

144 Avenue N.W. Improvements – Sage Hill Bridge

Oliver Buchner; Hayden Luger; Gurkanwalpreet Singh; Reyvileen Soriano; Selena Tang; Jessica Thi; Anush Thomas; Alexis Tutt

GRAHAM

ISL

SCHULICH
School of Engineering



Project Overview

Ongoing urban growth in Calgary's north-west community of Sage Hill has led to the need for additional infrastructure to support the influx of vehicle and pedestrian traffic in the area. This includes the extension of 144 Ave NW from Symons Valley Road to Panorama Road including a four-lane bridge over West Nose Creek. As a team, we divided into two groups - one structural and one project management - to tackle both aspects of this design-build style project.



Material and Methods

Material:

- 45 MPa High Performance Concrete
- 350 MPa G40.21 Steel
- 400 MPa Reinforcement Steel
- A490M High Strength Bolts
- Steel Handrails

Methods:

- Simplified Analysis
- SAP 2000 Modeling
- CSiBridge



Cost and Duration

Estimated Cost: \$11.8 million Construction

Duration: 1 year & 3 months



Design Moments



- Points indicate Bending Moments at midspan and field splices

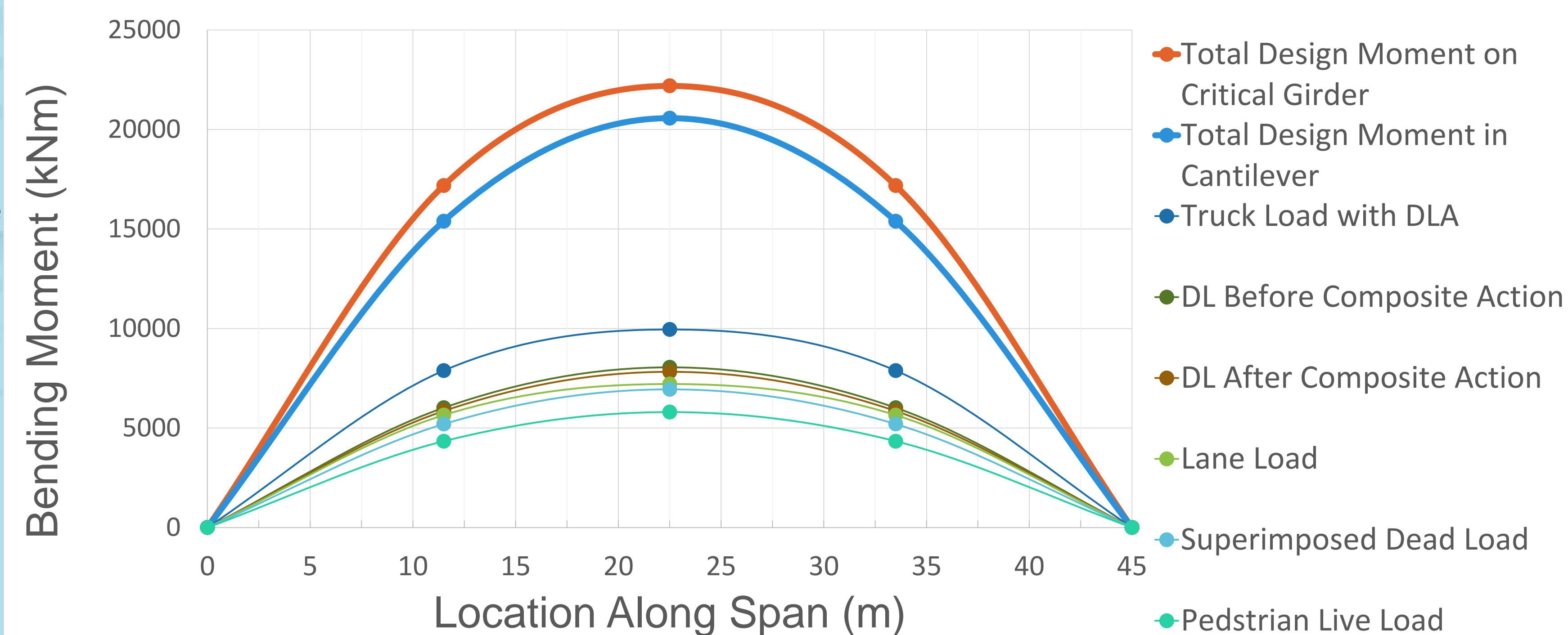
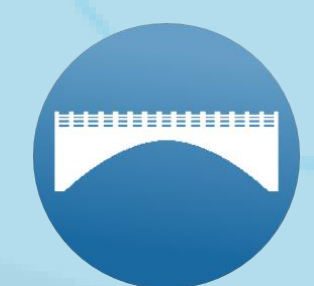
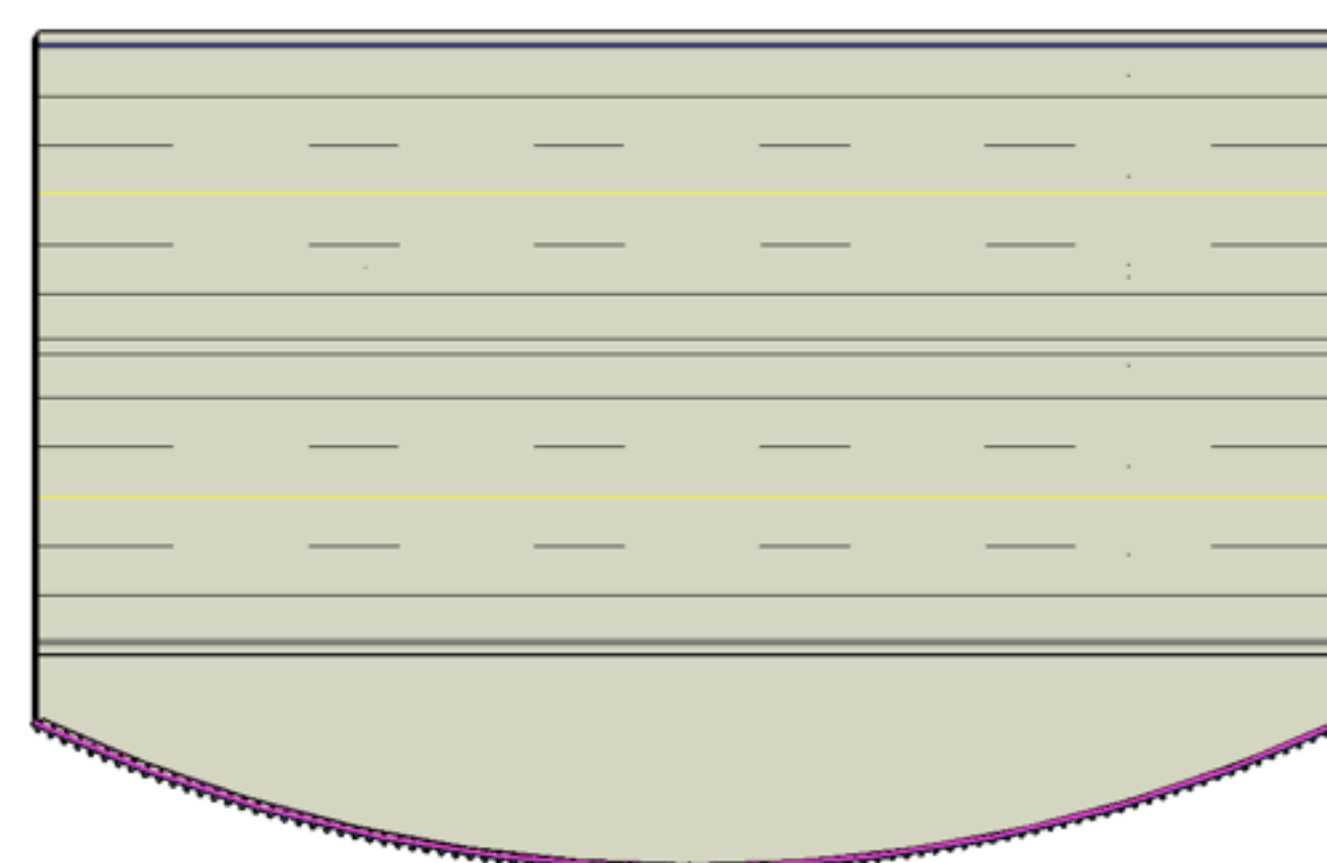


