



Allied Paper, Inc./Portage Creek/Kalamazoo River

Operable Unit 5

Area 1 Proposed Plan

May 19, 2015



Objectives



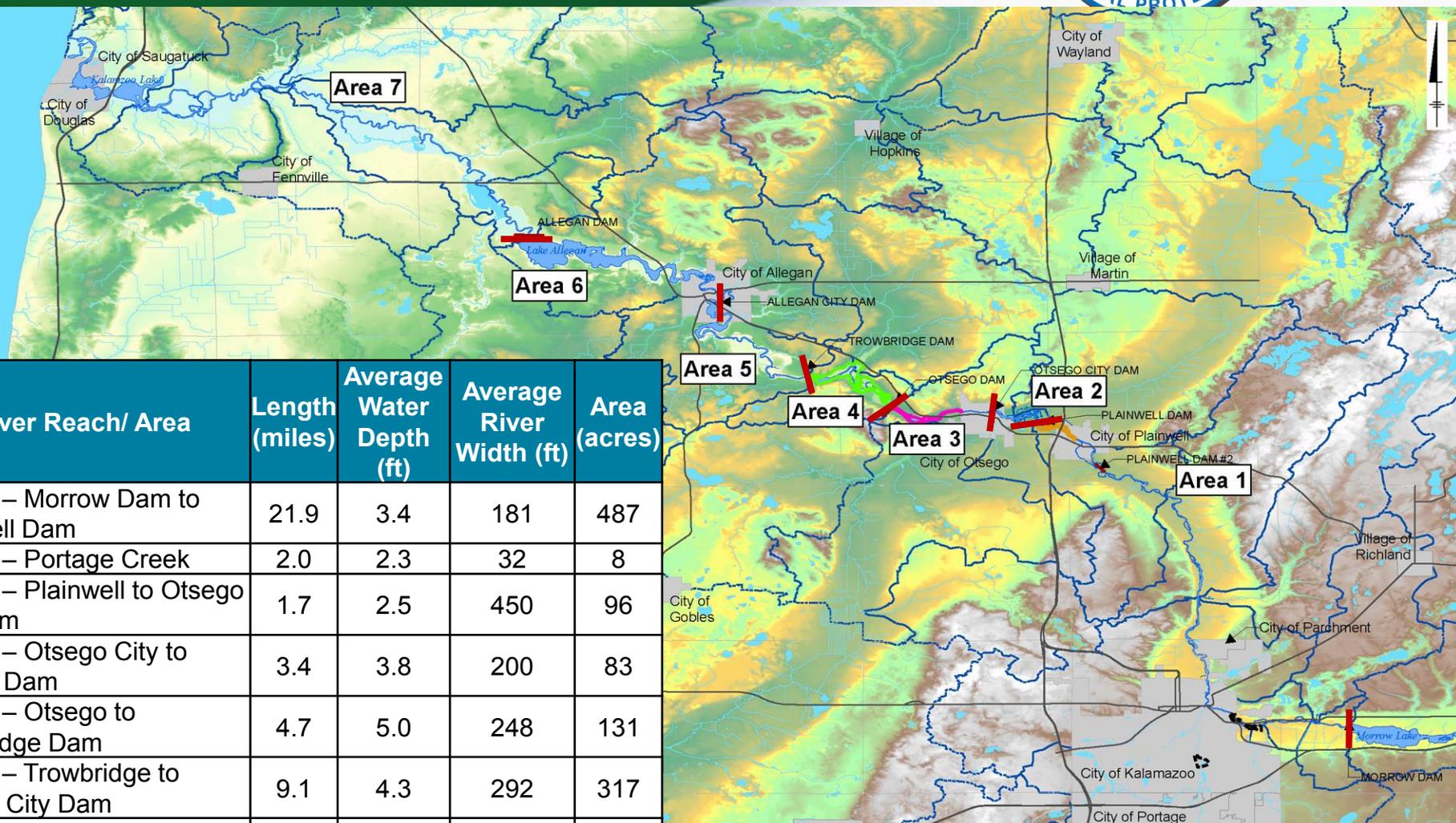
- **Provide information on EPA's proposed remedy for Area 1 of Operable Unit 5**
- **Informal comments**
- **Formal public hearing for comments to be included in the record**

Remedial Process



- **EPA receives comments during 30-day period**
- **EPA responds to comments in the Responsiveness Summary**
- **EPA finalizes remedy in Record of Decision (fall 2015)**

The Seven Areas of Operable Unit 5 (The Kalamazoo River and Portage Creek)

