Implementing the M-E Pavement Design Guide in Iowa

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Major Components

- Development of material characteristics
  - Dynamic modulus for HMA
  - Resilient modulus for unbound materials
- Climatic conditions
  - Historic
  - Forecast
- Calibration
  - Benchmarking performance predictions with actual performance using materials sampled from projects and pavement structure

Dynamic Modulus Testing

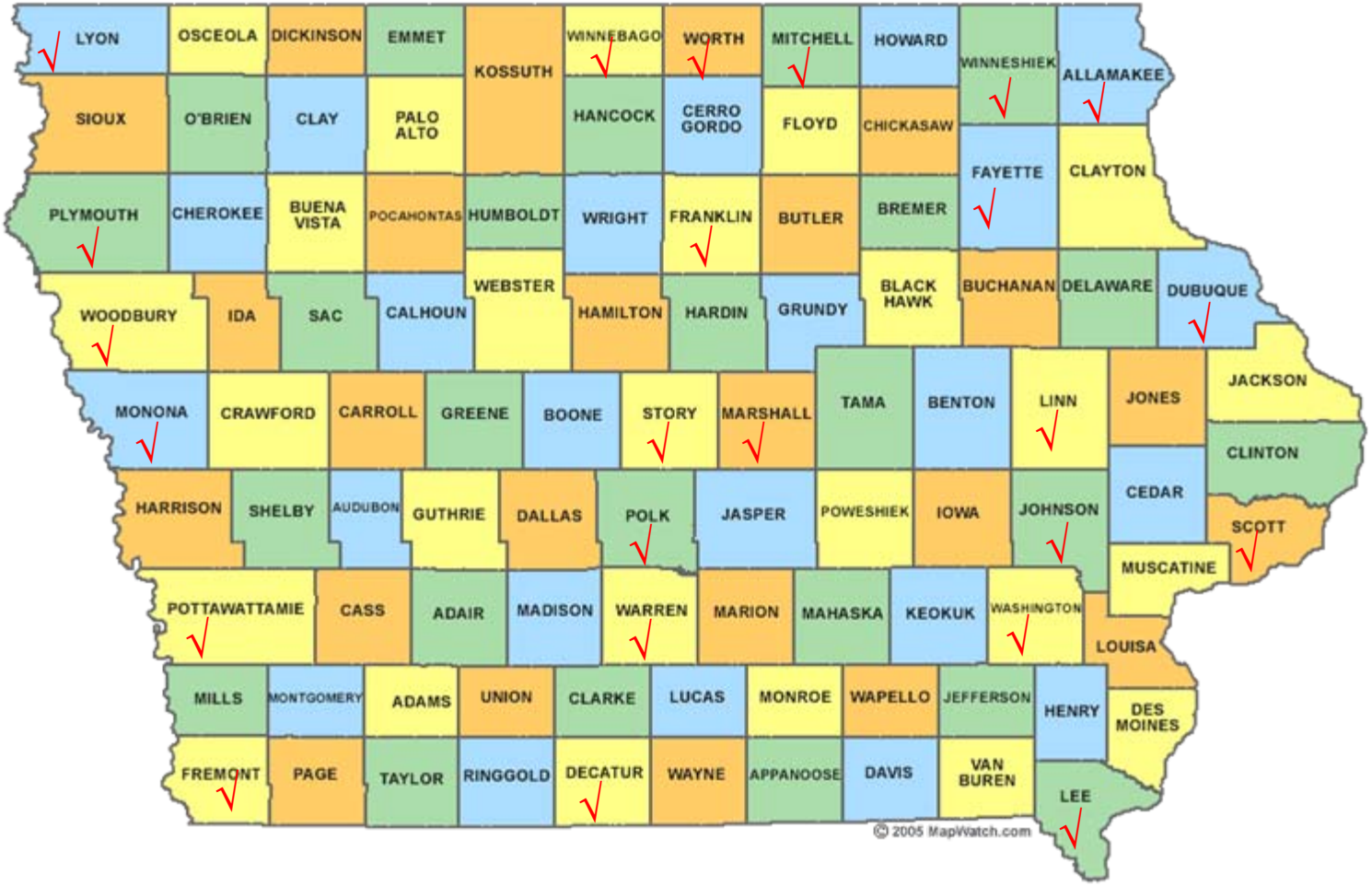
- Conducted a substantial amount of shakedown testing with equipment.
- Wanted to ensure quality data was being acquired.
- 21 mixes from across Iowa
- Represent low, medium and high volume mixes
- Three test temperatures (4, 21, and 37ºC)
- Nine frequencies (0.1, 0.3, 0.5, 1, 3, 5, 10, 15, 25 Hz)

Examining Climatic Information

- 24 Counties were selected to represent the state and were analyzed.
- Compare results achieved using files generated from historical data and from the data available in the design guide.

Counties Analyzed

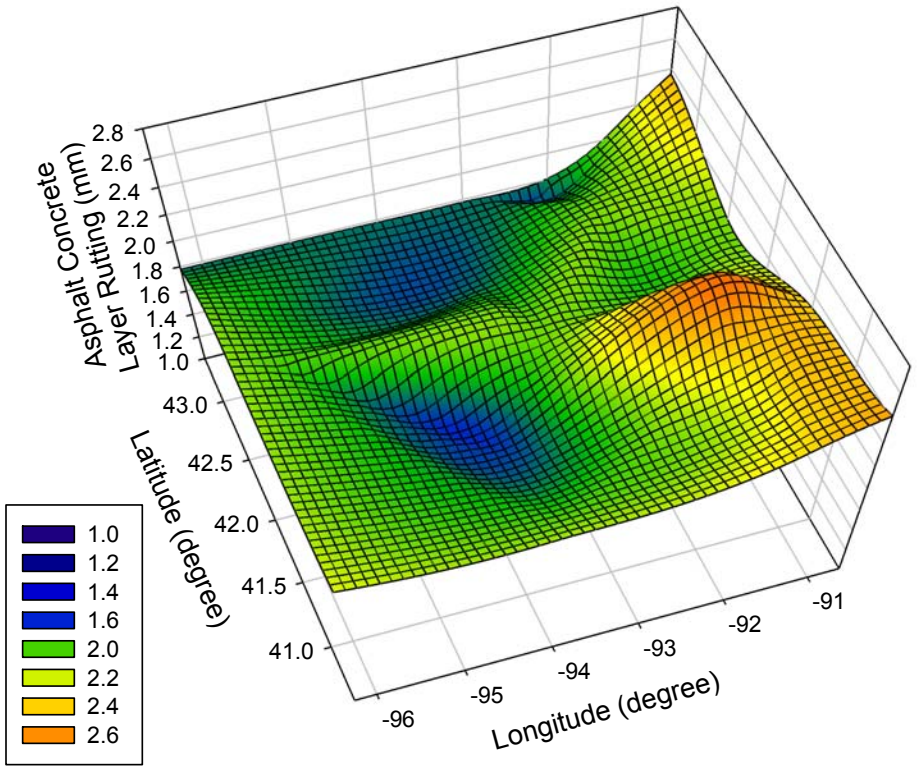
- http://www.mapwatch.com/multi-maps/full/iowa-county-map.gif