FIGURE 4: ULS BENDING MOMENT OF CRITICAL GIRDER

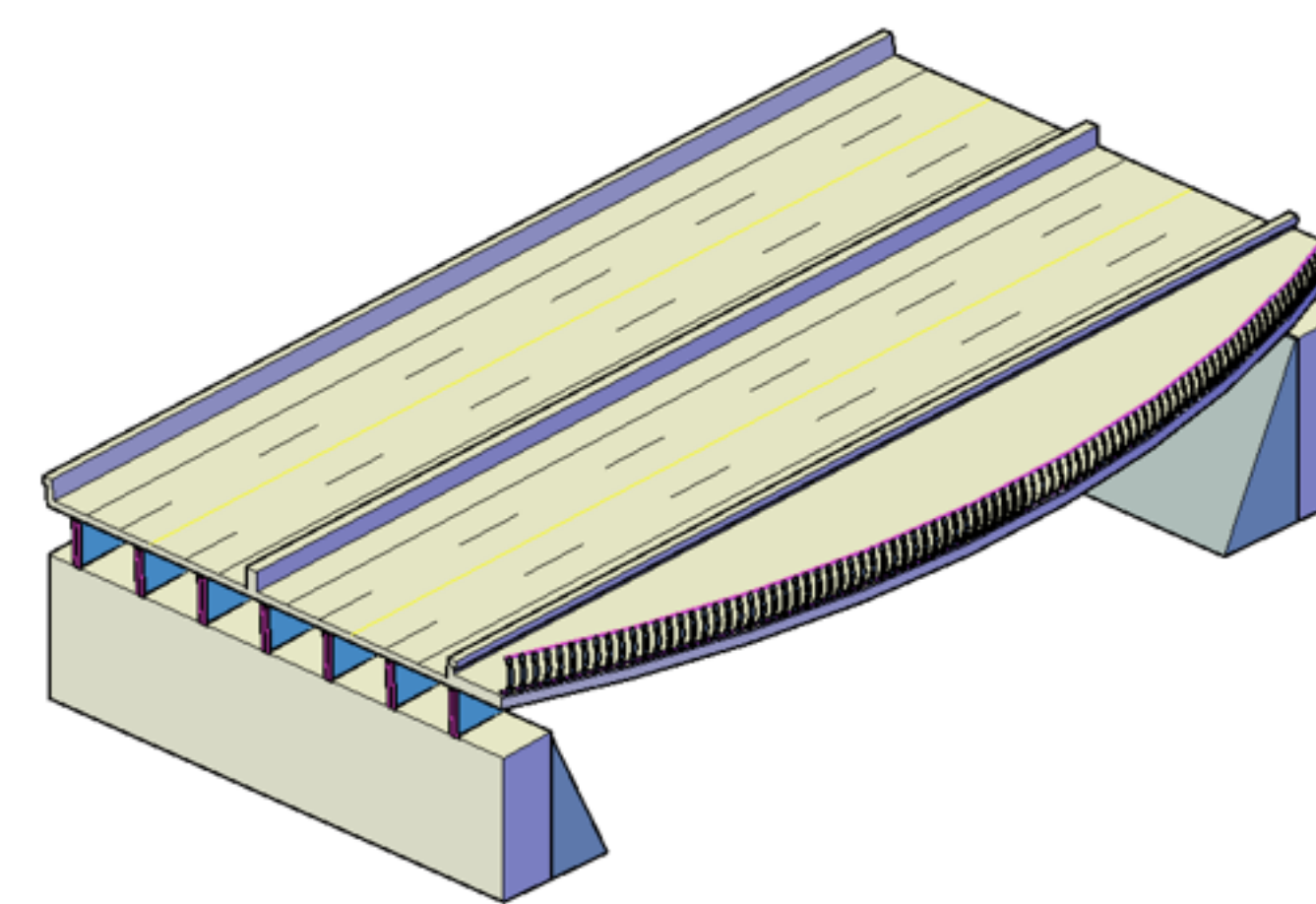


Steel Girder Bridge

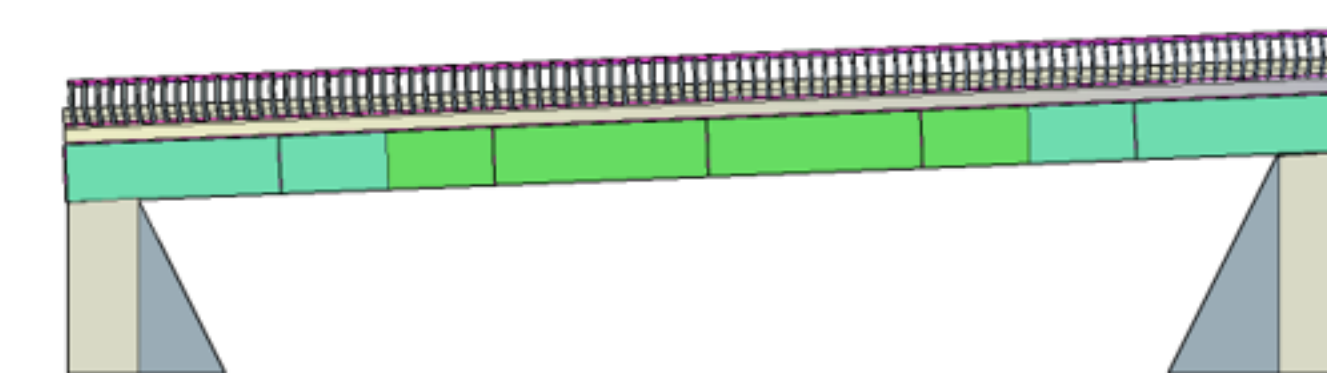
ORTHOGRAPHIC VIEWS



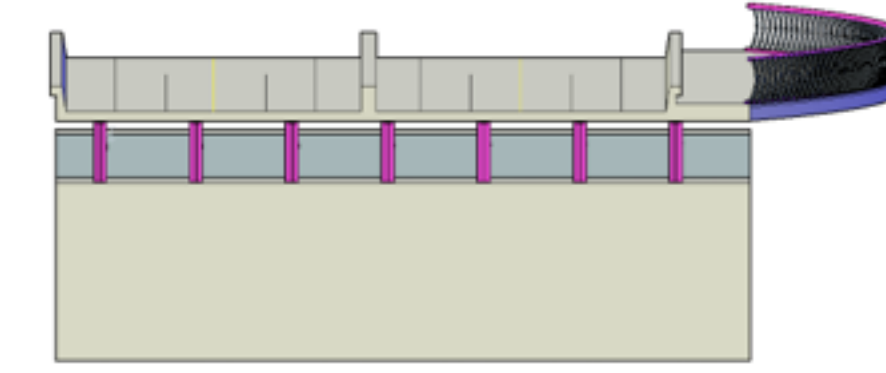
PLAN VIEW



ISOMETRIC VIEW



ELEVATION VIEW



