Sediment Area G	0.022	59.9

Table 2: PCB SWAC and Mean Concentrations by Sediment Subarea

Sediment Subareas	SWAC and Mean PCB Concentration (mg/kg)	
	0-6" Interval	6-12" Interval
Sediment Area A	0.08	0.2
Sediment Area C	0.22	0.08
Sediment Area A &C (Main Channel)	0.13	0.16
Sediment Area B	0.46	0.28
Sediment Area C1	0.92	0.05
Sediment Area D0	2.14	0.55
Sediment Area D1	3.91	4.88
Sediment Area D2	5.87	3.34
Sediment Area E	7.84	9.76
Sediment Area F	12.39	21.94
Sediment Area F0	0.02	0.02
Sediment Area G	1.22	9.05

Table 3: PCB Concentrations by Floodplain Soil Subarea

Floodplain Soil Subareas	PCB Concentration (mg/kg)	
	Minimum	Maximum
Lower Terrace	0.019	112
Lower Terrace Gun River	0.018	60.9
Medium Terrace	0.019	69
Medium Terrace Buffered	0.006	26.8
Medium Terrace Gun River	0.018	4.32
Previous Channel	0.017	108
Previous Main Channel	0.018	134
Previous Main Channel Anthropogenic	0.023	59
Upland Area	0.018	2.48
Upper Terrace	0.011	49
Upper Terrace Buffered	0.021	2.88

Table 4: Alternatives Comparative Analysis

Alternative	Capping Area (acres) / Removal Volume (cy)	Years to Reach PRGs for Smallmouth Bass	Overall Protection of Human Health and the Environment	Compliance with ARARs	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume Through Treatment	Implementability	Total Cost
A-1	None	35	Undocumented	Undocumented	Not Effective	Undocumented	No treatment	Nothing to implement	$0
A-2	None	35	Not Protective, ongoing bank erosion	Complies	Not Effective	Not Effective	No treatment	Readily implementable	$12,500,000
A-3	33 / 12,900	32	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment	Readily implementable	$43,800,000
A-4	33 / 16,900-22,300	32	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment	Readily implementable	$44,400,000 to $45,200,000
A-5	28 / 23,800-29,200	32	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment	Readily implementable	$45,600,000 to $46,400,000
A-6	8 / 124,900-130,300	32	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment	Readily implementable	$66,900,000 to $67,700,000
A-7	0 / 162,100-167,500	32	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment	Readily implementable	$74,500,000 to $75,300,000
A-8	0 / 1,260,000	40	Protective, longer timeframe, extensive habitat destruction	Compliance delayed	Not Effective	Effective	No treatment	Requires extensive effort	$325,000,000

APPENDICIES

APPENDIX 1

Applicable or Relevant and Appropriate Requirements

Table 2-1
Federal and State Chemical-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action/Medium	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Protection of surface water and sediment	Establishes effluent standard for toxic compounds including PCBs. Applies to discharges to navigable waters. The ambient water quality criterion for navigable waters is 0.001 µg/L total PCB.	Discharges to waters of the State of Michigan - **relevant and appropriate**	40 CFR Part 129.105 Toxic Pollutant Effluent Standards	X	X
Protection of aquatic life and human health	Water quality criterion for protection of aquatic life for continuous concentration (chronic) is 0.014 µg/L PCBs in freshwater. Water quality criterion for protection of human health is 0.000064 µg/L PCBs in freshwater.	PCB concentrations in surface water - **relevant and appropriate**	63 Fed. Reg. 68354 (December 10, 1998) Clean Water Act	X	
Protection of surface water, sediment, and soil	Water quality criteria for 29 pollutants and detailed methodologies to develop criteria for additional pollutants; implementation procedures to develop more consistent, enforceable water quality-based effluent limits in discharge permits, as well as total maximum daily loads of pollutants that can be allowed to reach the Great Lakes and their tributaries from all sources; and antidegradation policies and procedures. The Great Lakes States must adopt water quality standards, antidegradation policies and implementation procedures for waters within the Great Lakes System. The PCB human health criterion is 3.9 × 10-6 µg/L for both drinking and non-drinking water, and the wildlife protection criterion is 7.5 × 10-5 µg/L.	Effluent discharges to the Great Lakes and/or their tributaries - **relevant and appropriate**	40 CFR Parts 9, 122, 123, 131, and 132 Final Water Quality Guidance for the Great Lakes System	X	X
Protection of potential drinking water sources	The Safe Drinking Water Act regulations establish maximum contaminant levels (MCL) and maximum contaminant level goals (MCLG) for public water supplies. The MCL for PCBs is 0.5 µg/L and the MCLG is 0.0 µg/L.	PCB concentrations in a potential drinking water source - **relevant and appropriate**	40 CFR 141 Safe Drinking Water Act		
Protection of soil and sediment	Establishes requirements for handling, storage, and disposal of PCB-containing materials, including PCB remediation waste, in excess of 50 mg/kg. Applicable for PCB-containing materials that are removed from the Site. Establishes performance standards for disposal technologies. Soils containing PCBs at concentrations >50 mg/kg can be incinerated, treated with an equivalent method, or landfilled at a licensed chemical waste landfill. Industrial sludge with PCB concentrations in excess of 500 mg/kg may not be landfilled. Spill cleanup policy establishes cleanup criteria for spills after 5/4/87. Soil cleanup levels: Unrestricted access - 10 mg/kg, restricted access - 25 mg/kg.	PCB concentrations in soil and/or sediment - **relevant and appropriate**	40 CFR Part 761.60 - 761.79 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (Toxic Substance Control Act (TSCA) Regulations)	X	X
Protection of soil and sediment	Guidance on remedial actions for Superfund sites containing PCBs. May be used as a guideline for handling PCB-contaminated sediment/soil.	PCB concentrations in soil and/or sediment at CERCLA sites - **TBC**	OSWER Directive 9355.4-01 Guidance on Remedial Actions for Superfund Sites with PCB Contamination	X	X

Table 2-1
Federal and State Chemical-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action/Medium	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Protection of soil and sediment	Guidance on technology alternatives for the remediation of PCB-contaminated soil and sediment.	Remedial actions for PCB-contaminated soil and sediment - TBC	USEPA Guidance EPA/540/S-93/506 Technology Alternatives for the Remediation of PCB-Contaminated Soil and Sediment	X	X
Protection of surface water	Establishes water quality requirements for surface waters in the State. Part 4 rules specify standards for all waters of the State, and require that all deseignated uses of the receiving water be protected, including aquatic life and wildlife. Applicable to remedial activities. The approved water quality standard for protection of wildlife and human health are 1.2×10^{-4} µg/L and 2.6×10^{-5} µg/L PCBs, respectively. Prior Substantive Requirement Documents (SRDs) at the Site have specified PCB discharge limitations of 2.6×10^{-5} µg/L.	Discharges to waters of the State of Michigan -- standards are applicable to venting groundwater, storm water, and discharges associated with remedial action - **relevant and appropriate, except as noted in citation**	Michigan NREPA, MCL 324.3101-3133; Mich. Admin. Code R 323.1041-1097, R 323.1100-1117 (Part 4 Rules), and R 323.1201-1221 (Part 8 Rules) R 323.1098, Michigan's Antidegradation Rule, is **relevant but NOT APPROPRIATE** for this site. The Antidegradation Rule may be relevant and appropriate when TMDLs are established for PCBs entering the Kalamazoo River	X	
Protection of soil	Establishes screening levels and generic cleanup criteria for soils in the State.	PCB concentrations in sediment/soil -- would apply if federal requirements were less stringent. Here, because site-specific cleanup criteria are set at 2.5 and 11 mg/kg, Michigan's criteria are **relevant but NOT APPROPRIATE** for the floodplains.	Mich Admin Code R 299.1-299.50		
Risk-based Sediment Criteria for PCBs	Part 201 generic sediment cleanup criteria are not available. Site-specific cleanup criteria may be required to address multiple exposure scenarios. These standards may be used in determining site-specific PCB cleanup levels.	Would apply to development of site-specific cleanup criteria for PCBs in sediment; the cancer (1 in 100,000) and noncancer (HI=1) risk standards in Michigan's NREPA can be more protective than the EPA standards, and therefore would be **relevant and appropriate**	Michigan NREPA, MCL 324.20120a, 324.20120b	X	

