



5.18 Floodplain Impacts

5.18.1 Introduction

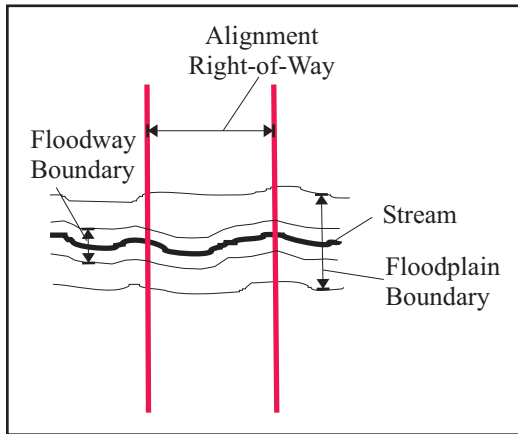


Figure 5.18-1: Latitudinal Floodplain Encroachment

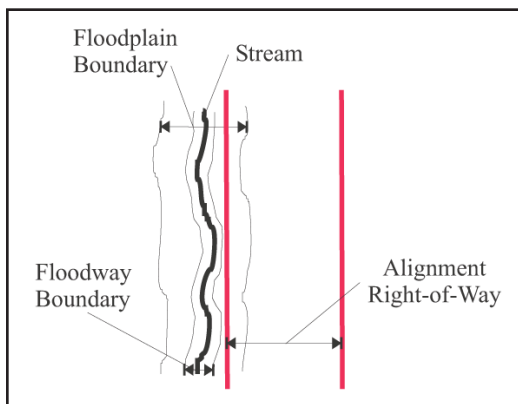


Figure 5.18-2: Longitudinal Floodplain Encroachment



Figure 5.18-3: Photograph of the White River "Backwater" Floodplain

Floodplains are a vital part of the river or stream ecosystem. They are important because they act as flood buffers, water filters, nurseries, and are major centers of biological life in the river or stream ecosystem. They are important for maintenance of water quality as they provide fresh water to wetlands and backwaters, dilute salts and nutrients, and improve the overall health of the habitat of many species of birds, fish, and plants. They are important biologically as they represent areas where many species reproduce and are important for breeding and regeneration cycles.

A floodplain is defined as the area around a stream or river that frequently floods during heavy rain. The 100-year floodplain was analyzed for this project. This is the area around the streams and rivers that will be under water whenever the 100-year storm occurs. Floodplains are composed of two general areas (see Figures 5.18-1 and 5.18-2). The first area is the floodway, which is the channel of a river or stream and those portions of the floodplain adjoining the channel which are reasonably required to efficiently carry and discharge the peak flow of the regulatory flood (100-year flood) of any river or stream. The second area is the remaining area of the floodplain, which is often referred to as "backwater." This "backwater" area is essentially a holding area providing storage of floodwater. Figure 5.18-3 shows a typical example of a "backwater" floodplain area.

Projects that directly cross or are adjacent to a stream or river will have some kind of floodplain encroachment. When a project crosses directly over a stream or river, it is referred to as a latitudinal floodplain encroachment (Figure 5.18-1). Likewise, when a project is located adjacent to a stream or river it is referred to as a longitudinal floodplain encroachment (Figure 5.18-2). Each of the alternatives has both latitudinal and longitudinal floodplain encroachments. Because a latitudinal floodplain encroachment has a higher probability of affecting the floodway of a stream or river, latitudinal floodplain encroachments have a greater overall impact than longitudinal floodplain encroachments. Impacts to floodplains require various permits, which are described in Section 5.25, *Permits*.

Since the publication of the DEIS, the following changes have been made to this section:

- Impacts calculations have been updated to reflect the selection of variations, route shifts and other changes, as described in Section 5.1.3.
- Commitment to bridge the Patoka River and Flat Creek floodplains.



5.18.2 Methodology

The approximate linear feet of each floodplain crossed by each of the alternatives was derived from measuring the approximate length of floodplain crossed by the working alignment. This data came from the Geographical Information System (GIS) layer titled “floodplain_sw”, which was derived from the book titled The Indiana Water Resource: Availability, Uses and Needs published by the Indiana Department of Natural Resources (Clark, 1980). To verify the floodplain areas used for this analysis, the larger floodplain areas were cross-referenced with the Federal Emergency Management Agency (FEMA) maps and showed approximately the same floodplain area. For more information on the use of the GIS and on the methodology, see Sections 4.1, *GIS Approach* and 5.1, *Methodology*, respectively.

The floodplains were split into two different categories: (1) floodplains with a latitudinal encroachment (alignment goes across the stream or river) and (2) floodplains with a longitudinal encroachment (alignment is located adjacent to the stream or river, but never crosses it). In general, the latitudinal floodplain encroachments will have a greater potential for floodplain impacts than the longitudinal encroachments because the latitudinal encroachments have a much greater chance of affecting the floodway.

In addition, each floodplain encroachment within the working alignment was analyzed to identify the potential amount of acres that may be impacted by each of the alternatives. The GIS “floodplain_sw” layer was used for this calculation. The working alignment for each alternative ranged from approximately 240 to 470 feet, and included a 500-foot radius for potential interchanges. These areas did not include floodplain encroachments located within the existing US 41 and/or SR 37 right-of-way.