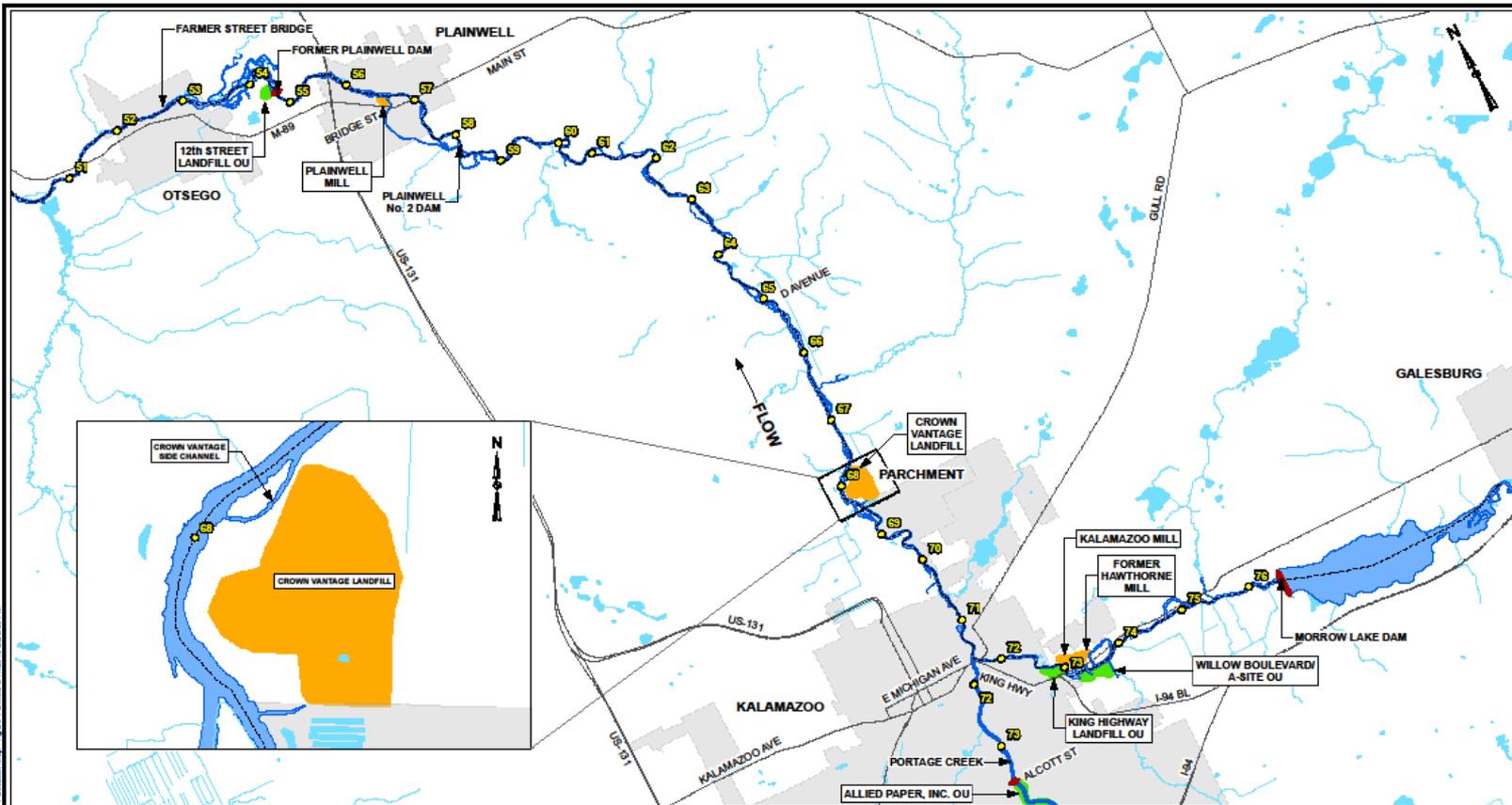


River Reach/ Area	Length (miles)	Average Water Depth (ft)	Average River Width (ft)	Area (acres)
Area 1 – Morrow Dam to Plainwell Dam	21.9	3.4	181	487
Area 1 – Portage Creek	2.0	2.3	32	8
Area 2 – Plainwell to Otsego City Dam	1.7	2.5	450	96
Area 3 – Otsego City to Otsego Dam	3.4	3.8	200	83
Area 4 – Otsego to Trowbridge Dam	4.7	5.0	248	131
Area 5 – Trowbridge to Allegan City Dam	9.1	4.3	292	317
Area 6 – Lake Allegan	9.8	6.7	1,500	1,650
Area 7 – Allegan Dam to Lake Michigan	26	5.5	212	670

Area 1 of Operable Unit 5 (The Kalamazoo River and Portage Creek)



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- LEGEND:**
- RIVER MILE MARKER
 - KALAMAZOO RIVER
 - RIVER CENTERLINE
 - WATER BODIES
 - AREA 1 STUDY AREA BOUNDARY
 - OPERABLE UNIT
 - ROAD
 - INCORPORATED AREA



NOTES:

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AREA 1 FEASIBILITY STUDY REPORT -
MORROW DAM TO FORMER PLAINWELL DAM
**AREA 1 - MORROW LAKE
DAM TO PLAINWELL DAM**

Prepared by Date:
JMP 08/19/13
Checked by Date:
MPP 08/19/13
Project Number:
2009-0146



City of Otsego, Michigan, MI. Created by: Zhifeng Wang. Last Modified by: jerry.jones
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Time-Critical Removal Actions



- **Bryant Mill Pond (1998-1999)**
- **Plainwell Dam (2007-2009)**
- **Plainwell 2 Dam (2009-2010)**
- **Portage Creek (2011-2013)**

Bryant Mill Pond TCRA



- **Conducted June 1998 to May 1999**
- **Removed 150,000 cy bank and in-stream PCB contaminated sediment**
- **Dry excavation diverting Portage Creek**
- **One of the largest sources of PCB contamination to Portage Creek and the Kalamazoo River**
- **Post excavation sampling PCB concentrations less than 1 ppm**
- **Fish tissue concentrations dropped an order of magnitude**



Plainwell Dam TCRA



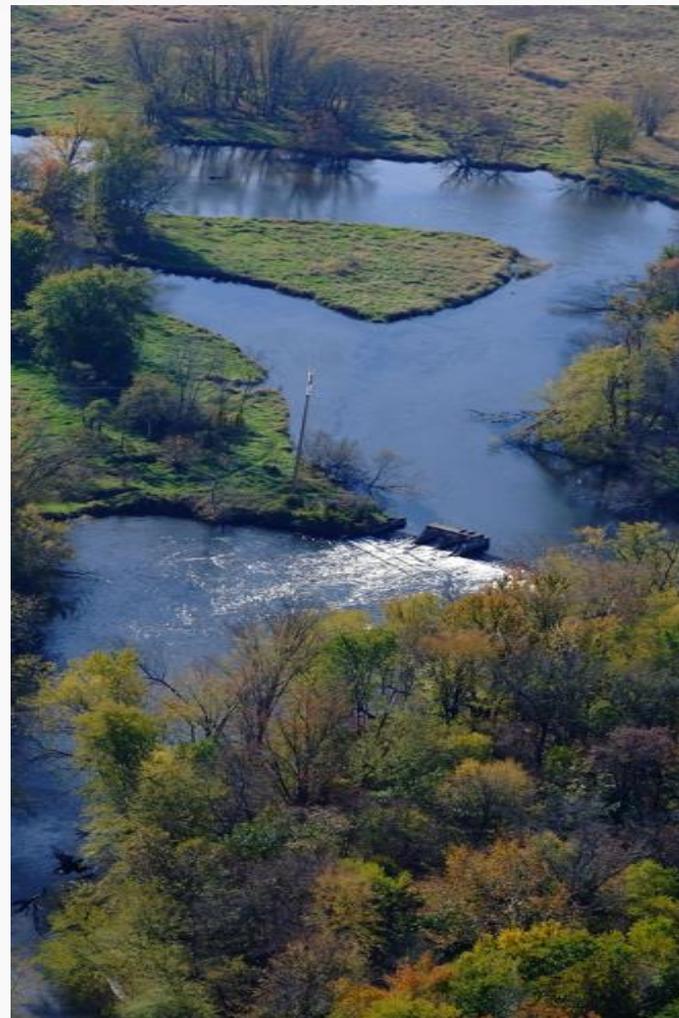
- **Conducted April 2007 to December 2009**
- **Removed 128,000 cy bank and in-stream PCB contaminated sediment**
- **Addressed 2 miles of the Kalamazoo River from Plainwell to the Plainwell Dam**
- **Removed the existing Plainwell dam and restored river to historical free-flowing channel**



Plainwell No. 2 Dam TCRA



- **August 2009 to December 2010**
- **1.9 miles of river bank**
- **Removal of 14,200 cy PCB contaminated bank and floodplain material**
- **12,000 cubic yards of soil removed from banks and floodplain**
- **2,200 cubic yards from oxbow/river area**



Portage Creek TCRA



- **2011-2013**
- **Removed approximately 23,700 cubic yards**
- **Dredge depths range from 12 inches to 70 inches in various Slope Areas and were backfilled to grade**
- **2.5 miles of Portage Creek**



Remedial Action Objectives



- **RAO 1: Protect people who consume Area 1 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:**
 - **A 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**
 - **Achievement of a non-cancer hazard index (HI) of 1.0 and a 10^{-5} cancer risk within 30 years for the high end sport angler (100% bass diet)**
 - **The fish tissue goal for bass will be achieved by reducing the sediment PCB SWAC in each of eight sections of the river within Area 1 to 0.33 ppm or less following completion of the remedial action**

Remedial Action Objectives



- **RAO 2: Protect aquatic ecological receptors from exposure to concentrations of PCBs in sediments that exceed protective levels for local populations.**
- **RAO 3: Protect Terrestrial ecological receptors from exposure to concentrations of PCBs in soils that exceed protective levels.**
- **RAO 4: Reduce transport of PCBs from Area 1 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.

