



**MID-STATES
CORRIDOR**

APPENDIX R – SECTION 303(D) IMPACT ANALYSIS

Mid-States Corridor Tier 1 Environmental Impact Statement

Prepared for
Indiana Department of Transportation
Mid-States Corridor Regional Development Authority

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IMPAIRED RIVERS AND STREAMS

Introduction

The following substantive changes have been made to this chapter since the Draft Environmental Impact Statement (DEIS) was published.

- Impacts for Alternatives R and Refined Preferred Alternative P (RPA P) have been added.

The purpose of this section is to provide additional data, graphics, and analyses regarding the potential impacts by the project alternatives to impaired streams (*those listed as a 303(d) waterbody in the Integrated Water Monitoring and Assessment Report*). Discussion and tables in Section 3.19 provide an overview of the type of impacts that may occur and the range of stream impacts with comparisons between alternatives. Tables in this appendix present impacts of the extended sections and variations within each alternative. Because the freeway facility type has been removed from consideration, this analysis will not include discussion of this type. Because existing US 231 in Section 1 and SR 37 in Section 3 will not include the potential for new alignment, they are excluded from discussion in the analysis.

As noted in Chapter 3.19, the Indiana Department of Environmental Management (IDEM) provides water quality reporting for the State of Indiana to the U.S. Environmental Protection Agency (EPA) to meet the requirements of Section 305(b) and 303(d) of the Clean Water Act. IDEM prepares the Integrated Water Monitoring and Assessment Report every two years, and these reports must be approved by the EPA as consistent with the Clean Water Act. At the time of the DEIS, the EPA had only partially approved the 2020 report; the 2022 report has been approved in the interim and will be reflected in this FEIS. No substantial differences were identified between the prior and current data with respect to segments analyzed.

IDEM has developed a water quality monitoring program that guides both surface and groundwater quality, but this appendix is focused on surface waters. Due to the volume of data collection and assessment of waterbodies in the state, IDEM has coordinated with EPA to establish a roughly nine-year rotation of major watersheds within the state. The Mid-States Corridor project crosses four of the nine major river basins: Ohio River Tributaries, Patoka River, West Fork White River and East Fork White River. The Ohio River Tributaries basin is limited to Section 1 of the corridor.

IDEM has developed the Consolidated Assessment and Listing Methodology (CALM) to guide its monitoring and assessment process of waterbodies in the state. CALM is updated, as necessary, with each reporting cycle to accommodate advances in scientific understanding and changes in guidance from EPA. Within this process each waterbody is assigned a designated beneficial use, and each use has associated criteria to measure the monitoring data against to determine if the uses are being met. The degree to which a waterbody is meeting its uses are reported as:

- **Category 1.** All designated beneficial uses for the waterbody are supported and no use is threatened.
- **Category 2.** The available data and other information indicate that some, but not all of the waterbody's designated beneficial uses are supported and no use(s) are impaired or threatened.



- **Category 3.** There is insufficient data and or other information available to determine if the waterbody is supporting a given designated beneficial use.
- **Category 4.** The available data and or information indicate that a designated beneficial use is impaired or threatened but a TMDL¹ is not required.
- **Category 5.** The designated beneficial use is impaired, and a TMDL is required².

Designated uses are separated into the following primary categories:

- **Aquatic Life Use.** This use focuses on both the physical and chemical conditions of the water to support wildlife. Criteria to determine this use includes presence of toxins, physical parameters (e.g., pH, nitrogen, phosphorus), macroinvertebrate community, fish community, or other scoring criteria to denote quality of habitat.
- **Recreational Use.** This use focuses on human interaction with water. All waterbodies are measured for human health in terms of having safe direct contact with the water; however, lakes and reservoirs are assigned an additional aesthetic component. Criteria to determine safety rely on measuring levels of *E. coli* in the water. No lakes or reservoirs are crossed by the Mid-States Corridor; the aesthetics use is not discussed further.
- **Fish Consumption Use.** This use focuses on human health related to direct consumption of fish from the waterbody. Criteria to determine this use includes the presence of Polychlorinated biphenyls (PCBs) and mercury found within fish tissues.
- **Public Water Supply Use.** This focuses on human health concerns related to use of the waterbody for public water supply. None of the streams crossed by the Mid-States Corridor have been designated for public water supply use and this category is not discussed further.

Waterbodies assessed as Category 5 for any of their designated uses are reported on the state's 303(d) List and the development of a TMDL is required. A TMDL is an evaluation of the watershed area necessary to determine the amount of the impairing pollutant that can be assimilated by the receiving water while still achieving water quality standards; the reporting should identify implementation strategies to restore the impaired use. Any transportation project that considers new alignment or modification of drainage patterns should be evaluated for the potential of the project to result in further impairment of the receiving waters. For those watersheds with an approved TMDL, the transportation project should be evaluated for consistency with the TMDL.

Transportation corridors have the potential to impact streams both during construction (physical disturbance) and during operation and maintenance (pollutant runoff). Stormwater runoff is collected through the roadway ditches and/or storm sewer systems and drain into the receiving waterbodies. Roadway crossings provide the entry point for transportation pollutants into the streams and represent a meaningful way to identify a potential pollutant source location.

¹ Total Maximum Daily Load.

² IDEM categorizes all fish tissue-related impairments into Category 5B (a state-defined subcategory similar to EPA's 5M subcategory) deferring development of a conventional TMDL to allow other contaminant clean-up efforts to remedy such impairments.



List of Impaired Rivers and Streams

Impairments to streams are reported by their assessment unit identifier (AUID). An AUID is a segment of a stream corresponding to U.S. Geological Survey (USGS) Hydrologic Unit Code (HUC) system. USGS uses a hierarchical system to divide the country into successively smaller geographic areas based on surface hydrologic features or drainages. IDEM uses the 12-digit HUC level to assign the unique stream AUID number. A total of 43 unique AUID stream segments of impaired streams were crossed by the alternatives (Table 1, Figures 1 and 2).

