



Allied Paper, Inc./Portage Creek/Kalamazoo River

Area 2

Proposed Plan Meeting

July 25, 2017



Objectives



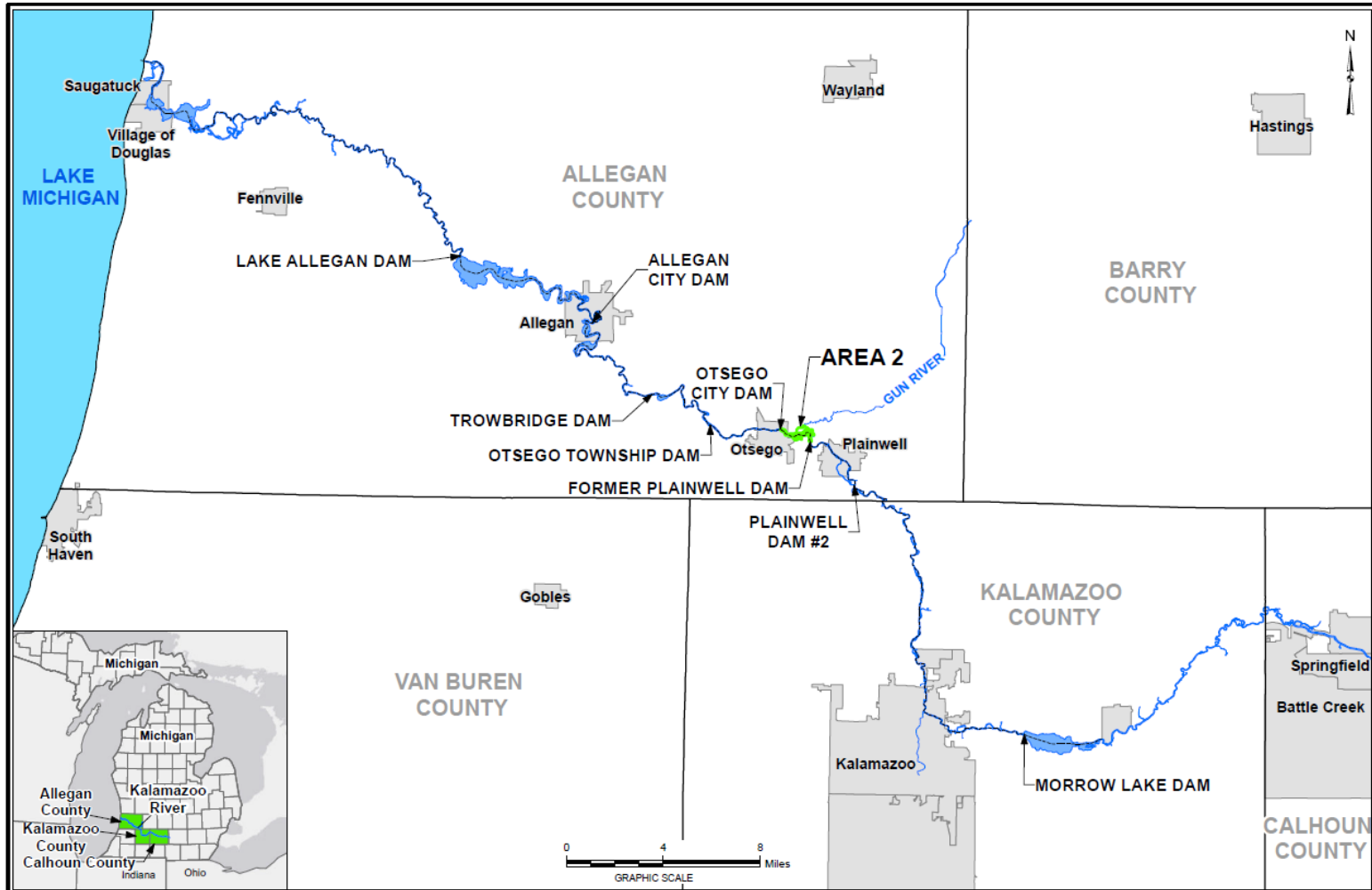
- **Provide information on EPA's proposed remedy for Area 2 of Operable Unit 5**
- **Informal comments**
- **Formal public hearing for comments to be included in the record**

Remedial Process



- **EPA receives comments during 60-day period**
- **EPA responds to comments in the Responsiveness Summary**
- **EPA finalizes remedy in Record of Decision (fall 2017)**

Allied Paper/Kalamazoo River Site

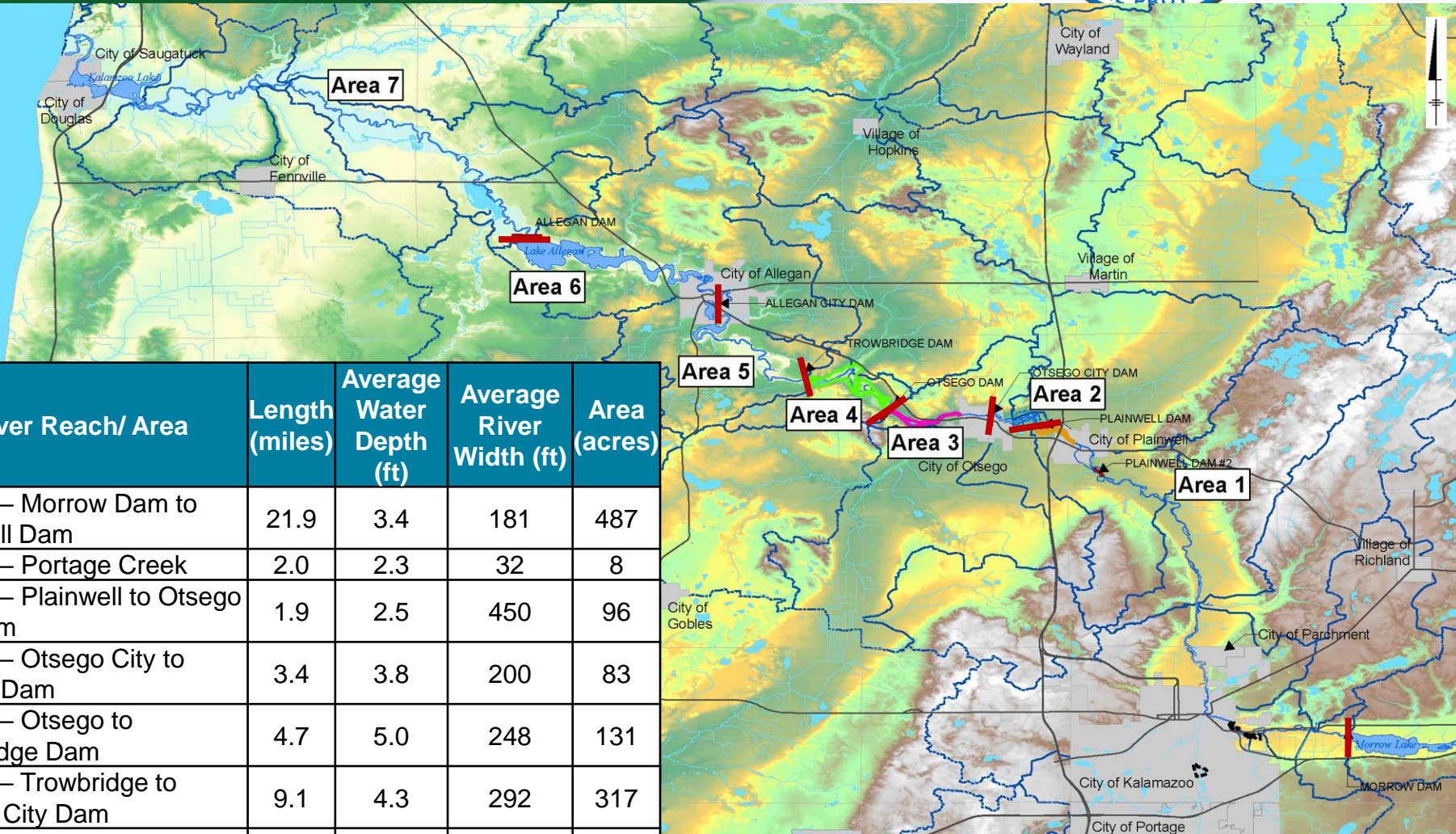


Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site



- **Operable Unit 1: Allied Paper Landfill**
- **Operable Unit 2: Willow Boulevard and A-Site Landfill**
- **Operable Unit 3: King Highway Landfill**
- **Operable Unit 4: 12th Street Landfill**
- **Operable Unit 5: Portage Creek and 80 miles of Kalamazoo River**
- **Georgia Pacific/Hawthorn Mill Properties**
- **Operable Unit 7: Plainwell Mill Property**

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

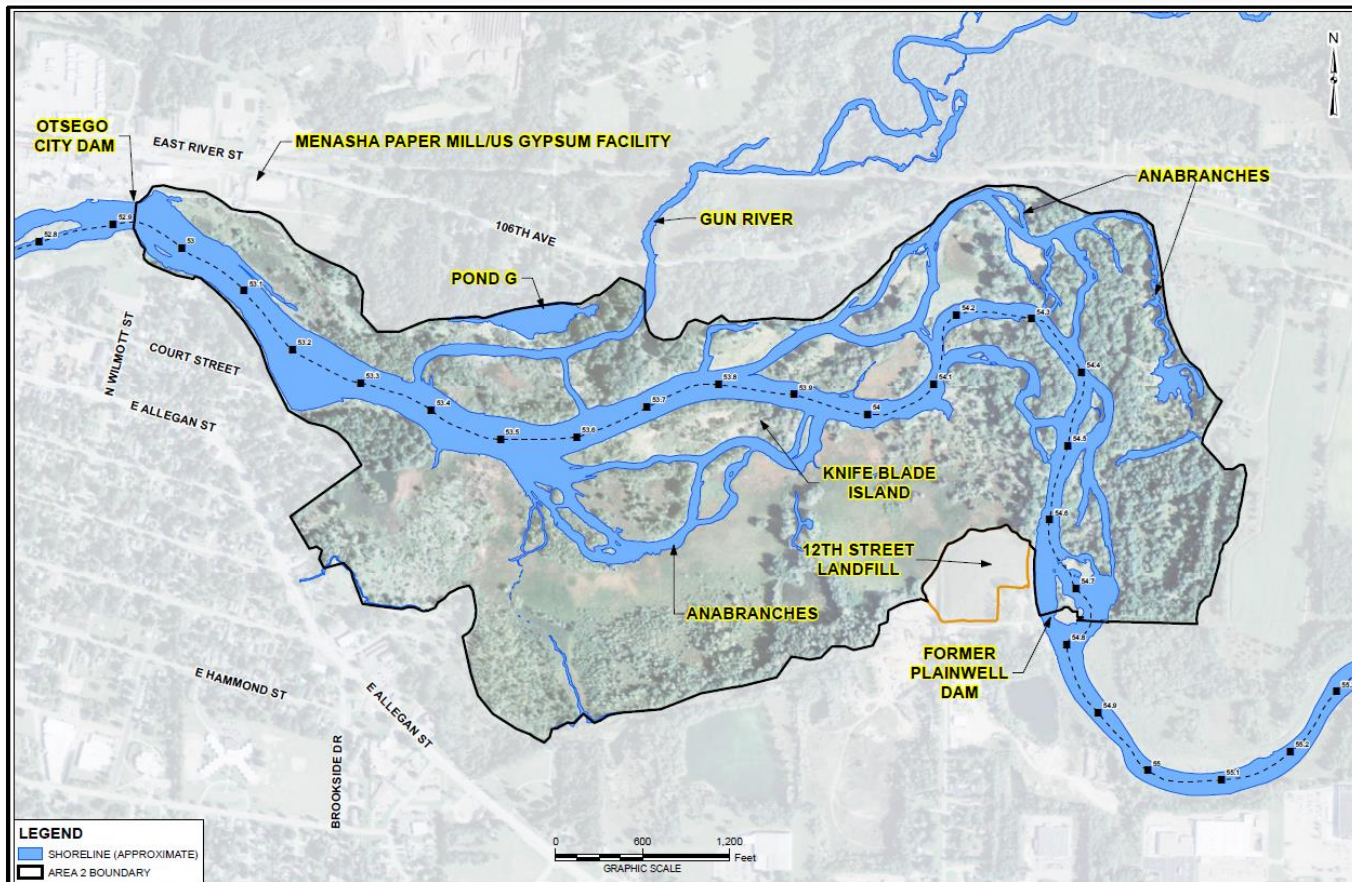


River Reach/ Area	Length (miles)	Average Water Depth (ft)	Average River Width (ft)	Area (acres)
Area 1 – Morrow Dam to Plainwell Dam	21.9	3.4	181	487
Area 1 – Portage Creek	2.0	2.3	32	8
Area 2 – Plainwell to Otsego City Dam	1.9	2.5	450	96
Area 3 – Otsego City to Otsego Dam	3.4	3.8	200	83
Area 4 – Otsego 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 2 Kalamazoo River



