Section 2
Data Evaluation

This HHRA evaluates potential current and foreseeable future risks to people who may recreate on or live near the Kalamazoo River and its floodplain. The range of possible exposures to river water, sediment, biota, and floodplain soil were examined. For some types of exposure, a quantitative assessment of cancer risk and noncancer hazard was conducted. For other types of exposure, only a qualitative evaluation was conducted because previous investigations for a similar site found these exposures to not be associated with a significant risk, given similar or higher media concentrations.

This section evaluates available data collected on and near the API/PC/KR site and determines whether data are adequate for conducting a quantitative or qualitative risk assessment.

2.1 Data Evaluation

Samples have been collected from fish, turtle, sediment, and surface water from the Kalamazoo River since 1971. The majority of the data used in this HHRA were collected in 1993 and 1997 and were reported in various technical memoranda prepared by BB&L, including Draft Technical Memorandum 12 – Former Impoundment Sediment and Geochronological Dating Investigation; Draft Technical Memorandum 14 (and addenda) – Biota Investigation; and Draft Technical Memorandum 5 – Willow Boulevard/A-Site Operable Unit: Results of Air Investigation.

Exposures to fish, turtle, floodplain soil, sediment, surface water, air, and waterfowl were considered in this risk assessment. Based on a review of these exposures, one of the following determinations was made for each exposure scenario/pathway under consideration:

- Quantitative evaluation of the associated exposure is needed
- Qualitative evaluation of the associated exposures is sufficient
- Additional data are needed to adequately evaluate the associated exposure

2.1.1 Fish Data

Fish data were collected in 1993 and 1997 as part of the Biota Investigation (BB&L 1994e, 1998). Several species of fish were collected including smallmouth bass, golden redhorse, carp, and spotted and white suckers. These data have been summarized and discussed in *Ecological Risk Assessment for the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site* (CDM June 1999).

Two species, smallmouth bass and carp, were selected to represent a popular targeted sport fish and a bottom feeding fish in the human health assessment. The 1993 fish tissue data included skin-off fillet data for carp and skin-on fillet data for smallmouth bass. These data were used for the risk assessment calculations. *Guidance for Assessing*

Chemical Contaminant Data for Use in Fish Advisories (EPA 1995) recommends that samples be prepared in a manner that best represents the edible portions of fish prepared and consumed by anglers. Concentrations of PCBs detected in fish fillets are presented in Table 2-1 for each of the seven areas evaluated in this risk assessment. To aid in the evaluation of aquatic habitats and chemical exposure, the API/PC/KR site was divided into 12 Aquatic Biota Study Areas (ABSAs). Nine of these ABSAs were evaluated as exposure areas in the HHRA. A list of these ABSAs is presented on Table 2-2. ABSAs 1 and 2 are located upstream of known sources associated with the API/PC/KR site and serve as reference areas for PCB contamination in fish tissues.

Table 2-1 Smallmouth Bass and Carp Data, API/PC/KR Site

Area/Species	Total Aroclor			
	Frequency of Detection	Range of Detection (mg/kg)	Average Conc. (mg/kg)	Maximum Conc. (mg/kg)
ABSA 3, 4, 5 Combined				
Small Mouth Bass	44/44	0.09 - 3.9	0.95	3.9
Carp	44/44	1.1 - 17	5.7	17
ABSA 6				
Small Mouth Bass	11/11	0.27 - 3.7	0.99	3.7
Carp	11/11	1.1 - 8.0	3.4	8.0
ABSA 7				
Small Mouth Bass	11/11	0.39 - 3.7	1.5	3.7
Carp	11/11	0.71 - 6.4	2.7	6.4
ABSA 8				
Small Mouth Bass	11/11	0.74 - 4.2	1.9	4.2
Carp	11/11	1.3 - 9.6	4.6	9.6
ABSA 9				
Small Mouth Bass	11/11	0.23 - 5.8	3.3	5.8
Carp	21/21	0.099 - 6.5	1.8	6.5
ABSA 10				
Small Mouth Bass	11/11	1.1 - 2.4	1.9	2.4
Carp	11/11	1.9 - 17	7.6	9.1
ABSA 11				
Small Mouth Bass	21/22	0.13 - 4.3	0.54	8.3
Carp	22/22	0.36 - 17	4.9	17

ABSA: Aquatic Biota Study Area. See Table 2-2 for description of ABSAs.