5.18.3 Analysis

The five alternatives were compared for (1) latitudinal floodplain encroachments measured in linear miles, (2) longitudinal floodplain encroachments measured in linear miles, and (3) potential floodplain acres to be impacted measured within the working alignments. The Patoka River and Flat Creek Floodplains will be bridged in their entirety to minimize floodplain impacts in these areas. Table 5.18-1 shows the results of the analysis. A map showing the alternatives and floodplains along with individual tables showing the potential floodplain impacts for each alternative may be found in Appendix J.

The results of this analysis show that Alternative 5A has the highest amount of potential latitudinal floodplain impacts followed by Alternatives 4C, 5B, 4B, 4A, 3A, 2C, 3C, 3B, 2B, and 2A respectively. Alternative 1 has the least amount of potential latitudinal floodplain impacts. A comparison of longitudinal impacts shows that Alternative 2C has the highest amount of potential longitudinal impacts followed by Alternatives 2B, 2A, 1, 4C,

Alternatives	Criteria		
	Latitudinal Impacts (linear miles)	Longitudinal Impacts (linear miles)	Potential Impacts* (acres)
Alternative 1	11.1	12.0	370-470
Alternative 2A	17.2	16.8	1010-1100
Alternative 2B	17.6	18	1070-1160
Alternative 2C	21.0	27.5	1550-1640
Alternative 3A	21.6	1.5	880
Alternative 3B	18.6	5.8	810
Alternative 3C	19.8	6.1	830
Alternative 4A	22.0	4.2	980
Alternative 4B	22.3	5.4	1050
Alternative 4C	25.3	9.0	1520
Alternative 5A	26.4	2.6	1190
Alternative 5B	23.4	7.5	960

* Floodplains areas measured from the GIS that are located within the working alignment excluding the floodplains located within the existing US 41 and/or SR 37 right-of-way



I-69 Evansville to Indianapolis

Final Environmental Impact Statement

5B, 3C, 3B, 4B, 4A, and 5A respectively. Alternative 3A has the least amount of potential longitudinal floodplain impacts. Total acres of potential floodplain impacts associated with both latitudinal and longitudinal impacts shows that Alternative 2C has the highest amount of potential floodplain acres being impacted followed by Alternatives 4C, 5A, 2B, 4B, 2A, 4A, 5B, 3A, 3C, and 3B respectively. Alternative 1 shows the least amount of potential floodplain acres impacted. The No Build Alternative would have no impacts on floodplains.

5.18.4 Mitigation

As discussed above, FHWA and INDOT are committing to bridge the floodplains of the Patoka River and Flat Creek, and will consider bridging additional floodplains in Tier 2. In addition, efforts have been made throughout Tier 1 to avoid and minimize impacts on floodplains in the development of alternatives.

Where floodplain impacts cannot be avoided, they are minimized and mitigated by designing the project to ensure that waterway openings of structures crossing the floodplain provide sufficient capacity for floodwaters. All structures constructed as part of this project will be designed to accommodate, at a minimum, a 100-year flood volume, in accordance with standard design practices.

5.18.5 Summary

The results of this analysis show that of the alternatives, Alternative 1 encroaches the least amount of linear miles of latitudinal floodplains, while Alternative 5A encroaches the greatest amount of linear miles of latitudinal floodplains. This analysis also shows that Alternative 3A encroaches the least amount of longitudinal floodplains, while Alternative 2C encroaches the greatest amount of longitudinal floodplains. This analysis indicates that as the topography increases from a flat landscape to a more hilly landscape, the amount of longitudinal floodplain encroachments decreases.

The overall results of the floodplain analysis show that Alternative 1 has the potential to encroach upon the least amount of floodplains compared to the other 11 alternatives. This analysis also showed that Alternative 1 has the least amount of potential floodplain acres within the working alignment and that Alternative 2C has the highest amount of potential floodplain acres within the working alignment. This analysis does not take into consideration the amount of floodplain areas located within the existing US 41 and/or SR 37 right-of-way. The No Build Alternative will have no impacts on floodplains.

Because the proposed bridges over waterways will be designed to perform hydraulically in a manner equal to or greater than the backwater surface elevations, they would not be expected to increase these backwater surface elevations. The new bridges will be designed to “pass” the 100-year floodway volume with adequate clearance under the structures. The I-69 project is not expected to have any material impacts to the floodplains located within the alternatives. After Tier 2 NEPA studies, during design, permits will be obtained from the appropriate resource agencies.

Preferred Alternative 3C crosses approximately 19.8 linear miles of latitudinal floodplains and 6.1 miles of longitudinal floodplains. This equates to a total of approximately 830 acres of floodplain being crossed by Preferred Alternative 3C. These numbers do not take into consideration the amount of floodplains that will be bridged. Specifically, both the Patoka River and Flat Creek will be bridged in their entirety. The exact amount of floodplains being impacted by Preferred Alternative 3C will be completed in the Tier 2 NEPA studies.



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