TABLE 1. LIST OF IMPAIRED STREAMS CROSSED BY THE ALTERNATIVES

AUID	Water Body / Basin	Designated Use ¹			Impairment Criteria ²
		Aquatic Life Use	Recreational Use	Fish Consumption	
INP0922_01	Straight River / Patoka	5	5	2	Biological Integrity, DO, and <i>E. Coli</i>
INP0932_06	Bruner Creek / Patoka	5	5	2	DO, <i>E. Coli</i> , and Nutrients
INP0932_07	Bruner Creek / Patoka	5	5	2	DO, <i>E. Coli</i> , and Nutrients
INP0932_T1003	Bruner Creek - unnamed tributary / Patoka	5	5	2	DO and <i>E. Coli</i>
INP0932_T1005	Short Creek / Patoka	5	5	2	Biological Integrity, DO, and <i>E. Coli</i>
INP0932_T1007	Short Creek / Patoka	5	5	2	Biological Integrity, DO, and <i>E. Coli</i>
INP0932_T1010	Short Creek - unnamed tributary / Patoka	5	5	2	Biological Integrity, DO, and <i>E. Coli</i>
INP0941_01	Dillon Creek	2	5	2	<i>E. Coli</i>
INP0942_T1008	Patoka River - unnamed tributary / Patoka	5	5	2	DO and <i>E. Coli</i>
INP0942_T1009	Leistner Creek / Patoka	5	5	2	DO and <i>E. Coli</i>
INP0943_05	Patoka River / Patoka	5	5	2	Biological Integrity, DO, and <i>E. Coli</i>
INP0943_T1020	Patoka River - unnamed tributary / Patoka	5	5	2	Biological Integrity, DO, and <i>E. Coli</i>
INP0943_T1023	Patoka River / Patoka	5	5	2	Biological Integrity, DO, and <i>E. Coli</i>
INP0944_03	Patoka River / Patoka	5	5	5	Biological Integrity, DO, <i>E. Coli</i> , PCB in tissue
INP0944_T1004	Buffalo Stream / Patoka	5	5	2	Biological Integrity, DO, <i>E. Coli</i> , Nutrients
INP0944_T1007	Pat Run / Patoka	5	5	5	Biological Integrity, <i>E. Coli</i> and PCB in tissue
INP0944_T1008	Patoka River - unnamed tributary / Patoka	5	5	5	Biological Integrity, <i>E. Coli</i> and PCB in tissue
INP0945_T1004	Ell Creek - unnamed tributary / Patoka	5	2	2	Nutrients
INP0945_T1006	Ell Creek - unnamed tributary / Patoka	5	5	2	DO, <i>E. Coli</i> , and Nutrients



AUID	Water Body / Basin	Designated Use ¹			Impairment Criteria ²
		Aquatic Life Use	Recreational Use	Fish Consumption	
INP0945_T1008	Ell Creek - unnamed tributary / Patoka	5	2	2	Nutrients
INP0945_T1009	Ell Creek - unnamed tributary / Patoka	5	2	2	Nutrients
INP0946_01	Patoka River/ Patoka	2	5	5	<i>E. Coli</i> and PCB in tissue
INP0946_02	Patoka River / Patoka	5	5	5	Biological Integrity, <i>E. Coli</i> , and PCB in tissue
INP0946_T1001	Dick Creek / Patoka	5	5	2	<i>E. Coli</i> , Nutrients
INP0946_T1002	Crooked Creek / Patoka	5	5	2	<i>E. Coli</i> , Nutrients
INP0946_T1003	Altar Creek / Patoka	5	5	2	Biological Integrity and <i>E. Coli</i>
INP0953_T1004	Flat Creek - unnamed tributary / Patoka	5	5	2	<i>E. Coli</i> , Nutrients
INP0953_T1007	Little Flat Creek / Patoka	4	5	2	<i>E. Coli</i> , Siltation (as Cat 4)
INW0291_02	Veale Creek / West Fork White River	2	5	2	<i>E. Coli</i>
INW0291_T1005	Veale Creek - unnamed tributary / West Fork White River	2	5	2	<i>E. Coli</i>
INW0292_02	Veale Creek / West Fork White River	2	5	2	<i>E. Coli</i>
INW0887_03	Salt Creek / East Fork White River	2	4	5	<i>E. Coli</i> , Hg in tissue, and PCB in tissue
INW0887_04	Salt Creek / East Fork White River	5	2	5	Biological Integrity, Hg in tissue, PCB in tissue
INW0896_02	Indian Creek / East Fork White River	2	2	5	Hg in tissue, PCB in tissue
INW0896_03	Indian Creek-Mt. Olive / East Fork White River	2	2	5	Hg in tissue
INW0896_04	Indian Creek-Mt. Olive / East Fork White River	2	2	5	Hg in tissue
INW08B3_03	Boggs Creek / East Fork White River	4	5	2	<i>E. Coli</i> , DO (as Cat 4)
INW08D3_02	Lick Creek / East Fork White River	2	5	2	<i>E. Coli</i>
INW08D3_05	Lick Creek / East Fork White River	2	5	2	<i>E. Coli</i>
INW08D4_03	French Lick Creek / East Fork White River	2	5	2	<i>E. Coli</i>
INW08D4_04	French Lick Creek / East Fork White River	2	5	2	<i>E. Coli</i>