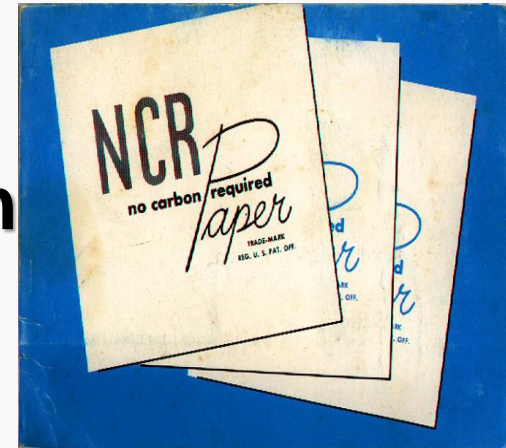
- 1.9 miles
- 2.5 feet



Conceptual Site Model



- **PCBs from recycling of carbonless copy paper 1950s-1970s**
- **Primary human health exposure pathway through fish consumption**
- **Ecological exposure pathway to exposed floodplain soils**
- **The ongoing, uncontrolled erosion of contaminated paper wastes and soils from the river banks is the most significant source of PCB loading to the Kalamazoo River.**



Pre- and Post-Dam Water Levels

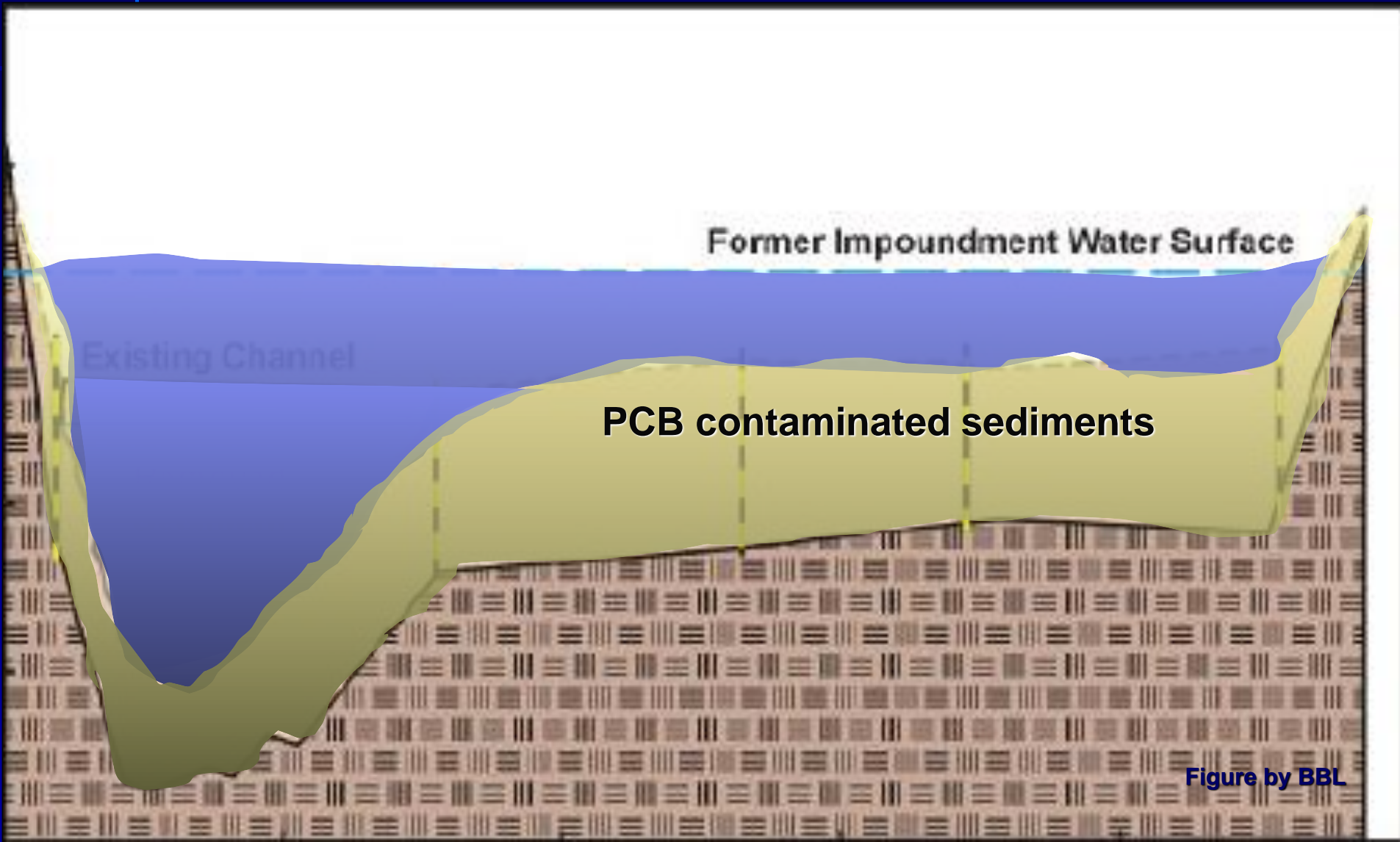


Figure by BBL

Remedial Action Objectives



- **RAO 1: Protect people who consume Area 2 Kalamazoo River fish from exposure to PCBs that exceed protective levels. The RAO is expected to be progressively achieved over time by meeting the following targets for fish tissue and sediment.**
 - **Fish Tissue Targets**
 - A reduction in fish tissue to the Michigan fish advisory level for smallmouth bass to two meals per month (0.11 mg/kg total PCBs) within 30 years.
 - Achieve 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; 125 meals/year)
 - **Sediment Target**
 - A SWAC of 0.33 mg/kg or less in Area 2 of the Kalamazoo River 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 the transport of PCBs from Area 2 to downstream areas of the Kalamazoo and Lake Michigan.**
- **RAO 5: Protect people that reside in Area 2 from exposure to PCBs that exceed protective levels.**

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 and fall within the PCB remediation footprint**
- **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)

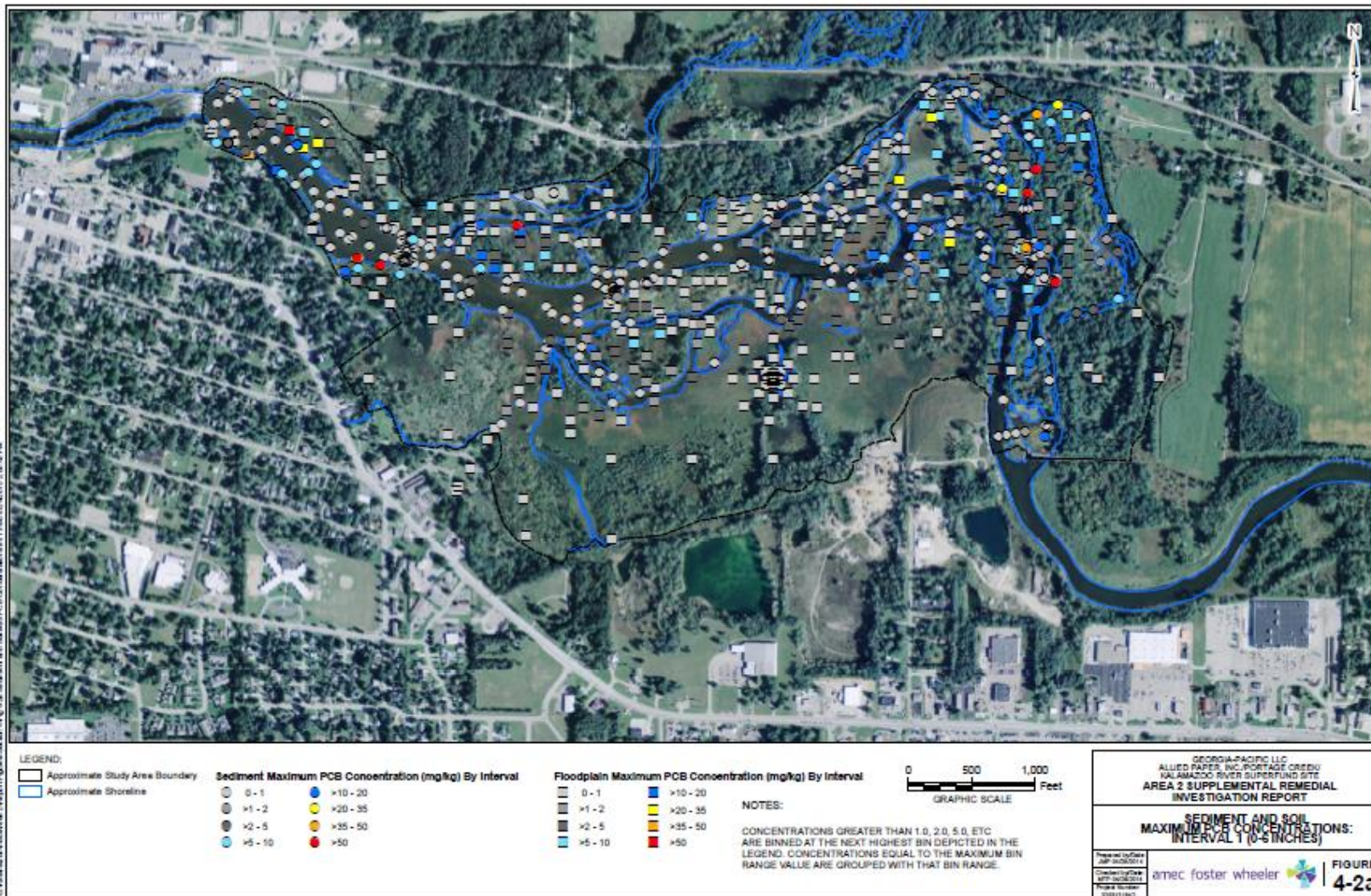
Risk Based PCB Concentrations for Fish Tissue (mg/kg)

Receptor	Fish tissue concentration protective at target Cancer Risk of 1E-05	Fish tissue concentration protective at target Hazard Index of 1 (Immunotoxicity)
Sport Angler – CTE Assumes 24 meals/year 15 g/day; bass only	0.109	0.187
Sport Angler-RME Assumes 125 meals/year 78 g/day; 50% site; bass only	0.042	0.072
Subsistence Angler Assumes 179 meals/year 110 g/day; bass only	0.015	0.025

Reference Area (Background) Fish Concentrations (Average)

