



Cedar Prairie Trail Bridge Replacement

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Project Location and Background

The Trail Bridge Replacement Project is in Waterloo, Iowa along the Cedar Prairie trail. The existing trail cross is over Black Hawk Creek and Prescott's Creek adjacent the Robinson Bird Sanctuary. The purpose of the project is to replace two existing bridges that are experiencing significant deterioration such as corrosion and rot, that is diminishing the safety of the bridges, and causing debris buildup that is restricting the waterway.

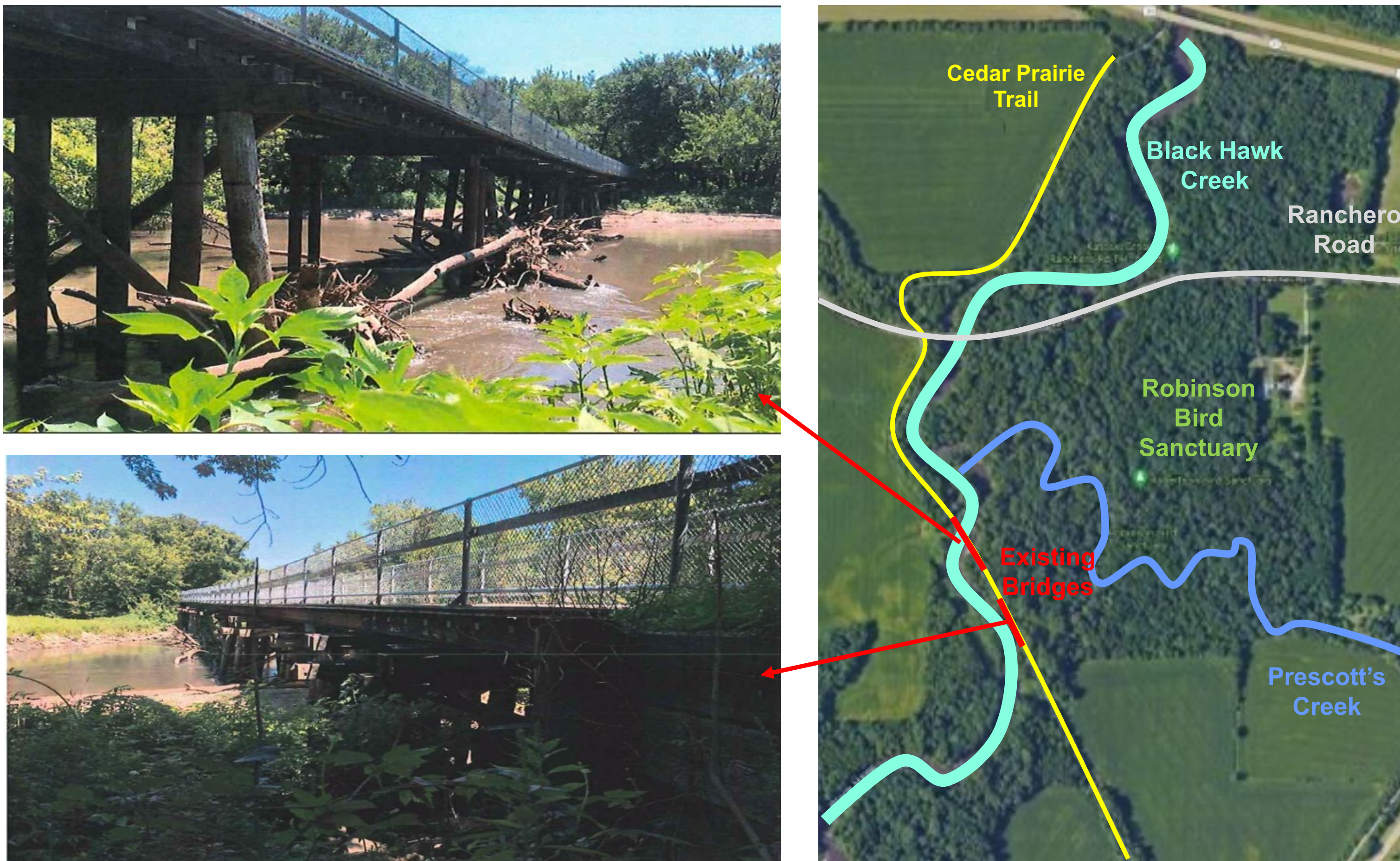


Figure 1. On the left are images of the two existing trail bridges. The right image is the project site with key markers.

Eastern Trail Alignment

Our second proposed design alternative replaces both bridges with a singular bridge to the east of Black Hawk Creek crossing Prescott's Creek within the Bird Sanctuary. The trail crosses Rancho Road and then moves south through the bird sanctuary. The bridge crosses Prescott's Creek with a span of 38 ft. For this alternative, a prefabricated bridge was used from Contech Engineered Solutions using a Link Truss design. The bridge is again composed of concrete foundations and abutments, weathering steel structural members, and a wood deck.