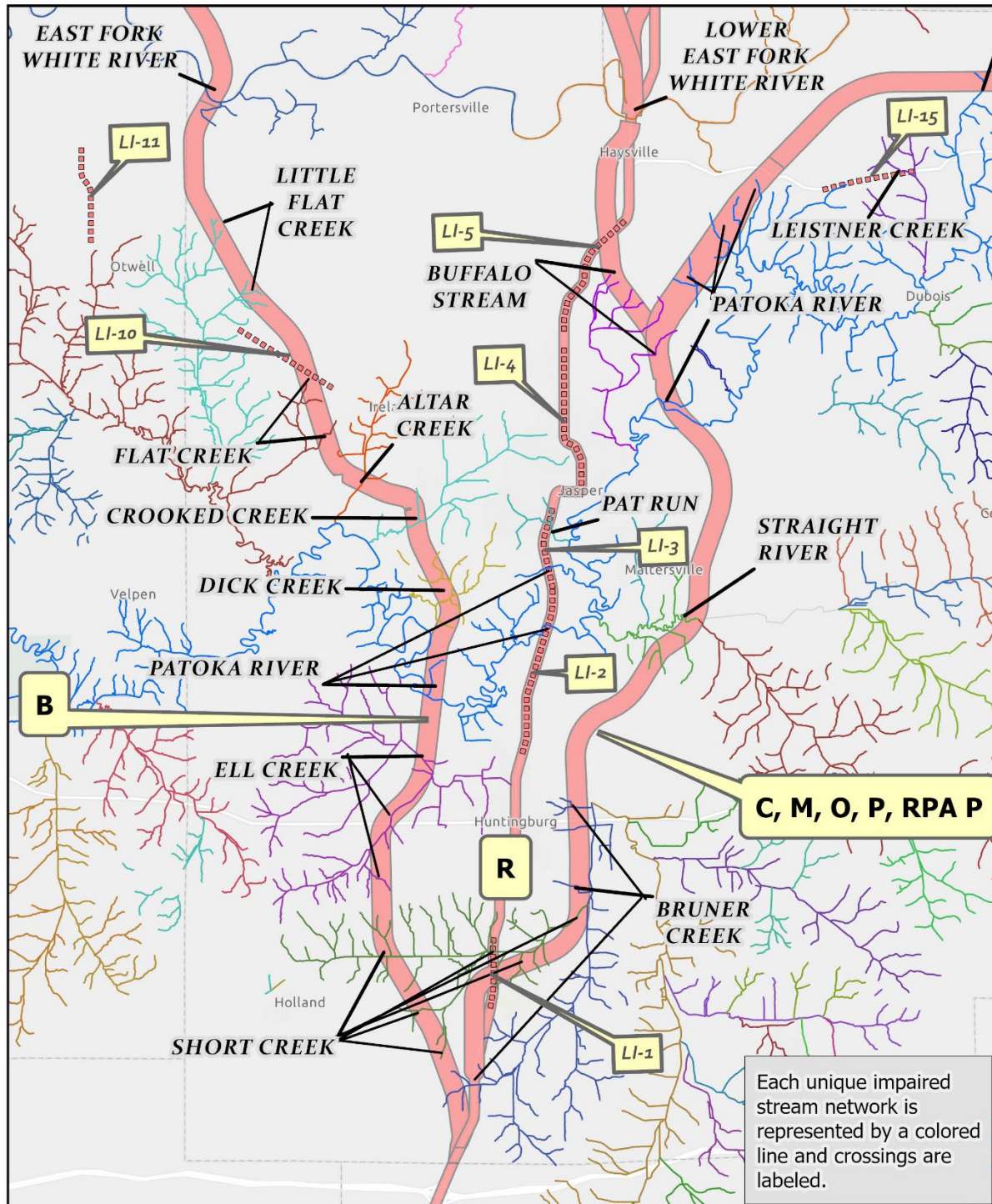
AUID	Water Body / Basin	Designated Use ¹			Impairment Criteria ²
		Aquatic Life Use	Recreational Use	Fish Consumption	
INW08D4_T1010	French Lick Creek - unnamed tributary / East Fork White River	5	5	2	Biological Integrity, <i>E. Coli</i>
INW08D5_04	Lost River (osrw) / East Fork White River	5	5	2	Biological Integrity, <i>E. Coli</i>
INW08D5_05	Lost River (osrw) / East Fork White River	5	5	2	Biological Integrity, <i>E. Coli</i>
INW08D5_T1006	Lost River - unnamed tributary / East Fork White River	5	5	2	Biological Integrity, <i>E. Coli</i>
INW08D5_T1013	Lost River - unnamed tributary / East Fork White River	5	5	2	Biological Integrity, <i>E. Coli</i>
INW08F2_03	Lower East Fork White River / East Fork White River	4	2	5	PCB in tissue, Biological Integrity
INW08F4_T1004	Sugar Creek, East Fork / East Fork White River	4	4	2	Biological Integrity, <i>E. Coli</i> , DO
INW08F4_T1005	West Fork Sugar Creek / East Fork White River	2	4	2	DO, <i>E. Coli</i>
INW08F6_04	East Fork White River / East Fork White River	2	2	5	PCB in tissue


¹ 2020 Listed Category for Designated Use. A and B modifiers not shown. IDEM did not distinguish between Category 2 and 3, Category 2 was listed in all cases for presentation.