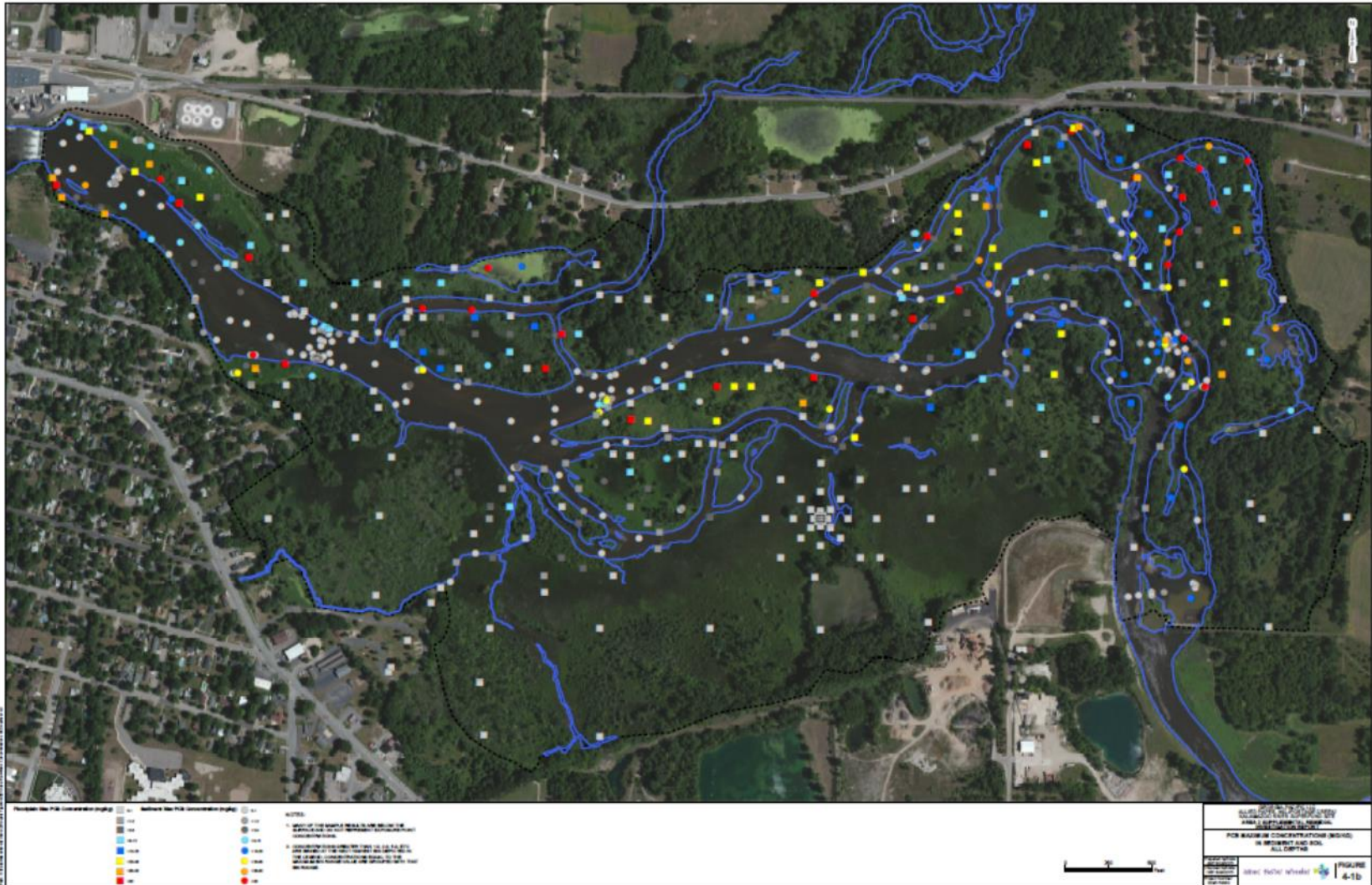
Species	Ceresco mg/kg PCB	Morrow Lake mg/kg PCB
Bass	0.03 <small>Below PRG for Sport Angler – RME, Bass Only</small>	0.14
Carp	0.24	0.50

Area 2 Surface PCB Concentrations

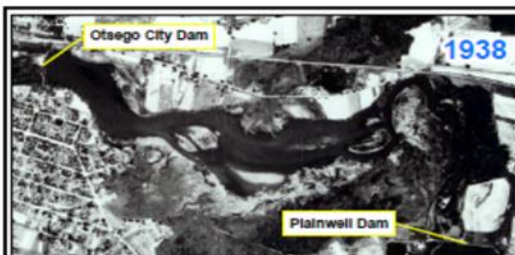


G:\Projects\2008101402\Area 2\Area 2 Surface PCB Concentrations.mxd, 03/26/2014 10:00:00 AM

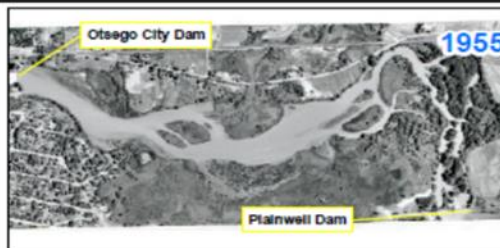
Area 2 Maximum PCB Concentrations



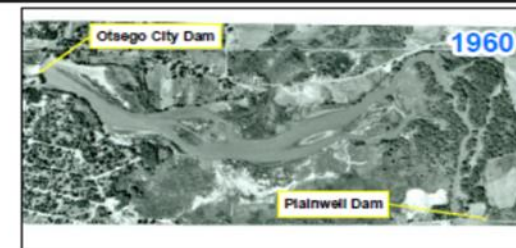
Area 2 Historical Aerial Photographs



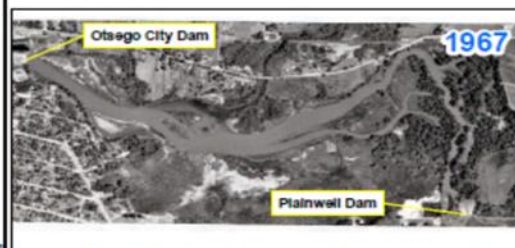
Base image from Agricultural Adjustment Administration taken July 4, 1938, obtained from Aerial Imagery Archive at Michigan State University (775 cfs)



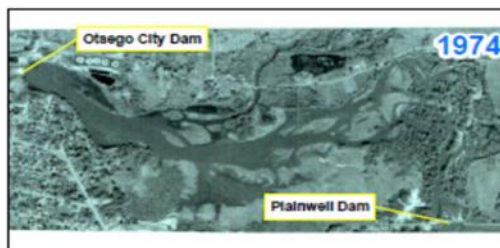
Aerial photograph taken August 11, 1955 (450 cfs)



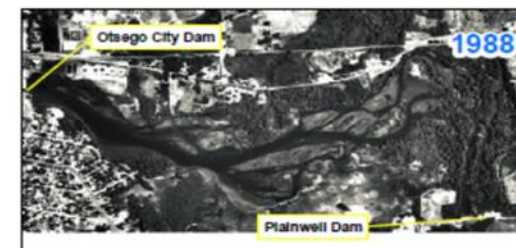
Aerial photograph taken September 5, 1960 (470 cfs)



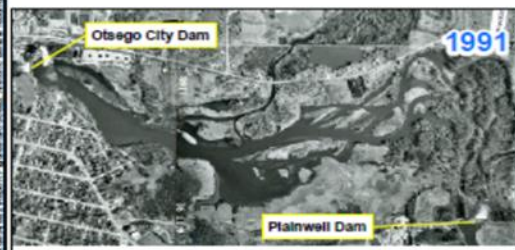
Base image from Agricultural Stabilization and Conservation Service taken September 3, 1967, obtained from Aerial Imagery Archive at Michigan State University (418 cfs)



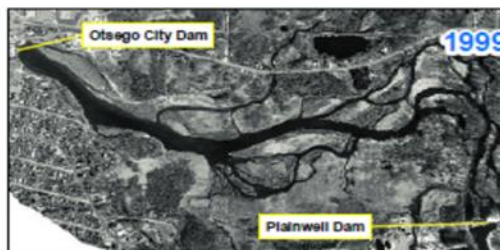
Aerial Photograph taken October 10, 1974 (616 cfs)



Base Image from Michigan Department of Natural Resources (1988), obtained from Aerial Imagery Archive at Michigan State University.



Aerial Photograph taken April 17, 1991 (1670 cfs)

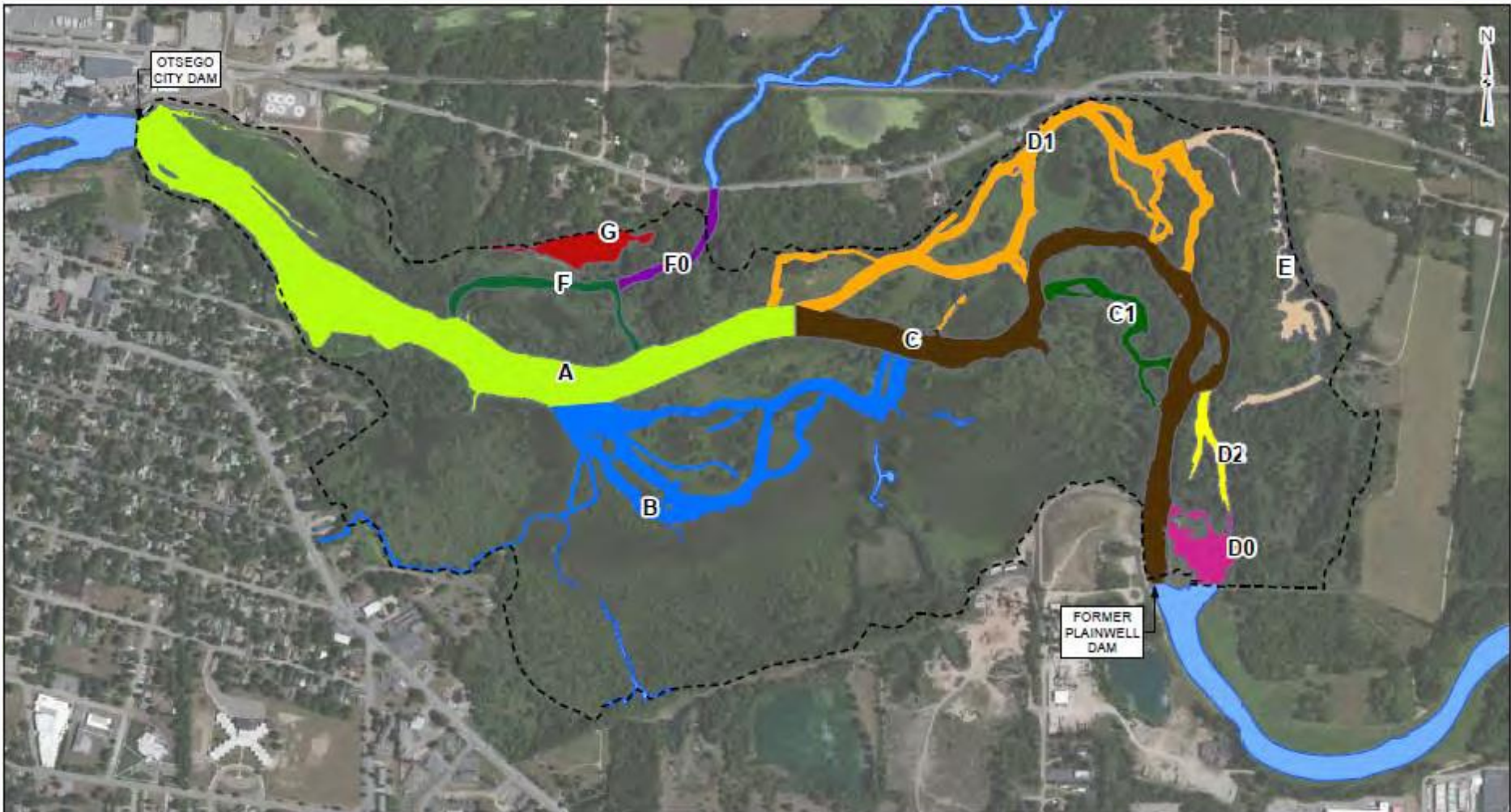


Aerial Photograph taken March 26, 1999 and April 12, 1999 (Google Earth composite) (957 cfs 3/26 and 1350 cfs 4/12)