Preliminary Remediation Goals Contaminants of Concern



- **PRGs developed based upon Human Health and Ecological Risk Assessments**
- **PCB primary risk driver**
- **Majority of non-PCB constituents co-located with PCB in river sediment**
- **Fish consumption is the primary risk**

Fish/Sediment/Soil PRGs

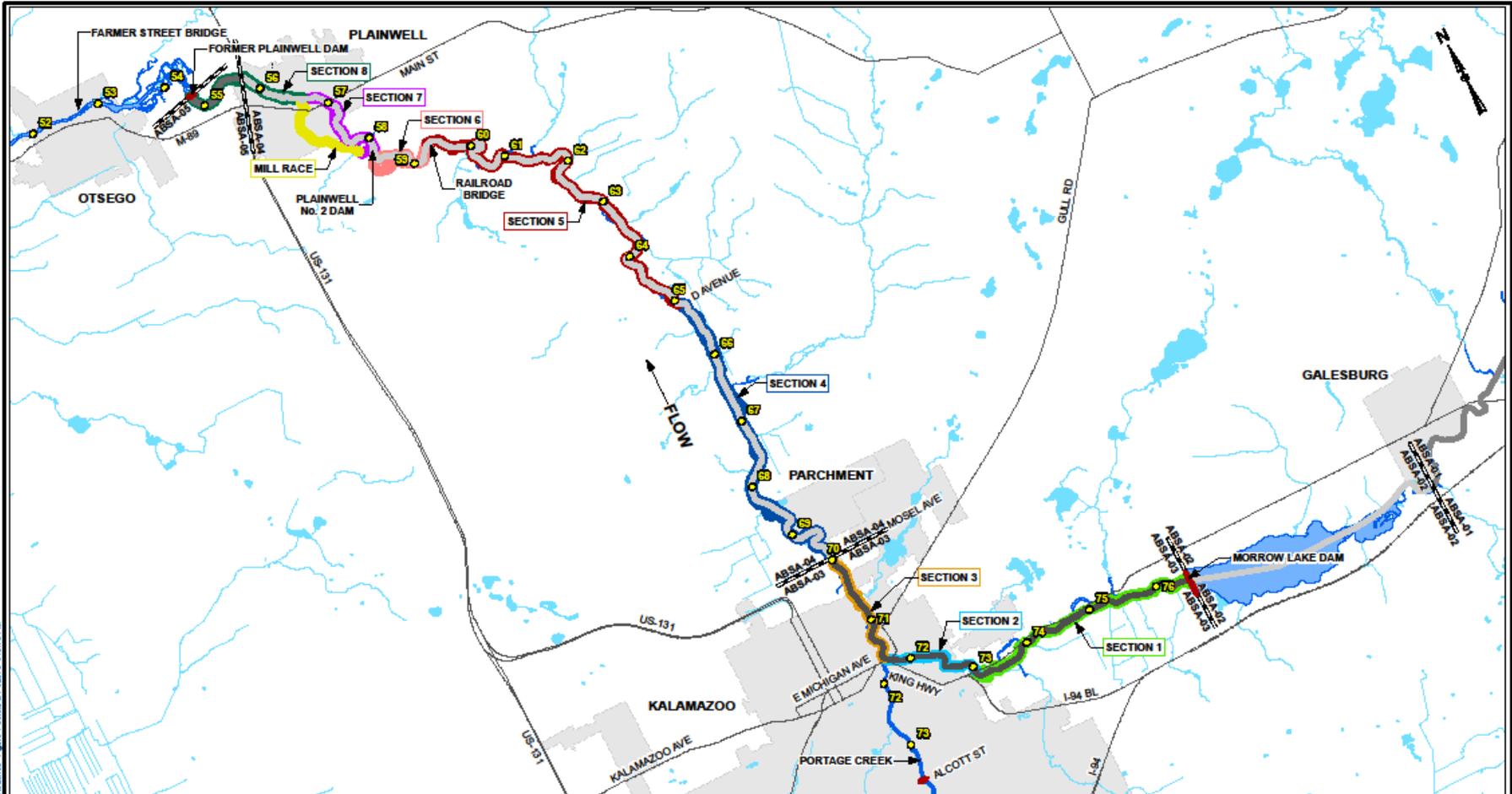


Recommended PRGs for Area 1 of OU5	
Media	PRG for Total PCBs
Fish Tissue	0.042 mg/kg (RAO 1, cancer risk of 1×10^{-5}) 0.072 mg/kg (RAO 1, non-cancer HI of 1) 0.6 mg/kg (RAO 2, ecological receptors)
Sediment	0.33 mg/kg (SWAC in each river section)
Floodplain Soil	11 mg/kg (all areas except residential) 2.5 mg/kg (residential areas)

Eight Sections of Area 1



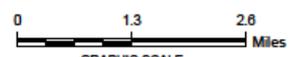
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LEGEND:

	RIVER MILE MARKER		SECTION 1		SECTION 6		ABSA BREAKS
	AREA 1 STUDY AREA BOUNDARY		SECTION 2		SECTION 7		ABSA-01
	ROAD		SECTION 3		SECTION 8		ABSA-02
	KALAMAZOO RIVER		SECTION 4		MILL RACE		ABSA-03



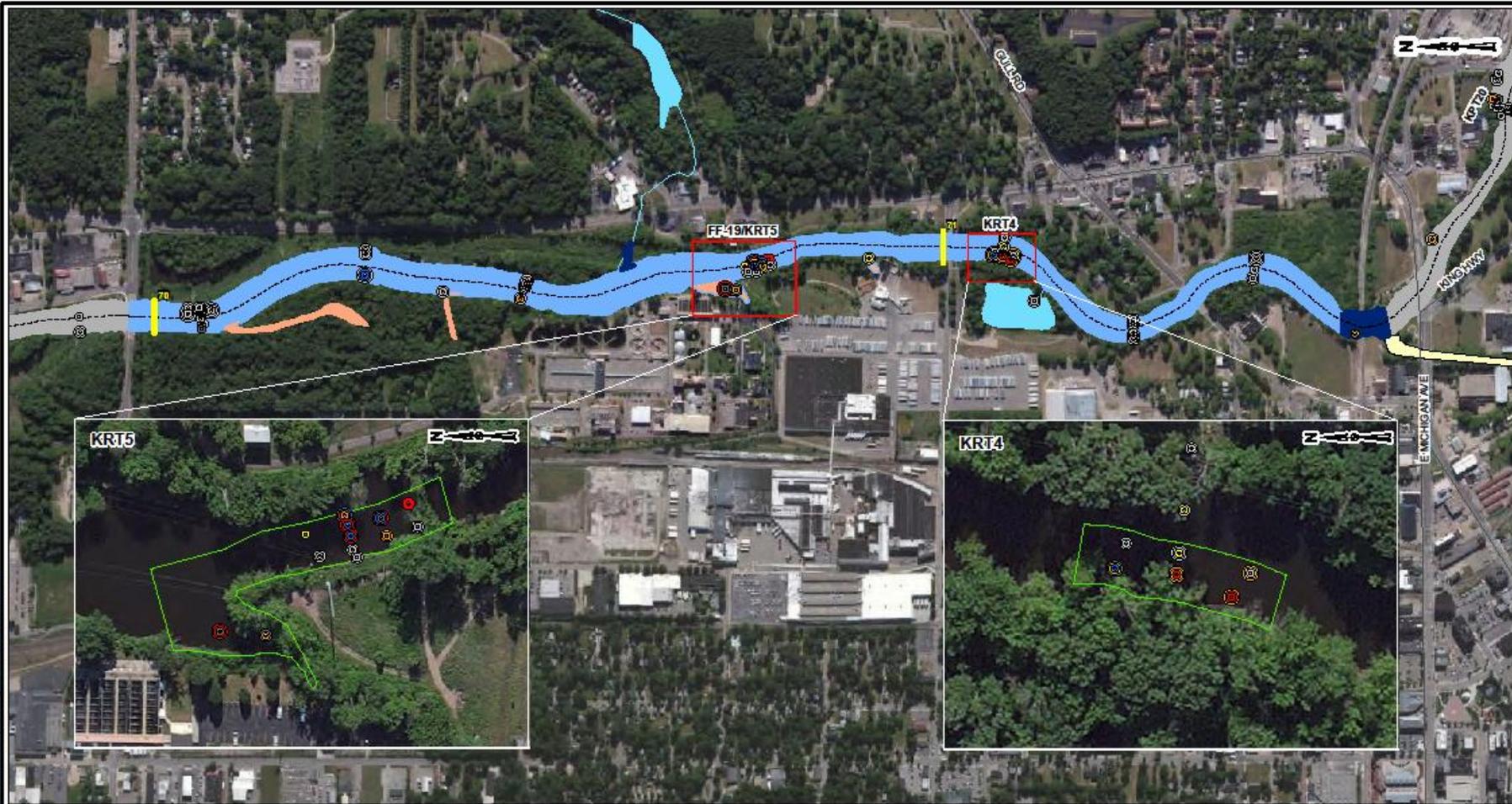
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2. ORIGINAL SOURCE OF BASE MAP: ARCADIS