Table 2-2 API/PC/KR Biological Study Areas

ABSA 3	Kalamazoo River from Morrow Dam to Mosel Ave., Kalamazoo Aquatic biota were collected just downstream of Morrow Dam.
ABSA 4	Kalamazoo River at Mosel Ave. to Hwy. 131 bridge. Aquatic biota were collected from the Kalamazoo River near Mosel Avenue.
ABSA 5	Kalamazoo River near Hwy 131 bridge to Plainwell Dam. Aquatic biota were collected from the Kalamazoo River upstream of Plainwell Dam. Includes TBSAs 8, 9, and 10.
ABSA 6	Kalamazoo River from Plainwell Dam to Otsego City Dam. Aquatic biota were collected from the Kalamazoo River upstream of Otsego City Dam. Includes TBSA 10.
ABSA 7	Kalamazoo River from Otsego City Dam to Otsego Dam. Aquatic biota were collected just upstream of Otsego Dam.
ABSA 8	Kalamazoo River from Otsego Dam to Trowbridge Dam. Aquatic biota were collected upstream of Trowbridge Dam. Includes TBSA 3 and 5.
ABSA 9	Kalamazoo River from Trowbridge Dam to Lake Allegan Dam. Aquatic biota were collected from Lake Allegan.
ABSA 10	Kalamazoo River from Lake Allegan Dam to Ottawa Marsh. Aquatic biota were collected downstream of Allegan Dam. Includes TBSA 1.

Table 2-2 API/PC/KR Biological Study Areas

ABSA 11	Kalamazoo River from Ottawa Marsh to US 31. Aquatic biota were collected near Saugatuck.