- Notes:
1. Aerial Photograph taken from 1938, 1967, 1988, and 1999 from USGS Water-Resources Investigations Report 03-4218.
 2. Aerial photographs from 1955, 1960, 1974, and 1991 obtained from USGS
 3. Where USGS flows for the Comstock Station are available, they are posted in the caption

REGIONAL PHOTO LOG SULLY AND COMPANY AREA 2 SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT AREA 2 - HISTORICAL AERIAL PHOTOS	
Prepared by: Date: Project: Scale: Date:	amec foster wheeler FIGURE 1-3

Area 2: River Sediment Sub-areas



Area 2: River SWACs

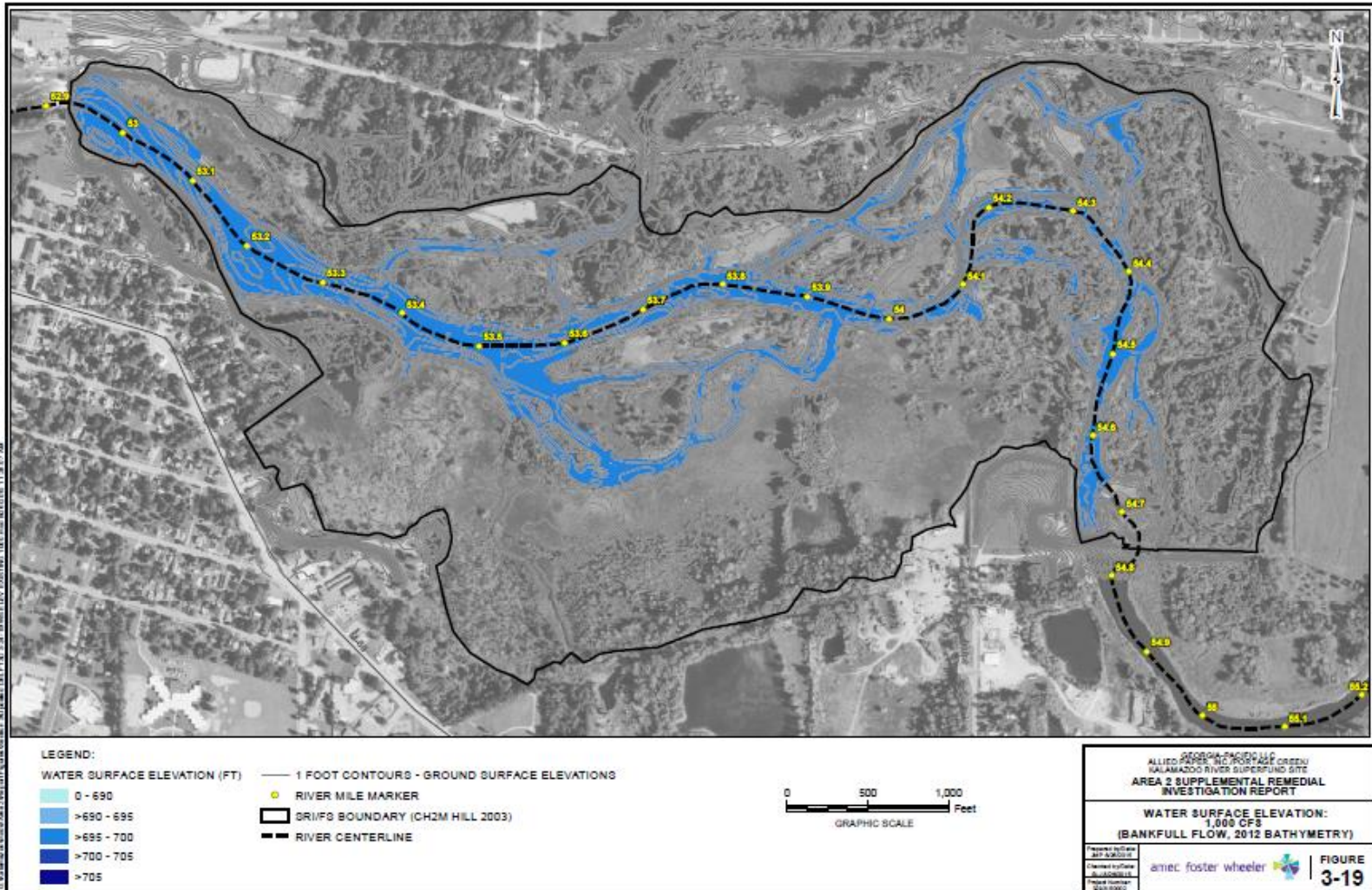


	PCB SWAC (mg/kg)		
Interval	Subarea A	Subarea C	Main Channel (Subareas A & C)
1	0.08	0.22	0.13
2	0.20	0.09	0.16
3	0.12	0.11	0.12
4	0.06	0.13	0.09
5	0.17	0.01	0.11
6	0.17	--	0.11

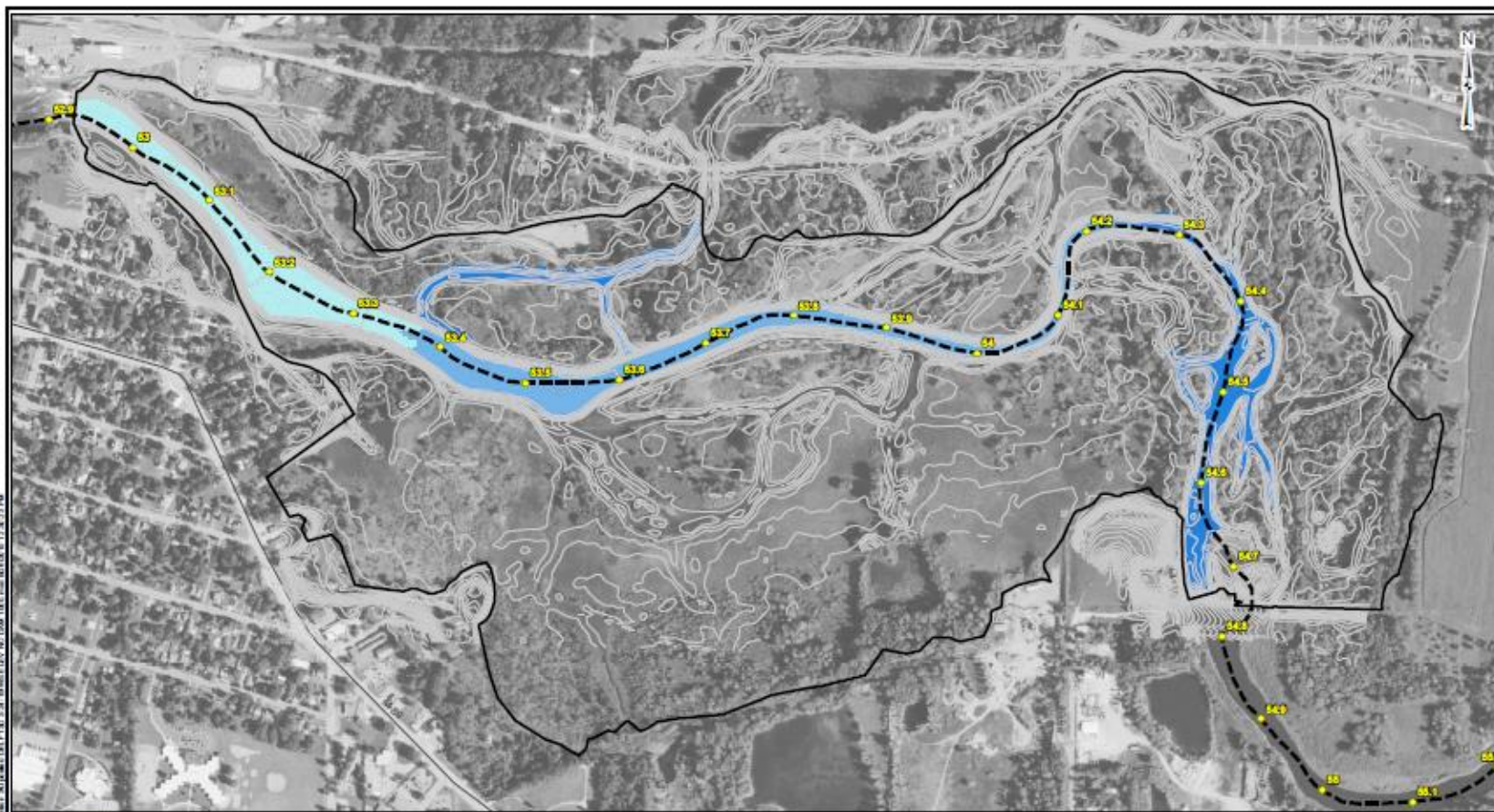


	Average PCB Concentration (mg/kg)								
Interval	Subarea								
	B	C1	D0	D1	D2	E	F	F0	G
1	0.46	0.92	2.14	3.91	5.87	7.84	12.39	0.02	1.22
2	0.28	0.05	0.55	4.64	3.34	9.75	21.94	0.02	9.05
3	0.21	0.02	0.77	6.71	3.76	17.64	4.58	0.02	16.81
4	0.18	0.02	0.09	5.33	27.80	10.07	0.95	0.02	16.23
5	0.04	0.02	0.08	0.37	--	3.48	0.07	--	0.72
6	0.02	--	--	1.43	--	0.02	0.05	--	0.05

Area 2: Dam in Bank Full Water Elevation



Area 2: Dam Out Bank Full Water Elevation



LEGEND:

WATER SURFACE ELEVATION (FT)

- 0 - 690
- > 690 - 695
- > 695 - 700
- > 700 - 705
- > 705

1 FOOT CONTOURS - LOWERED BATHYMETRY

RIVER MILE MARKER

GRIFPS BOUNDARY (CH2M HILL 2003)