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 KALAMAZOO RIVER SUPERFUND SITE
 AREA 1 FEASIBILITY STUDY REPORT -
 MORROW DAM TO FORMER PLAINWELL DAM

AREA 1 - SECTIONS AND ABSAs

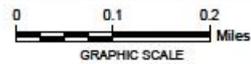
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LEGEND:

PROPOSED REMEDIATION AREA	RIVER MILE MARKER	MAXIMUM CONC. IN INTERVAL (MG/KG PCB)	DEPTH INTERVALS
SECTION 3	RIVER CENTERLINE	<1	0-6 Inches
CONFLUENCE	ROAD	1-2	6-12 Inches
BACKWATER		2-5	12-24 Inches
WATER BODIES		5-10	>24 Inches
PORTAGE CREEK TCRA AREA		10-50	
		>50	

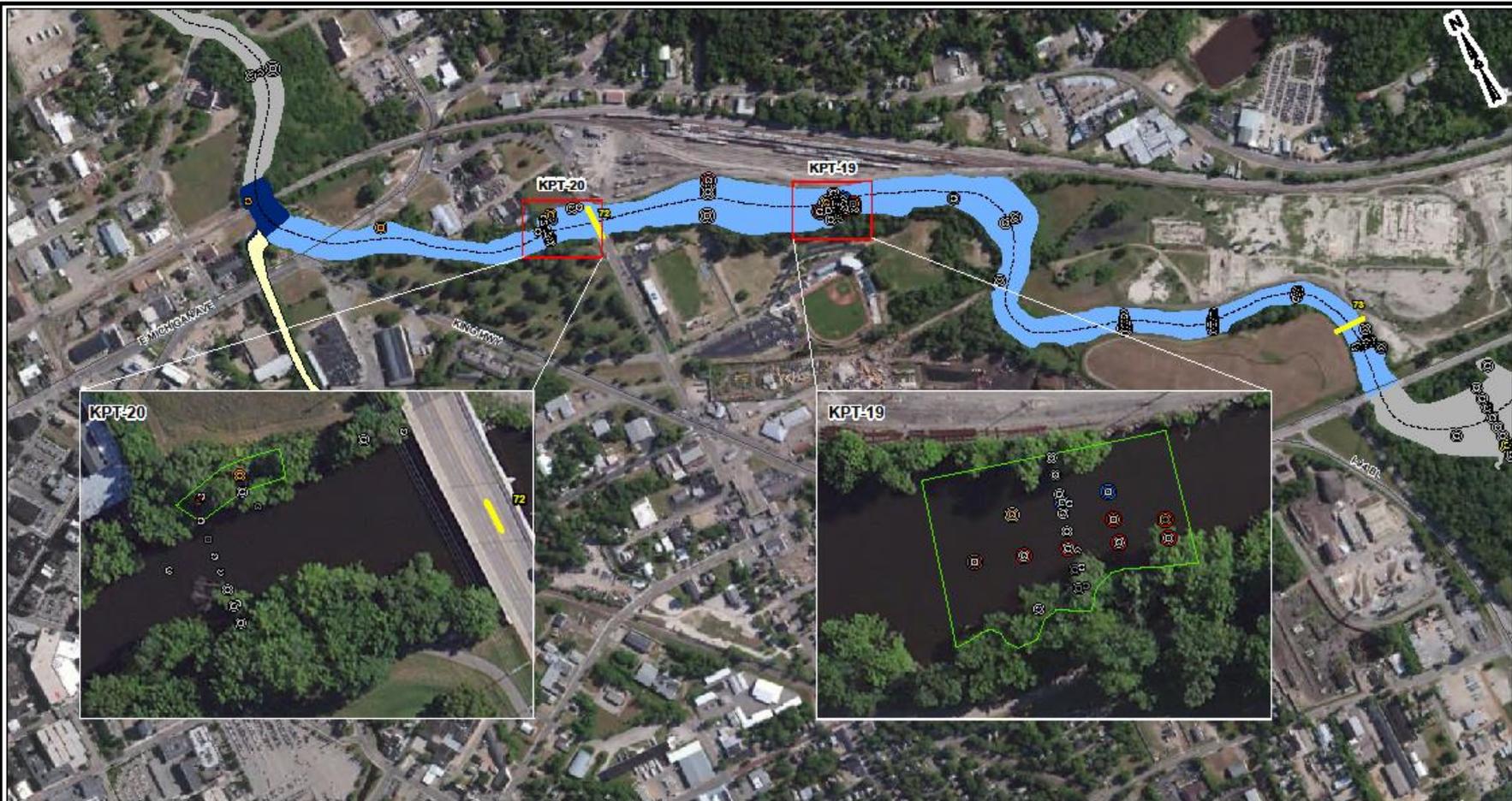


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GEORGIA-PACIFIC LLC ALLIED PAPER, INC./PORTAGE CREEK/ KALAMAZOO RIVER SUPERFUND SITE AREA 1 FEASIBILITY STUDY REPORT - MORROW DAM TO FORMER PLAINWELL DAM	
AREA 1 - SECTION 3 HOT SPOT AREAS	
Prepared by Date: JMP 02/17/14	
Checked by Date: MTP 02/17/14	
Project Number: 22613-1041	
FIGURE 3-2	

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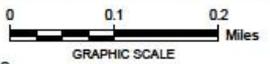


LEGEND:

- PROPOSED REMEDIATION AREA
- SECTION 2
- CONFLUENCE
- BACKWATER
- WATER BODIES
- PORTAGE CREEK TCRA AREA
- RIVER MILE MARKER
- RIVER CENTERLINE
- ROAD