Low Volume Traffic

- Rutting in Asphalt Concrete Layer

Design Guide Climatic Files



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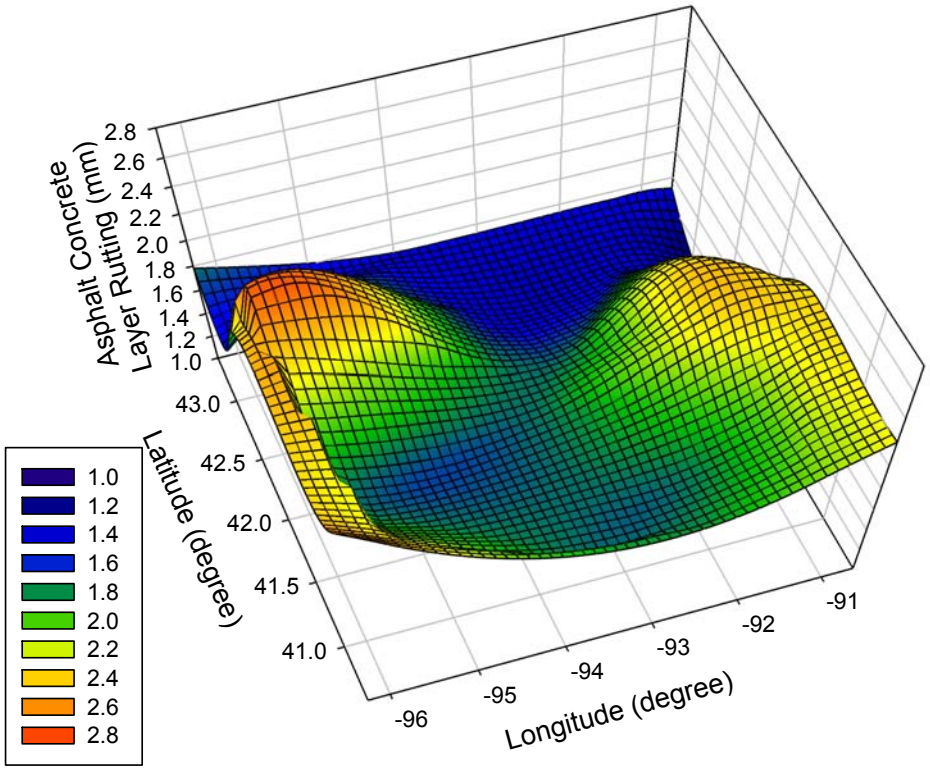

Medium Volume Traffic

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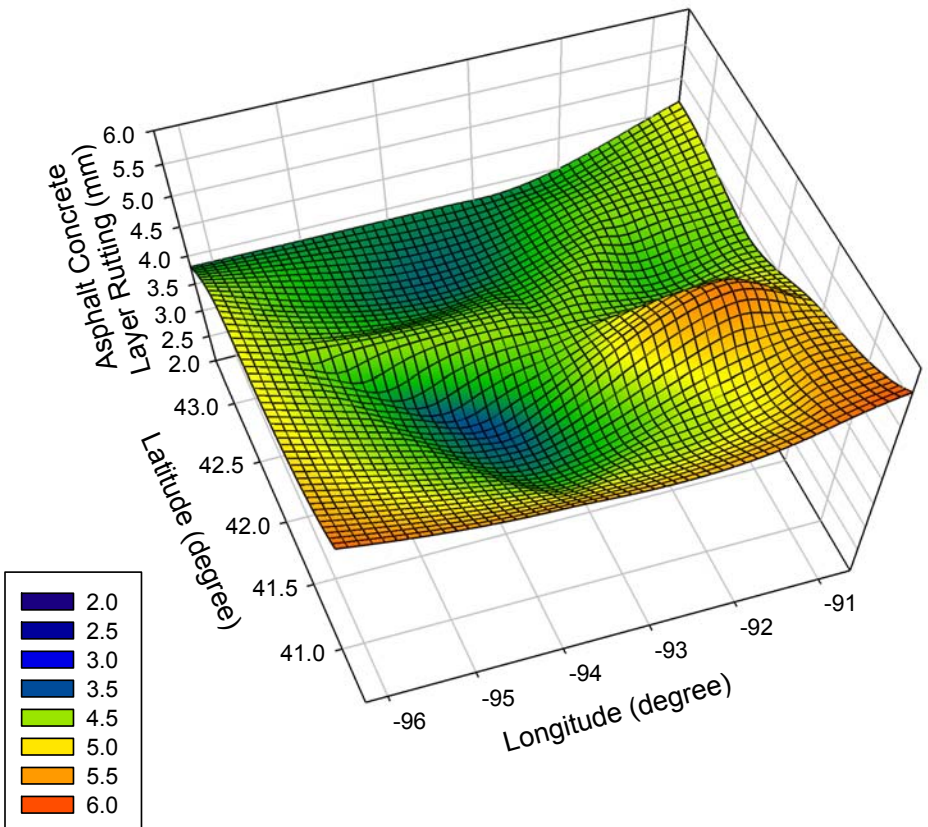