RIVER CENTERLINE

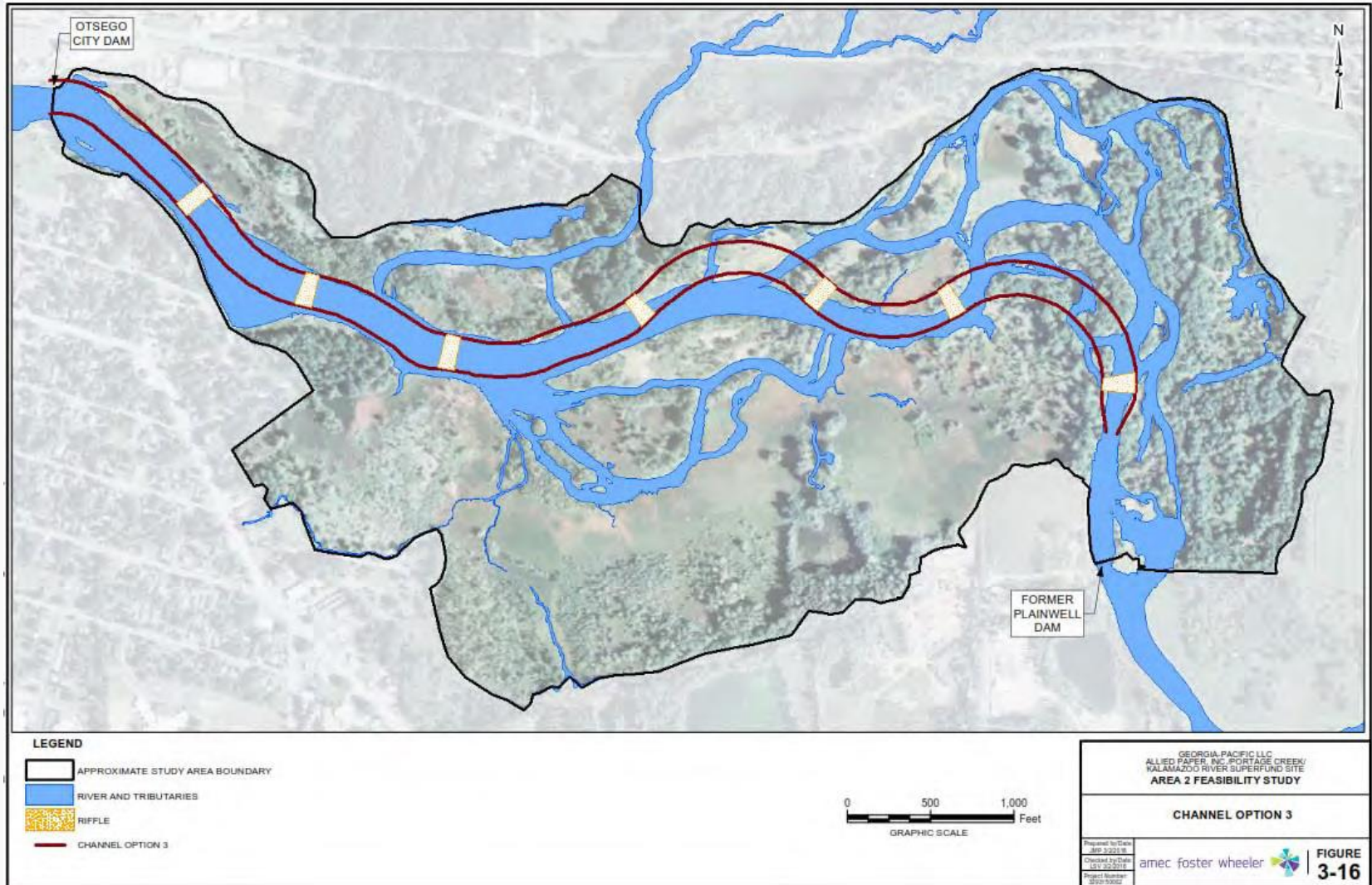
0 500 1,000
Feet
GRAPHIC SCALE

GEORGIA PACIFIC LLC
ALLIED PACIFIC, INC. (FORMERLY GEORGIA PACIFIC)
KAUWAIAZOO RIVER SUPERFUND SITE
AREA 2 SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

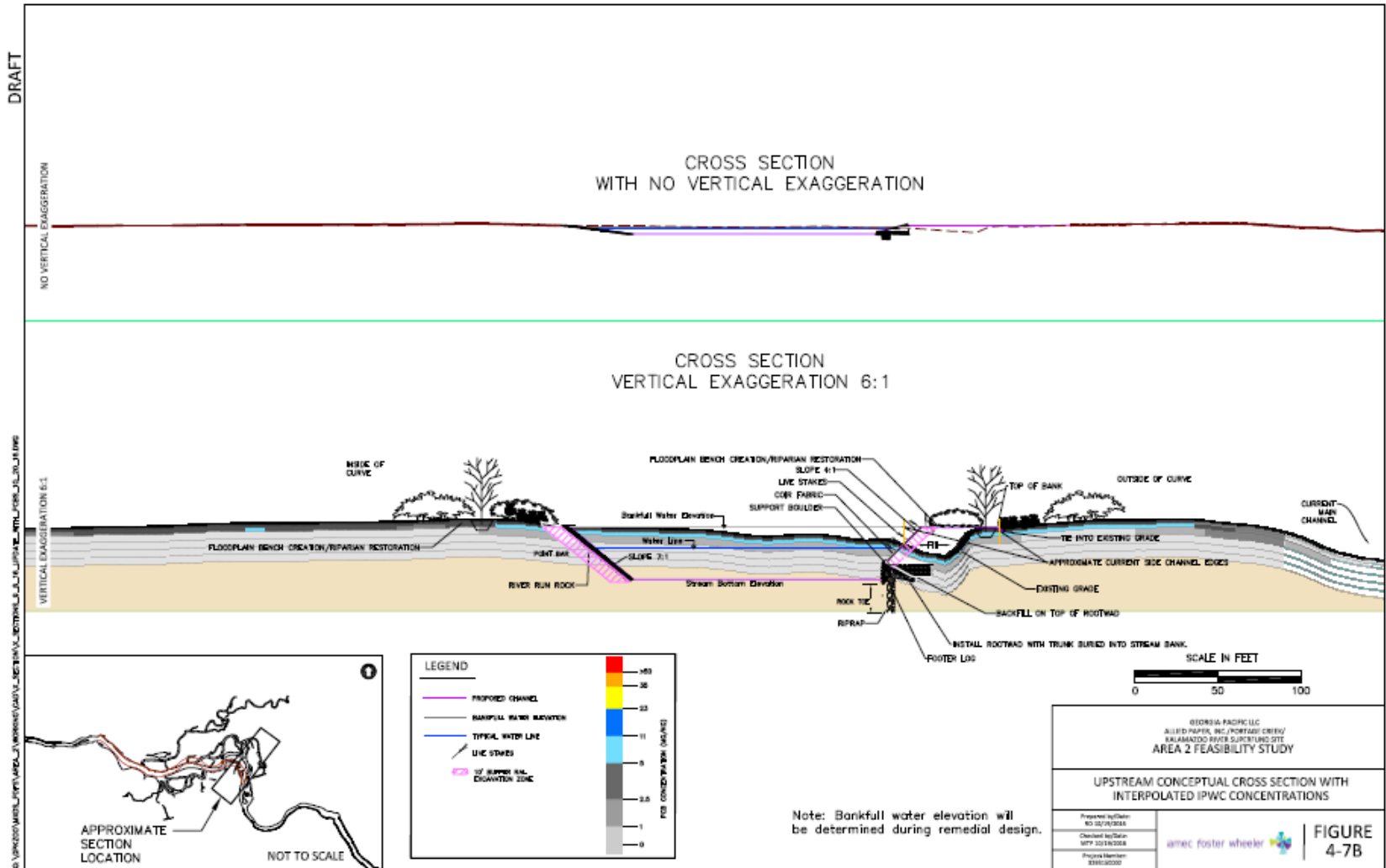
**WATER SURFACE ELEVATION:
1,000 CFS
(BANKFULL FLOW, DAM-OUT BATHYMETRY)**

amec foster wheeler **FIGURE 3-31**

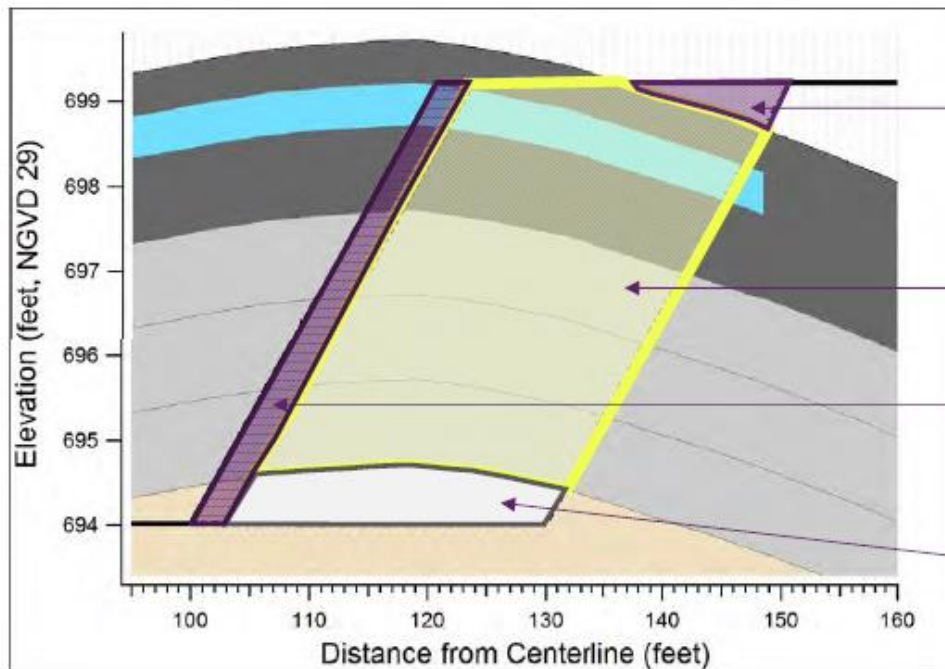
Area 2: Channel Alignment Option 3



Area 2: Channel Option 3 Cross-Section



Area 2: Channel Option 3 10' Buffer Area



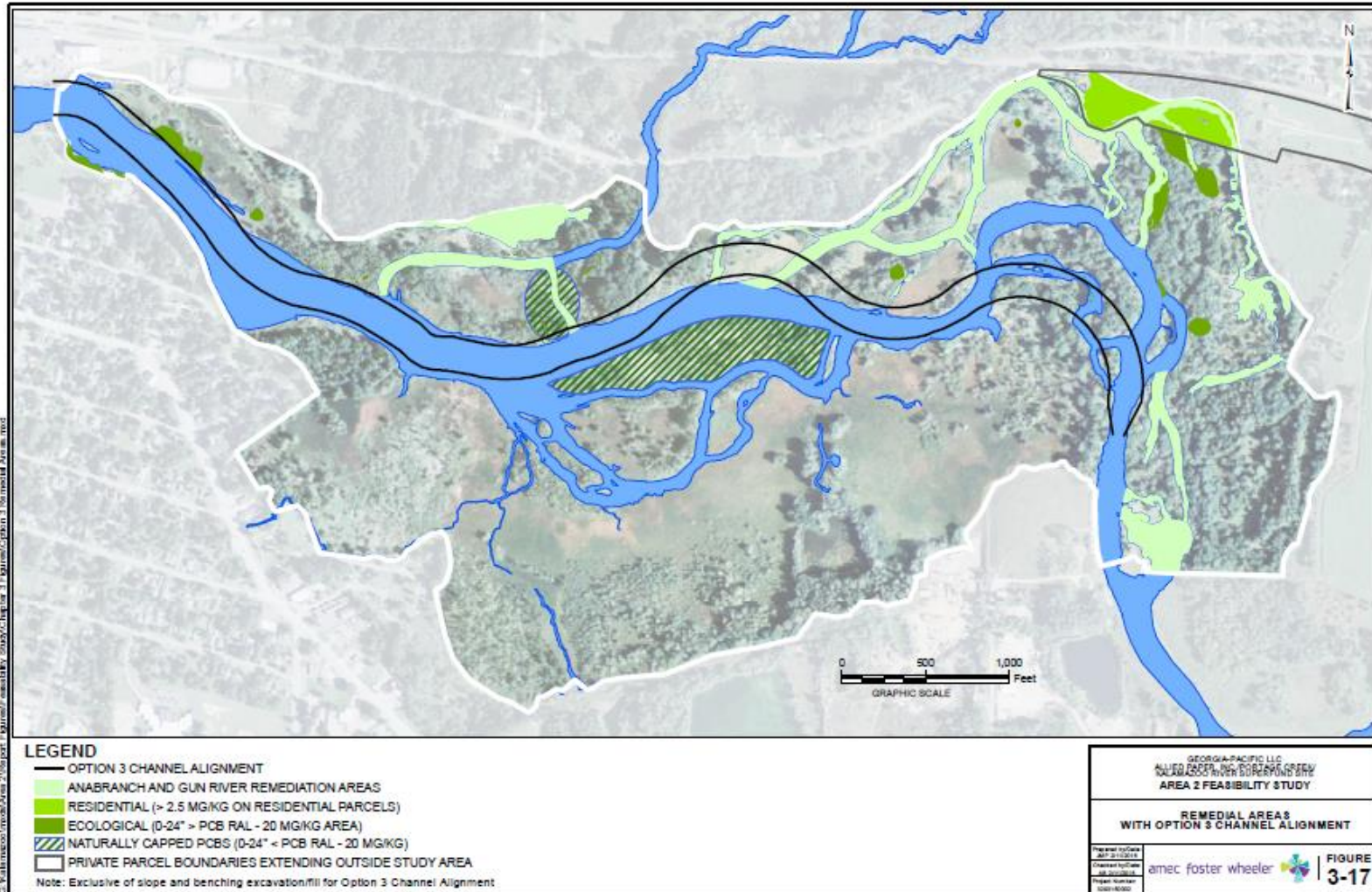
Backfilled
(~0.16 mg/kg)