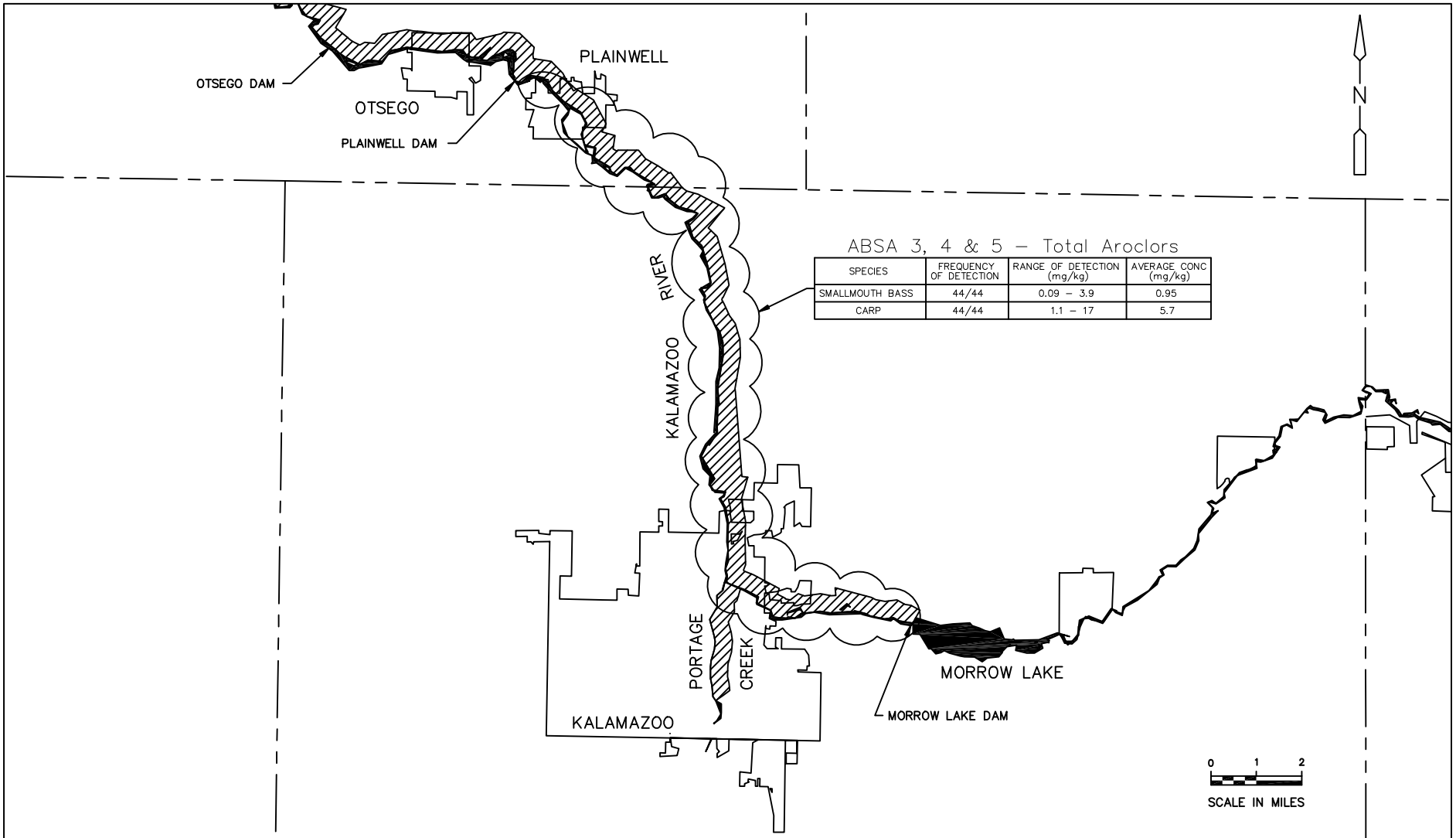
Note: ABSAs 1 and 2 are located upstream of Morrow Dam.

Three ABSAs, 3, 4, and 5, cover the area between Morrow Dam and Plainwell Dam. Data from these three ABSAs were combined for purposes of this assessment because it is assumed that fish can migrate within these areas, but due to the presence of the dams, will not migrate to adjacent ABSAs (i.e., ABSAs 2 and 6). After combining ABSAs 3, 4, and 5, all data sets represent a stretch of the river between two dams. Figures 2-1 through 2-4 illustrate fish data collected from the nine HHRA study areas.

Between 11 and 22 fish fillet samples for each species (smallmouth bass and carp) were collected for each ABSA. Quality control data is presented in Draft Technical Memorandum 14 – Biota Investigation (BB&L 1994) and generally conforms to the data quality objectives established for the site. For these reasons, fish data sets were considered adequate for risk assessment purposes. Because fish ingestion is the primary exposure pathway of concern for this site, this pathway was evaluated quantitatively. Risks and hazards were calculated using both average and maximum tissue concentrations.

2.1.2 Turtle Data

Taking of snapping turtles for consumption is known to occur in the vicinity of the site. While not well documented, the quantities of turtles ingested by individuals are believed to be less than the quantities of fish ingested. Representative data for PCB concentrations in turtle tissue are not available. Eleven turtle samples were collected from ABSAs 5 and 10. Detected concentrations of PCBs in turtles were reported in the Biota Investigation. Aroclor 1260 was detected in 11 out of 11 samples from ABSA 5, and 9 out of 11 samples from ABSA 10. Aroclor 1254 was detected one time in a sample from ABSA 10 at 0.53 mg/kg. Concentrations of Aroclor 1260 ranged from 0.021 to 0.49 mg/kg at ABSA 1 (reference area), 0.23 to 1.9 mg/kg at ABSA 5, and 0.11 to 8.1 mg/kg at ABSA 10. Turtles were collected from May 16 through May 21, 1994. Because samples were collected in the spring, lipid levels would likely be at their lowest. Similarly, concentrations of PCBs, which accumulate in fatty tissue, would also be lower at this time of year. Turtle samples collected later in the summer or fall would likely exhibit higher lipid levels and, possibly, higher PCB levels. Available data may under-represent PCB concentrations to which people ingesting turtles caught later in the summer and fall would be exposed.