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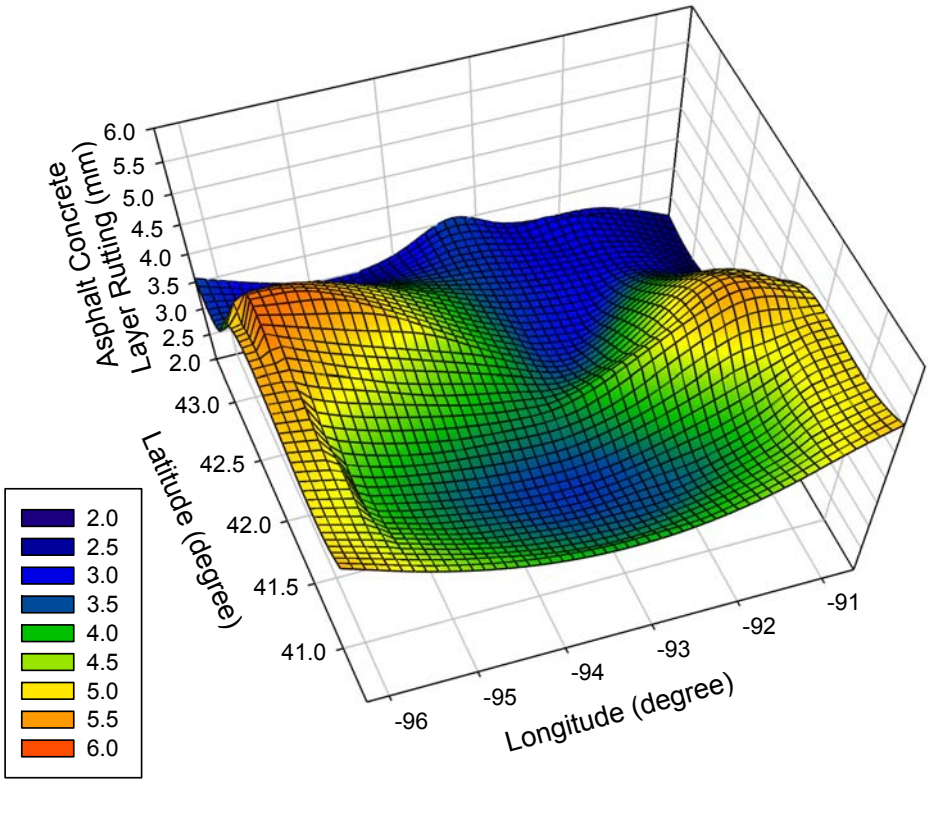

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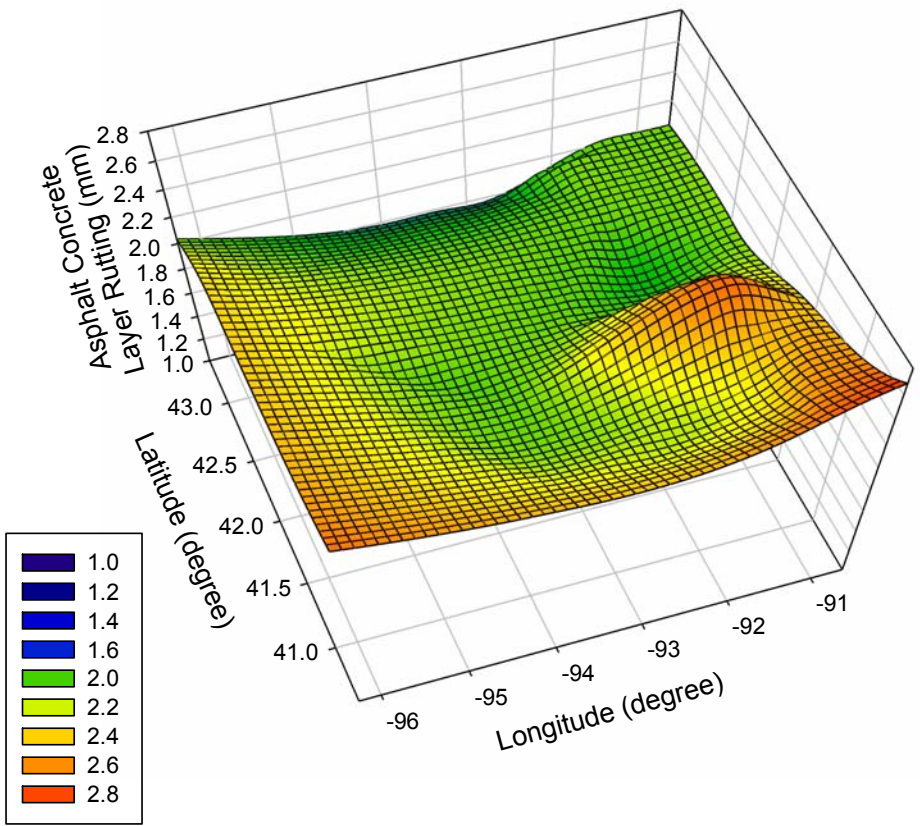

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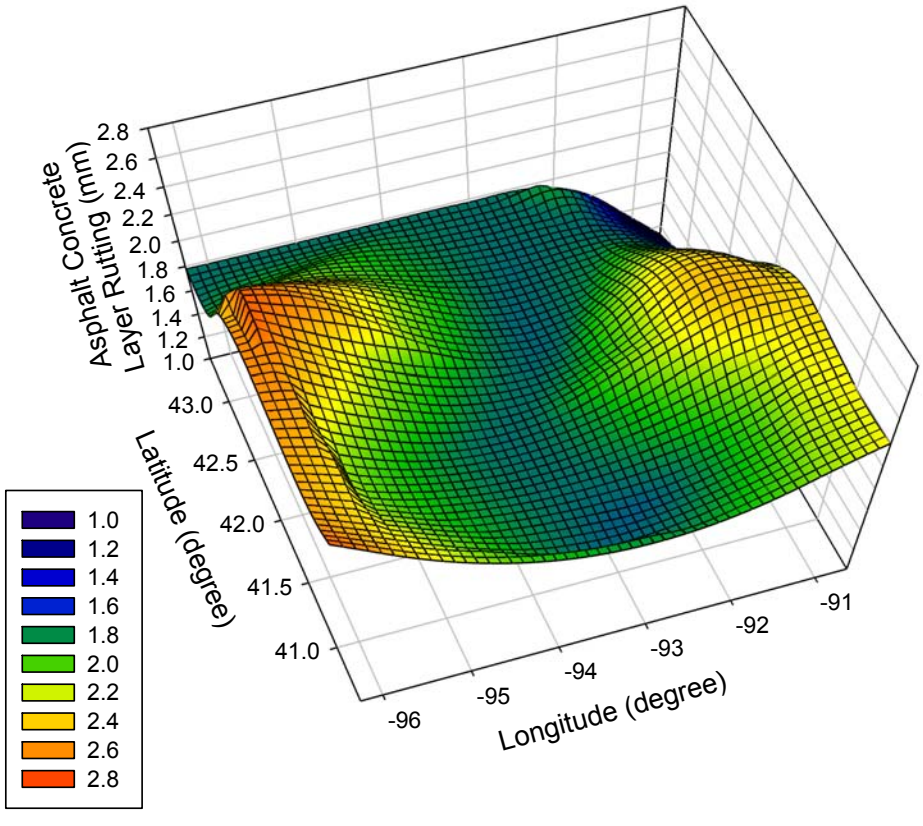