Table 2-1
Federal and State Chemical-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action/Medium	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Risk-based Soil Criteria	Protocol for developing site-specific human exposure concentrations over a representative exposure area (e.g., a residential back yard) for PCBs in soil. Concentrations are back-calculated from various cancer risk thresholds and non-cancer hazard indices based on a combination of site-specific characteristics and site-specific exposure assumptions. Site-specific PCB risk-based thresholds in soil (CDM 2003b): Residential: Carcinogenic at $1x10^{-5}$ risk: 2.5 mg/kg Non-carcinogenic at HI = 1: 15 mg/kg Recreationist: Carcinogenic at $1x10^{-5}$ risk: 23 mg/kg Non-carcinogenic at HI = 1: 139 mg/kg Part 201 soil criteria for non-PCB constituents may be revelant and appropraite for residential parcels that do not have institutional controls or restrictive covenants.	PCB concentrations in floodplain soil; site-specific human health risk assessment per CERCLA guidance - TBC Michigan's NREPA could be relevant and appropriate	*Risk Assessment Guidance for Superfund Volume 1, Human Health Evaluation Manual (Part B, Development of Risk-based Preliminary Remediation Goals)*, EPA/540/R-92/003, December 1991. Michigan NREPA, MCL 324.20120a, 324.20120b		X
Protection of surface water, soil, and floodplains	Establishes permit requirements for alteration of floodplains and discharges to surface waters. Applicable if remedial alternatives involve construction in floodplains.	Discharges to waters of the State of Michigan classified for wildlife use and human health, Alteration of floodplains as defined by MDEQ R324.3101 - R324.3111 and R323.2190 - relevant and appropriate	Michigan NREPA (Part 4 of Part 31) Water Resources Protection R324.3101 - R324.3111		X
Fish Tissue Residue Criterion for PCBs	Since 1970, MDCH has issued Guidelines to provide the public with the information needed to make decisions to protect themselves and their families from the health risks of consuming fish that contain environmental contaminants. The MDCH Mission statement summarizes the intent of Michigan's GUidelines: Protect, preserve, and promote the health and safety of the people of Michigan with particular attention to providing for the needs of vulnerable and under-served populations. (MDCH 2014)	PCBs in fish tissue residue - TBC	Michigan Fish Consumption Advisory Program Guidance Document Dated August 1, 2013.	X	

References

MDCH 2014. Michigan Fish Consumption Advisory Program Guidance Document. http://www.michigan.gov/documents/mdch/MDCH_MFCAP_Guidance_Document_417043_7.pdf

TMDLs - total maximum daily load standards

Prepared by/Date: KPW 04/21/14
Checked by/Date: MTP 06/11/14

Table 2-2
Federal and State Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Location	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Presence of farmland as indicated in Farmland Protection Policy Act of 1981 7 USC 4201, et seq	The purpose of the law is to "...minimize the extent to which Federal programs contribute to the unnecessary conversion of farmland to nonagricultural uses..." (P.L. 97-98, Sec. 1539-1549; 7 U.S.C. 4201, et seq.). The FPPA also stipulates that federal programs be compatible with state, local and private efforts to protect farmland. For the purposes of the law, federal programs include construction projects—such as highways, airports, dams and federal buildings—sponsored or financed in whole or part by the federal government, and the management of federal lands.	Federal actions that involve potential conversion of farmland to non-agricultural areas - **relevant and appropriate**	Farmland Protection Policy Act of 1981		X
Presence of Kalamazoo River, a direct link to surface waters of the Great Lakes	Applicable to action or activity by any source, point or nonpoint, of pollutants that is anticipated to result in an increased loading of bioaccumulative contaminants of concern to surface waters of the Great Lakes.	Remedial actions that are anticipated to result in increased loading of bioaccumulative contaminants in the surface water of the Kalamazoo River and, in turn, the Great Lakes - **relevant and appropriate**	40 CFR Part 132, Appendix E Great Lakes Water Quality Initiative Antidegradation Policy	X	
Presence of floodplain, designated as such on a map	Shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.	Federal actions that involve potential impacts to, or take place within, floodplains – **applicable**	Executive Order 11988 – *Floodplain Management* Section 1. Floodplain Management	X	X
Presence of floodplain, designated as such on a map	Shall consider alternatives to avoid, to the extent possible, adverse effects and incompatible development in the floodplain. Design or modify its action in order to minimize potential harm to or within the floodplain	Federal actions that involve potential impacts to, or take place within, floodplains – **applicable**	Executive Order 11988 Section 2.(a)(2) Floodplain Management	X	X
Presence of floodplain, designated as such on a map	If there is no practicable alternative to locating in or affecting the floodplain, the potential harm to the floodplain shall be minimized. The natural and beneficial values of floodplains shall be restored and preserved.	Federal actions that involve potential impacts to, or take place within, floodplains – **applicable**	40 C.F.R. Part 6, App. A, § 6(a)(5)	X	X
Presence of floodplain, designated as such on a map	Structures and facilities must be constructed in accordance with existing criteria and standards set forth under the National Flood Insurance Program (NFIP) and must include mitigation of adverse impacts wherever feasible. If newly constructed structures or facilities are to be located in a floodplain, accepted floodproofing and other flood protection measures shall be undertaken. To achieve flood protection, EPA shall, wherever practicable, elevate structures above the base flood level rather than filling land.	Construction of structures and facilities within floodplains – **applicable**	40 C.F.R. Part 6, App. A, § 6(c)(1) & (2)	X	X
Presence of floodplain, designated as such on a map; discharge to surface water	Establishes permit requirements for alteration of floodplains and discharges to surface waters.	Substantive requirements would apply if remedial alternatives involve construction in floodplains - **relevant and appropriate**	Michigan NREPA, MCL 324.3108; Part 13 Floodplain Rules at Mich. Admin. Code R. 323.1311-323.1329		X

Table 2-2
Federal and State Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Location	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Presence of federally endangered or threatened species, as designated in 50 C.F.R. §§ 17.11 and 17.12 -or- critical habitat of such species listed in 50 C.F.R. § 17.95	Actions that jeopardize the existence of a listed species or results in the destruction or adverse modification of critical habitat must be avoided or reasonable and prudent mitigation measures taken.	Action that is likely to jeopardize fish, wildlife, or plant species or destroy or adversely modify critical habitat— **relevant and appropriate**	16 U.S.C. § 1538(a)	X	X
Presence of federally endangered or threatened species, as designated in 50 C.F.R. §§ 17.11 and 17.12 -or- critical habitat of such species listed in 50 C.F.R. § 17.95	Each Federal agency shall, in consultation with and with the assistance of the Secretary [of DOI], insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by [DOI] to be critical.	Actions authorized, funded, or carried out by any Federal agency, pursuant to 16 U.S.C. § 1536 – **relevant and appropriate**	16 U.S.C. § 1536(a)(2); 50 C.F.R. §§ 402.13(a), 402.14	X	X
Presence of endangered or threatened species, as designated in MCL 324.36501-36507	Establishes requirements for conservation, management, enhancement, and protection of species either endangered or threatened with extinction. For certain remedial alternatives, activities may disrupt or disturb endangered species.	Action that is likely to jeopardize fish, wildlife, or plant species or destroy or adversely modify critical habitat — **relevant and appropriate**	Michigan NREPA (Part 365), MCL 324.36501-36507	X	X
Presence of any migratory bird, as defined by 50 C.F.R. § 10.13	It shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or eggs of any such bird.	Federal actions that have, or are likely to have, a measurable negative effect on migratory bird populations – **relevant and appropriate**	16 U.S.C. § 703(a)	X	X
Presence of archaelogically or historically sensitive area	Establishes procedures to provide for preservation of historical and archaeological data which might be destroyed through alteration of terrain as a result of a federal construction project for a federal licensed activity or program. Historic or archaeological value is currently unknown.	Location of historically or archaelogically significant areas in Area 1 - **relevant and appropriate**	40 CFR Part 6.301(c)	X	X
Presence of archaelogically or historically sensitive area	The NAGPR act requires federal agencies and museums with possession or control over Native American human remains and associated funerary objects to compile an inventory of such items. It requires federal agencies and museums with possession or control over Native American non-associated funerary objects, sacred objects, or objects of cultural patrimony to provide a written summary of such objects. It prescribes when a federal agency or museum must return Native American cultural items. This regulation is only applicable if Native American remains or funerary objects are in Area 1.	Applies if Native American remains or funerary objects are discovered in Area 1 - **relevant and appropriate**	43 CFR Part 10 Excavations and Inadvertent Discoveries		X
Presence of wetlands	Shall take action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance beneficial values of wetlands.	Federal actions that involve potential impacts to, or take place within, wetlands – **TBC**	Executive Order 11990 – *Protection of Wetlands* Section 1.(a)	X	X
Presence of wetlands	Shall avoid undertaking construction located in wetlands unless: (1) there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.	Federal actions that involve potential impacts to, or take place within, wetlands – **TBC**	Executive Order 11990, Section 2.(a) Protection of Wetlands	X	X