ABSA 3, 4 & 5 – Total Aroclors

SPECIES	FREQUENCY OF DETECTION	RANGE OF DETECTION (mg/kg)	AVERAGE CONC (mg/kg)
SMALLMOUTH BASS	44/44	0.09 – 3.9	0.95
CARP	44/44	1.1 – 17	5.7

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KALAMAZOO RIVER HUMAN HEALTH RISK ASSESSMENT
ABSA 3, 4 & 5

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Figure No. 2–1

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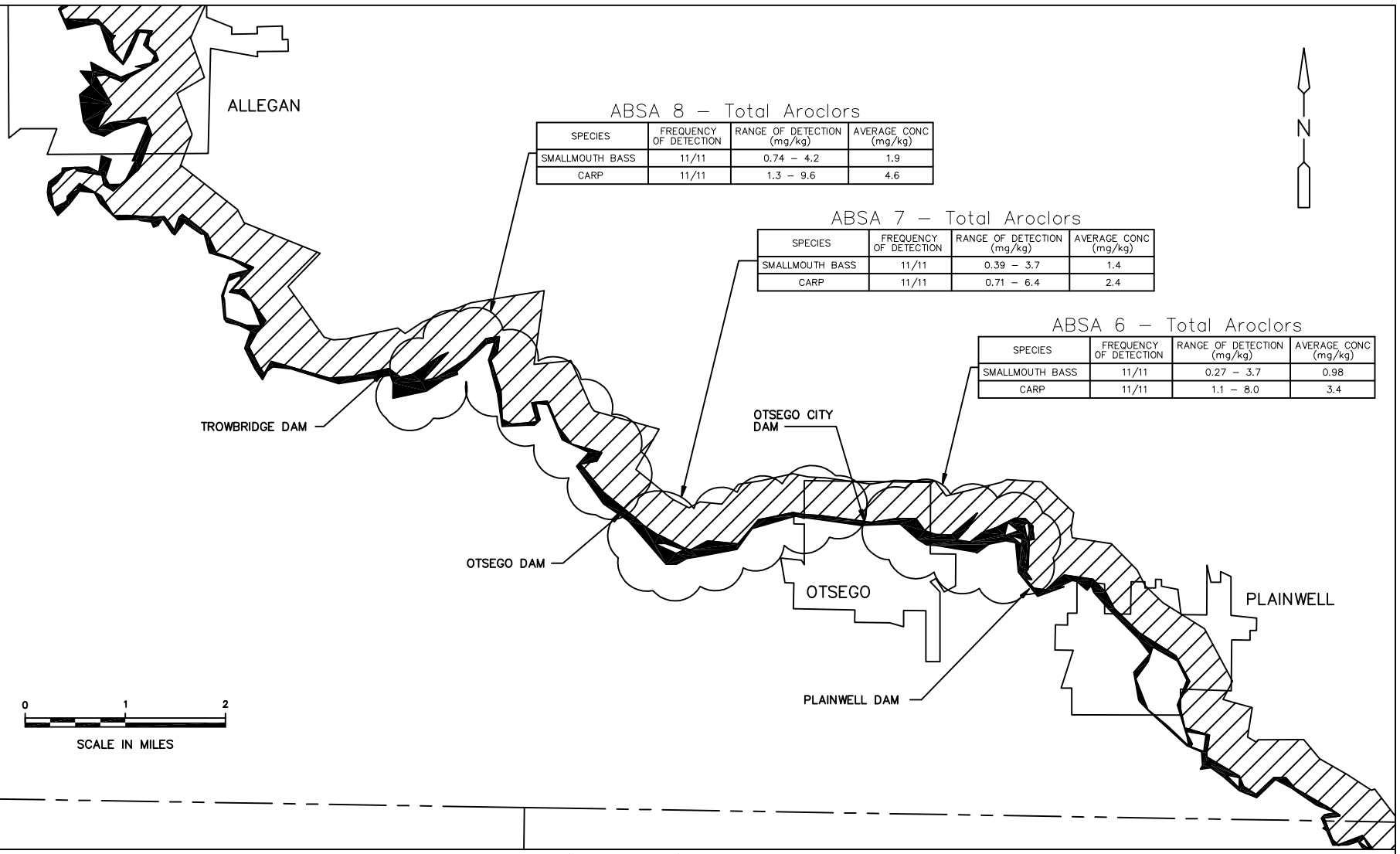