Low Volume Traffic

- Total Pavement Rutting

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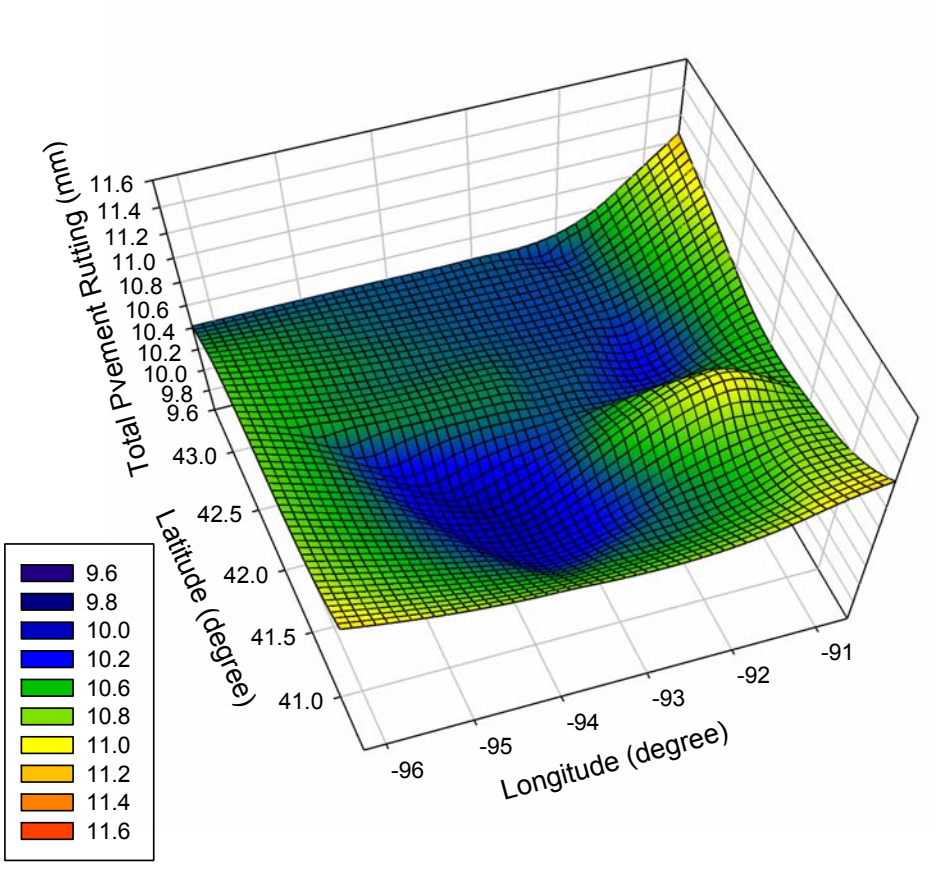

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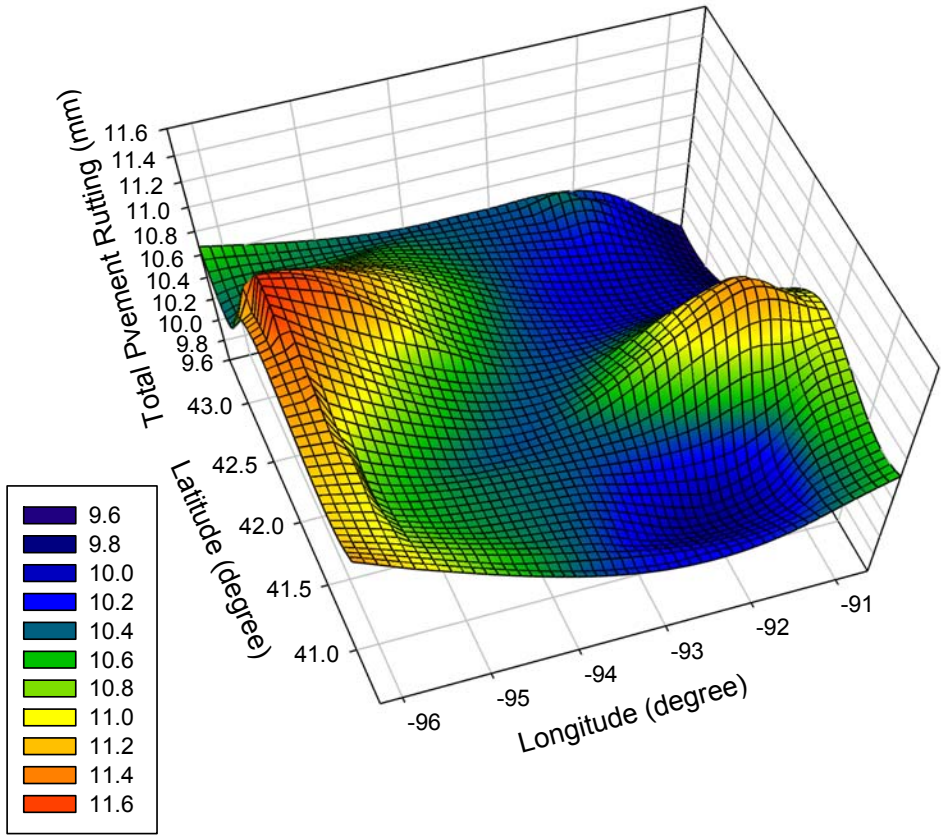

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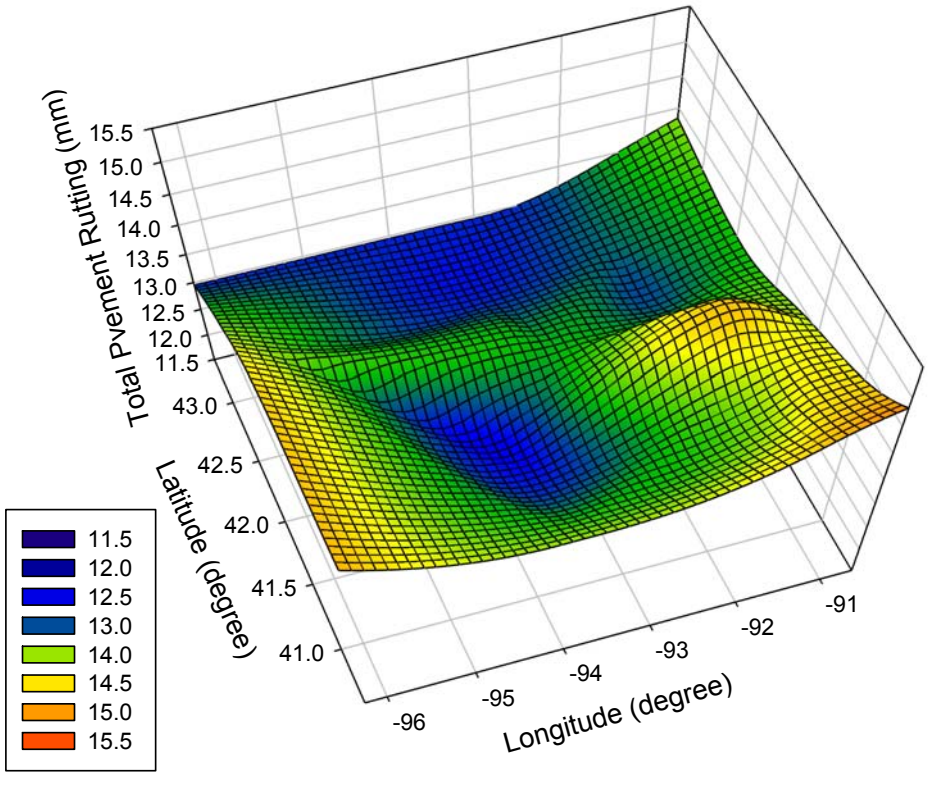