SECTION VIEW

FIGURE 1: GENERAL ARRANGMENT OF BRIDGE

CONSTRUCTION SITE



FIGURE 2: TEAM PHOTO ONSITE

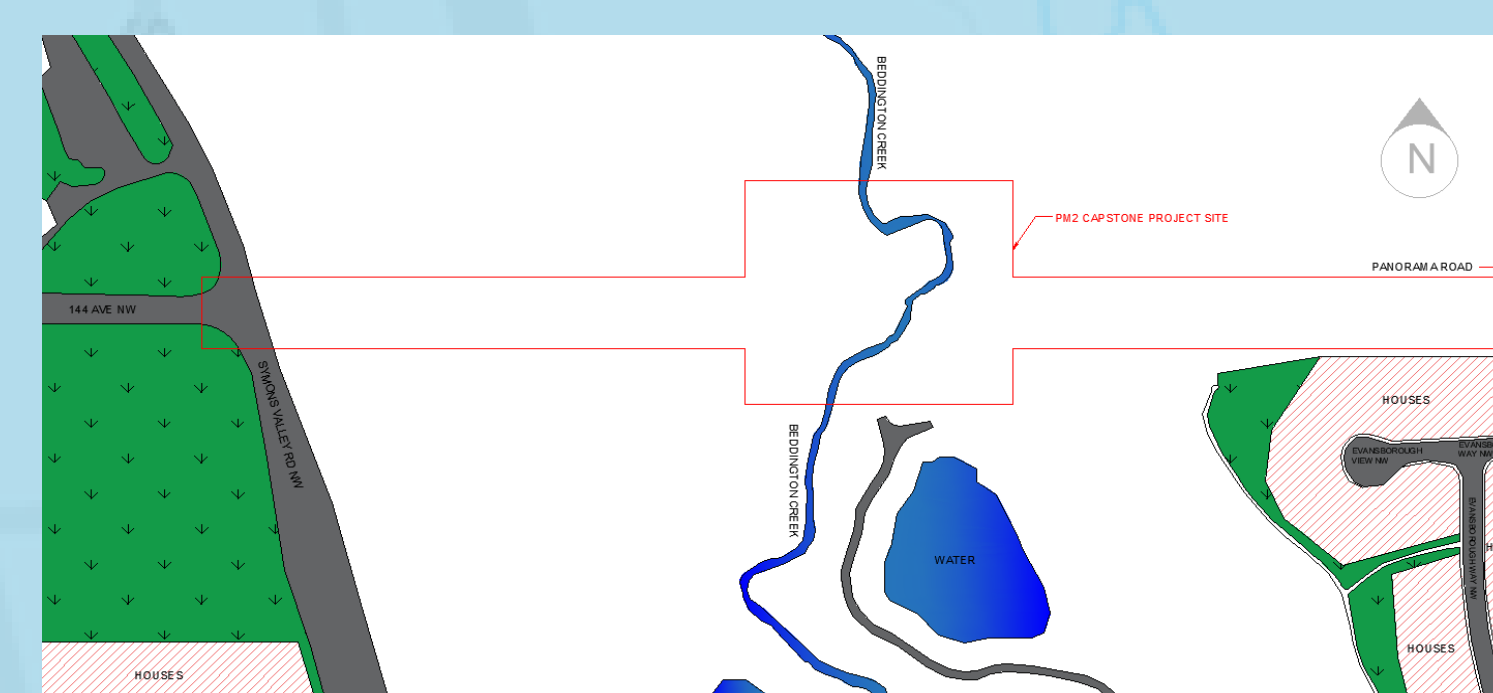


FIGURE 3: PLAN VIEW OF SITE

Creek Alignment PHASE 1

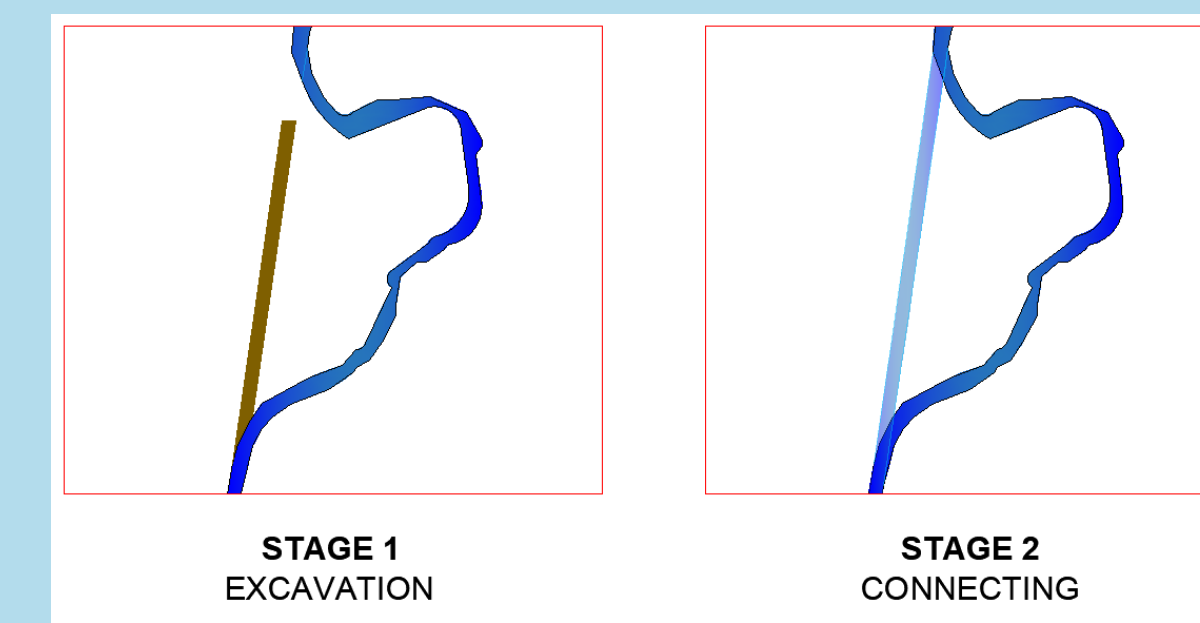