² Dissolved Oxygen (DO), *Escherichia coli* (*E. Coli*), Polychlorinated Biphenyl (PCB), Mercury (Hg)



FIGURE 1. IMPAIRED DRAINAGES IN SECTION 2 CROSSED BY ALTERNATIVES



 **MID-STATES CORRIDOR**

Impaired Stream Impacts, Section 2

0 1 3 5 Miles


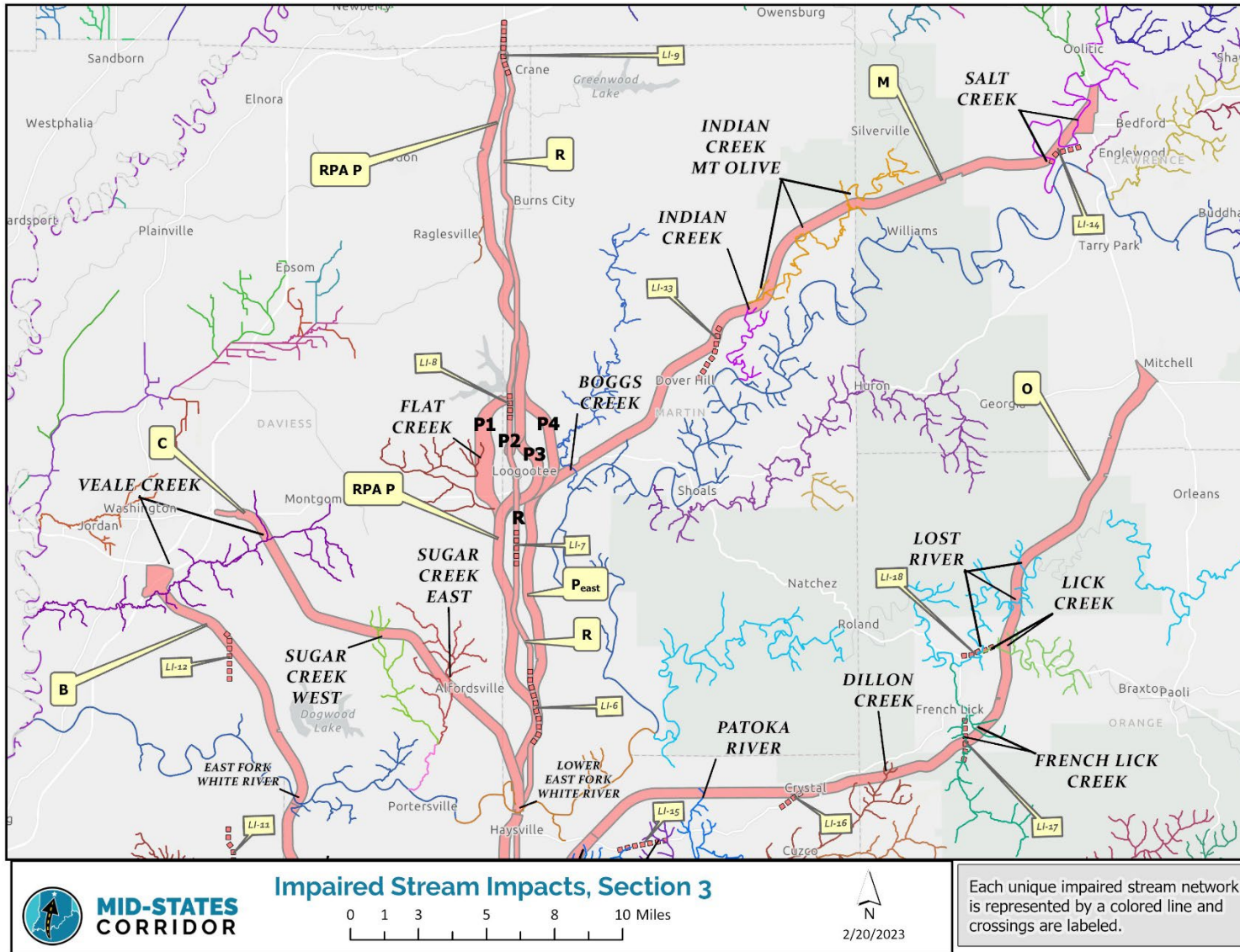
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FIGURE 2. IMPAIRED DRAINAGES IN SECTION 3 CROSSED BY ALTERNATIVES





Analysis

The Mid-States Corridor study area is predominantly rural with agricultural practices being the primary land use. The impairments reflect an influence of these activities with most pollutants assessed being associated with agricultural runoff. For example, levels of *E. coli* were an impairment source for 34 of the 43 AUID stream segments in the 2022 reporting. *E. coli* is associated with fecal contamination and can enter a stream from sewage treatment malfunction and overflow from human sources or from runoff of livestock feedlots or pastures. The low population density and high agricultural land use indicate a greater influence from agricultural runoff. High levels of *E. coli* prevent the recreational beneficial use from being supported.

Agricultural runoff also impacts the Aquatic Life Use. More than half the impaired streams failed to be supported due to levels of dissolved oxygen, excessive nutrients, or biological integrity. Elevated nutrient levels, even if they do not reach the degree of impairment on their own, increase the biological activity in the aquatic environment which in turn increases the biological oxygen demand within the water column and results in reduced dissolved oxygen. Cycles of lowered dissolved oxygen can have a cascading effect which results in alterations to habitat availability for aquatic fauna.

Fish consumption is impaired in 12 of the 50 stream segments, due to levels of PCBs and/or Mercury found in fish tissue. None of the streams were impaired directly for high levels of metals or other toxins found in the stream sediments. Pollutants such as PCBs and Mercury tend to bioaccumulate in the aquatic food chain. Mercury is most commonly released into the air from the burning of fossil fuels and other incineration then falls onto the land within precipitation. This process spreads the pollutant over a wide area. It becomes soluble in water where it is absorbed by bacteria and algae in the form of methylmercury, beginning the bioaccumulation process. The five stream segments impaired for Mercury in fish tissue were limited to three subbasins of the East Fork White River: Salt Creek, Indian Creek, and the Mt. Olive Branch of Indian Creek. Salt Creek and Indian Creek were also found to have use impairment associated with PCBs in fish tissue.