Interpolated IPWC grid

Bank Treatment
(~0.16 mg/kg)

Background
concentrations
(0.16 mg/kg)

Area 2 Remedial Areas with Option 3 Channel Footprint



C:\Users\mca\Documents\workspace\1\project\assess\study\chapter 3\figure\option 3 remedial areas.mxd

Area 2 Remedial Alternatives



- 1. No Action**
- 2. MNR (dam removal): \$12.5M**
- 3. Capping: \$43.8M**
- 4. Capping, Bank RAL Excavation: \$44.4M-\$45.2M**
- 5. Capping Anabranches, Bank RAL & Floodplain Soil Excavation: \$45.6M-\$46.4M**
- 6. Capping Floodplain Soil, Bank RAL & Anabranch Excavation: \$66.9M-\$67.7M**
- 7. Excavation (RAL-based in remedial areas): \$74.5M-\$75.3M**
- 8. Aggressive Excavation (PRG 0.33 mg/kg): \$325M**

Common Elements of Alternatives 3 through 7



- **Dam Removal**
- **Channel Realignment Option 3**
- **Gun River Excavation**
- **5 year Construction Period**
- **Remedial Design Sampling and Excavation of Hot Spots Greater Than 50 mg/kg PCB**
- **Long-Term Monitoring and Maintenance (to fish tissue PRGs) (32 years)**
- **Institutional Controls**

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**

Remedial Alternatives Comparison Table



Remedial Alternative	Description	Remedial Action								Years to Reach Fish Tissue Goal	Total Cost
		Channel Realignment	Banks > RAL	Gun River	KBI Areas > 50 mg/kg	Pond G	Floodplain Soil > RAL 20 mg/kg	Northeast Anabranches	Private Parcel Soil > 2.5 mg/kg		
A-1: No Action	Required by USEPA to compare with other alternatives.	No	None	None	None	None	None	None	None	35	\$0
A-2: MNR, ICs, and LTM	No physical cleanup; relies on natural processes and site restrictions.	No	None	MNR	MNR	MNR	MNR	MNR	ICs	35	\$12.5 million
A-3: Capping, Channel Realignment, Gun River Excavation, KBI Targeted Excavation, ICs, and LTM	Capping and/or bank channel protection in the northeast anabranches, Pond G, and floodplain soil exceeding RAL of 20 mg/kg PCBs; main river channel realignment to stabilize channel and protect floodplains.	Yes	Protect + Stabilize	Excavate	Excavate	Cap	Cap	Cap	ICs	32	\$43.8 million
A-4: Capping, Channel Realignment, Bank RAL/Gun River Excavation, KBI Targeted Excavation, ICs, and LTM	Same as A-3 with addition of bank soil excavation above a RAL.	Yes	Excavate	Excavate	Excavate	Cap	Cap	Cap	ICs	32	\$44.4 million - \$45.2 million
A-5: Anabranch Capping, Channel Realignment, Bank RAL/Floodplain Soil/Gun River Excavation, KBI Targeted Excavation, ICs, and LTM	Same as A-4 except floodplain soils above RAL 20 mg/kg will be excavated.	Yes	Excavate	Excavate	Excavate	Cap	Excavate	Cap	ICs	32	\$45.6 million - \$46.4 million
A-6: Floodplain Capping, Channel Realignment, Bank RAL/Floodplain Soil/Anabranch/Gun River Excavation, KBI Targeted Excavation, ICs, and LTM	Same as A-4 except anabranch areas will be excavated.	Yes	Excavate	Excavate	Excavate	Cap	Cap	Excavate	ICs	32	\$66.9 million - \$67.7 million
A-7: Floodplain, Anabranch, Bank RAL Excavation, Channel Realignment, Gun River Excavation, KBI Targeted Excavation, ICs, and LTM	Excavation with backfilling to restore grade and riparian habitat restoration in: former anabranches, Pond G, floodplain soil > RAL 20 outside channel realignment footprint, and soil > 2.5 mg/kg on the private parcel in the northeast portion of the area.	Yes	Excavate	Excavate	Excavate	Excavate	Excavate	Excavate	Excavate	32	\$74.5 million - \$75.3 million
A-8: Area-Wide Aggressive Excavation, ECs, ICs, and LTM	Area-wide removal of sediment and floodplain soil exceeding 0.33 mg/kg, achieving the sediment PRG throughout the floodplain and without channel realignment.	No	Excavate	Excavate	Excavate	Excavate	Excavate	Excavate	Excavate	40	\$325 million

Definitions:

ECs - Engineering Controls
 ICs - Institutional Controls
 KBI - Knife Blade Island

LTM - Longterm Monitoring
 mg/kg - milligram per kilogram
 MNR - Monitored Natural Recovery
 RAL - Remedial Action Level

Alternative Evaluation Summary

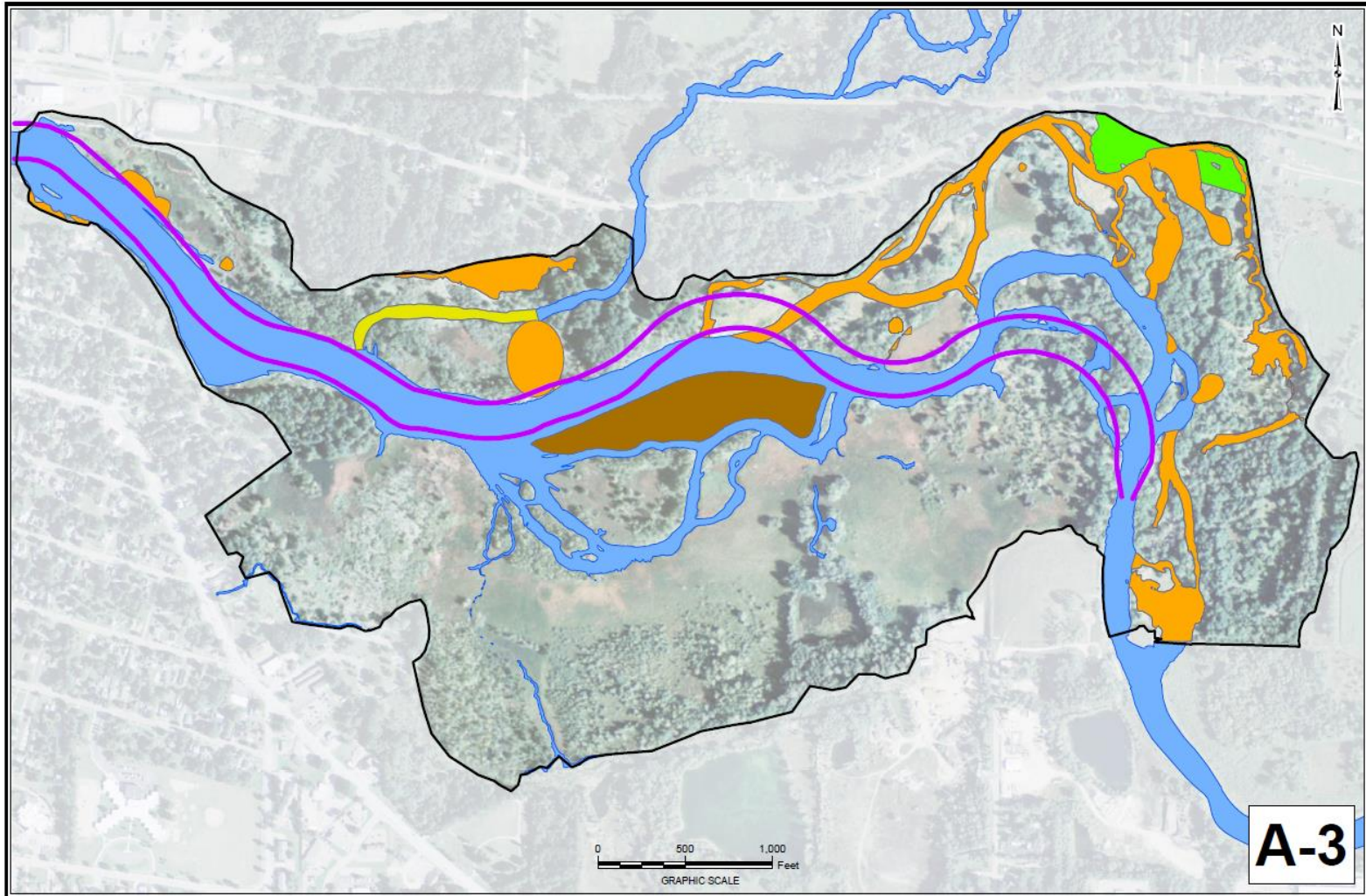


Alternative	Capping Area (acres) / Removal Volume (cy)	Years to Reach PRGs for Smallmouth Bass	Overall Protection of Human Health and the Environment	Compliance with ARARs	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume Through Treatment	Implementability	Total 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

Alternative 3

Capping, Channel Realignment, Gun River
Excavation, KBI Targeted Excavation, ICs, LTM

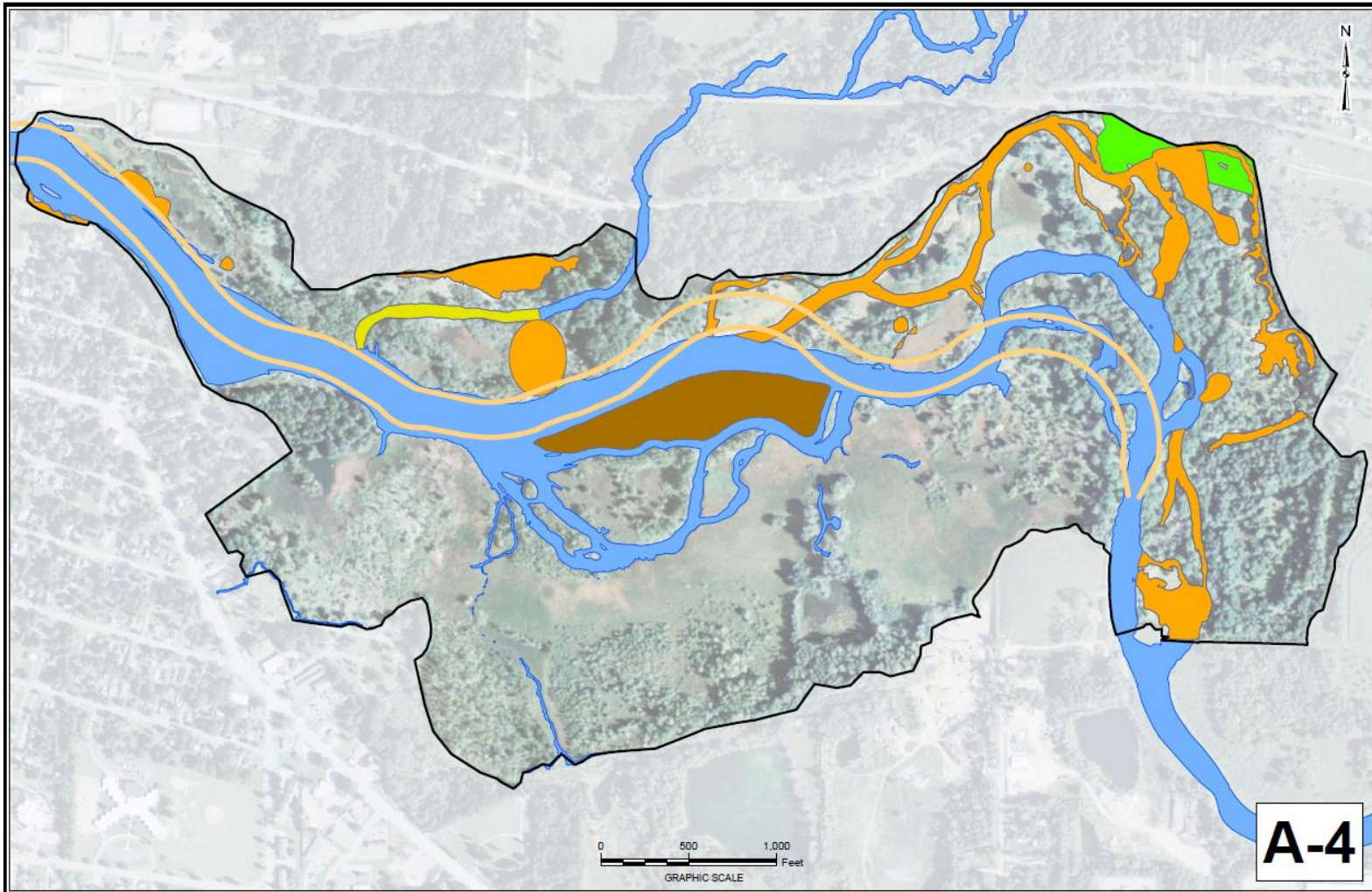
\$43.8M



Alternative 4

Capping, Channel Realignment, Bank RAL, Gun
River Excavation, KBI Targeted Excavation, ICs, LTM