Table 2-2
Federal and State Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Location	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Location encompassing aquatic ecosystem as defined in 40 C.F.R. § 230.3(c)	No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.	Action that involves discharge of dredged or fill material into waters of the United States, including wetlands – **relevant and appropriate**	40 C.F.R. § 230.10(a)	X	
Location encompassing aquatic ecosystem as defined in 40 C.F.R. § 230.3(c)	No discharge of dredged or fill material shall be permitted if it: • Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard; • Violates any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act; • Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, or results in the likelihood of the destruction or adverse modification of critical habitat; • Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under title III of the Marine Protection, Research, and Sanctuaries Act of 1972.	Action that involves discharge of dredged or fill material into waters of the United States, including wetlands – **relevant and appropriate**	40 C.F.R. § 230.10(b)	X	
Location encompassing aquatic ecosystem as defined in 40 C.F.R. § 230.3(c)	No discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States	Action that involves discharge of dredged or fill material into waters of the United States, including wetlands – **relevant and appropriate**	40 C.F.R. § 230.10(c)	X	
Location encompassing aquatic ecosystem as defined in 40 C.F.R. § 230.3(c)	No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Action that involves discharge of dredged or fill material into waters of the United States, including wetlands – **relevant and appropriate**	40 C.F.R. § 230.10(d)	X	
Presence of any stream or other body of water proposed to be impounded, diverted, controlled, or modified for drainage	Whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the United States, or by any public or private agency under Federal permit or license, such department or agency first shall consult with the United States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular State wherein the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water-resource development.	Federal actions that propose to impound, divert, control, or modify waters of any stream or body of water – **relevant and appropriate**	16 U.S.C. § 662(a)	X	
Presence of contamination requiring remedial action, risk assessment, and environmental response activities.	Establishes rules specifying environmental response, risk assessment, remedial action, and site cleanup criteria. Applicable to remedial activities conducted in Area 1.	Occurrence of environmental response, remedial action, and site cleanup - **relevant and appropriate**	Michigan NREPA (Part 201); MDEQ Admin. Code R324.20101 - R324.20142	X	X

Table 2-2
Federal and State Location-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Location	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Presence of floodplain as defined in MDEQ Admin. Code R324.9101 - R324.9123a	Establishes rules prescribing soil erosion and sedimentation control plans, procedures, and measures. If work is conducted in floodplain areas, a soil erosion and sedimentation control plan may be required to perform earth changes.	State actions that involve potential impacts to, or take place within, a floodplain - **relevant and appropriate**	Michigan NREPA (Part 17); Michigan NREPA (Part 91); MDEQ Admin. Code R324.9101 - R324.9123a	X	X
Presence of designated environmental area boundary as defined in MDEQ Admin. Code R324.32301 - R324.32315	In the absence of an approved local ordinance, any person or agency must first apply for and obtain a permit from the MDEQ when proposing to dredge, fill, grade, or otherwise alter the soil, alter the natural drainage, or alter the vegetation on a parcel or property within a designated environmental area boundary.	Activities likely to involve dredging, filling, grading, or other alterations to the soil within an environmental boundary - **relevant and appropriate**	Michigan NREPA (Part 323); MDEQ Admin Code R324.32301 - R324.32315	X	X
Presence of endangered or thereatened species, as deisgnated in MDEQ Admin. Code R324.36501 - R324.36507	Establishes rules to provide for conservation, management, enhancement, and protection of species either endangered or threatened with extinction. For certain remedial alternatives, activities may disrupt or disturb endangered species.	Action that is likely to jeopardize fish, wildlife, or plant species or destory or adversely modify critical habitat - **relevant and appropriate**	Michigan NREPA (Part 365); MDEQ Admin Code R324.36501 - R324.36507	X	X
Enaction of fish consumption advisory as defined by MDCH Division of Community Health 2014	The *MichiganEat Safe Consumption Guide* provides fish consumption advice for Kalamazoo River by fish species and fish length.	Consumption of fish from Area 1 - **TBC**	Michigan Department of Community Health (MDCH) Fish Consumption Advisory MDCH Division of Community Health 2014	X	

Reference

MDCH. 2014. Michigan Fish Advisory. Michigan Department of Community Health, Lansing, MI, 2014.

Prepared by/Date: KPW 04/22/14
Checked by/Date: MTP 06/11/14

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Engagement in remedial activities damaging to fish or wildlife	Requires the Corps of Engineers to develop mitigation plans to repair fish and wildlife damage associated with remedy implementation.	Remedy incurs damage to fish and wildlife as indicated in 33 USC §§ 2201-2331 - **relevant and appropriate**	33 USC § 2201 et seq.	X	
Water quality-based limits for discharge into navigable waters	Regulates any federal-authorized activity which may result in any discharge into navigable waters and requires reasonable assurance that the action will comply with state applicable water quality standards.	Dredging activities are considered to impact discharge to navigable waters as defined in Section 401, Clean Water Act - **relevant and appropriate**	Clean Water Act 33 USC §§ 1341 Section 401	X	
Risk-based limits protective of human health for air emissions associated with soil and sediment removal	Establishes ambient air quality standards for protection of public health.	Air emissions are generated that create threats to human health as defined in 40 CFR Part 50 - **relevant and appropriate**	40 CFR Part 50 National Primary and Secondary Ambient Air Quality Standards	X	X
Risk-based limits protective of human health for air emissions associated with soil and sediment removal	Establishes filing requirements and standards for constituent emission rates in accordance with National Ambient Air Quality Standards (NAAQS). To be considered for remedial alternatives that include removal of sediment/soil.	Air emissions are generated that create threats to human health as defined in 40 CFR Part 50 - **relevant and appropriate**	40 CFR Part 52 Approval and Promulgation of Implementation Plans	X	X
Protection of soil and sediment	Establishes requirements for handling, storage, and disposal of PCB-containing materials, including PCB remediation waste in excess of 50 mg/kg. Applicable for PCB-containing materials that are removed from the Site. Establishes performance standards for disposal technologies. Soils containing PCBs at concentrations in excess of 50 mg/kg can be incinerated, treated with an equivalent method, or landfilled at a licensed chemical waste landfill. Industrial sludge with PCB concentrations in excess of 500 mg/kg may not be landfilled. Spill cleanup policy establishes cleanup criteria for spills after 5/4/87. Soil cleanup levels: Unrestricted access - 1 to10 mg/kg, restricted access - 10 to 50 mg/kg.	Actions which address soil and/or sediment containing PCBs - **relevant and appropriate**	40 CFR Part 761.60 - 761.79 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions (Toxic Substance Control Act (TSCA) Regulations)	X	X
Transportation of hazardous waste off site	Defines threshold levels and criteria to determine whether material is hazardous waste.	Waste generated from remedial process and analyzed in accordance with 40 CFR Part 261 - **relevant and appropriate**	40 CFR Part 261 Identification and Listing of Hazardous Waste	X	X
Transportation of hazardous waste off site	Includes manifest, record-keeping and other requirements applicable to generators of hazardous waste.	Waste generated from remedial process and transported off site for storage and/or disposal - **relevant and appropriate**	40 CFR Part 262 Standards Applicable to Generators of Hazardous Waste	X	X
Transportation of hazardous waste off site	Sets forth standards for transporters of hazardous wastes, including the receipt of an EPA identification number and manifesting requirements.	Waste generated from remedial process and transported off site for storage and/or disposal - **relevant and appropriate**	40 CFR Part 263 Standards Applicable to Transporters of Hazardous Waste	X	X
Transportation, storage, and disposal of hazardous waste off site	Includes management standards including record keeping, requirements for particular units such as tanks or containers, and other requirements applicable to owners and operators of hazardous waste treatment, storage and disposal facilities.	Waste generated from remedial process and transported off site for storage and/or disposal in accordance with 40 CFR Part 264 - **relevant and appropriate**	40 CFR Parts 264 and 265 Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	X	X
Disposal of samples and remedial waste	On-site treatment of samples and remedial waste treatment standards and related testing, tracking and record keeping requirements on hazardous waste.	Waste generated from remedial process and analyzed samples transported off site for disposal in accordance with 40 CFR Part 268 - applicable and relevant	40 CFR Part 268 Subparts D and E Land Disposal Restrictions	X	X