PCBs were used in electrical equipment, hydraulic fluids, heat transfer fluids, lubricants, and plasticizers. Although PCBs were banned in the United States in 1977, fish can still become contaminated if their water or food sources were contaminated in the past. PCBs can enter the stream ecosystem through spills, leaks from electrical and other equipment, and improper disposal and storage. PCBs bind strongly to soil and sediment, persisting in the environment, and can be transported long distances. A total of seven stream segments were impaired for PCBs in fish tissue. In addition to Salt Creek and Indian Creek, Patoka River and the East Fork of the White River were impaired for this.

The combined alternatives cross roughly 17 different 10-digit HUC watersheds, with alternatives individually crossing six - ten watersheds each (**Figure 3**). None of the receiving waterbodies were identified as expressing impairment from transportation sources.

Of these watersheds, four have approved TMDLs: First Creek, Prairie Creek, East Fork White River, and Salt Creek (**Figure 4**). Additionally, there are four watershed management areas which cover seven of the 10-digit HUC watersheds crossed by alternatives: Dry Branch of the Lost River, Lost River, Alter Creek, Straight River, Hunley Creek, Flat Creek, and Prairie Creek. While IDEM is responsible for creating TMDLs, Watershed Management Plans (WMPs) are developed by local sponsors, typically county soil



and water conservation districts. WMPs are independent of TMDLs but aspire to accomplish the same goal of reducing pollutant loading and to improve water quality.

FIGURE 3. 10-DIGIT HUC WATERSHEDS IN SECTIONS 2 AND 3

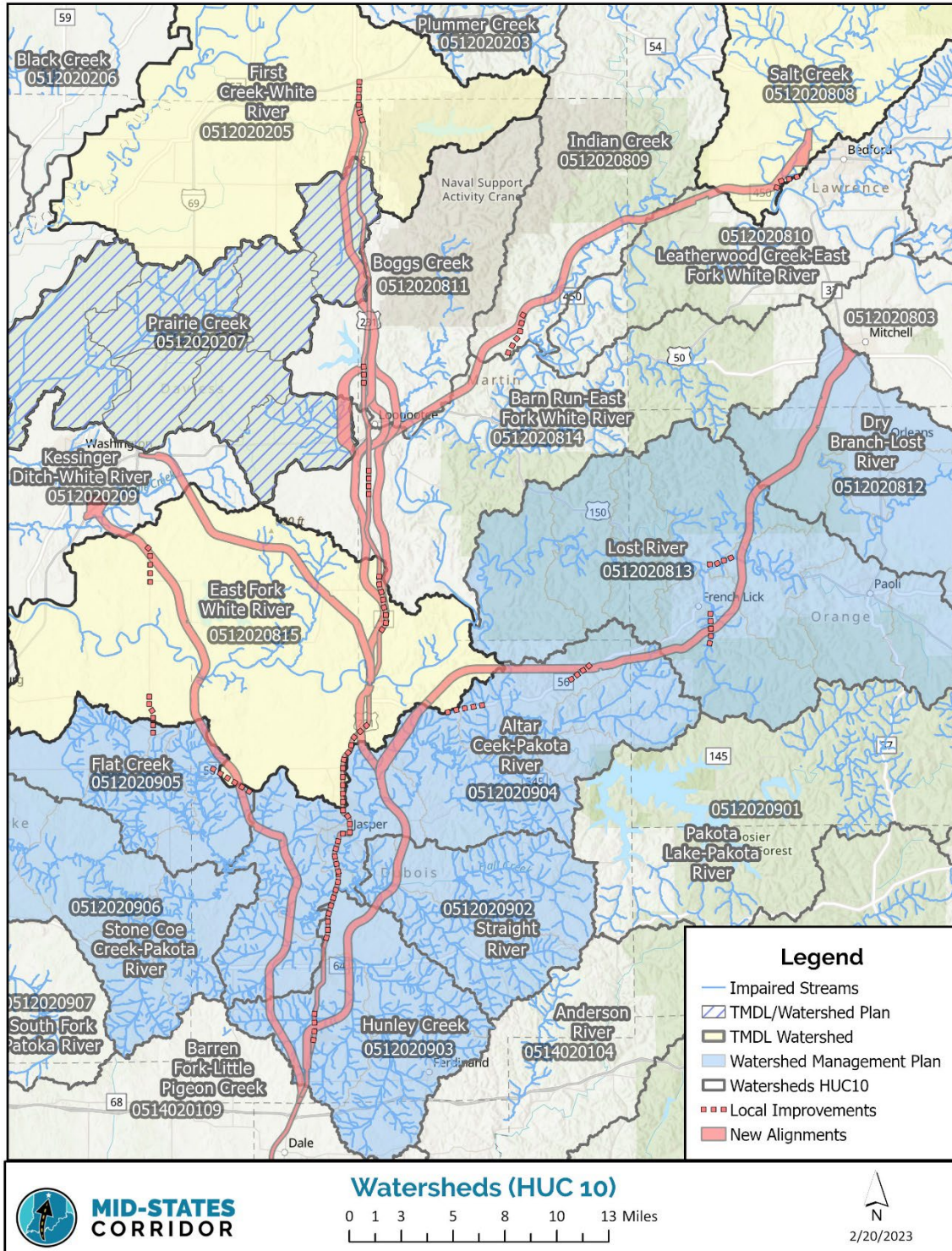
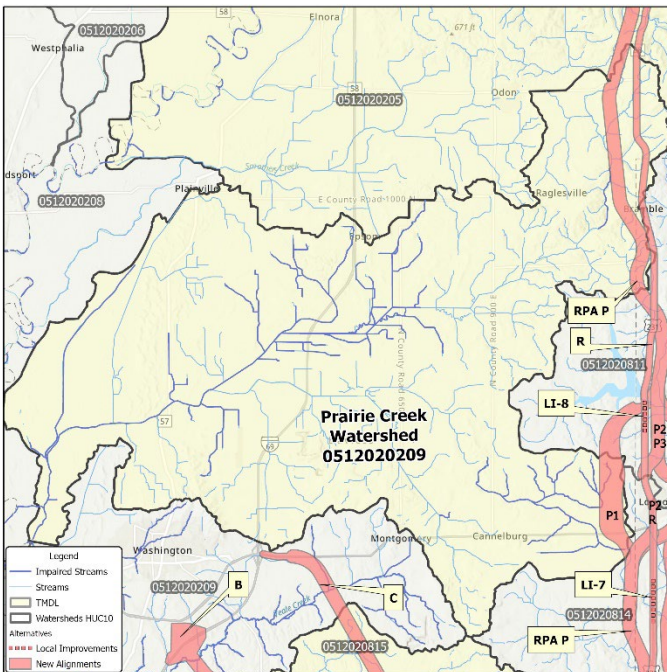
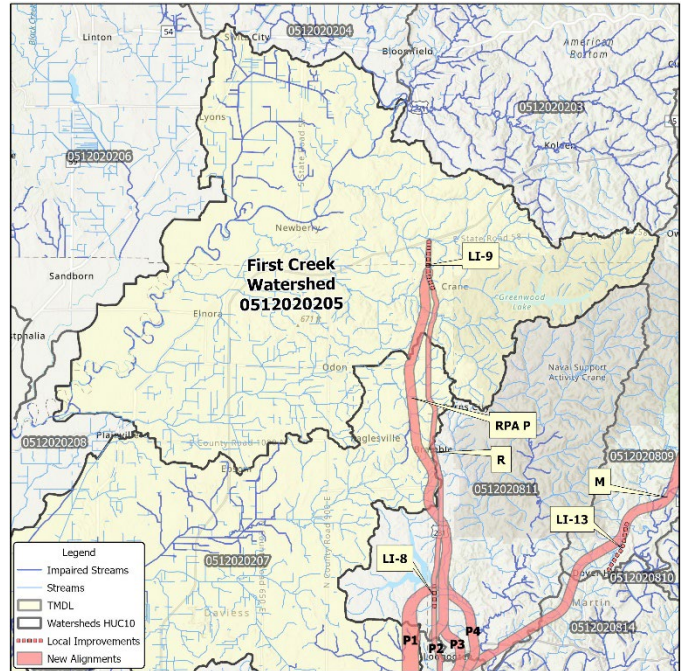
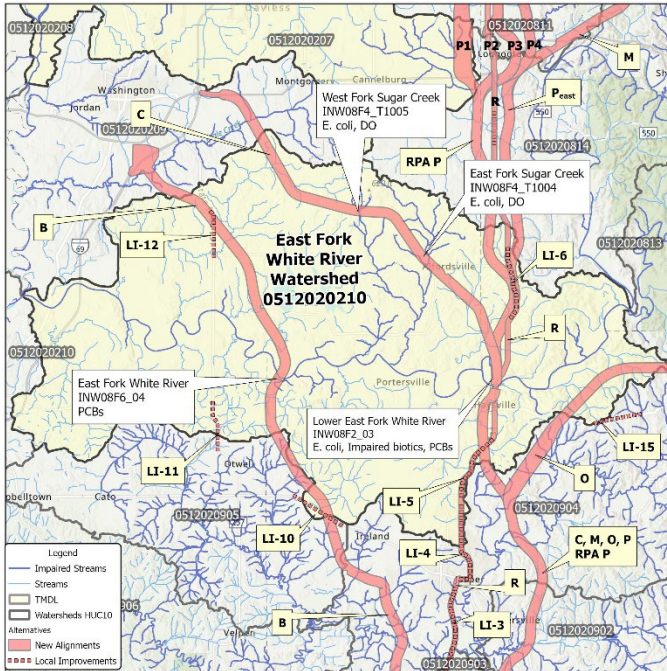