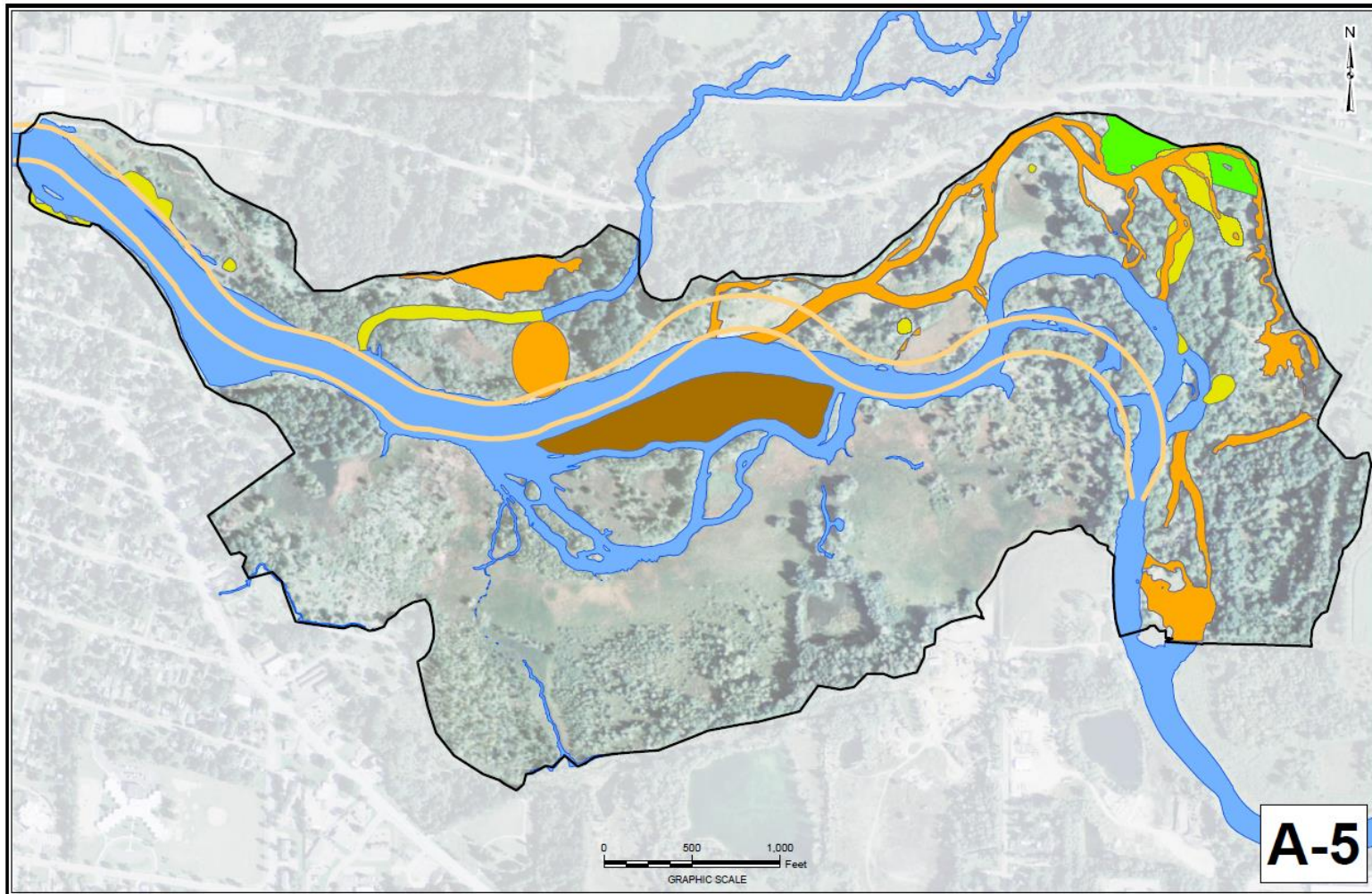
\$44.4M-\$45.2M



Alternative 5

Anabranch Capping, Channel Realignment, Bank RAL,
Floodplain Soil and Gun River Excavation, KBI Targeted
Excavation, ICs, LTM

\$45.6M-\$46.4M

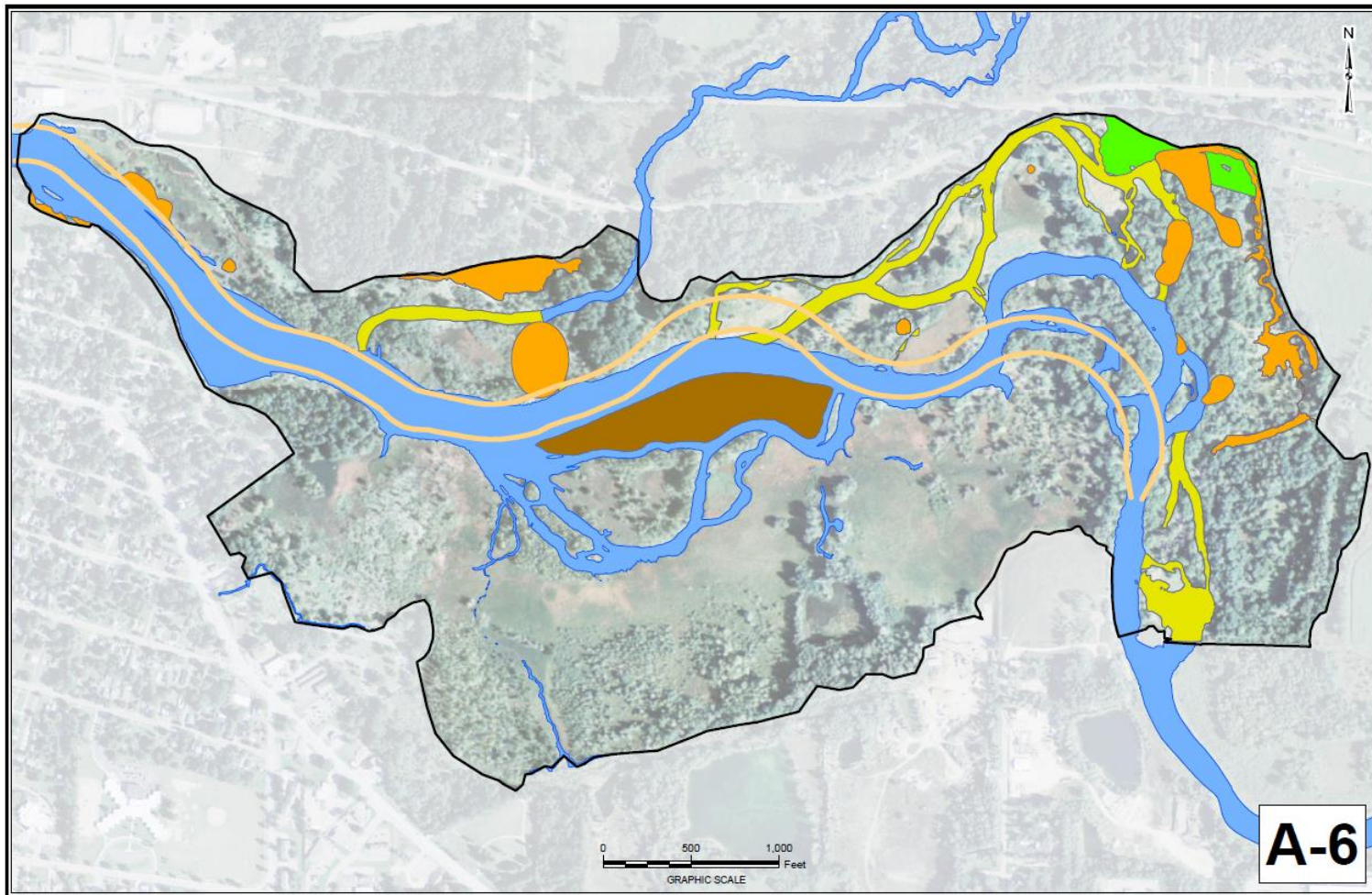


Alternative 6



Floodplain Soil Capping, Channel Realignment, Bank
RAL, Anabranch and Gun River Excavation, KBI Targeted
Excavation, ICs, LTM

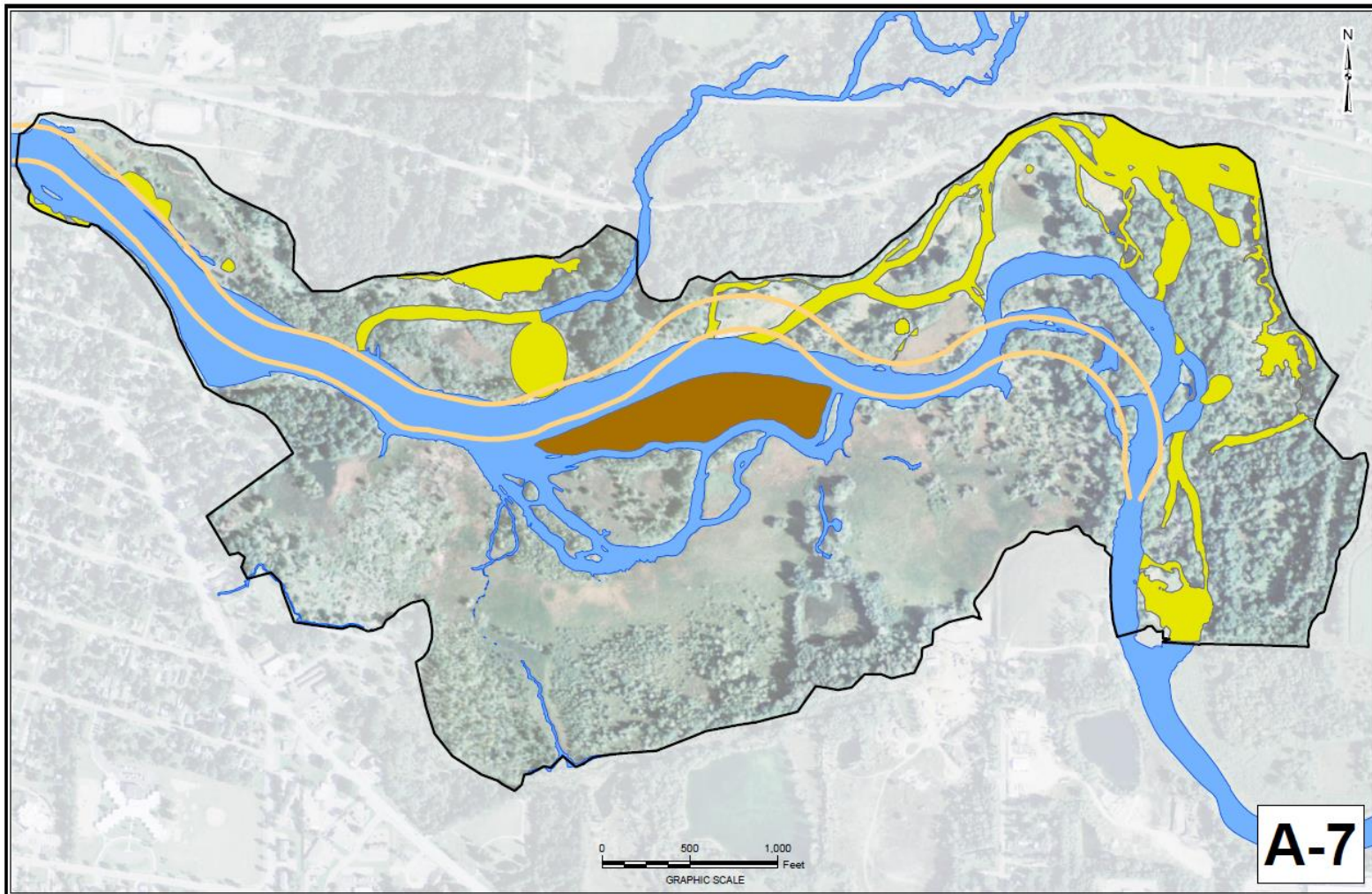
\$66.9M-\$67.7M



Alternative 7

Channel Realignment, Bank RAL, Anabranch, Gun River,
and Floodplain Soil Excavation, KBI Targeted Excavation,
ICs, LTM