MAXIMUM CONC. IN INTERVAL (MG/KG PCB)
 <1
 1-2
 2-5
 5-10
 10-50
 >50

- DEPTH INTERVALS
- 0-6 Inches
 - 6-12 Inches
 - 12-24 Inches
 - >24 Inches



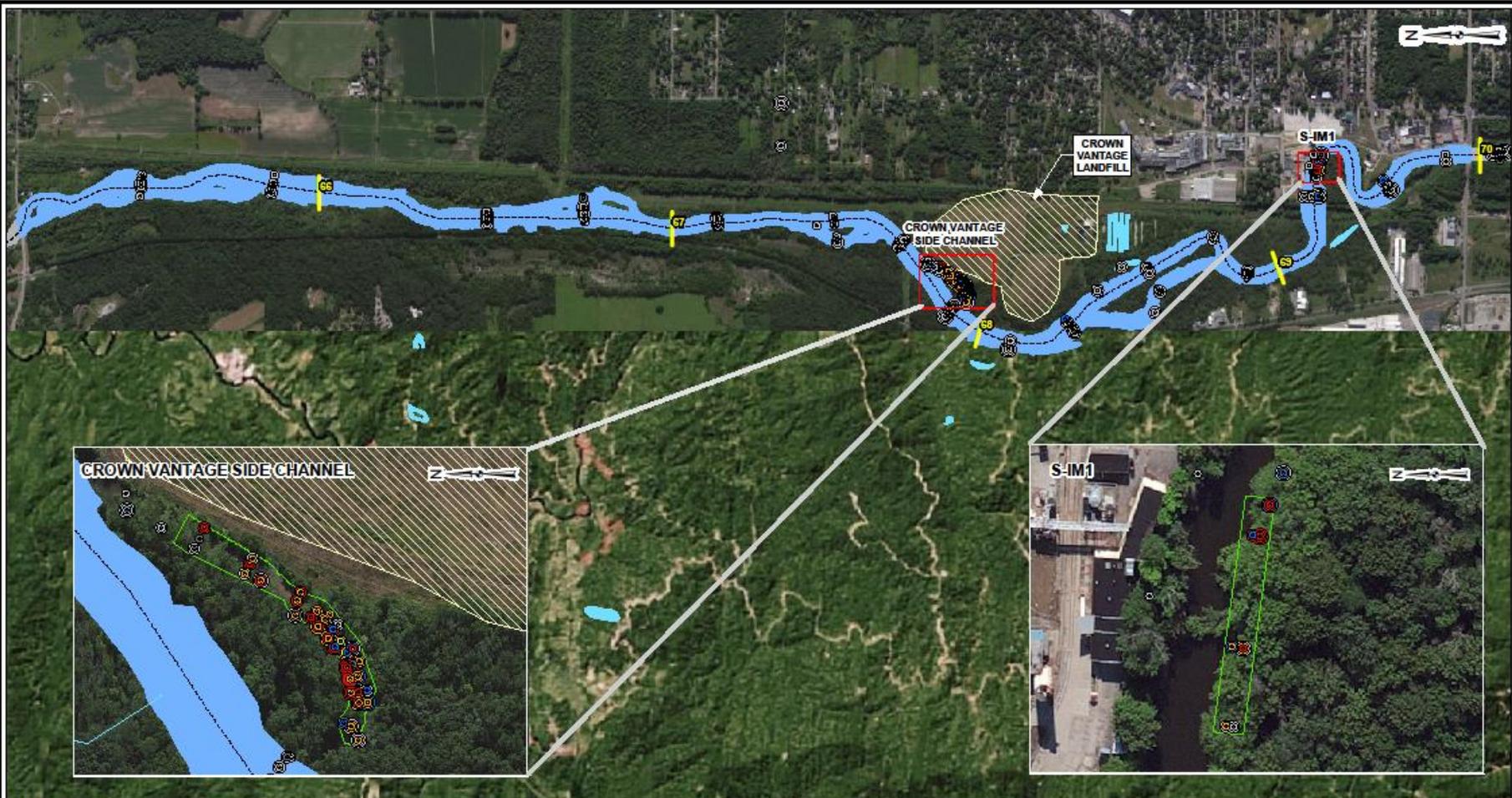
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 AREA 1 FEASIBILITY STUDY REPORT -
 MORROW DAM TO FORMER PLAINWELL DAM
AREA 1 - SECTION 2
HOT SPOT AREAS

Prepared by/Date: JMR/04/2016	
Checked by/Date: MJP/04/2016	
Project Number: 300010001	

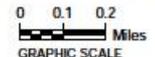
FIGURE 3-1

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LEGEND:

PROPOSED REMEDIATION AREA	RIVER MILE MARKER	MAXIMUM CONC. IN INTERVAL (MG/KG PCB)	DEPTH INTERVALS
SECTION 4	RIVER CENTERLINE	<1	0-6 Inches
CONFLUENCE	ROAD	1-2	6-12 Inches
BACKWATER		2-5	12-24 Inches
WATER BODIES		5-10	>24 Inches
PORTAGE CREEK TCRA AREA		10-50	
		>50	



- NOTES:**
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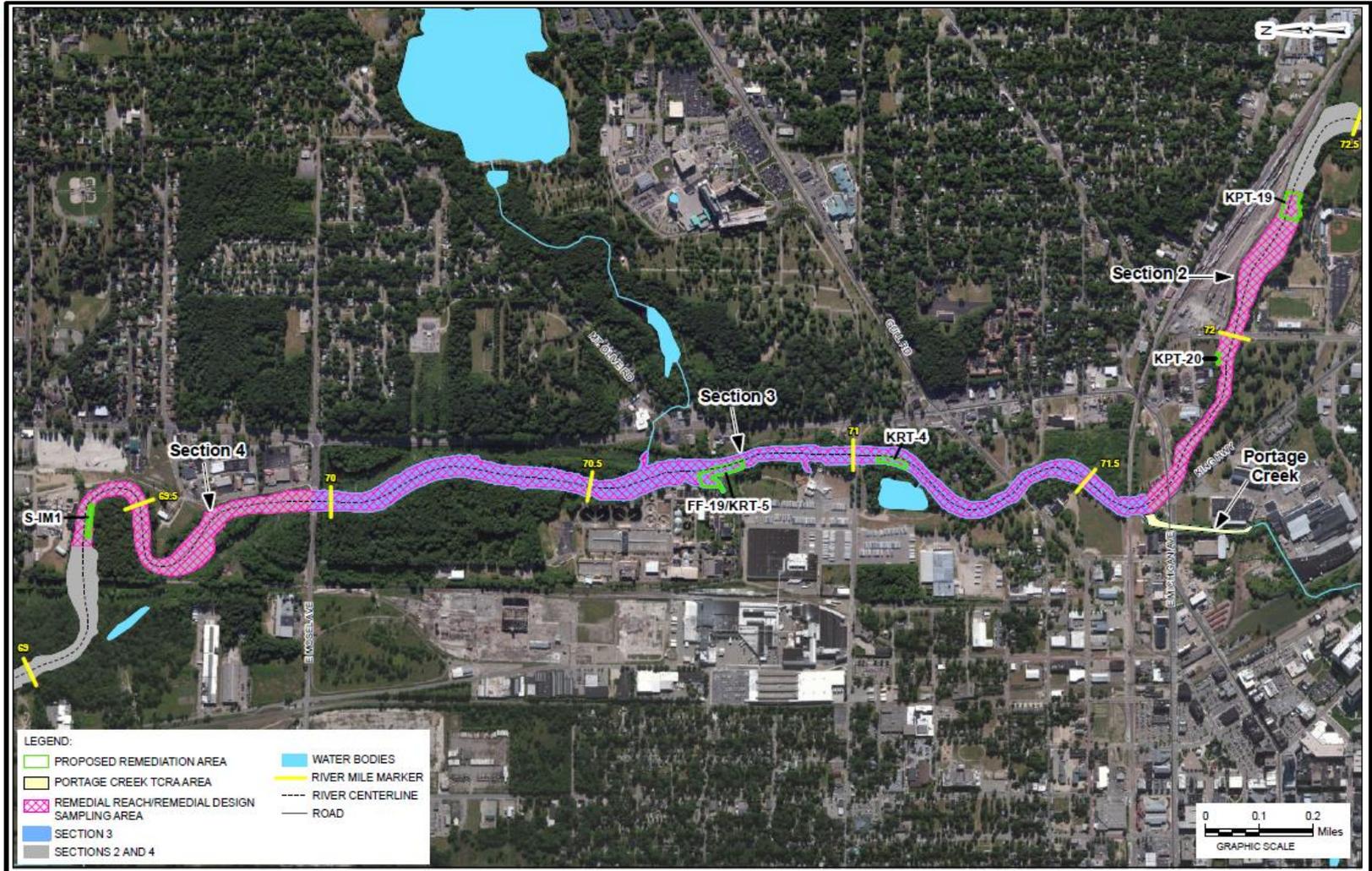
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**AREA 1 FEASIBILITY STUDY REPORT -
 MORROW DAM TO FORMER PLAINWELL DAM**
**AREA 1 - SECTION 4
 HOT SPOT AREA AND
 CROWN VANTAGE SIDE CHANNEL**