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Disposal of samples and remedial waste	Identifies disposal requirements for various PCB waste types.		40 CFR Part 761.50 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions: Storage and Disposal, Applicability	X	X
Disposal of PCB remediation waste	Cleanup and disposal options for PCB remediation waste, which includes PCB-contaminated sediments and dredged materials. Disposal options for PCB remediation waste include disposal in a high-temperature incinerator, an approved chemical waste landfill, or a facility with a coordinated approval under 40 CFR Part 761.77. PCB remediation waste containing PCBs at concentrations less than 50 mg/kg may be disposed of off-site in an approved land disposal facility for the management of municipal solid waste, or in a disposal facility approved under 40 CFR Part 761. 40 CFR Part 761.61(c) allows an EPA Regional Administrator to approve a risk-based disposal method that will not pose an unreasonable risk of injury to human health or the environment.	Sediment waste with PCB concentrations less than 50 mg/kg generated from remedial process and transported off site for storage and/or disposal in accordance with 40 CFR Part 761.61 -relevant and appropriate	40 CFR Part 761.61 PCB Remediation Waste	X	X
Storage of hazardous waste on site	Storage requirements: Establishes technical requirements for temporary storage of PCB wastes prior to treatment or disposal.	PCB wastes generated on site with storage needs defined in 40 CFR Part 761.65 - relevant and appropriate	40 CFR Part 761.65 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions: Storage for Disposal	X	X
Decontamination of equipment used in remedial activities	Decontamination standards and procedures for removing PCBs that are regulated for disposal from water, organic liquids, and other materials.	Decontamination necessary for equipment, water, organic liquids, or other materials contaminated with PCBs during remedial activities 40 CFR Part 761.79 **- relevant and appropriate**	40 CFR Part 761.79 Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions: Decontamination standards and procedures	X	X
Technology-based water quality discharge limits	Best available technology and monitoring requirements.	Wastewater generated in remedial process to be discharged **- relevant and appropriate**	40 CFR Part 122.44 (a,e,l) Establishing Limitations, Standards, and Other Permit Conditions	X	X
Technology-based water quality discharge limits	Establishes criteria and standards for imposing technology-based treatment requirements.	Wastewater generated in remedial process to be discharged **- relevant and appropriate**	40 CFR Part 125 Criteria and Standards for the National Pollutant Discharge Elimination System	X	X
Disposal of dredged or fill material on site	These regulations apply to all existing, proposed, or potential disposal sites for discharges of dredged or fill materials into U.S. waters, which include wetlands. Includes special policies, practices, and procedures to be followed by the U.S. Army Corp of Engineers in connection with the review of applications for permits to authorize the discharge of dredged or fill material into waters of the United States pursuant to Sections 301 and 404 of the Clean Water Act. In accordance with CERCLA Section 121(e), a permit is not required for on-site CERCLA response actions, although the selected remedy will comply with substantive requirements of these regulations.	Dredged or fill materials will be disposed of on site, in a wetland area as defined in 40 CFR Part 231, Section 301 Effluent Standards, Section 404(c) Procedures, and 33 CFR Parts 320-330 - relevant and appropriate	40 CFR Part 231 Section 301 Effluent Standards Section 404(c) Procedures 33 CFR Parts 320-330 Navigation and Navigable Waters	X	X
Treatment of wastewater generated from remediation process	Establishes responsibilities of Federal, State, and local government, industry and the public to implement National Pretreatment Standards to control pollutants which pass through or interfere with treatment processes in Publicly Owned Treatment Works (POTWs). Provides guidelines establishing test procedures for the analysis of pollutants.	Remedial actions generate waste that will pass through or interfere with treatment processes in POTWs as defined in 40 CFR Part 403 and 40 CFR Part 136 **- relevant and appropriate**	40 CFR Part 403 General Pre-Treatment Regulations for Existing and New Sources of Pollution 40 CFR Part 136 Guidelines Establishing Test Procedures for the Analysis of Pollutants	X	X

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Remedial activities on site include dredging, filling, etc.	Prohibits unauthorized obstruction or alteration of any navigable water in the U.S. (dredging, filling, cofferdams, piers, etc.). Remedial activities may have to be conducted in such a way as to avoid obstruction or alteration of the waterway.	The Kalamazoo River altered by dredging, filling, etc. to complete remedial actions - **relevant and appropriate**	33 CFR Parts 320-330 Navigation and Navigable Waters	X	
Remedial activities on site include dredging, filling, etc.	Requirements for permits affecting "navigable waters of the U.S." If excavation or capping activities are performed, the substantive requirements of the Act must be met for work affecting "navigable waters of the United States."	The Kalamazoo River altered by dredging, filling, etc. to complete remedial actions - **relevant and appropriate**	33 CFR Part 322 Permits for Structures or Work in or Affecting Navigable Waters of the United States	X	
Transportation, storage, and disposal of hazardous waste off site	Transportation and handling requirements for hazardous materials, including procedures for the packaging, labeling, manifesting and transporting of hazardous materials. This would apply to alternatives where sediment/soil are removed and transported from Area 1.	Contaminated, hazardous soil and sediment are removed and transported off site for storage and/or disposal as defined by 49 CFR Part 107, 49 CFR Part 171, and 49 CFR Part 172 - relevant and appropriate	49 CFR Part 107 Hazardous Materials Program Procedures 49 CFR Part 171 General Information, Regulations and Definitions 49 CFR Part 172 Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements	X	X
Human health and risk-based limits for air emissions	Establishes 8-hour time-weighted average air concentrations for particulates and PCBs for protection of worker breathing zones, PPE requirements, medical monitoring requirements, respiratory protection requirements, and HAZMAT training requirements. Establishes health and safety requirements for cleanup operations at NPL sites; Site is listed on NPL.	Air emissions are generated during remedial activities that create threats to human health as defined in 29 CFR Part 1910 Subpart I - **to be considered (TBC)**	29 CFR Part 1910 Subpart I, Personal Protective Equipment (General Industry); also Parts 1904 and 1926	X	X
Disposal of dredged or fill material	Guidelines for Specification of Disposal Sites for Dredged or Fill Material. Except as otherwise provided under Clean Water Act § 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. If there is no other practical alternative, impacts must be minimized. Includes criteria for evaluating whether a particular discharge site may be specified.	Disposal of dreged or fill materials will create adverse environmental impacts in proposed disposal site - **relevant and appropriate**	40 CFR Part 230 Guidelines for Specification of Disposal Sites for Dredged or Fill Material.	X	X
Waste characterization of dredged or fill material	Testing manual establishes procedures for determining the potential for contaminant-related impacts associated with discharge of dredged material in inland waters.	Dredged or fill wastes generated in the remedial process for disposal off site as defined in Department of Army, U.S. Army Corps of Engineers Directive - TBC	Department of Army U.S. Army Corps of Engineers Directive	X	X
Transportation and handling of contaminated sediments	Guidance designed to assist EPA staff managing sediment sites by providing a thorough overview of methods that can be used to reduce risk caused by contaminated sediment.	Dredged or fill wastes generated in the remedial process for handling/transportation off site as defined in EPA-540-R-05-012, OSWER 9355.0-85 - TBC	EPA-540-R-05-012, OSWER 9355.0-85	X	
Characterization of solid waste (all primary and secondary wastes)	Must determine if solid waste is excluded from regulation under 40 C.F.R. § 261.4(b); and determine if waste is listed as hazardous waste under subpart D 40 C.F.R. Part 261. Must determine whether the waste is (characteristic waste) identified in subpart C of 40 CFR part 261by either: (1) Testing the waste according to the methods set forth in subpart C of 40 CFR part 261, or according to an equivalent method approved by the Administrator under 40 CFR 260.21; or (2) Applying knowledge of the hazard characteristic of the waste in light of the materials or the processes used.	Generation of solid waste as defined in 40 C.F.R. § 261.2 – **applicable**	40 C.F.R. § 262.11	X	X
Characterization of solid waste (all primary and secondary wastes)	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous waste – **applicable**	40 C.F.R. § 262.11(d)	X	X