FIGURE 5: STAGE 1 & 2 OF CREEK ALIGNMENT

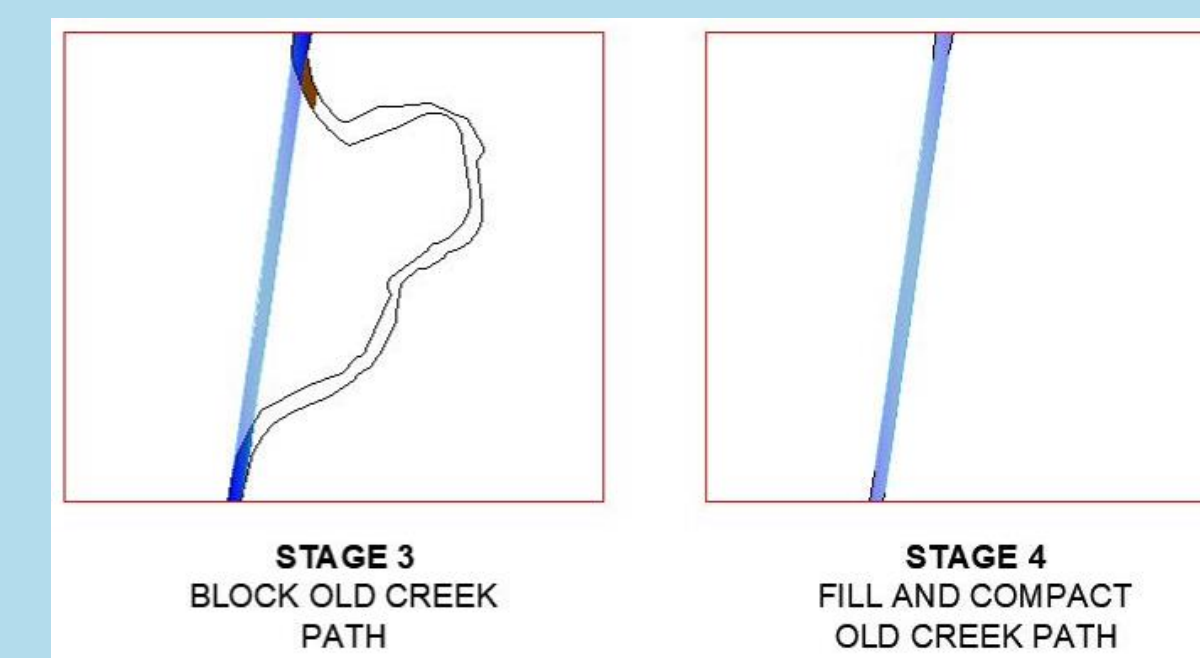


FIGURE 6: STAGE 3 & 4 OF CREEK ALIGNMENT

Earthworks PHASE 2

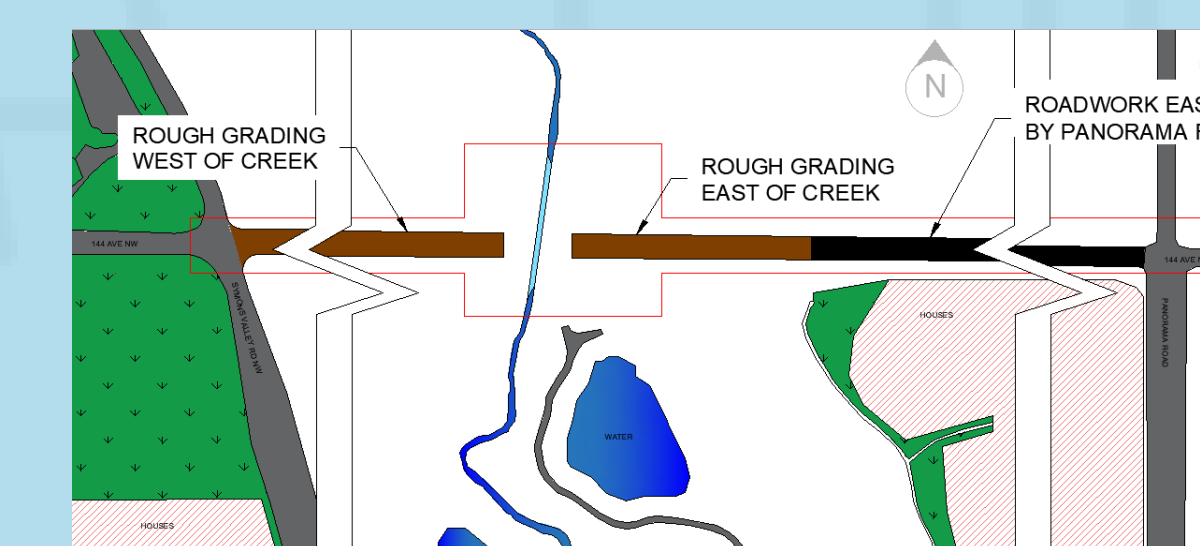


FIGURE 7: STAGE 1 - PLAN VIEW
ROUGH GRADING WEST + EAST OF CREEK