Prepared by Date: AMF 02/17/14 Checked by Date: MFP 03/17/14 Project Number: 328131541	
FIGURE 3-3	

Remedial Reach



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Remedial Alternatives



SEDIMENT ALTERNATIVES	FLOODPLAIN SOIL ALTERNATIVES
<ul style="list-style-type: none"> • S-1: No Further Action • S-2: Monitored Natural Recovery, Institutional Controls, and Engineering Controls • S-3A: Removal of Hot Spot Areas and Crown Vantage Side Channel, MNR, ICs, and ECs (EPA'S RECOMMENDED SEDIMENT ALTERNATIVE) • S-3B: Removal of Hot Spot Areas, In-Situ Capping for Crown Vantage Side Channel, MNR, ICs, and ECs • S-4A: Removal of Hot Spot Areas, Crown Vantage Side Channel, and Section 3 River Channel Edges, MNR, ICs, and ECs • S-4B: Removal of Hot Spot Areas and Section 3 Channel Edges, In-situ Capping for Crown Vantage Side Channel, MNR, ICs, and ECs • S-5: Area 1-Wide Removal (RAL 1), MNR, ICs, and ECs 	<ul style="list-style-type: none"> • FPS-1: No Further Action • FPS-2: Monitored Natural Recovery, Institutional Controls, and Engineering Controls • FPS-3: Capping (RAL 20), ICs, and ECs • FPS-4A: Removal (RAL 20), ICs, and ECs (EPA'S RECOMMENDED FLOODPLAIN SOIL ALTERNATIVE) • FPS-4B: Removal (RAL 0.5), ICs, and ECs

Superfund Evaluation Criteria



Threshold Criteria

- **Protection of human health and the environment**
- **Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)**

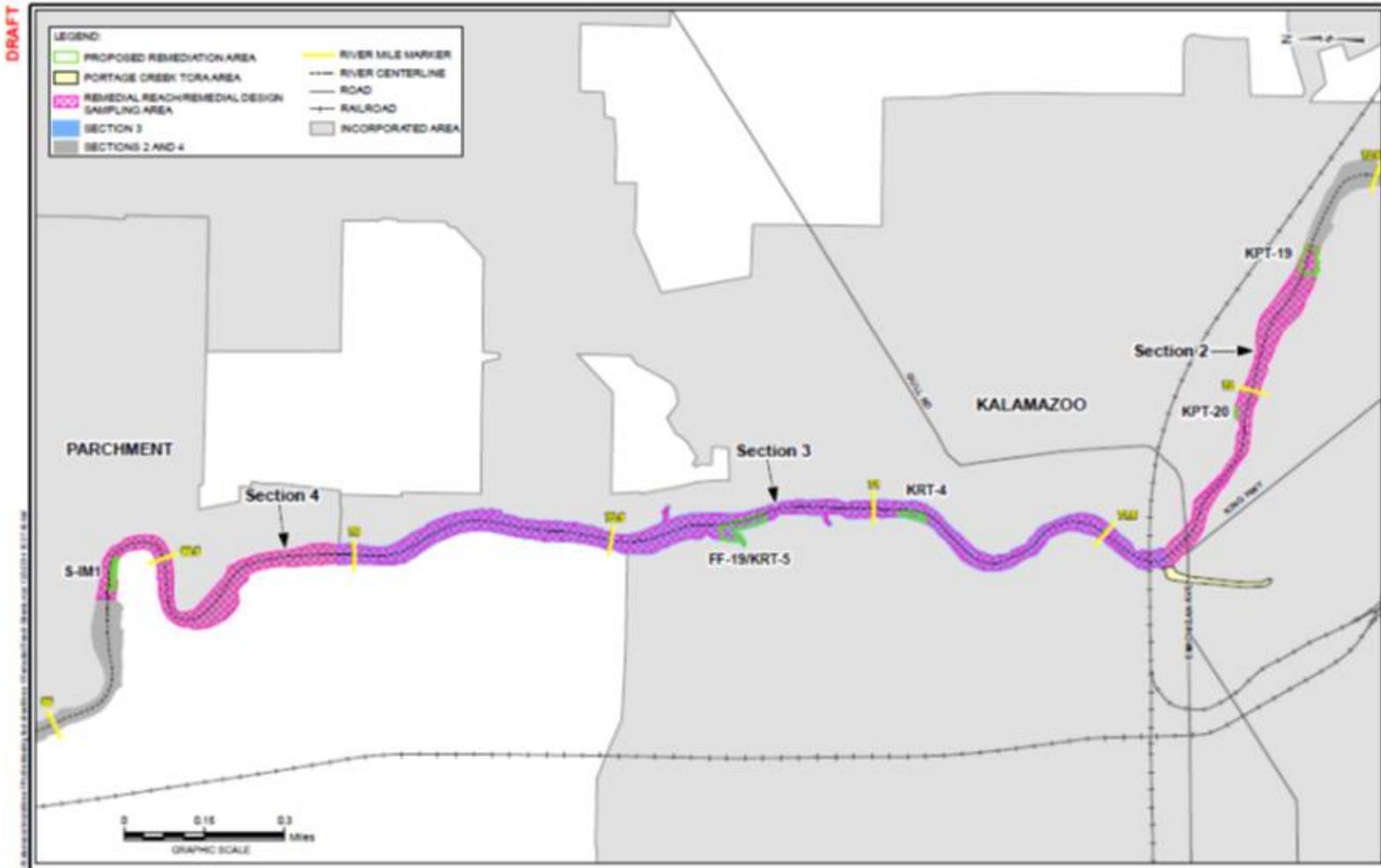
Balancing Criteria

- **Implementability**
- **Long-term effectiveness and permanence**
- **Short-term effectiveness**
- **Preference for treatment**
- **Cost effectiveness**