\$74.5M-\$75.3M



EPA's Preferred Alternative A-5



Cleanup alternatives evaluation criteria comparison

Options	Overall protection of human health and the environment	Compliance with ARARs	Long-term effectiveness and permanence	Reduction of toxicity, mobility, or volume through treatment	Short-term effectiveness	Implementability
A-1	Undocumented	Undocumented	Undocumented	○	○	NA
A-2	○	●	●	○	○	●
A-3	●	●	●	○	●	●
A-4	●	●	●	○	●	●
* A-5	●	●	●	○	●	●
A-6	●	●	●	○	●	●
A-7	●	●	●	○	●	●
A-8	●	⊙	○	○	○	●

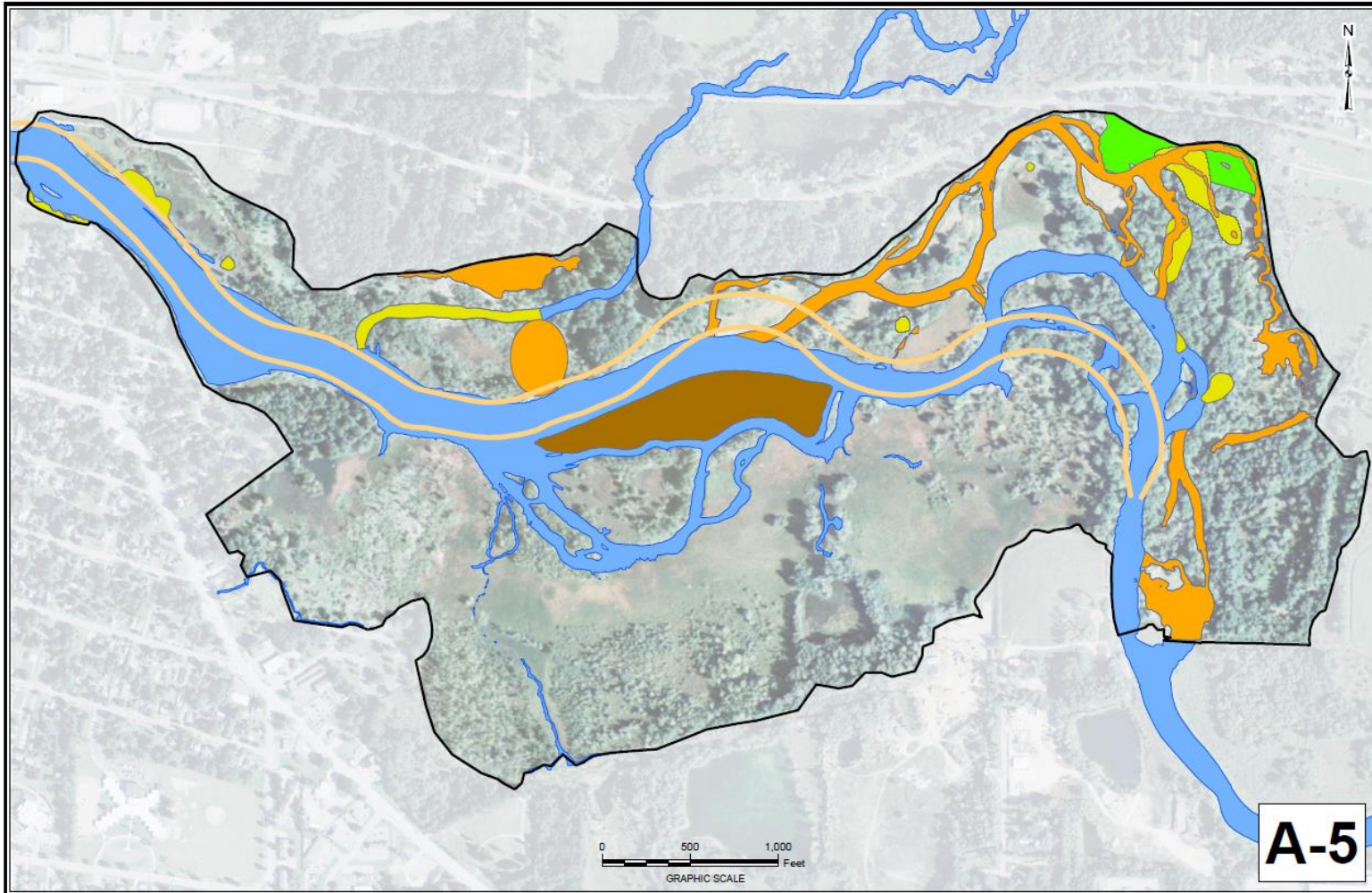
● = fully meets criteria ⊙ = partially meets criteria ○ = Does not meet criteria NA = Not applicable

* = EPA's recommended alternative ARARs = Applicable or Relevant and Appropriate Requirements.

EPA Preferred Alternative 5

Anabranch Capping, Channel Realignment, Bank RAL,
Floodplain Soil and Gun River Excavation, KBI Targeted
Excavation, ICs, LTM

\$46.4M



EPA's Preferred Alternative 5

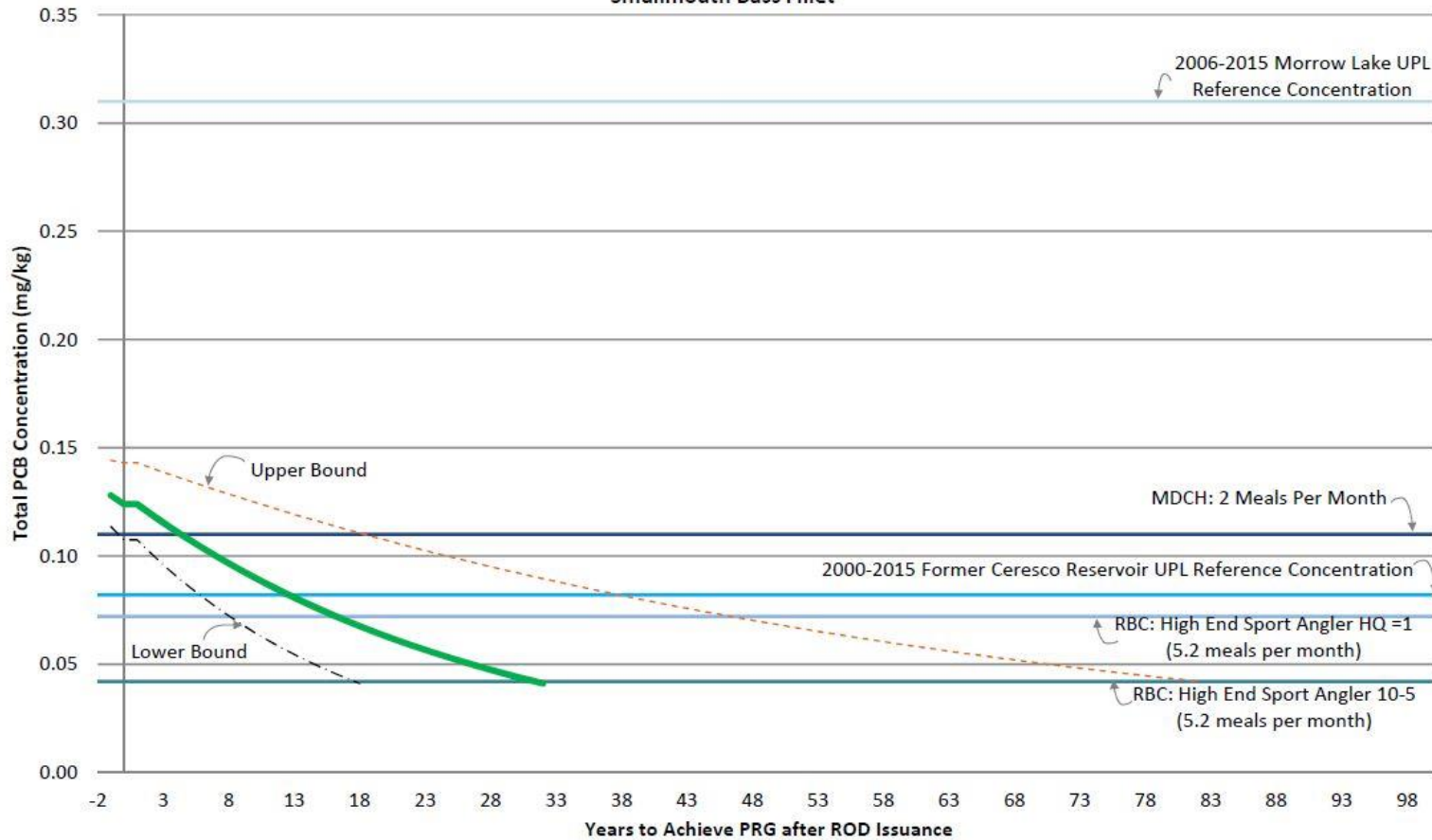


- **Otsego Dam Removal and Channel Realignment Option 3**
- **Bank RAL Excavation (5 mg/kg PCB)**
- **Remedial Design Sampling and Excavation of Hot Spots Greater Than 50 mg/kg PCB**
- **Excavation of Floodplain Soil Exceeding 20 mg/kg PCB Outside of Channel Footprint**
- **Capping of Northeast Anabranches and Pond G**
- **Gun River Excavation**
- **Long-Term Monitoring and Maintenance (to fish tissue PRGs) (32 years) and Institutional Controls**
- **29,200 Cubic Yards Excavated**
- **28 Acres Capped**
- **5 Year Construction Period**
- **\$46.4 M**

Area 2: SMB Fish Tissue Projections



Fish Tissue Projections for Active Remediation, Alternatives A-3 through A-7:
Smallmouth Bass Fillet



2006-2015 Morrow Lake UPL Reference Concentration = 0.31 mg/kg
 MDCH: 2 Meals Per Month = 0.11 mg/kg
 2000-2015 Former Ceresco Reservoir UPL Reference Concentration = 0.082 mg/kg
 Human Health Fish Consumption RBC: High End Sport Angler (HQ = 1) = 0.072 mg/kg
 Human Health Fish Consumption RBC: High End Sport Angler (10⁻⁵) = 0.042 mg/kg
 Refer to Table F-1.1 for definition of segments

--- Active Remediation, Alternatives 3 through 7: Upper Bound
 — Active Remediation, Alternatives 3 through 7
 - - - Active Remediation, Alternatives 3 through 7: Lower Bound

Next Steps



- **Questions/Informal Comments**
- **Formal public hearing for comments to be incorporated into the responsiveness summary**
- **EPA evaluates comments and finalizes remedy in a Record of Decision (Fall 2017)**



Questions?

Jim Saric

saric.james@epa.gov

312.886.0992

<http://www.epa.gov/superfund/allied-paper-kalamazoo>