ROADWORK EAST BY PANORAMA ROAD

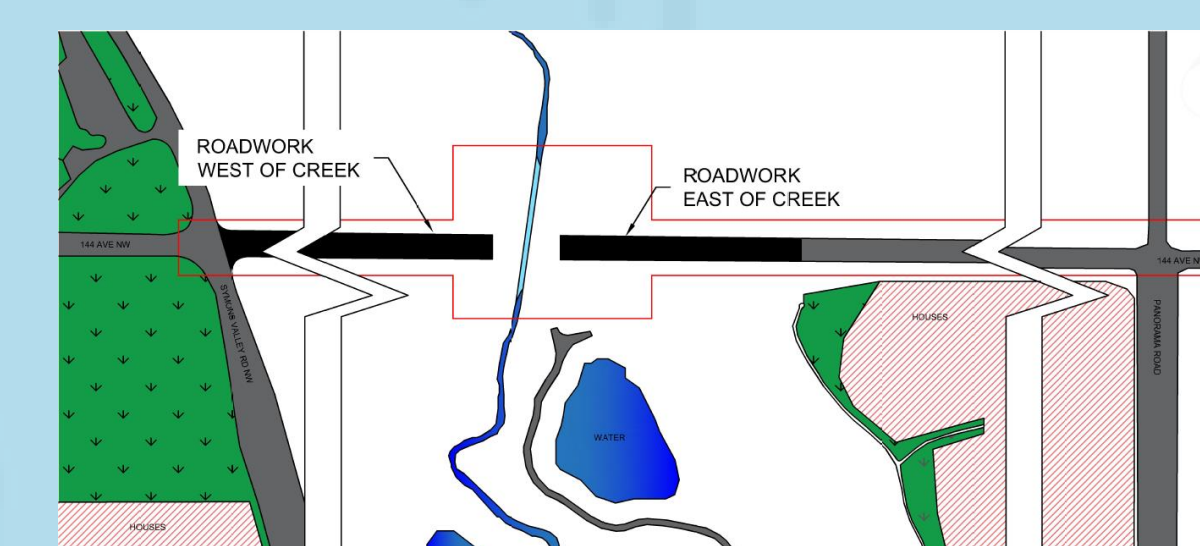


FIGURE 8: STAGE 2 - PLAN VIEW
ROADWORK WEST + EAST OF CREEK



Bridge Construction PHASE 3

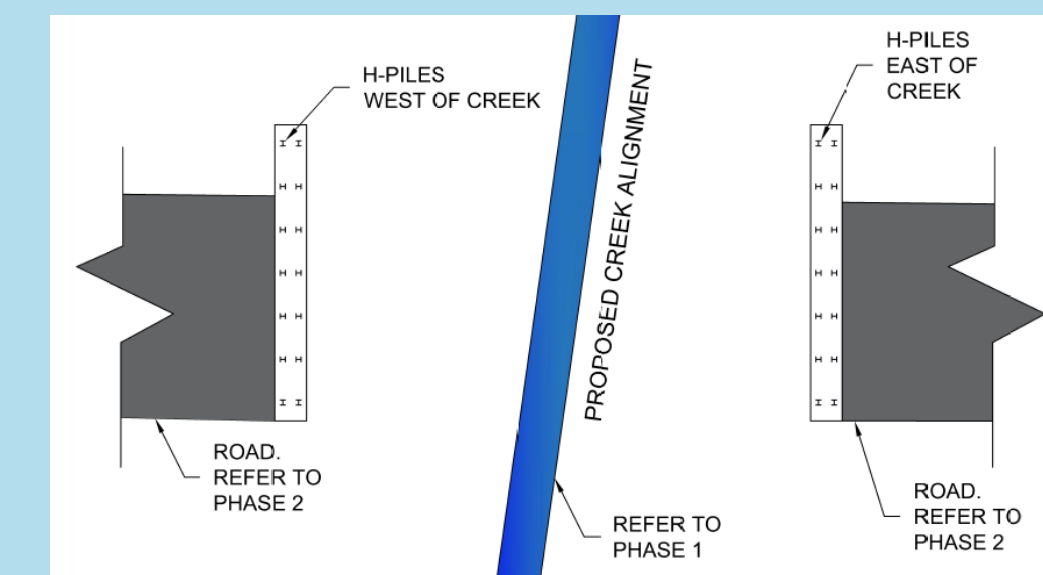


FIGURE 9: STAGE 1 - PLAN VIEW
PILING (14 H-PILES PER SIDE)

