

Date:	April 24, 2020
Project:	HNTB I-69 Lansing: Drainage/Strom Sewer Design, Stormwater Treatment/LID, Wetland Mitigation/Water Retention
Submittal:	Final Report
Re: CEE 4905	Senior Design Spring 2020



1400 Townsend Drive
Houghton, MI 49931

LETTER OF TRANSMITTAL

To: Pierce Treend
HNTB

Copy to: Melanie Kueber Watkins
Michigan Technological University

Attn:

WE ARE SENDING YOU: Attached Under separate cover

via hand the following items:

Final Report

- | | | |
|--|---|---|
| <input type="checkbox"/> For payment | <input type="checkbox"/> Approved as submitted | <input type="checkbox"/> Resubmit copies for approval |
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REMARKS:

Our mission is to allow for successful completion of updating the existing infrastructure while ensuring compliance with Michigan Department of Transportation (MDOT, Environment, Great Lakes & Energy (EGLE), conserving wetlands, and implementing low impact development (LID). Out of the five culverts of interest that were identified in our beginning stages, encompassed within four drainage areas, we are recommending that the west culvert in the Rall and Watson drain be replaced. We prepared a Soil Erosion and Sediment Control Plan to be enacted for when the construction occurs. Thank you to our client, HNTB, and to Melanie Kueber Watkins for guiding us through this process.

This report, titled “Final Report: HNTB I-69 Reconstruction - Environmental” represents the efforts of undergraduate students in the Civil and Environmental Engineering Department of Michigan Technological University. While the students worked under the supervision and guidance of associated faculty members, the contents of this report **should not** be considered professional engineering.

Signed by principles in charge,
Kyle Danko, Rachel Bouchey, Julia Manzano, and Katelyn Zelinski

of **KKRJ Consulting**

If enclosures are not as noted, kindly notify us at once.



Final Report

HNTB I-69 Reconstruction - Environmental

1.0 EXECUTIVE SUMMARY

This report encompasses information collected and created by KKRJ Consulting for the drainage/storm sewer design, stormwater treatment/LID, wetland mitigation/water retention aspects of the reconstruction of I-69 in Lansing, Michigan, specifically from I-96 to Airport Road. After investigation of the area covered by the project scope, five culverts are deemed to be significant. These five culverts fall within four drainage areas- Watson and Summers, Rall and Watson (contains an east and west culvert), Rhine, and Aldrich. ArcGIS Pro is used to delineate each drainage area in order to obtain the total acreage along with the acreage of each identified land use area. The Rational Method is utilized to determine the 50-year storm event discharge rate for each drainage area, with the rainfall intensity value coming from the National Oceanic and Atmospheric Administration's Precipitation Frequency Estimate chart for Michigan. The 50-year discharge rate is used as that is what is required by the Michigan Department of Transportation Drainage Manual. These discharge rates, along with the properties of the existing culverts, are entered into HY-8 for a hydraulic analysis of the existing infrastructure. This allows for visualization of the culverts and their respective water level during a 50-year storm, along with numerical values for this in addition to the discharge that the specific culvert will overtop at. It is determined that none of the culverts as they currently stand will overtop during a 50-year storm event. Data from a Video Survey and Condition Assessment that was performed in 2017 is obtained and within it recommends that the west culvert in the Rall and Watson drain eventually be replaced. KKRJ is recommending that these both be done while corresponding to the timeline that Copper Country Bridge and Road plans to follow for road reconstruction. A Soil Erosion and Sediment Control Plan is prepared and includes the utilization of turbidity curtains, sediment traps, and silt fencing. The turbidity curtains are to be placed on the bank of the drains, sediment traps located at the end of each drain, and silt fencing on either side of the roads being worked on. All soil and sediment control measures will only be taken into effect within the right of way. Low impact development options are considered, specifically the use of wet swales, with the intention of minimizing stormwater runoff. It is estimated that the aspects of this project evaluated by KKRJ will cost \$2,336,303.19, with the removal and replacement of the underdrains being the largest factor at 84% of the total cost.