ABSA 8 – Total Aroclors

SPECIES	FREQUENCY OF DETECTION	RANGE OF DETECTION (mg/kg)	AVERAGE CONC (mg/kg)
SMALLMOUTH BASS	11/11	0.74 – 4.2	1.9
CARP	11/11	1.3 – 9.6	4.6

ABSA 7 – Total Aroclors

SPECIES	FREQUENCY OF DETECTION	RANGE OF DETECTION (mg/kg)	AVERAGE CONC (mg/kg)
SMALLMOUTH BASS	11/11	0.39 – 3.7	1.4
CARP	11/11	0.71 – 6.4	2.4

ABSA 6 – Total Aroclors

SPECIES	FREQUENCY OF DETECTION	RANGE OF DETECTION (mg/kg)	AVERAGE CONC (mg/kg)
SMALLMOUTH BASS	11/11	0.27 – 3.7	0.98
CARP	11/11	1.1 – 8.0	3.4

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KALAMAZOO RIVER HUMAN HEALTH RISK ASSESSMENT
ABSA 6, 7 & 8

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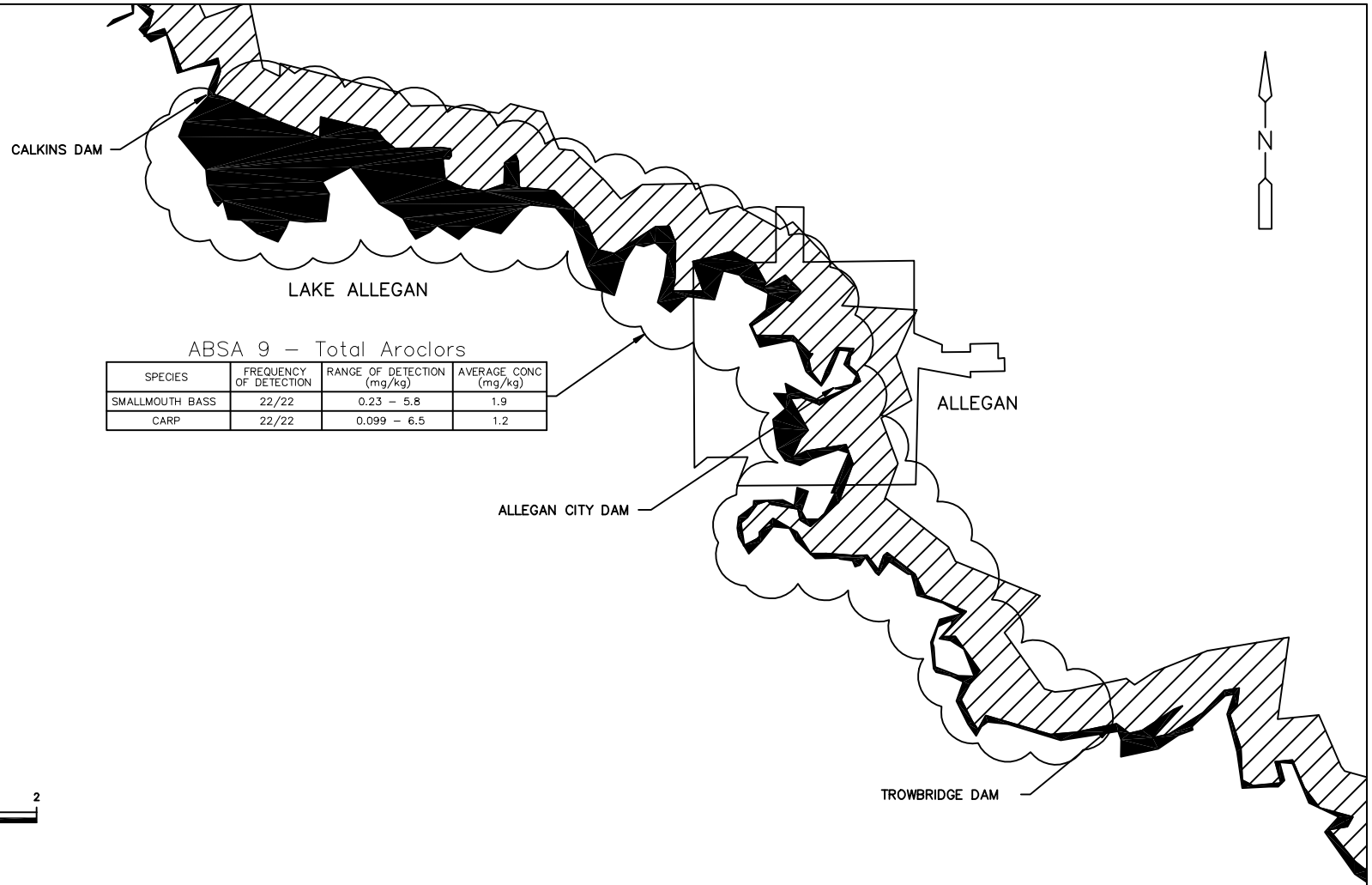
Figure No. 2–2



ABSA 9 – Total Aroclors

SPECIES	FREQUENCY OF DETECTION	RANGE OF DETECTION (mg/kg)	AVERAGE CONC (mg/kg)
SMALLMOUTH BASS	22/22	0.23 – 5.8	1.9
CARP	22/22	0.099 – 6.5	1.2