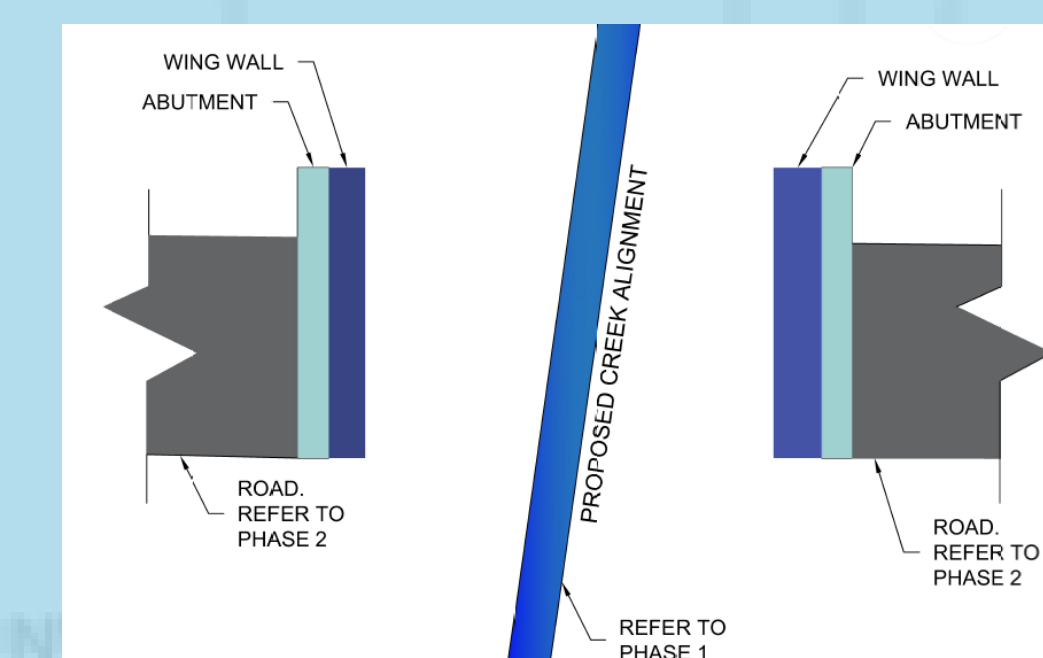


FIGURE 10: STAGE 2 - PLAN VIEW
ABUTMENT AND WINGWALL WEST SIDE
THEN ABUTMENT AND WINGWALL EAST SIDE

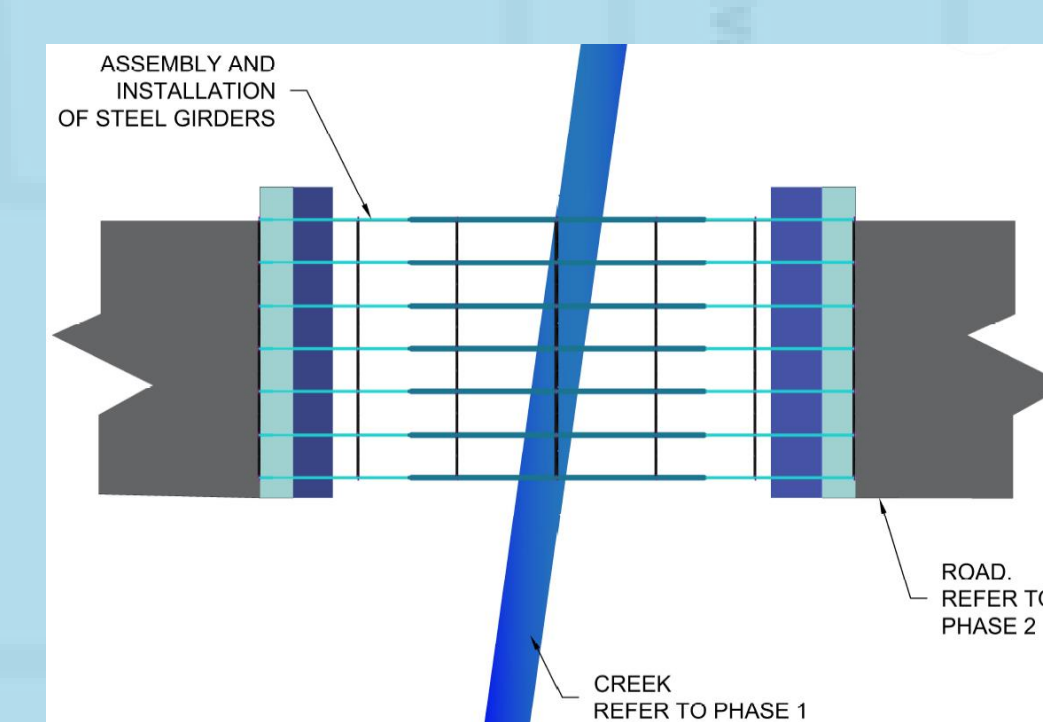


FIGURE 11: STAGE 3 - PLAN VIEW
ASSEMBLY OF 7 STEEL GIRDERS ON SITE, AND
INSTALLATION

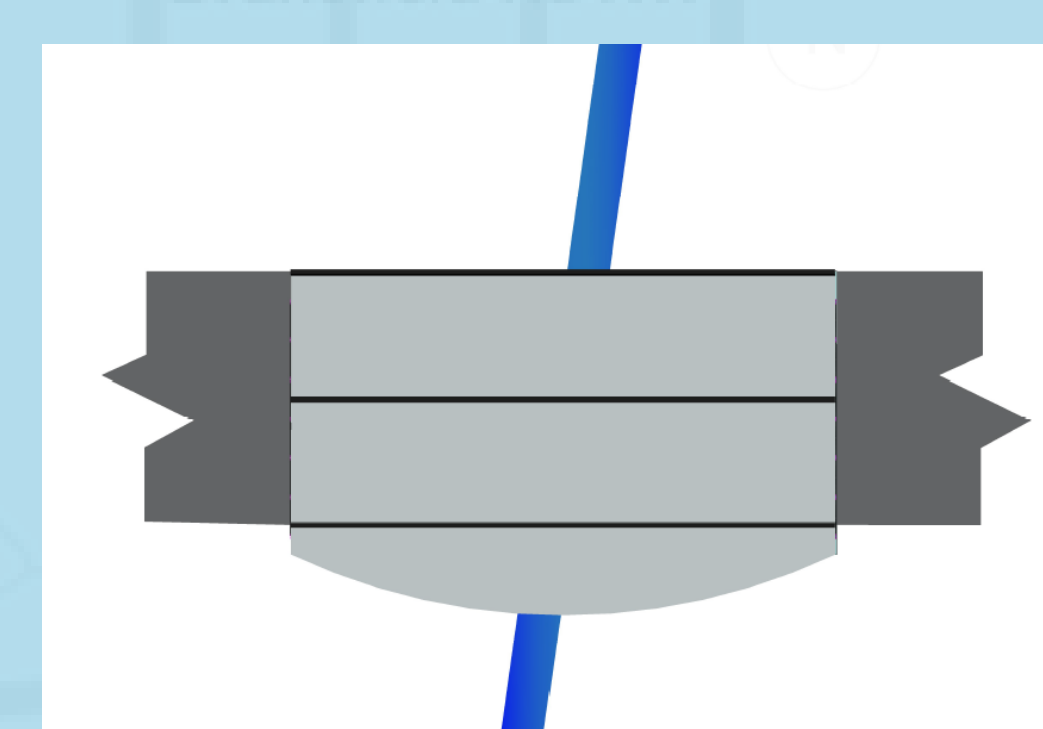


FIGURE 12: STAGE 4 - PLAN VIEW
CONSTRUCTION OF OVERHANG, DECK (2 STAGES
OF CONCRETE POUR), BARRIERS, AND MEDIAN

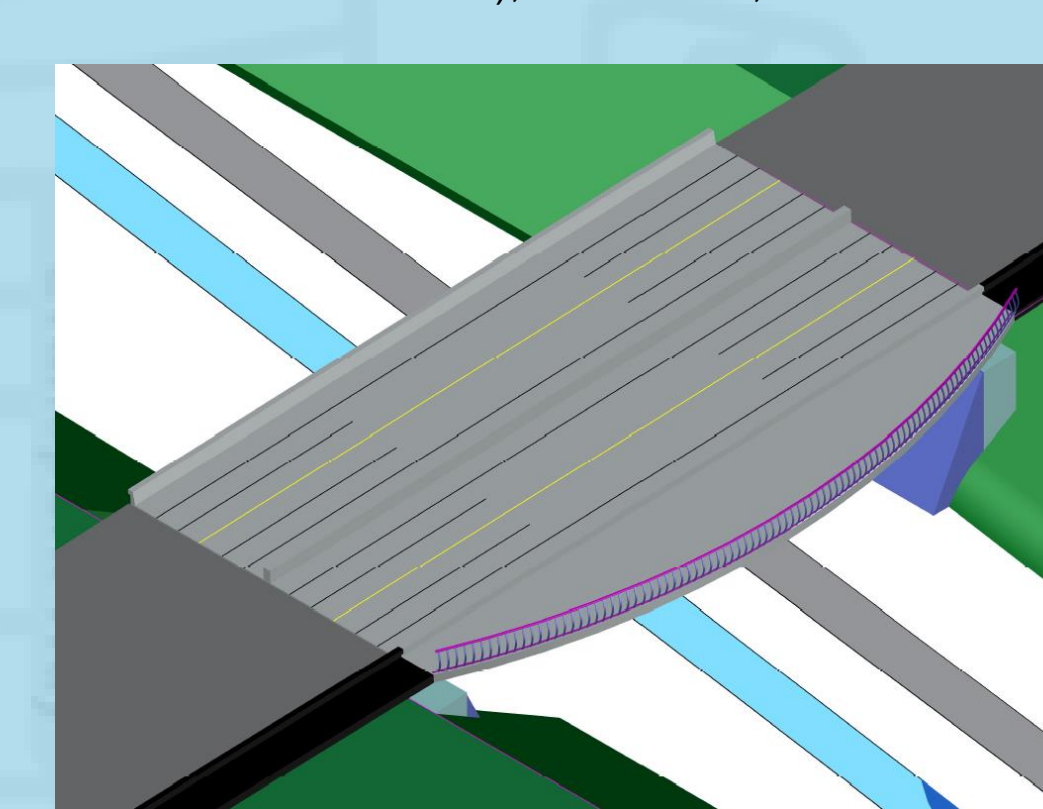


FIGURE 13: STAGE 5 - ISOMETRIC VIEW
SIDEWALK (ONE SIDE ON BRIDGE, AND ONE UNDER
THE BRIDGE).
CITY OF CALGARY LANE MARKINGS,
AND LANDSCAPING OF SITE



References

Alberta Transportation (2020). *Standard specifications for bridge construction* (17th ed.). Bridge Engineering Technical Standards Branch Alberta Transportation.

Canadian Institute of Steel Construction (2011). *Steel bridges design, fabrication, construction: Course design examples*. CSA Group.

Canadian Institute of Steel Construction (2021). *Handbook of steel construction* (12th ed.). CSA Group.

Canadian Standards Association (2019). *Canadian highway bridge design code - CSA S6:19* (12th ed.). CSA Group.

City of Calgary (2020). *Transportation infrastructure: Design guidelines for bridges and structures*.