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Characterization of hazardous waste (all primary and secondary wastes)	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 C.F.R. Parts 264 and 268.	Generation of RCRA-hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 264.13(a)(1)	X	X
Determinations for management of hazardous waste	Must determine each EPA Hazardous Waste Number (waste code) applicable to the waste in order to determine the applicable treatment standards under 40 C.F.R. Part 268 et seq. Note: This determination may be made concurrently with the hazardous waste determination required in Sec. 262.11 of this chapter.	Generation of hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 268.9(a)	X	X
Determinations for management of hazardous waste	Must determine the underlying hazardous constituents [as defined in 40 C.F.R. § 268.2(i)] in the waste.	Generation of RCRA characteristic hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 268.9(a)	X	X
Determinations for management of hazardous waste	Must determine if the hazardous waste meets the treatment standards in 40 C.F.R. §§ 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste. Note: This determination can be made concurrently with the hazardous waste determination required in 40 CFR 262.11.	Generation of RCRA characteristic hazardous waste for storage, treatment or disposal – **applicable**	40 C.F.R. § 268.7(a)	X	X
Temporary on-site storage of hazardous waste in containers (e.g., excavated sediments and soils)	A generator may accumulate hazardous waste at the facility provided that: • Waste is placed in containers that comply with 40 C.F.R. §§ 265.171-173; and • The date upon which accumulation begins is clearly marked and visible for inspection on each container; and • Container may be marked with other words that identify the contents. • Container is marked with the words "hazardous waste"; or	Accumulation of RCRA hazardous waste on site as defined in 40 C.F.R. § 260.10 – **applicable** Accumulation of 55 gal. or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in 261.33(e) at or near any point of generation – **applicable**	40 C.F.R. § 262.34(a)(1)(i); 40 C.F.R. § 262.34(a)(2) &(3); 40 C.F.R. § 262.34(c)(1)	X	X
Use and management of hazardous waste in containers	If container is not in good condition (*e.g.*, severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition. Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired. Keep containers closed during storage, except to add/remove waste. Open, handle and store containers in a manner that will not cause containers to rupture or leak. Containers having capacity greater than 30 gallons must not be stacked over two containers high.	Storage of RCRA hazardous waste in containers – **applicable**	40 C.F.R. § 265.171 40 C.F.R. § 265.172 40 C.F.R. § 265.173	X	X
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 C.F.R. § 264.175(b).	Storage of RCRA hazardous waste in containers *with free liquids* – **applicable**	40 C.F.R. § 264.175(a)	X	X
Storage of hazardous waste in container area	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA-hazardous waste in containers that *do not contain free liquids* (other than F020, F021, F022, F023, F026 and F027) –**applicable**	40 C.F.R. § 264.175(c)	X	X
Closure of RCRA container storage unit	At closure, all hazardous waste and hazardous waste residues must be removed from the containment system. Remaining containers, liners, bases, and soils containing or contaminated with hazardous waste and hazardous waste residues must be decontaminated or removed. [Comment: At closure, as throughout the operating period, unless the owner or operator can demonstrate in accordance with40 CFR 261.3(d) of this chapter that the solid waste removed from the containment system is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of parts 262 through 266 of this chapter].	Storage of RCRA hazardous waste in containers in a unit with a containment system – applicable	40 C.F.R. § 264.178	X	X

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Temporary on-site storage of remediation waste in staging piles (e.g., excavated sediments and soils)	Must be located within the contiguous property under the control of the owner/operator where the wastes are to be managed in the staging pile originated. For purposes of this section, storage includes mixing, sizing, blending or other similar physical operations so long as intended to prepare the wastes for subsequent management or treatment.	Accumulation of non-flowing hazardous remediation waste (or remediation waste otherwise subject to land disposal restrictions) as defined in 40 C.F.R. § 260.10 –applicable	40 C.F.R. § 264.554(a)(1)	X	X
Performance criteria for staging pile	Staging pile must: • Facilitate a reliable, effective and protective remedy; • Must be designed to prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross–media transfer as necessary to protect human health and the environment (e.g. use of liners, covers, run–off/run–on controls).	Storage of remediation waste in a staging pile –applicable	40 C.F.R. § 264.554(d)(1)(i) and (ii)	X	X
Operation of a staging pile	Must not operate for more than 2 years, except when an operating term extension under 40 CFR 264.554(i) is granted. Note: Must measure the 2-year limit (or other operating term specified) from first time remediation waste placed in staging pile. Must not use staging pile longer than the length of time designated by EPA in appropriate decision document	Storage of remediation waste in a staging pile – **applicable**	40 C.F.R. § 264.554(d)(1)(iii) 40 C.F.R. § 264.554(h)	X	X
Design criteria for a staging pile	In setting standards and design criteria, must consider the following factors: • Length of time pile will be in operation; • Volumes of waste you intend to store in the pile; • Physical and chemical characteristics of the wastes to be stored in the unit; • Potential for releases from the unit; • Hydrogeological and other relevant environmental conditions at the facility that may influence the migration of any potential releases; and • Potential for human and environmental exposure to potential releases from the unit.	Storage of remediation waste in a staging pile – **applicable**	40 C.F.R. § 264.554(d)(2)(i) –(vi)	X	X
Closure of staging pile of remediation waste	Must be closed within 180 days after the operating term by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate. Must decontaminate contaminated sub –soils in a manner that EPA determines will protect human and the environment.	Storage of remediation waste in staging pile in ***previously contaminated area*** – **applicable**	40 C.F.R. § 264.554(j)(1) and (2)	X	X
Discharge of residual water from dewatering activities to surface water	Comply with any applicable substantive water quality requirements under the Clean Water Act (CWA) including application of technology- or ambient water quality- based effluent limitations to ensure discharge does not cause or contribute to violation of water quality standards.	Discharge of pollutants into surface waters – **applicable**	40 C.F.R. § 122	X	

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Discharge of residual water from dewatering activities to surface water	• Technology based effluent limitations and standards based on effluent limitations and standards promulgated under Sections 301 of the [CWA], or case-by-case effluent limitations determined under Section 402(a)(1) of the [CWA] when technology based standards or new source performance standards have not been promulgated, or on a combination of the two. • Other applicable effluent limitations and standards under Sections 301, 302, 303, 304, 307, 318, and 405 of the [CWA] and applicable effluent guidelines and standards under 40 C.F.R. Subchapter N.; and • Other requirements in addition to or more stringent than promulgated effluent limitations, guidelines, or standards under Sections 301, 306, 307, 318, and 405 of the Clean Water Act where necessary to achieve water quality standards established under Section 303 of the Clean Water Act and AWPCA §2-22-9(g) • Take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of effluent standards which has the reasonable likelihood of adversely affecting human health and the environment. • Properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used to achieve compliance with effluent standards. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures.	Discharge of pollutants into surface waters – **applicable**	40 C.F.R. § 122.44(a), (b), (d) 40 C.F.R. § 122.41(d) 40 C.F.R. § 122.41(e)	X	
Disposal of RCRA hazardous waste in an off-site land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste – **applicable**	40 C.F.R. § 268.40(a)	X	X
Disposal of RCRA hazardous waste in an off-site land-based unit	All underlying hazardous constituents [as defined in 40 CFR 268.2(i)] must meet the Universal Treatment Standards (UTSs), found in 40 CFR 268.48 Table UTS prior to land disposal	Land disposal of restricted RCRA characteristic wastes (D001 –D043) that are not managed in a wastewater treatment system that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well – **applicable**	40 C.F.R. § 268.40(e)	X	X
Disposal of RCRA – hazardous waste soil in an off-site land–based unit	Must be treated according to the alternative treatment standards of 40 CFR 268.49(c) or according to the UTSs specified in 40 CFR 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils – **applicable**	40 C.F.R. § 268.49(b)	X	X
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 C.F.R. §§ 171-180 related to marking, labeling, placarding, packaging, emergency response, etc.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material – **applicable**	49 C.F.R. § 171.1(c)	X	X
Transportation of hazardous waste *off–site*	Must comply with the generator standards of Part 262 including 40 C.F.R. §§ 262.20-23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding.	Preparation and initiation of shipment of hazardous waste off–site – **applicable**	40 C.F.R. § 262.10(h);	X	X
Transportation of samples (i.e. contaminated soils and wastewaters)	Except as provided in 40 C.F.R. § 261.4(d)(2), a sample of waste is not subject to any requirements of 40 C.F.R. Parts 261 through 268 or 270 provided the requirements specified in subparagraphs d)(1) (i) through (iii) are complied with. Exemption does not apply if laboratory determines waste is hazardous but it no longer meets conditions in paragraph (d)(1).	Samples of solid waste or a sample of water, soil for purpose of conducting testing to determine its characteristics or composition – **applicable**	40 C.F.R. § 261.4 (d)	X	X
Presence of floodplain, designated as such on a map	Shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains.	Federal actions that involve potential impacts to, or take place within, floodplains – **relevant and appropriate**	Executive Order 11988 – *Floodplain Management* Section 1. Floodplain Management	X	X