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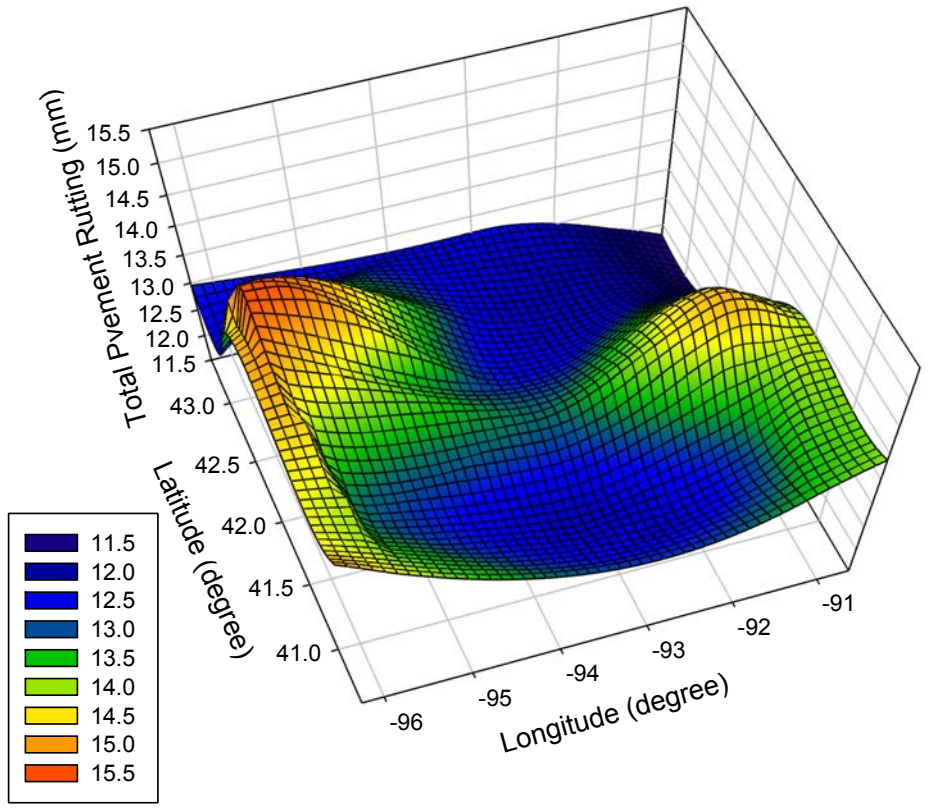

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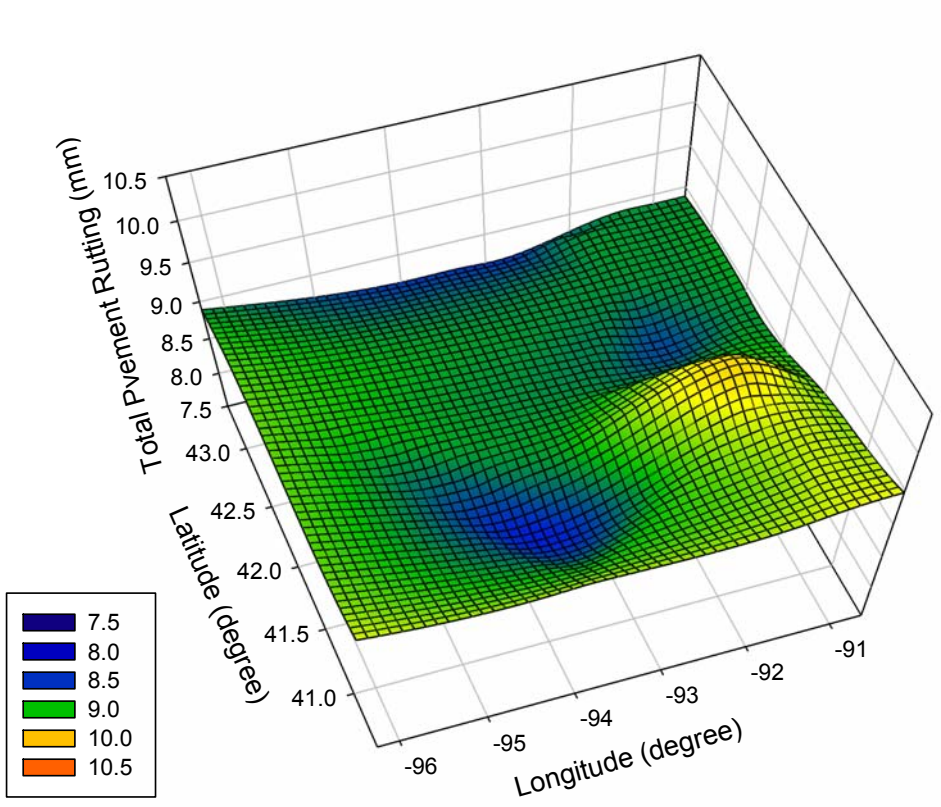