FIGURE 4. IMPAIRED STREAM SEGMENTS CROSSED WITHIN TMDL WATERSHEDS





Most stream impacts are perpendicular crossings which cause the overall number of stream segments impacted by the two facility types (expressway and Super-2) to be near equal along each alternative. **Table 1** provides the summary of the impairment associated with each AUID segment; **Table 2** provides the number of impaired segments impacted by each alternative associated with each drainage unit.

TABLE 2. NUMBER OF IMPAIRED STREAM CROSSINGS FOR EACH ALTERNATIVE.

303(d) Impaired Streams								
Impaired Stream Name	TMDL	WMP	Number of Crossings					
			B	C	M	O	p ¹	R
SECTION 2								
Altar Creek	No	Yes	1					
Bruner Creek	No	Yes		3	3	3	3	
Bruner Creek UNT	No	Yes	1	1	1	1	1	1
Buffalo Stream	No	No		6	6	2	6	
Crooked Creek	No	No	1					
Dick Creek	No	No	3					
East Fork White River	Yes	No	2					
Ell Creek UNT	No	Yes	5					
Ell Creek UNT LTD	No	Yes	1					
Flat Creek UNT	No	Yes	2					
Little Flat Creek	No	No	5					
Pat Run	No	Yes	2	2	2	2	2	2
Patoka River	No	Yes	3 - 4	3	3	6	3	1
Patoka River UNT	No	Yes	1	1	1	5	1	1
Short Creek	No	Yes	4	6	6	6	6	1
Short Creek UNT	No	Yes	3					
Straight River	No	Yes		4	4	4	4	
SECTION 2 TOTAL CROSSINGS			34 - 35	26	26	29	26	6
SECTION 3								
Boggs Creek	No	No			1			
Dillon Creek	No	Yes				1		
East Fork White River	Yes	No	1					
French Lick Creek	No	No				5		
French Lick Creek UNT	No	No				2 - 3		
Indian Creek	No	No			1			
Indian Creek Mt. Olive	No	No			5 - 6			
Leistner Creek	No	Yes				1		