Table 2-3
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Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Presence of floodplain, designated as such on a map	Shall consider alternatives to avoid, to the extent possible, adverse effects and incompatible development in the floodplain. Design or modify its action in order to minimize potential harm to or within the floodplain	Federal actions that involve potential impacts to, or take place within, floodplains – **relevant and appropriate**	Executive Order 11988 Section 2.(a)(2) Floodplain Management	X	X
Presence of floodplain, designated as such on a map	If there is no practicable alternative to locating in or affecting the floodplain, the potential harm to the floodplain shall be minimized. The natural and beneficial values of floodplains shall be restored and preserved.	Federal actions that involve potential impacts to, or take place within, floodplains – **relevant and appropriate**	40 C.F.R. Part 6, App. A, § 6(a)(5)	X	X
Presence of floodplain, designated as such on a map	Structures and facilities must be constructed in accordance with existing criteria and standards set forth under the National Flood Insurance Program (NFIP) and must include mitigation of adverse impacts wherever feasible. If newly constructed structures or facilities are to be located in a floodplain, accepted floodproofing and other flood protection measures shall be undertaken. To achieve flood protection, EPA shall, wherever practicable, elevate structures above the base flood level rather than filling land.	Construction of structures and facilities within floodplains – **relevant and appropriate**	40 C.F.R. Part 6, App. A, § 6(c)(1) & (2)	X	X
Presence of federally endangered or threatened species, as designated in 50 C.F.R. §§ 17.11 and 17.12 **-or-** critical habitat of such species listed in 50 C.F.R. § 17.95	Actions that jeopardize the existence of a listed species or results in the destruction or adverse modification of critical habitat must be avoided or reasonable and prudent mitigation measures taken.	Action that is likely to jeopardize fish, wildlife, or plant species or destroy or adversely modify critical habitat— **applicable**	16 U.S.C. § 1538(a)	X	X
Presence of federally endangered or threatened species, as designated in 50 C.F.R. §§ 17.11 and 17.12 **-or-** critical habitat of such species listed in 50 C.F.R. § 17.95	Each Federal agency shall, in consultation with and with the assistance of the Secretary [of DOI], insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by [DOI] to be critical.	Actions authorized, funded, or carried out by any Federal agency, pursuant to 16 U.S.C. § 1536 – **relevant and appropriate**	16 U.S.C. § 1536(a)(2); 50 C.F.R. §§ 402.13(a), 402.14	X	X
Presence of any migratory bird, as defined by 50 C.F.R. § 10.13	It shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or eggs of any such bird.	Federal actions that have, or are likely to have, a measurable negative effect on migratory bird populations – **applicable**	16 U.S.C. § 703(a)	X	X
Presence of wetlands	Shall take action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance beneficial values of wetlands. Shall avoid undertaking construction located in wetlands unless: (1) there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.	Federal actions that involve potential impacts to, or take place within, wetlands – **TBC**	Executive Order 11990 – Protection of Wetlands Section 1.(a) Section 2.(a)	X	X
Location encompassing aquatic ecosystem as defined in 40 C.F.R. § 230.3(c)	No discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences.	Action that involves discharge of dredged or fill material into waters of the United States, including wetlands – **relevant and appropriate**	40 C.F.R. § 230.10(a)	X	

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Location encompassing aquatic ecosystem as defined in 40 C.F.R. § 230.3(c)	No discharge of dredged or fill material shall be permitted if it: • Causes or contributes, after consideration of disposal site dilution and dispersion, to violations of any applicable State water quality standard; • Violates any applicable toxic effluent standard or prohibition under Section 307 of the Clean Water Act; • Jeopardizes the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, or results in the likelihood of the destruction or adverse modification of critical habitat; • Violates any requirement imposed by the Secretary of Commerce to protect any marine sanctuary designated under title III of the Marine Protection, Research, and Sanctuaries Act of 1972. • No discharge of dredged or fill material shall be permitted which will cause or contribute to significant degradation of the waters of the United States • No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Action that involves discharge of dredged or fill material into waters of the United States, including wetlands – **relevant and appropriate**	40 C.F.R. § 230.10(b) 40 C.F.R. § 230.10(c) 40 C.F.R. § 230.10(d)	X	
Presence of any stream or other body of water proposed to be impounded, diverted, controlled, or modified for drainage	Whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the United States, or by any public or private agency under Federal permit or license, such department or agency first shall consult with the United States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular State wherein the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water-resource development.	Federal actions that propose to impound, divert, control, or modify waters of any stream or body of water – **relevant and appropriate**	16 U.S.C. § 662(a)	X	
Water quality-based limits for discharge into navigable waters	Establishes effluent standards in accordance with federal WPCA and CWA. Applicable for alternatives involving discharge of water to the river.	Wastes generated from remedial process to be discharged to river would be subject to the substantive requirements of Part 31 of the NREPA, MCL 324.3101 *et seq*, and Mich Admin Code R. 323.1201-1221; and R. 323.2101-2195 - **relevant and appropriate**	Michigan NREPA, MCL 324.1301 *et seq*, Mich Admin Code R 323.1201-1221; R 323.2101-2195	X	X
Water quality-based limits for discharge to groundwater or the ground	Establishes requirements for discharges of waters or waste to groundwater or to the ground.	Substantive requirements would apply if remedial alternatives involve discharges of wastewater or wastes to groundwater or to the ground - **relevant and appropriate**	Mich Admin Code R 323.2201-2240 (Part 22 Rules for groundwater protection)	X	X
Transportation, storage, and disposal of hazardous waste off site	Establishes requirements for hazardous waste generators, transporters, and treatment/storage/disposal (TSD) facilities. Area 1 is likely not a TSD facility nor a generator of hazardous wastes, although certain portions of the regulations may be useful as a means of determining handling/transportation requirements.	Hazaradous wates generated from remedial process to be transported, stored, and/or disposed of off site as defined in MCL324.11101-11153 - **relevant and appropriate**	Miichigan NREPA, MCL 324.11101-11153	X	X
Disposal of non-hazardous waste off site	Establishes rules for solid waste disposal facilities. Applies to a remedial alternative involving landfilling.	Non-hazardous wasts generated from remedial process to be transported and disposed of off site as defined in MCL 324.11101-11153 and Mich Admin Code R. 299.4401 - 4922 - **relevant and appropriate**	Michigan NREPA, MCL 324.11101-11153 and Mich Admin Code R 299.4401 - 4922	X	X
Regulation of activities in inland lakes or streams to complete remedial actions	Regulates dredging or filling of lake or stream bottoms and establishes mitigation requirments. For certain remedial alternatives, activities may be affected by these regulations.	Dredging or filling will be included in remedial activities as defined in MCL 324.30101 - 30113 - **applicable**	Michigan NREPA, MCL 324.30101 - 30113; Mich Admin Code R 281.811-845	X	X

Table 2-3
Federal and State Action-Specific Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considereds (TBCs)
Area 2, OU-5 Kalamazoo River

Action	Requirements	Prerequisite	Citation	Applicable to Sediment/Soil Alternatives	
				Sediment	Soil
Use of dredging or filling in wetlands to complete remedial activities	Establishes the rules regarding wetland uses and the permit application process for protection of state wetland areas. For certain remedial alternatives, activities may be affected by these rules.	Dredging or filling in regulated wetlands may be included in remedial activities as defined in MCL 324.30101 - 30113 - **relevant and appropriate**	Michigan NREPA, MCL 324.30101-30329; Mich Admin Code R 281.921-925; R 281.951-961; Part 303 (Wetlands Protection), MCL 324.30319	X	X
Maintaining safe conditions during remedial activities	Establishes the rules for safety standards in the workplace. For certain remedial alternatives, activities may be restricted by these regulations.	Safety standards used during remedial activities as detailed in MCL 408.1001 - 1094 - **applicable**	Michigan NREPA, MCL 408.1001-1094; portions of the MIOSHA rules including Part 4 through 13 of the All Industry Administrative Rules, Parts 1-91 of Construction Safety Standards Comission Rules, Part 1-93 of the General Industry Safety Standards Comission Rules, and Parts 301-681 of the Occupational Health Standards Commission Rules.	X	X
Human health and wildlife risk-based limits for air emissions	Establishes rules prohibiting the emission of air contaminants in quantities that cause injurious effects to human health, animal life, plant life of significant economic value, and/or property. For certain remedial alternatives, dust emissions may need to be monitored and controlled, if appropriate.	Air emissions may be generated that create threats to human health as defined in MCL 324.5501 - 5542 and Mich Admin Code R. 336.1101-2823 - **relevant and appropriate**	Michigan NREPA, MCL 324.5501-5542; Mich Admin Code R 336.1101-2823	X	X
Soil erosion and sediment control requirements for owners of land undergoing an earth change	Establishes rules prescribing soil erosion and sedimentation control plans, procedures, and measures	For any remedial action involving an earth change, substantive requirements of permit must be satisfied - **relevant and appropriate**	Michigan NREPA, Part 91 (Soil Erosion and Sediment Control), MCL 324.9101-9112; Mich Admin Code R 323.1701-1744	X	X
Dam Safety	Provides requirements for dam construction and maintenance to ensure that dams are properly constructed, inspected, and maintained, and that the owners have adequately prepared for potential emergencies. Permits are required for the construction, enlargement, repair, alteration, removal, abandonment, and reconstruction of state regulated dams. Dam removal will also have an impact on water resources, so there will also be applicable rules in Part 31.	Applies to dams over 6' in height and over 5 acres of impoundment during the design flood. Would apply to remedial actions that impact regulated dams and surrounding areas - **relevant and appropriate**	Michigan NREPA, Part 315 (Dam Safety), MCL 324.31501-31529; Part 31 (Water Resources), MCL 324.3101	X	X
Invasive Species	Lists nonnative species that are prohibited or restricted in Michigan; provides authority and procedures for State Natural Resources Commission to add or delete from the list. Provides for a permit for introduction of genetically engineered organisms. Provides penalties for violations.	Substantive requirements apply to remedial alternatives that involve restoration or planting activities - **relevant and appropriate**	Michigan NREPA, Part 413 (Transgenic and Nonnative Organisms), MCL 324.41301-41325	X	X
Storage and handling of liquid industrial wastes	Imposes requirements on generators for storage, documentation, and handling for onsite liquid waste in preparation for transport, for the use of registered haulers, and for the inspection of vehicles and control of the disposal of wastes.	Remedial actions may require transportation and disposal of liquid waste, and the Part 121 requirements apply to the storage and transport of those wastes - **relevant and appropriate**	Michigan NREPA, Part 121 (Liquid Industrial Waste), MCL 324.12101-12118	X	X
Reporting wastewater discharge	Requires discharge reporting on the part of any wastewater discharger other than of sanitary sewage to a sewer system. Applicable to any alternatives involving discharge of wastewater.	Remedial activities include discharge of wastewater as defined Mich Admin Code R. 299.9007 - **relevant and applicable**	Michigan NREPA; Mich Admin Code R 299.9007	X	X
Human health and wildlife risk-based limits for air emissions	Establishes rules prohibiting the emission of air contaminants in quantities that cause injurious effects to human health, animal life, plant life of significant economic value, and/or property. For certain remedial alternatives, dust emissions may need to be monitored.	Air emissions are generated that create threats to human health as defined in MCL 336.1101 - 2823 and MCL 324.5501 -5542 - **relevant and applicable**	Michigan NREPA; MCL 336.1101 - 2823; MCL 324.5501 - 5542	X	X