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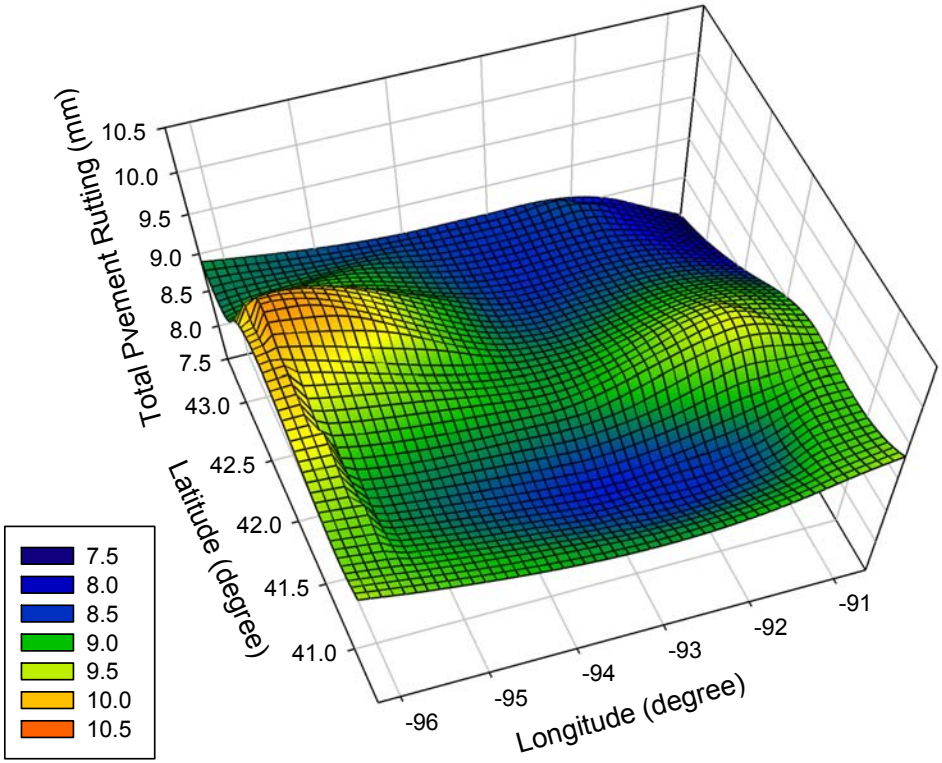

Low Volume Traffic

- Transverse Cracking

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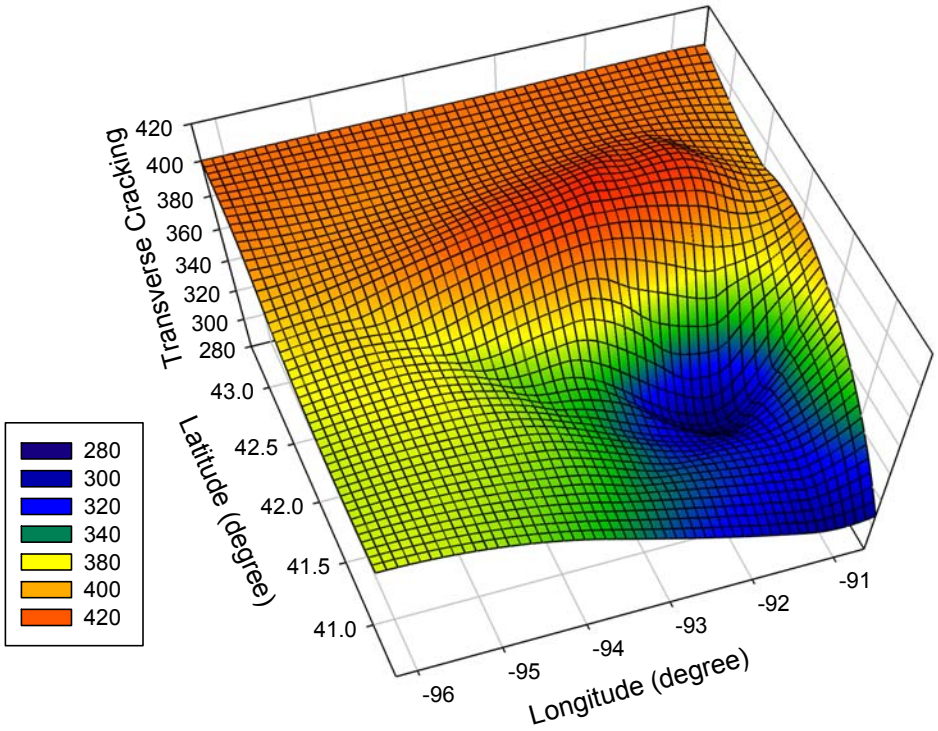

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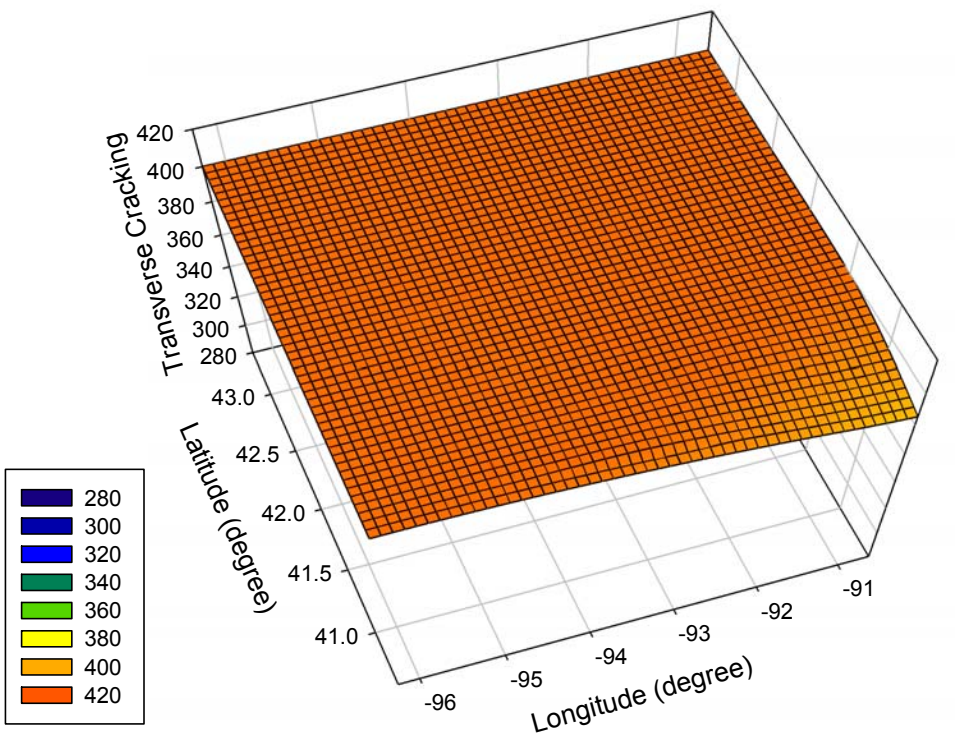

