Slope Stability Analysis of Saskatoon Freeway Bridge

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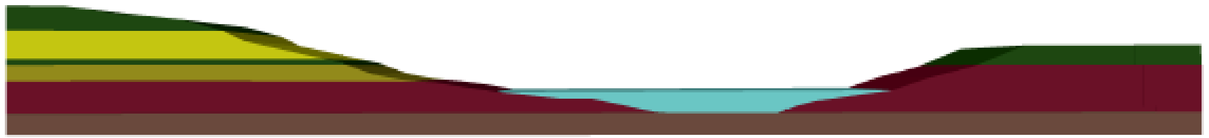
Objectives

- Ensure slope stability of South Saskatchewan River embankments.
- Determine the Factor of Safety (FS) under critical field conditions after the placement of the abutment.
- Recommend design implementation strategies for optimal performance & operation.



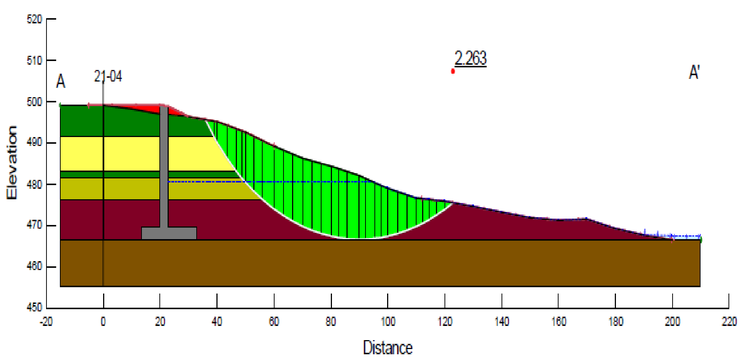
Methodology

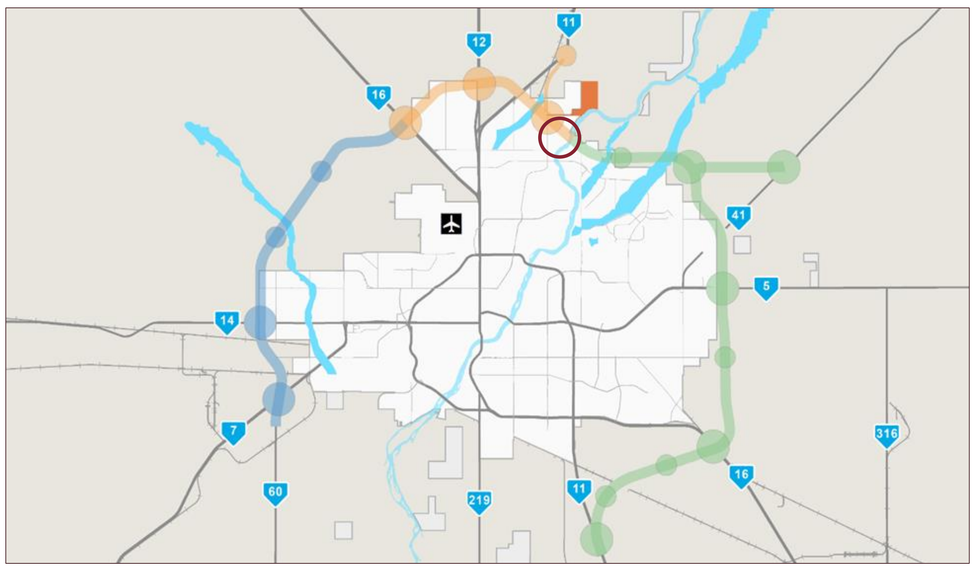
- Limit Equilibrium method by Morgenstern-Price (1965) was used to determine the FS.
- 48 slope stability models were developed under 4 conditions & 6 abutment location variations, along both embankments.
- 4 conditions – Steady State, 100-year Flood Event, Fully Saturated, & Rapid Drawdown Event.

$$FS = \frac{Resisting\ Forces}{Driving\ Forces}$$

Results

- Sensitivity analysis performed by variating abutment placement along the embankments.
- Ideal locations were determined to be at:
  - West Embankment – 20 meters
  - East Embankment – 105 meters





Conclusion

- The FS of the South Saskatchewan River embankments for the placement of abutments was found to be above the required industry standard of 1.5.
- No significant changes are required to the geometry of the embankment.
- The cost for the recommended design was estimated to be $5 million.

Recommendations

- Erosion prevention & sediment control methods including vegetation covers, & riprap are recommended.
- Geotechnical instruments including piezometers & inclinometers are recommended for monitoring.