Prepared by/Date: KPW 04/22/14
Checked by/Date: MTP 06/11/14

APPENDIX 2

Administrative Record Index

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR THE
ALLIED PAPER/PORTAGE CREEK/KALAMAZOO RIVER SITE
OPERABLE UNIT 5, AREA 2
KALAMAZOO, KALAMAZOO COUNTY, MICHIGAN

UPDATE 1
SEPTEMBER 27, 2017
SEMS ID: 935138

NO.	SEMS ID	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	936300	Undated	U.S. EPA	Public	Learn About Dioxin Webpage	4
2	936314	Undated	U S. EPA	Public	Cleanup Levels for Dioxin at Superfund Sites Web Page	3
3	936319	Undated	Always, R., Otsego Planning Commission	File	Comments on Proposed EPA Cleanup Plan for Area 2 of the Kalamazoo River	2
4	381731	3/1/76	U.S. EPA	U.S. EPA	Journal Article: "The View of the Paper Industry on the Occurrence of PCBS in the Environment and the Need for Regulation" (National Conference on Polychlorinated Biphenyls Proceedings)	6
5	381732	3/1/76	U.S. EPA	U.S. EPA	Journal Article: "Statement Relating to Polychlorinated Biphenyls on Behalf of the Wisconsin Paper Council" (National Conference on Polychlorinated Biphenyls Proceedings)	5
6	381735	3/1/76	Institute of Paper Chemistry	File	Journal Article: Determination of Polychlorinated Biphenyls in Paper Mills Effluents and Process Streams	31
7	381733	7/22/77	Institute of Paper Chemistry	File	Report: Polychlorinated Biphenyls in Pulp and Paper Mills - Part 2, Distribution and Removal	64

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8	381734	8/1/79	Institute of Paper Chemistry	File	Journal Article: "InterLaboratory Study of the Determination of Polychlorinated Biphenyls in a Paper Mill Effluent	20
9	930007	10/1/80	U.S. EPA	File	Ambient Water Quality Criteria for Polychlorinated Biphenyls	200
10	171135	12/13/82	Creel, W., MI Dept. of Natural Resources	Gettle, G., MI Dept. of Natural Resources	MDNR Memo re: Otsego Dam	3
11	165912	2/1/86	Allied Paper Co. & Varnum Riddering Schmidt & Howlett	U.S. EPA	Allied Paper Inc. - Proposal for Implementation of Immediate Remedial Action Plan & Assessment of Future Remedial Action Plan	45
12	171120	3/1/86	Nus Corp	Michigan, State of	Feasibility Study of Alternatives (Vol 1)	8
13	930004	4/1/86	Eisler, R., U.S. Deot. Of Interior/Fish & Wildlife Services	File	Polychlorinated Biphenyls Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review	53
14	165918	11/19/86	Wallace, C., MI Dept. of Natural Reources	Eaton, R., Allied Paper Co.	Site Inspection Report & Hazardous Ranking System Packet (Cover Letter Attached)	93
15	936297	3/1/88	U.S. EPA	File	USEPA/Paper Industry Cooperative Dioxin Screening Study	333
16	165953	3/7/90	Luzkow, S., MI Dept. of Natural Resources	Leep, T., MI Dept. of Natural Resources	Draft Preliminary Health Assessment (3/8/1990 Cover Memo Attached)	25
17	936297	7/1/90	U.S. EPA	File	USEPA/Paper Industry Cooperative Dioxin Study "The 104 Mill Study" - Summary Report	29
18	381968	8/30/90	Federal Register	Public	NPL Site Narrative	2
19	494780	4/19/91	File	File	Land Application of Bleached Pulp & Paper Mill Wastewater Treatment Sludges	102
20	167821	12/23/91	MI Dept. of Public Health & ATSDR	U.S. EPA	Preliminary Health Assessment	42

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21	165888	5/1/92	Blasland Bouck & Lee Inc.	U.S. EPA	Description of Current Situation - Vol II of VII	211
22	165892	5/1/92	Blasland Bouck & Lee Inc.	U.S. EPA	Description of Current Situation (Drawings) - Vol III of VII	43
23	165251	5/1/92	Brasland & Bouck Engineers P C	U.S. EPA	Description of Current Situation - Aerial Photographs - Vol IV of VII	36
24	165894	5/1/92	Blasland Bouck & Lee Inc.	U.S. EPA	Description pf Current Situation - Appendix B - Land Use Figures - Vol V of VII	13
25	165895	5/1/92	Blasland Bouck & Lee Inc.	U.S EPA	Draft Description of Current Situation - Appendix A-D - Vol VI of VII	253
26	165897	5/1/92	Blasland Bouck & Lee Inc.	U.S. EPA	Description of Current Situation - Appendix E - Stiff Diagrams - Vol VII of VII	14
27	235188	7/1/92	Blasland Bouck & Lee Inc.	Kalamazoo River Study Group	Description of Current Situation (Vols 1-7)	884
28	930006	9/1/96	U.S. EPA	File	PCBS: Cancer Dose-Response Assessment and Application to Environmental Mixtures	83
29	167797	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation	211
30	167798	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix B - Field Documentation	243
31	167799	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix C - Photographic Log	388
32	167800	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix D - QA/QC Review of Data Summary Of Precision & Accuracy Assessment	242
33	167801	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix E - Data Quality Review Reports - Vol 1 of 3	667

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34	167802	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix E - Data Quality Review Reports - Vol 2 of 3	631
35	168049	1/1/02	Blasland Bouck & Lee Inc.	U S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix E - Data Quality Review Reports - Vol 3 of 3	1003
36	168048	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix F - Chain of Custody Records	531
37	168050	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix G - PCDD/PCDF Fish Tissue Laboratory Documentation	80
38	168051	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix H - 1997 Fish Trend Monitoring Investigation	56
39	168052	1/1/02	Blasland Bouck & Lee Inc.	U.S. EPA	Final Technical Memorandum 14 - Biota Investigation - Appendix I - Data Quality Review Reports - Turtle Tissue Analytical Results	420
40	249486	5/1/03	Camp Dresser & Mckee Inc	U.S. EPA	Final Human Health Risk Assessment (Revised)	109
41	910573	8/27/10	Saric, J., U.S. EPA	Erickson, M., Arcadis	Letter re: Area 2 Supplemental Remedial Investigation/ Feasibility Study Work Plan Disapproval	8
42	910572	12/1/10	Saric, J., U.S. EPA	Erickson, M , Arcadis	Letter re: Area 2 Supplemental Remedial Investigation/ Feasibility Study Work Plan Approval	3
43	910571	2/10/11	Saric, J., U.S. EPA	Erickson, M., Arcadis	Letter re: Area 2 Supplemental Remedial Investigation/ Feasibility Study Reconnaissance Plan Extension	2
44	935137	10/21/11	URS	U.S. EPA	Engineering Design Report - Dam Removal and Channel Restoration ***(Redacted)***	140