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KALAMAZOO RIVER HUMAN HEALTH RISK ASSESSMENT
ABSA 9

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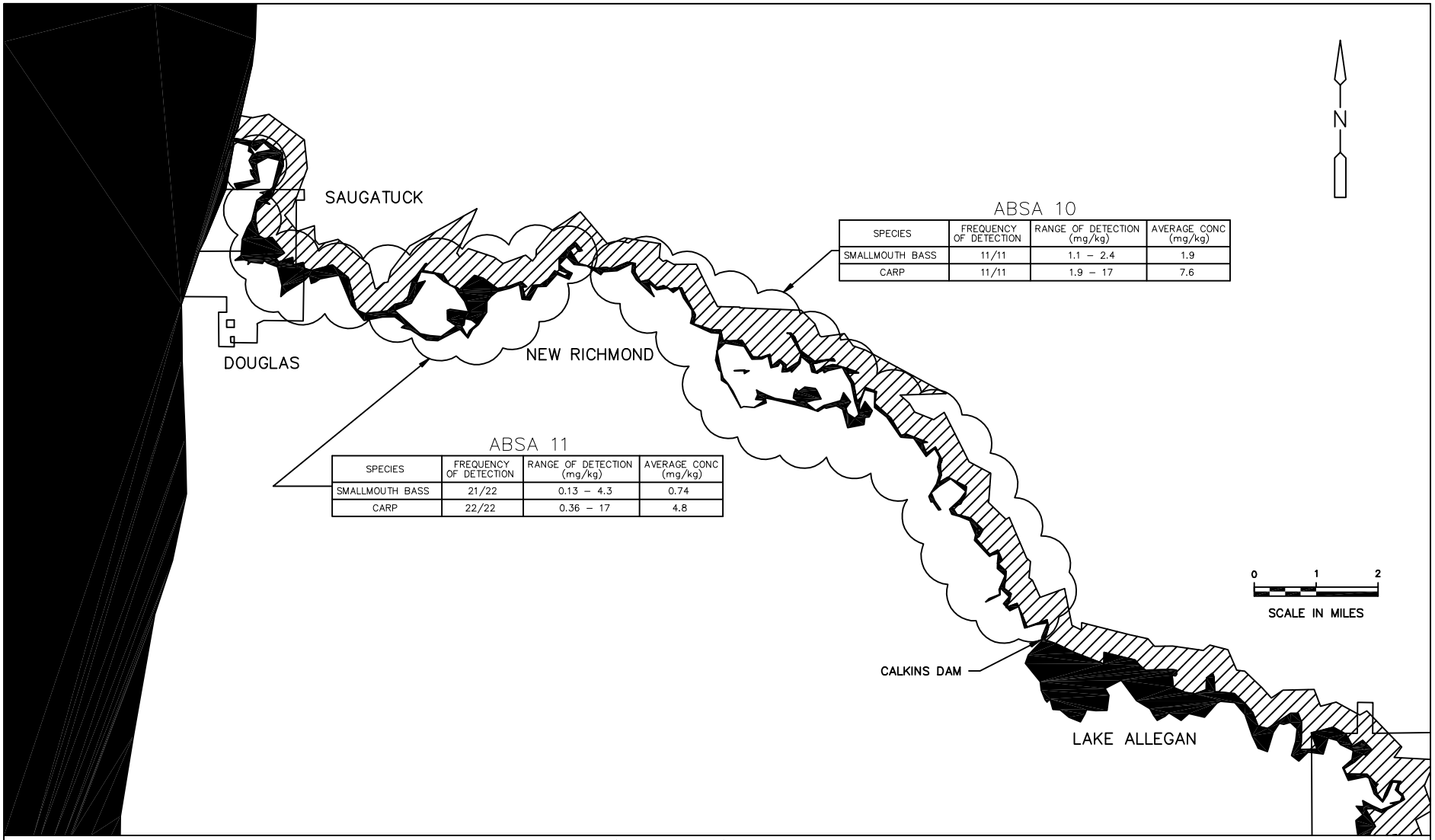
Figure No. 2–3



ABSA 10

SPECIES	FREQUENCY OF DETECTION	RANGE OF DETECTION (mg/kg)	AVERAGE CONC (mg/kg)
SMALLMOUTH BASS	11/11	1.1 – 2.4	1.9
CARP	11/11	1.9 – 17	7.6

ABSA 11

SPECIES	FREQUENCY OF DETECTION	RANGE OF DETECTION (mg/kg)	AVERAGE CONC (mg/kg)
SMALLMOUTH BASS	21/22	0.13 – 4.3	0.74
CARP	22/22	0.36 – 17	4.8