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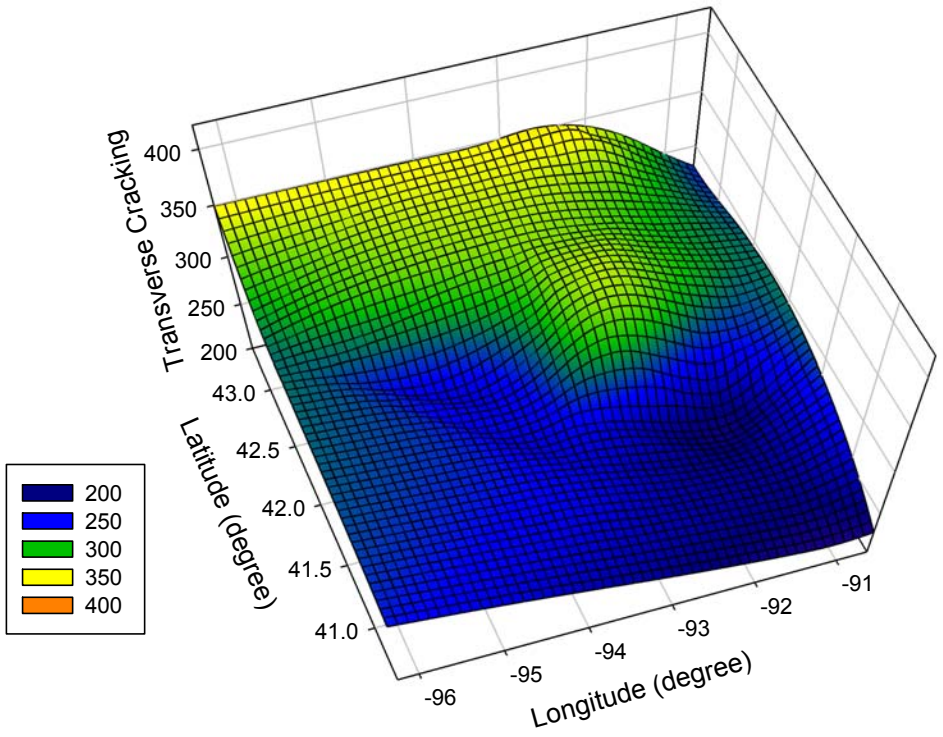

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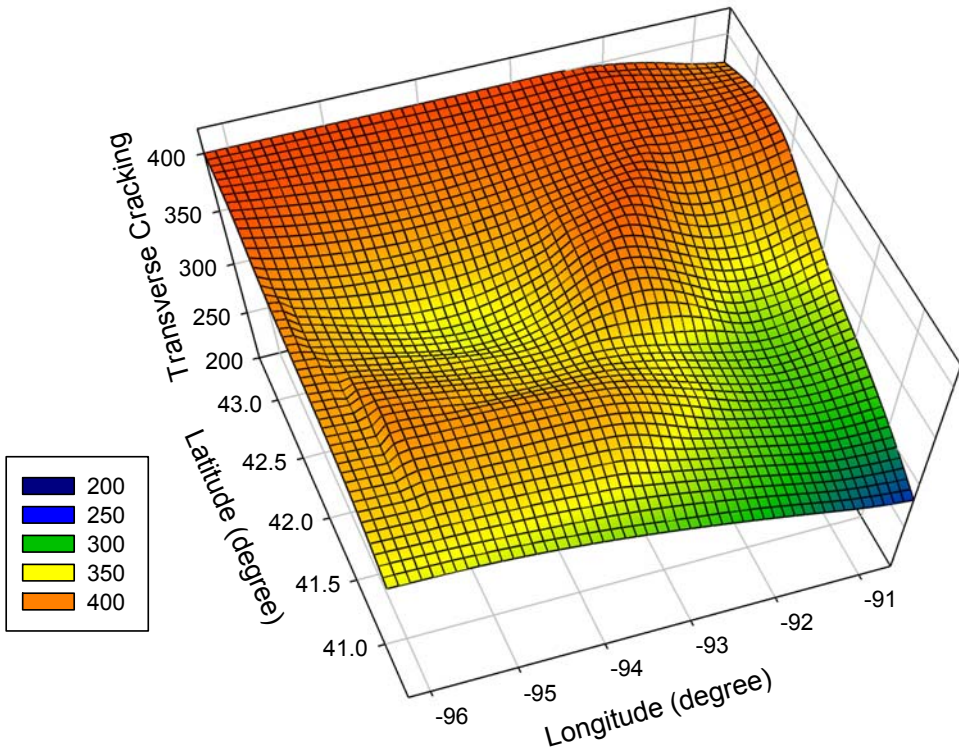

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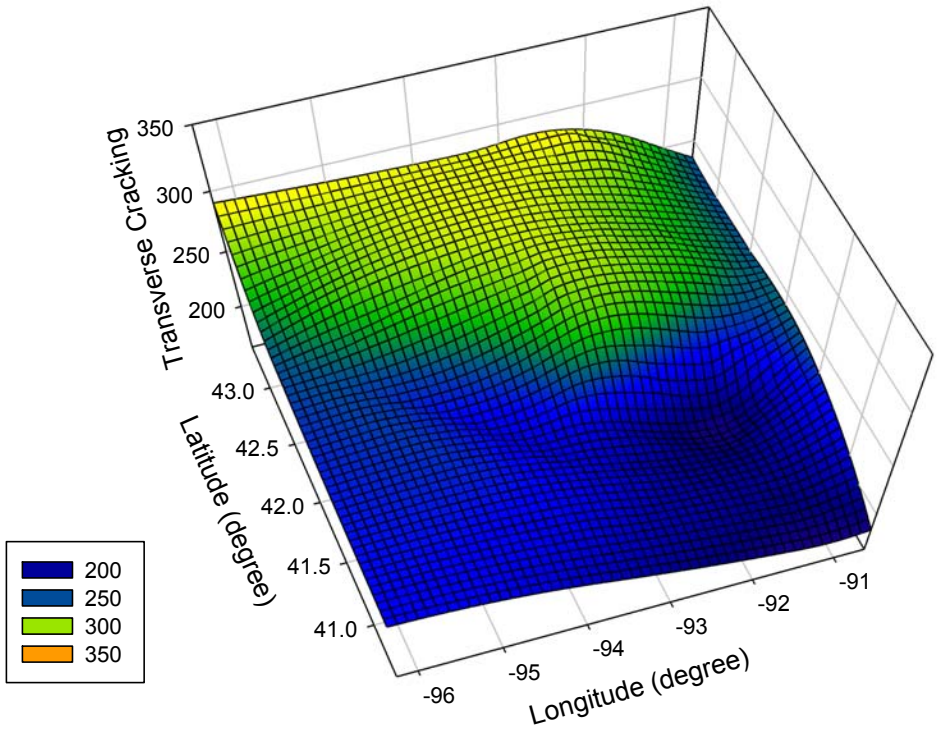