Modifying Criteria

- **State acceptance**
- **Community acceptance**

Sediment Alternatives



Sediment Alternatives



Sediment Alternative	Description	Time to implement cleanup	Time to reach cleanup in fish	Long-term monitoring required?	Cost
S-1: No Further Action	Required baseline to compare with other alternatives.	NA	87 years	No	\$0
S-2: Monitored Natural Recovery (MNR), Institutional Controls (ICs) and Engineering Controls (ECs)	No physical cleanup; relies on natural processes, site restrictions and physical barriers to the site.	Long-term monitoring and review of remedy every 5 years	87 years	Yes	\$2.7 million
S-3A: Removal of Hot Spot Areas and Crown Vantage Side Channel, MNR, ICs and ECs (EPA's preferred alternative)	Remove 19,500 cubic yards of sediment from five highly contaminated areas in Sections 2, 3 and 4 and the Crown Vantage side channel. Additional sampling in Sections 2, 3 and 4 to identify additional hot spots.	2 years	32 years	Yes	\$13.1 million - \$16.6 million
S-3B: Removal of Hot Spot Areas, Capping for Crown Vantage Side Channel, MNR, ICs and ECs	All actions in S-3A except replacing removal of Crown Vantage side channel with capping. Volume of sediment removed is reduced to 15,600 cubic yards.	2 years	32 years	Yes	\$12.2 million - \$15.7 million
S-4A: Removal of Hot Spot Areas, Crown Vantage Side Channel and Section 3 River Channel Edges, MNR, ICs and ECs	All actions in S-3A, plus excavation of sediment along the edges of Section 3 that exceed cleanup goals. The total volume of sediment removed is estimated at 63,900 cubic yards.	4 years	25 years	Yes	\$33.7 million - \$37.2 million
S-4B: Removal of Hot Spot Areas and Section 3 Channel Edges, Capping for Crown Vantage Side Channel, MNR, ICs and ECs	All actions in S-4A except replacing removal of Crown Vantage Side Channel with capping. Volume of sediment removed would be reduced to 59,900 cubic yards.	4 years	25 years	Yes	\$32.3 million - \$35.8 million
S-5: Area 1-Wide Removal, MNR, ICs and ECs	Total excavation of all highly contaminated sediment throughout the river in Area 1. Removal of 300,000- 490,000 cubic yards of sediment.	10 years	45 years	Yes	\$202 million - \$337 million

Sediment Alternatives



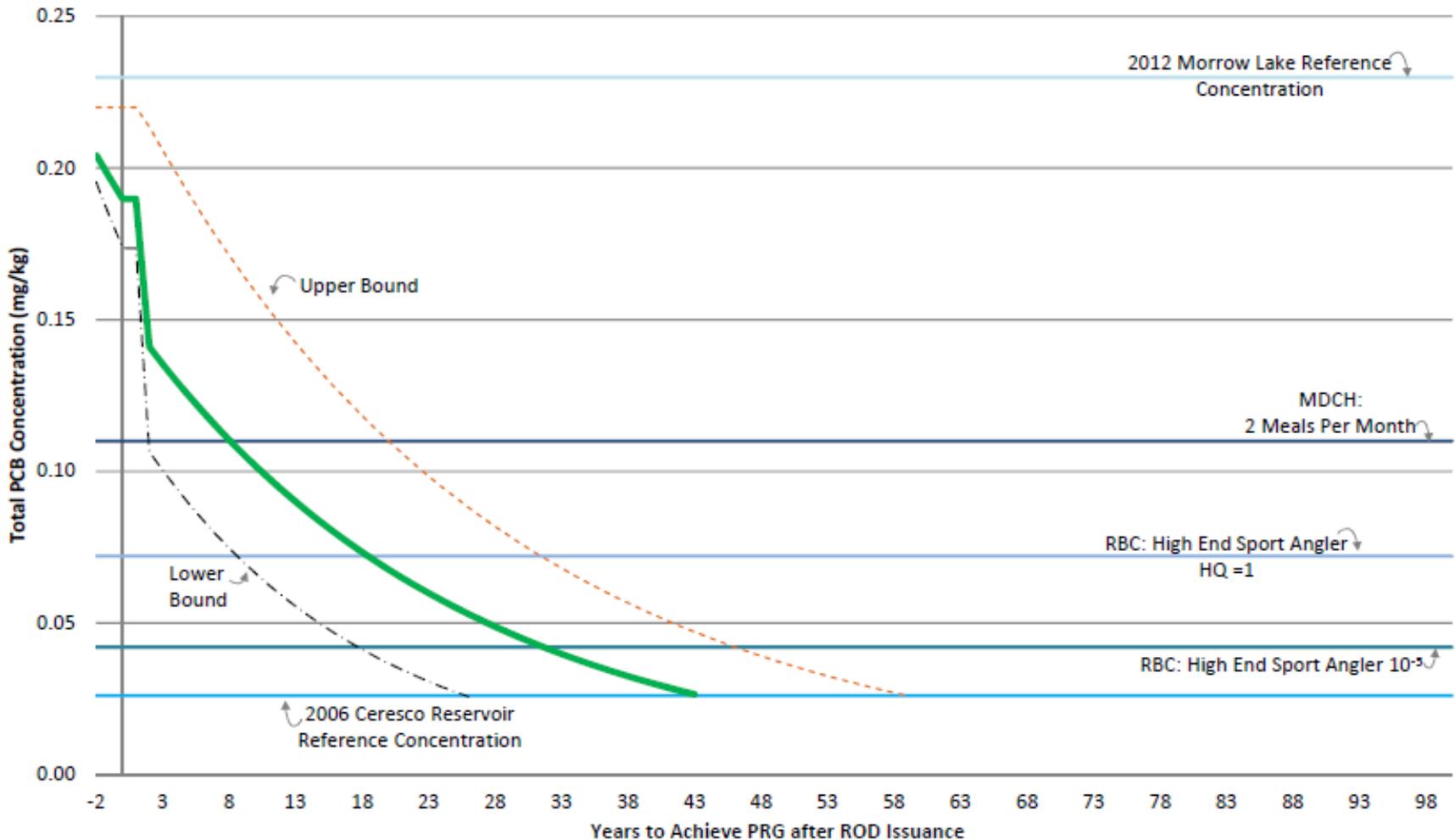
Alternative	Capping Area (acres) / Removal Volume (cy)	Years to Reach PRGs for Smallmouth Bass	Overall Protection of Human Health and the Environment	Compliance with ARARs	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume Through Treatment	Implementability	Total Cost
S-1	None	87	Undocumented	Undocumented	Not Effective	Effective	No treatment, No reduction	Nothing to implement	\$0
S-2	None	87	Protective, lengthy timeframe	Complies	Not Effective	Effective	No treatment, No reduction	Readily implementable	\$2,700,000
S-3A	0 / 19,500	32	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment, Reduced volume	Readily implementable	\$13,100,000 to \$16,600,000
S-3B	1.2 / 15,600	32	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment, Reduced mobility and volume	Readily implementable	\$12,200,000 to \$15,700,000
S-4A	0 / 63,900	25	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment, Reduced volume	Readily implementable	\$33,700,000 to \$37,200,000
S-4B	1.2 / 59,900	25	Protective, reasonable timeframe	Complies	Effective	Effective	No treatment, Reduced mobility and volume	Readily implementable	\$32,300,000 to \$35,800,000
S-5	0 / 300,000 to 490,000	45	Protective, longer timeframe, extensive habitat destruction	Compliance delayed	Not Effective	Effective	No treatment, Reduced volume	Requires extensive effort	\$202,000,000 to \$337,000,000