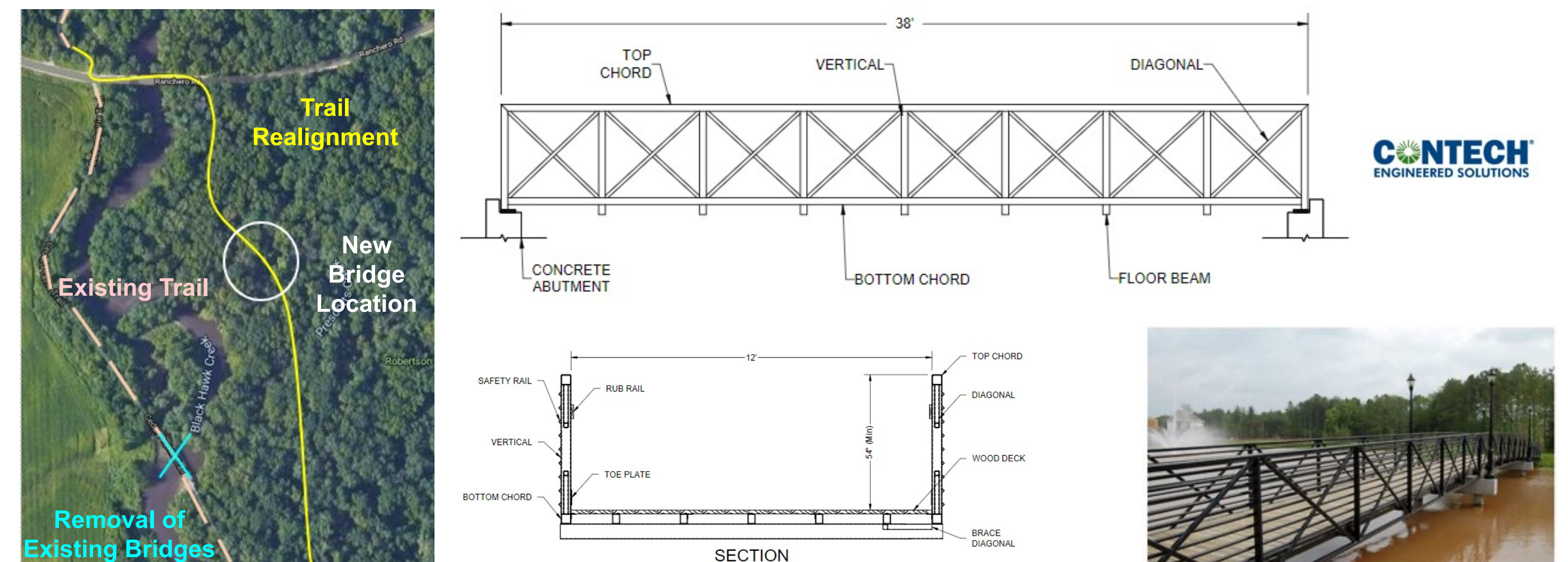


Figure 3. Design plan for Western Bridge Alternative including the alignment and bridge design.

Hydraulic Analysis

Both new trail alignments are in the two-year and five-year floodplain. Therefore, for the change in alignments and location of the bridges, a hydraulic analysis was conducted to determine how the site modifications will impact the flow of Black Hawk Creek. The analysis showed that both trails will experience flooding on a regular basis. However, utilizing Rancho Road to Sergeant Road Trail makes the flooded areas avoidable.