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45	910566	10/26/11	Saric, J., U.S. EPA	Erickson, M., Arcadis	Letter re: Area 2 Proposed Soil and Sediment Field Sampling Plan Approval	4
46	910564	11/22/11	Erickson, M., Arcadis	Saric, J., U.S. EPA	Area 2 Revised Soil and Sediment Field Sampling Plan	269
47	910567	4/2/12	Saric, J., U.S. EPA	Erickson, M., Arcadis	Letter re: Area 2 Proposed Supplemental Non-PCB Analysis Approval	2
48	910568	5/29/12	Saric, J., U.S. EPA	Erickson, M., Arcadis	Letter re: Area 2 Supplemental Soil and Sediment Field Sampling Plan Approval	2
49	918185	8/1/12	File	File	Supplemental Remedial Investigation Report - OU-5, Area 1	4740
50	910565	10/11/12	Saric, J., U.S. EPA	Erickson, M., Arcadis	Letter re: Area 2 Alternatives Screening Technical Memorandum Extension	1
51	934400	3/27/13	U.S. EPA	File	Memo re: Procedure for Re-evaluation of Dioxin Risk at Region 5 Remedial Superfund Sites	2
52	910569	4/8/13	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 Draft Supplemental Remedial Investigation Report Disapproval	22
53	910570	5/23/13	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 Revised Supplemental Remedial Investigation Report Extension	1
54	916473	2/27/14	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 and 3 Revised Draft Supplemental Remedial Investigation Report and Alternatives Screening Technical Memorandum (with EPA Comments)	25
55	916472	5/27/14	Saric, J., U.S. EPA	Fortenberry, C , Georgia-Pacific LLC	Letter re: Area 2 and 3 Alternatives Screening Technical Memorandum Extension	1
56	916474	7/31/14	Saric, J., U.S. EPA	Fortenberry, C , Georgia-Pacific LLC	Letter re: Area 2 Revised Draft Supplemental Remedial Investigation Report Disapproval (with EPA Comments)	11

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57	934402	8/1/14	AMEC	U.S. EPA	Draft Area 2 Alternatives Screening Technical Memorandum	127
58	934401	8/7/14	Bucholtz, P., MDEQ	Fortenberry, C., Georgia-Pacific LLC	Letter re: Comments for Operable Unit 5, Area 2 Revised Draft Supplemental Remedial Investigation Report	30
59	916475	10/6/14	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 Revised Draft Supplemental Remedial Investigation Report Extension	1
60	934391	3/5/15	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 and Area 3 Revised Supplemental Remedial Investigation Report Submittal Dates	1
61	936322	4/30/15	Resident of Kalamazoo	Public	Letter re: Open Letter to the Residents of the City of Kalamazoo Concerning the Allied Paper Co. Landfill	34
62	934397	7/28/15	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 Revised Supplemental Remedial Investigation Report Approval	2
63	936353	8/3/15	Bucholtz, P., MDEQ	Fortenberry, C., Georgia-Pacific LLC	Letter re: Comments for OU5 Allied Paper, Inc./Portage Creek/Kalamazoo River, Area 2	12
64	934392	9/8/15	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Final Comments on Area 2 Alternatives Screening Technical Memorandum	8
65	934404	9/25/15	Fortenberry, C., Georgia-Pacific LLC	Saric, J., U.S. EPA	Supplemental Remedial Investigation Report (Text and Tables) - Operable Unit 5, Area 2	393
66	934405	9/25/15	Fortenberry, C., Georgia-Pacific LLC	Saric, J., U.S. EPA	Supplemental Remedial Investigation Report (Appendices) - Operable Unit 5, Area 2	1
67	934406	9/25/15	Georgia-Pacific	U.S. EPA	Responses to Final U.S. EPA Comments on Area 2 Supplemental Remedial Investigation Report	1
68	934407	9/29/15	Georgia-Pacific	U.S. EPA	Responses to Final MDEQ Comments on Area 2 Supplemental Remedial Investigation Report	15

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69	934395	11/18/15	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 Feasibility Study Report Extension	1
70	516258	1/27/16	Saric, J., U.S. EPA	Fortenberry, C., Georgia Pacific Corp	Letter re. Final Multi-Area Quality Assurance Project Plan Revision 1, Addendum 1 and Quality Management Plan Approval	4
71	934394	8/8/16	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Disapproval of Area 2 Draft Feasibility Study Report	9
72	934396	10/3/16	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Area 2 Revised Feasibility Study Report Extension	1
73	934398	12/7/16	Saric, J., U.S. EPA	Ells, S., Contaminated Sediments Technical Advisory Group	Memo re. Tier 2 Sediment Site Consideration Memo	19
74	934393	3/15/17	Saric, J., U.S. EPA	Fortenberry, C., Georgia-Pacific LLC	Letter re: Approval of Area 2 Revised Draft Feasibility Study Report with Modifications	5
75	516268	3/15/17	Saric, J , U.S. EPA	Fortenberry, C., Georgia Pacific Corp.	Letter re: Area 2: Revised Draft Feasibility Study Report	6
76	516254	4/7/17	Saric, J , U.S. EPA	Bucholtz, P , MI Dept of Environmental Quality	Letter re: Allied Paper, Inc /Portage Creek/Kalamazoo River Third Five-Year Review	2
77	934399	4/21/17	Guerriero, M., U.S. EPA	Woolford, J., U.S. EPA	Memo re: National Remedy Review Board Review Not Warranted for Proposed Response Action at Operable Unit 5, Area 2	94
78	936352	4/21/17	Bradley, J., MI Dept. of Environmental Quality	Fortenberry, C., Georgia Pacific Corp.	Letter re: Comments for OU5 Allied Paper, Inc./Portage Creek/Kalamazoo River, Area 2	14
79	934403	4/28/17	AMEC	U S EPA	Feasibility Study for Operable Unit 5, Area 2	669

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80	934408	4/28/17	Georgia-Pacific	U.S. EPA	Responses to U.S. EPA Comments on Area 2 Revised Draft Feasibility Study	3
81	934409	4/28/17	Fortenberry, C., Georgia-Pacific LLC	Goeks, T., NOAA and Alfano, J., MDEQ	Letter re: Categorical Response to Comments on the October 21, 2016 Area 2 Draft Feasibility Study	4
82	934410	4/28/17	Fortenberry, C., Georgia-Pacific LLC	Saric, J., U.S. EPA	Letter re. Submission of Final Area 2 Revised Draft Feasibility Study	1
83	934438	6/1/17	U.S. EPA	Public	Regional Screening Level (RSL) Resident Soil	11
84	936313	6/6/17	Peabody, D., MI Dept. of Environmental Quality	Saric, J., U.S. EPA	Letter re: Comments for the Draft Proposed Plan - May 2017	7
85	936312	6/27/17	Saric, J., U S. EPA	Peabody, D., MI Dept. of Environmental Quality	Letter re: MDEQ Comments on Draft Proposed Plan	2
86	936324	7/12/17	File	U.S. EPA	Comments on the Proposed Cleanup Plan for the Kalamazoo River Area 2	2
87	936320	7/25/17	Jenson Litigation Solutions	Saric, J., & Russell, D., U.S. EPA	Public Meeting - Proposed Cleanup Plan for Area 2 of the Kalamazoo River Site	37
88	936325	7/31/17	Peterson, R., Saugatuck-Douglas Chamber of Commerce	U.S. EPA	Comments on the Proposed Cleanup Plan for the Kalamazoo River Area 2	4
89	516256	7/31/17	Morgan, T., U.S. Government National Labor Relations Board	Bachelder, A., Sachs Waldman, P.C.	Letter re: Decision to Dismiss	4
90	936315	8/3/17	Hamilton, S., Kalamazoo River Watershed Council	Russell, D., U.S. EPA	Email re: Kalamazoo River Watershed Council Comment on Proposed Area 2 Cleanup	1
91	936326	8/4/17	Johnson, S., EcoSPEARS	Russell, D., U.S. EPA	Email re: NASA Tech for PCB Remediation	19

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92	936316	8/25/17	Georgia-Pacific LLC	Saric, J., U.S. EPA	Letter re: Comments on the July 2017 Proposed Plan Area and Fact Sheet	3
93	936317	8/30/17	Harrison, D , Kalamazoo River Protection Associtaion	Saric, J., & Russell, D , U.S. EPA	Letter re: Comments on EPA Proposed Plan for Remediation Plan	4
94	936318	8/30/17	Alfano, J , MI Dept. of Environmental Qualtiy	Saric, J., & Russell, D., U.S. EPA	Letter re· Kalamazoo River Proposed Plan Comments from the NRD Trustees	4
95	936327	9/21/17	Peabody, D., MI Dept. of Environmental Quality	Saric, J., U S. EPA	Letter re: Comments for the Draft Record of Decision	5
96	-	-	-	File	Record of Decision - Operable Unit 5 Area 2 ***(Pending)***	-