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KALAMAZOO RIVER HUMAN HEALTH RISK ASSESSMENT
ABSA 10 & 11

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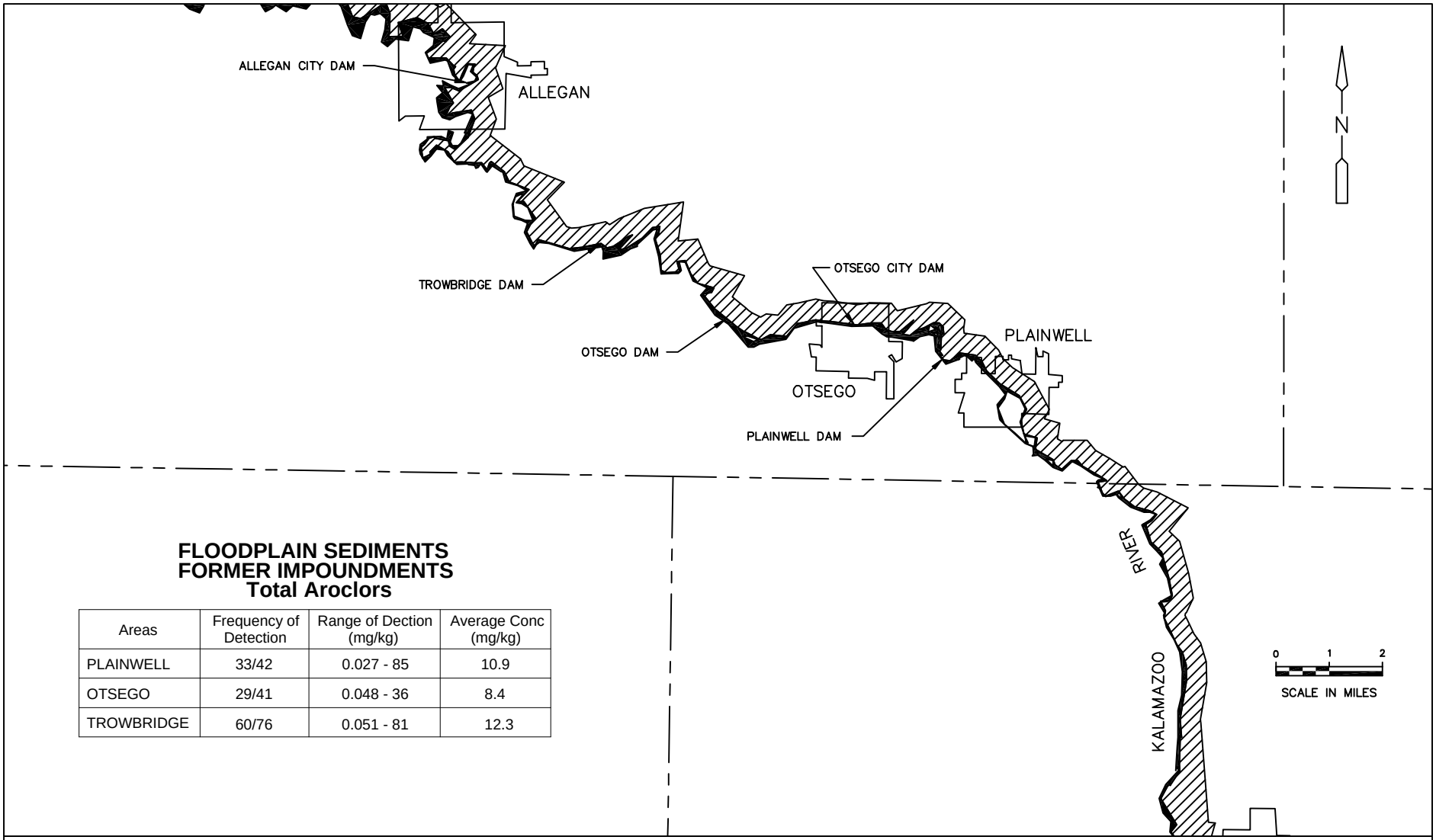
Figure No. 2–4



FLOODPLAIN SEDIMENTS
FORMER IMPOUNDMENTS
Total Aroclors

Areas	Frequency of Detection	Range of Dection (mg/kg)	Average Conc (mg/kg)
PLAINWELL	33/42	0.027 - 85	10.9
OTSEGO	29/41	0.048 - 36	8.4
TROWBRIDGE	60/76	0.051 - 81	12.3

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KALAMAZOO RIVER HUMAN HEALTH RISK ASSESSMENT
FLOODPLAIN SEDIMENTS

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Figure No. 2–5

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