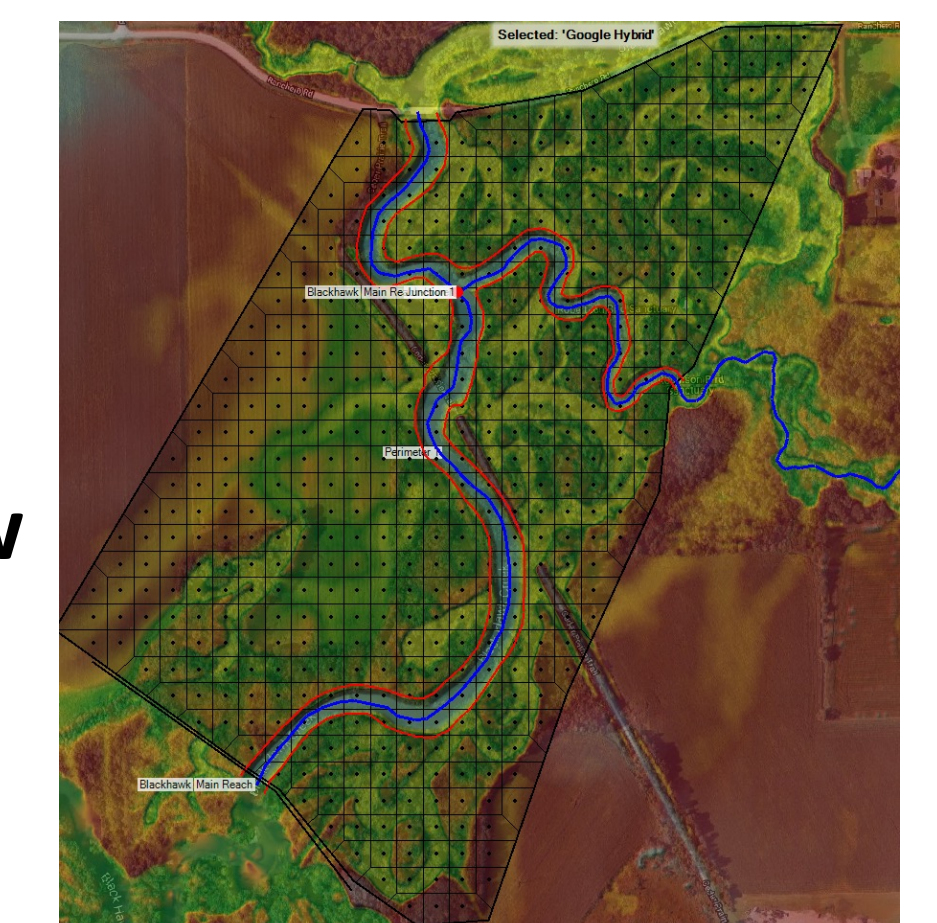


Figure 4. HEC-RAS Model of the existing project site.

Final Recommendation

We recommend pursuing the Eastern Trail Alignment. The alternatives were compared on several criteria shown below in Table 1. They were then weighted from 0-1 on importance, and then each alternative was rated from 1-5 on how well they met that criteria. The main criteria was the cost estimate of each alternative. It was estimated that the Western Bridge Alternative will cost approximately \$521,500, and the Eastern Bridge Alternative will cost \$209,500, making it significantly more cost effective.

Table 5. Decision Matrix for preliminary design options.

Evaluation Criteria	Weight	Western Alignment	Eastern Alignment
Cost	0.7	2	5
Flooding	0.5	2	1
Removal of Trees	0.2	3	1
Ease of Construction	0.5	4	4
Pedestrian Experience	0.3	3	4
Client Preference	0.4	4	5
Weighted Total		7.5	9.4

Western Trail Alignment

Our first proposed design alternative replaces both bridges with a singular bridge further south on Black Hawk Creek. The trail moves south along the creek on the west side of the bank. The bridge crosses Black Hawk Creek at a span of 130 ft. The bridge is constructed using concrete foundations and abutments, steel framing, and a wood deck.

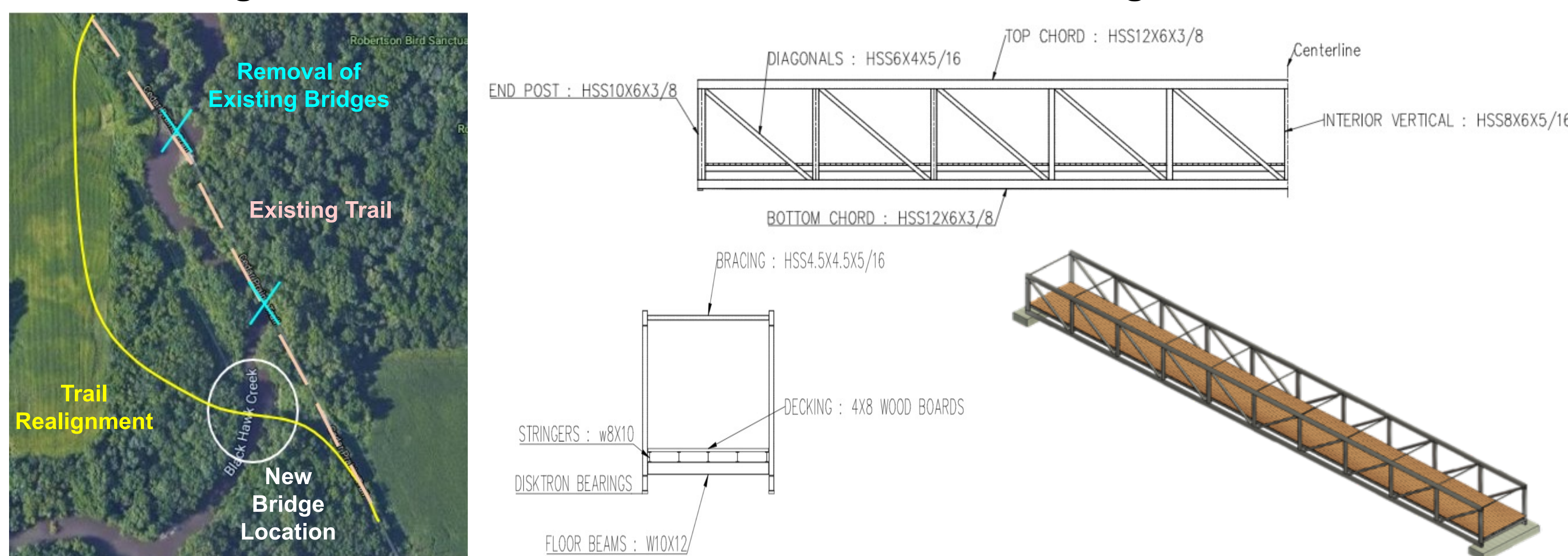


Figure 2. Design plan for Western Bridge Alternative including the alignment and bridge design.