EPA's Preferred Sediment Alternative S-3A



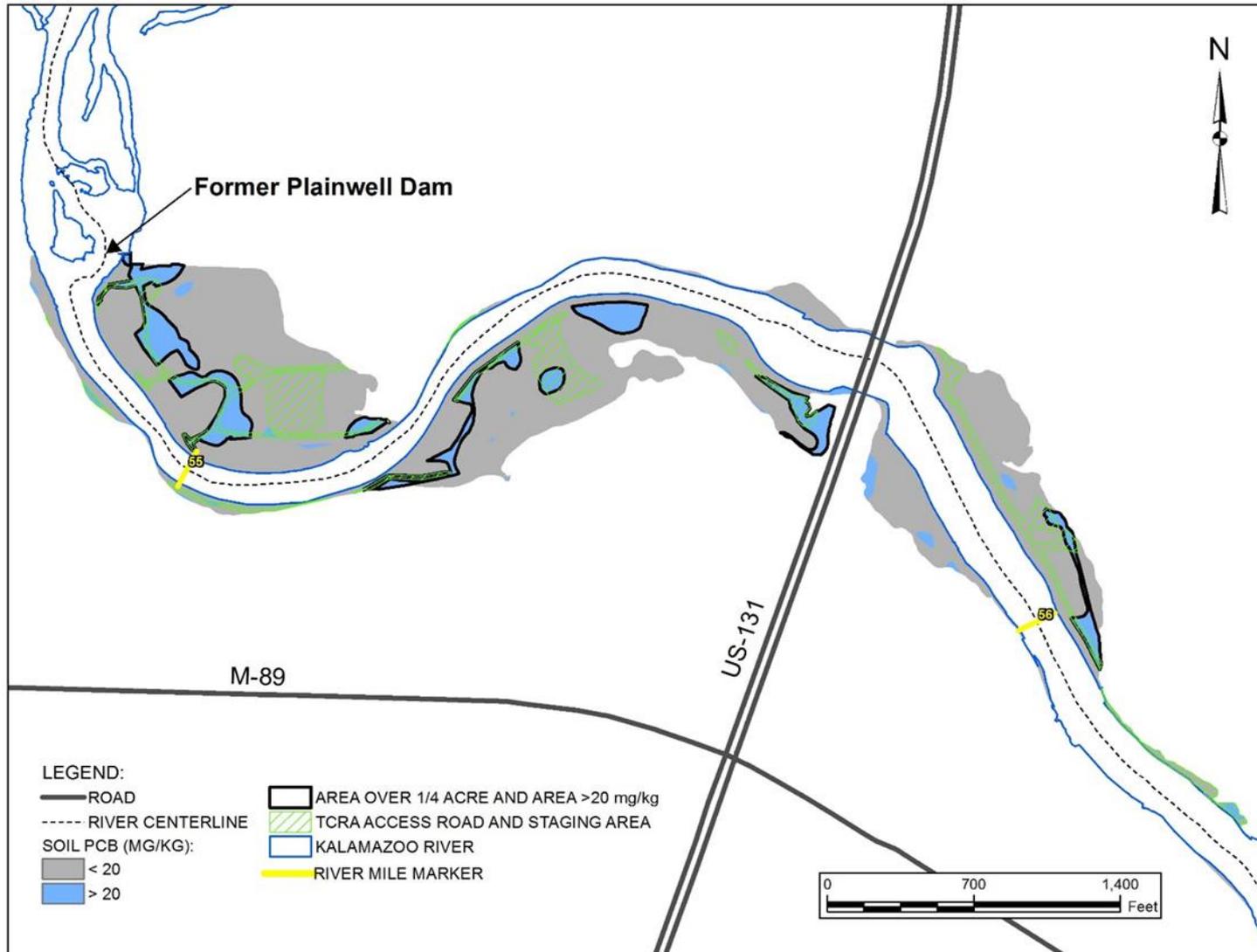
- Removal of PCB-contaminated sediment in at least five hot spot areas within the Remedial Reach and the Crown Vantage side channel, with Monitored Natural Recovery, Institutional Controls (ICs) and Engineering Controls (ECs) throughout Area 1.
- Additional sampling throughout the Remedial Reach would be performed during Remedial Design to further delineate the removal boundaries around the known hot spots and to identify others.
- The estimated total volume to be removed is approximately 19,500 cy.
- The Surface Weighted Average Concentration for the Remedial Reach would be reduced from 1.76 mg/kg to 1.09 mg/kg following remediation (2 years).
- Long-Term Monitoring (LTM) would be implemented until cleanup goals are achieved (approximately 32 years).
- The estimated cost is \$13,100,000 to \$16,600,000 (depending on the number of hot spot areas to be remediated).

Time Projection for Fish to Reach Cleanup Goals: S-3A



PRGs 26 Preliminary Remedial Goals (or cleanup goals)

Floodplain Soil Alternatives



Floodplain Soil Alternatives



Floodplain Alternative	Description	Time to reach cleanup	Long-term monitoring required?	Cost
FPS-1: No Further Action	Required baseline to compare with other alternatives.	NA	No	\$0
FPS-2: MNR, ICs, ECs	No physical cleanup; relies on natural processes, site restrictions and physical barriers to the site.	NA	Yes	\$1.3 million
FPS-3: Capping, ICs, and ECs	Placing a 12-inch cap over 7 acres of floodplain soil in the former Plainwell Impoundment with high PCB concentrations; also relies on ICs and ECs.	1 year	Yes	\$3.8 million
FPS-4A: Removal, ICs, and ECs (EPA's preferred alternative)	Excavation of 11,300 cubic yards of floodplain soil with high levels of PCBs; also relies on ICs and ECs.	1 year	Yes	\$6.8 million
FPS-4B: Removal, ICs, and ECs	Total excavation in all of Area 1; remove 1.4 million cubic yards of floodplain soil with high PCB levels.	10 years	No	\$486 million

Floodplain Soil Alternatives



Alternative	Capping or Excavation Footprint	Remediation Time	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
FPS-1	None	Lengthy	Undocumented	Unable to predict	Not Effective	Unknown, indeterminable	No treatment, No reduction	Nothing to implement	\$0
FPS-2	None	Lengthy	Protective, lengthy timeframe	Unable to predict	Not Effective	Unknown, determinable	No treatment, No reduction	Readily Implementable	\$1,300,000
FPS-3	7 Acres	1 year	Protective	Complies	Effective	Effective	No treatment, Reduced mobility	Readily Implementable	\$3,800,000
FPS-4A	7 Acres	1 year	Protective	Complies	Effective	Effective	No treatment, Reduced mobility & volume	Readily Implementable	\$6,800,000
FPS-4B	850 Acres	10 years	Protective	Complies	Effective	Effective	No treatment, Reduced volume	Difficult with access limitations and extensive habitat destruction	\$486,000,000

EPA's Preferred Floodplain Soil Alternative FPS-4A



- Excavation of 11,300 cy (7 acres) of floodplain soil in the former Plainwell Impoundment with PCB concentrations greater than 20 mg/kg in contiguous areas of one-quarter acre or larger.
- Excavation would be completed to a target standard depth of 12 inches.
- A geotextile fabric would be placed over the excavation area.
- Backfilling would include 6 inches of clean fill and a minimum 6-inch topsoil cover to support revegetation and restoration of ecological habitat.
- Includes ICs, ECs, and LTM to ensure land use does not change and floodplain material does not erode into the river.
- This alternative would result in 98% to 100% of home ranges for ecological receptors meeting the floodplain soil cleanup level of 11 mg/kg following construction (1 year).
- The estimated cost is \$6,800,000.
- Additional sampling in natural floodplain areas within Area 1 (outside of impoundments) to confirm they meet residential cleanup level of 2.5 mg/kg.

Next Steps



- **Questions/Informal Comments**
- **Formal public hearing for comments to be incorporated into the**
- **EPA evaluates comments and finalizes remedy in a Record of Decision (Fall 2015)**



Questions?

Jim Saric

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312.886.0992