303(d) Impaired Streams								
Impaired Stream Name	TMDL	WMP	Number of Crossings					
			B	C	M	O	P ¹	R
Lick Creek	No	No				3		
Lost River UNT	No	Yes				2		
Lost River OSRW	No	Yes				2		
Lower East Fork White River	Yes	No		1	1		1	1
Patoka River UNT	No	Yes				2		
Salt Creek	Yes	No			5			
Sugar Creek, East Fork	Yes	No		1				
Veale Creek	No	No	4 - 5	1				
Veale Creek UNT	No	No		1				
West Fork Sugar Creek	Yes	No		1				
SECTION 3 TOTAL CROSSINGS			5 - 6	5	13 - 14	18 - 19	1	1
TOTAL CROSSINGS			40	31	39 - 40	47 - 48	27	7

¹ P and RPA-P have the same number of crossings, variants of the alignment for RPA-P occur in Section 3 where they each share the same crossing of the White River.

Shared Alignment in Section 2, Alternatives C, M, O, P, and RPA-P

Alternatives C, M, P, RPA P and the majority of O have the same Section 2 alignments going east around Huntingburg and Jasper. Section 2 crossings account for most of the total crossings for all alternatives. Alternatives C, M, P and RPA P have the least crossings in the Patoka River Basin with 26 crossings of ten impaired stream segments listed in the 2022 303(d) report. Alternative O has 29 crossings of 13 impaired streams segments. Most of the impaired streams in the Patoka River basin are listed for levels of *E. coli* and dissolved oxygen. Bruner Creek and Buffalo Creek are also listed for nutrient levels. The Patoka River itself is additionally listed for PCB levels in fish tissue. Although most crossings are perpendicular to the channel, the alignment runs parallel to one tributary of Bruner Creek and one tributary of Straight River which could result in some channel realignment by the project. No Section 2 impacts for C, M, P, RPA P or O are within an approved TMDL watershed. Bruner Creek, Short Creek, Straight River and Patoka River are within the Middle Patoka Source Water Protection Plan, a WMP sponsored by the Alliance of Rural Water Indiana (IDEM approved 2012). The Patoka River is also in the Upper Patoka River WMP, sponsored by the Dubois County Soil and Water Conservation District (IDEM approved 2008). The Upper Patoka River WMP includes Buffalo Stream. The watershed plan completed by the Alliance of Rural Water Indiana is classified as a Source Water Protection Plan which indicates that it includes information regarding drinking water.

Alternative B

Alternative B has the most crossings in the Patoka River basin, with 32 to 33 crossings of 17 impaired stream segments. Alternative B has a unique new alignment west of Huntingburg and Jasper for all of Section 2 and 3 and is not shared with the other alternatives. It has 40 impaired crossings of 19 stream segments listed in the 2022 303(d) report. Section 2 contains 34 to 35 crossings of 18 impaired stream segments, while Section 3 contains five to six crossings of two streams. Alternative B crosses three major



basins, Patoka River, East Fork White River and West Fork White River. In Section 2, most impaired streams are listed for *E. coli* levels. Similar to the shared Eastern Corridor of the other alternatives in Section 2, Alternative B crosses Bruner Creek, Short Creek and the Patoka River. Each of these waterways runs east-west across the project area. The alignment parallels roughly a half mile of Ell Creek, a quarter mile Little Flat Creek, and 900 feet of a tributary of Veale Creek which may result in some channel realignment. The two tributaries of the East Fork White River in Section 2 and the main crossing of the East Fork White River in Section 3 are in a TMDL watershed. Bruner Creek, Ell Creek, Short Creek, Flat Creek and Patoka River are within the Middle Patoka WMP. The Patoka River is within the Middle and Upper Patoka River WMPs.

Alternative C

Alternative C has 31 crossings of 15 impaired streams. Section 2, which is shared with alternatives for M, P and part of O (described above), contains 26 crossings of ten impaired streams. Section 3, which shares a short section of alternatives for M and P but is mostly unique, has five crossings of five impaired streams. The main crossing of the Lower East Fork of the White River is impaired for PCBs in fish tissue, *E. coli* and biological integrity. At the I-69 terminus near Washington, the footprint at the interchange is estimated to cover an extended length of Veale Creek. This segment of Veale Creek is impaired for *E. coli* and may require some channel realignment. The main channels of Sugar Creek and West Fork Sugar Creek are impaired for *E. coli* and dissolved oxygen levels and are within the East Fork White River TMDL.

Alternative M

Alternative M has 33 to 34 crossings of 11 impaired streams. Section 2, which is shared with alternatives for C, P, RPA P and part of O (described above), contains 21 crossings of six impaired streams. Alternatives M and P share an alignment in Section 3 until Alternative P branches off south of Loogootee. However, no impaired stream impacts occur within this shared segment with the exception of the main Lower East Fork White River crossing at the break between Sections 2 and 3. The East Fork White River is impaired for PCBs in fish tissue, *E. coli*, and biological integrity. Section 3, including this crossing and the remainder of the section going east from Loogootee, has 13 crossings of five impaired streams. All these Section 3 303(d) streams crossed are impaired for levels of Mercury in fish tissue; Boggs Creek is impaired only for *E. coli*. Impairments for PCBs in fish tissue occurred the Lower East Fork White River, Indian Creek at Trinity Springs, and Salt Creek. Lower East Fork White River and Salt Creek also are impaired for *E. coli* and biological integrity. All crossings of these streams are perpendicular except at Salt Creek at the connection with SR 37 on the western side of Bedford. The alternative includes two approved TMDL watersheds: East Fork White River and Salt Creek. No impaired stream crossings in Section 3 are part of a WMP.

Alternative O

Alternative O has 39 to 40 crossings of 17 impaired stream segments. Section 2, which is shared with alternatives for C, M, P and RPA P (described above), and contains 26 crossings of ten impaired streams. Section 3 contains 13 to 14 crossings of seven impaired streams. All the Section 3 impaired streams are listed for *E. coli* and none of them are listed for PCB or Mercury levels in fish tissue. The Patoka River, whose tributary crosses Section 3 just south of Thales, is impaired also for dissolved oxygen levels. The Lost River and French Lick Creek are impaired for biological integrity. The alignment parallels two segments of Buffalo Stream which may require some channel realignment. These segments are impaired



for nutrient levels. Impaired streams occur in the Patoka River and East Fork White River Basins. Part of the alternative crosses the East Fork White River TMDL but none of the Section 3 streams occur within. While none of the impaired streams are within a TMDL watershed, the alternative includes three areas with WMPs: Middle Patoka River, Upper Patoka River, and Lost River. Dillon Creek and the Patoka Rivers are in the Upper Patoka River WMP while the Lost River and its tributaries are in the Lost River WMP.

Alternative P and RPA P

Alternative P has two alternative variations in how the alignments bypass Loogootee (east and west). RPA P has three alternative variations for bypassing Loogootee and one variation through Loogootee. All P variations have the same number of crossings to impaired streams: 27 crossings of nine streams. Section 3 contains only one impaired stream, the main crossing of the Lower East Fork of the White River. The East Fork White River crossing is impaired for PCB in fish tissue, *E. coli*, and biological integrity. The remainder of Section 3, from the East Fork White River Bridge to I-69 at Crane, has no impaired stream crossings. A small segment of the impaired North Fork of Prairie Creek runs parallel to the alignment of P. This stream is impaired for *E. coli* levels but is not anticipated to be impacted by the project. The western variation (P1) around Loogootee is near Flat Creek, which is impaired for *E. coli*, dissolved oxygen, and nutrients, but is not anticipated to be impacted. Boggs Creek comes near the eastern variations and is impaired for *E. coli* but is not anticipated to be impacted. The alternative includes three approved TMDLs and three watershed management plans. The TMDLs are East Fork White River, Prairie Creek and First Creek. The WMPs are Upper Patoka River, Middle Patoka River and Prairie Creek. Bruner Creek in Section 2 and the Lower East Fork White River at the break between Section 2 and 3 are the only impaired streams within a TMDL. Bruner Creek plus Straight River, Patoka River, Buffalo Stream and Short Creek are within WMPs.

Local Improvements

Table 3 provides a summary of impaired stream impacts by individual local improvement that may be a part of more than one alternative, as noted in the table.

Alternative R

Alternative R represents an upgrade of the existing alignment of US 231. This alternative contains seven crossings of six impaired streams. Although this alternative has no associated local improvements, five of the crossings are captured in LI-1, -2, and -3. The impaired streams crossed include an unnamed tributary of Bruner Creek, Short Creek, Pat Run, Patoka River and an unnamed tributary of the Patoka River, and the White River. The alternative includes three approved TMDLs and three watershed management plans. The TMDLs are East Fork White River, Prairie Creek and First Creek. The WMPs are Upper Patoka River, Middle Patoka River and Prairie Creek. Bruner Creek in Section 2 and the Lower East Fork White River at the break between Section 2 and 3 are the only impaired streams within a TMDL. Bruner Creek plus Patoka River and Short Creek are with WMPs.



TABLE 3: NUMBER OF IMPAIRED STREAM CROSSINGS FOR EACH LOCAL IMPROVEMENTS.

Local Improvements*				Impaired Stream Impacts
LI-#	Existing Road	Alternatives	Section	No. of Crossings
LI-1	US 231	B, C, M, O, P, RPA P	2	1
LI-2	US 231	B, C, M, O, P, RPA P	2	1
LI-3	US 231	B, C, M, O, P, RPA P	2	3
LI-4	US 231	C, M, O, P, RPA P	2	-
LI-5	US 231	C, M, O, P, RPA P	2	-
LI-6	US 231	M, P, RPA P	3	-
LI-7	US 231	M, P, RPA P	3	-
LI-8	US 231	P, RPA P	3	-
LI-9	US 231	P, RPA P	3	-
LI-10	SR 56	B	2	-
LI-11	SR 257	B	2	-
LI-12	SR 257	B	3	-
LI-13	SR 450	M	3	-
LI-14	SR 450	M	3	1
LI-15	SR 56	O	3	1
LI-16	SR 56	O	3	-
LI-17	SR 145	O	3	4
LI-18	US 150	O	3	2

* Local Improvements are associated with the alternatives.

Summary

Of the new alignment alternatives, Alternative P and RPA P have the least impact to impaired streams, followed closely by Alternative C. Alternatives B and M have similar total impacts, falling in the middle of the impacts rank for the alternatives. Alternative O has the greatest number of impaired stream crossings. For all alternatives, Section 2 has the most crossings with impaired streams. In Section 3, Alternatives M and O have the most crossings of impaired streams, which is consistent with the length of their centerlines and the nearby rivers. Alternative O has crossings with the Lost River, which is in sensitive karst geology. Alternative P and RPA P are generally outside known karst areas thus are not anticipated to have the potential to impact water quality resources. Alternative R would include no new crossings of impaired streams; however, the roadway improvements would still require construction within streams. Review of the 303(d) list indicates impairments are predominantly associated with agricultural runoff. It is not anticipated that stormwater runoff from the transportation corridor would contribute to an increase in the impairments identified for 303(d) listed streams in the study area.