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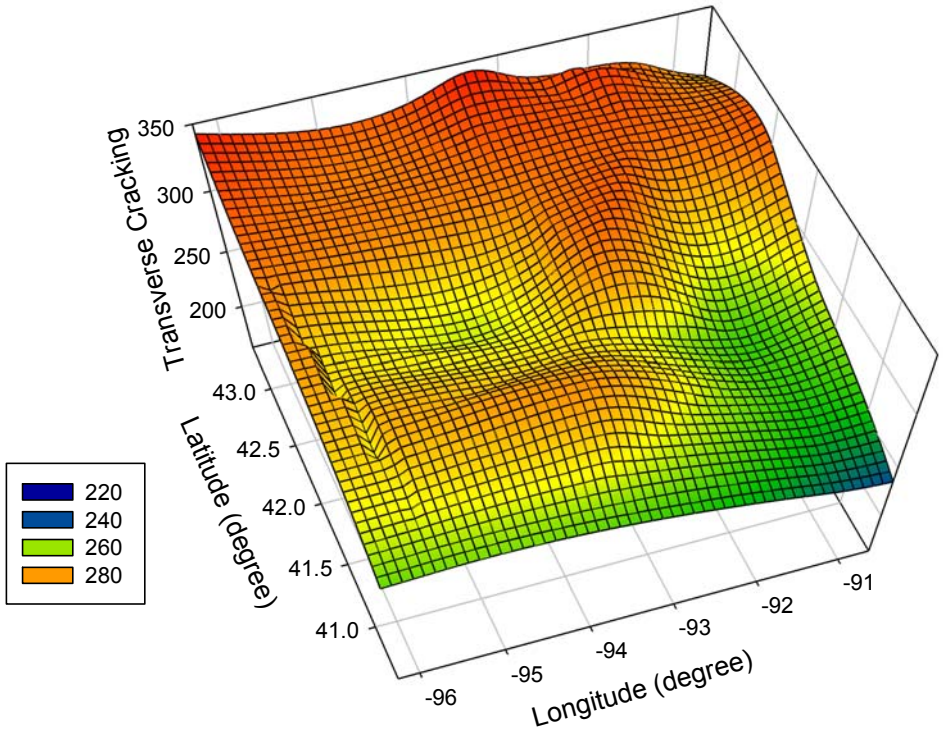

Low Volume Traffic

- Fatigue Cracking

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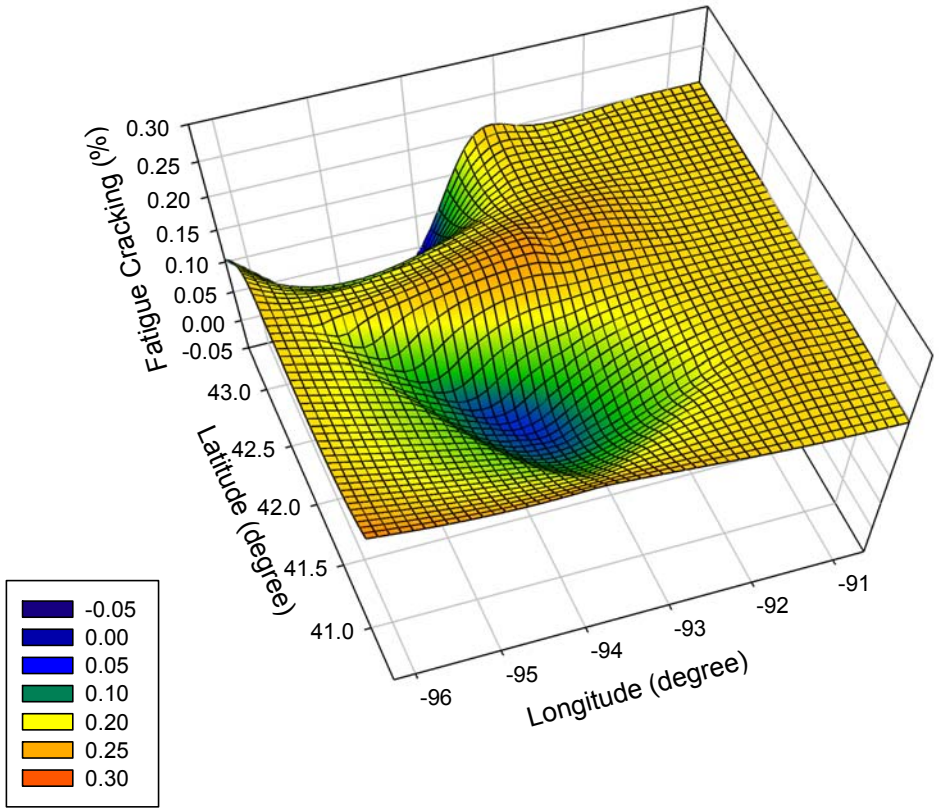

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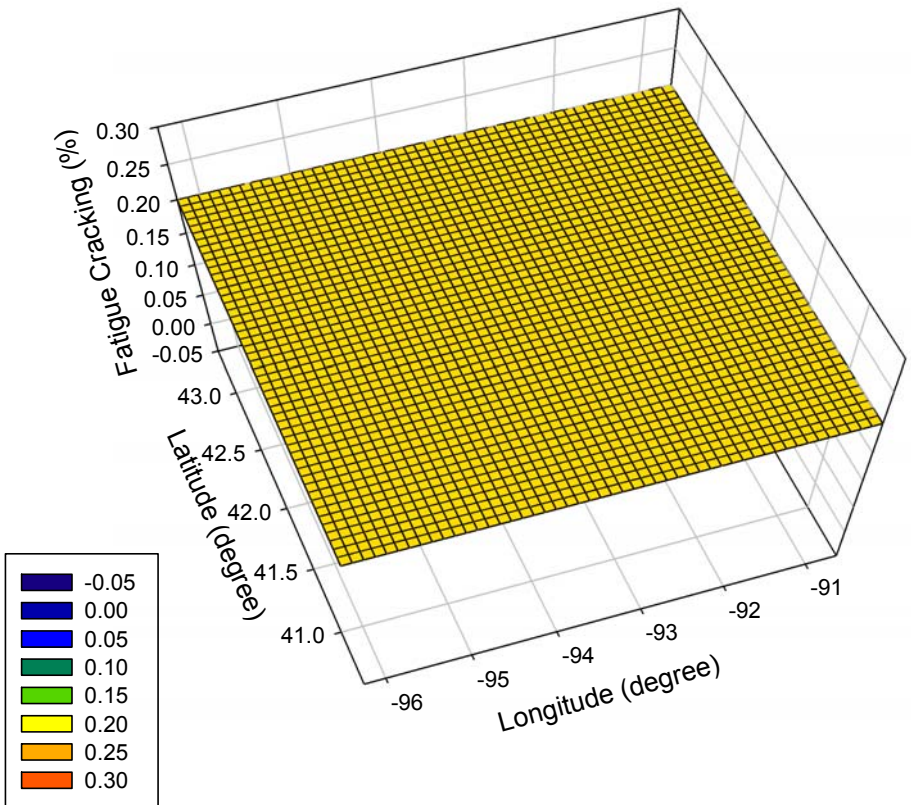

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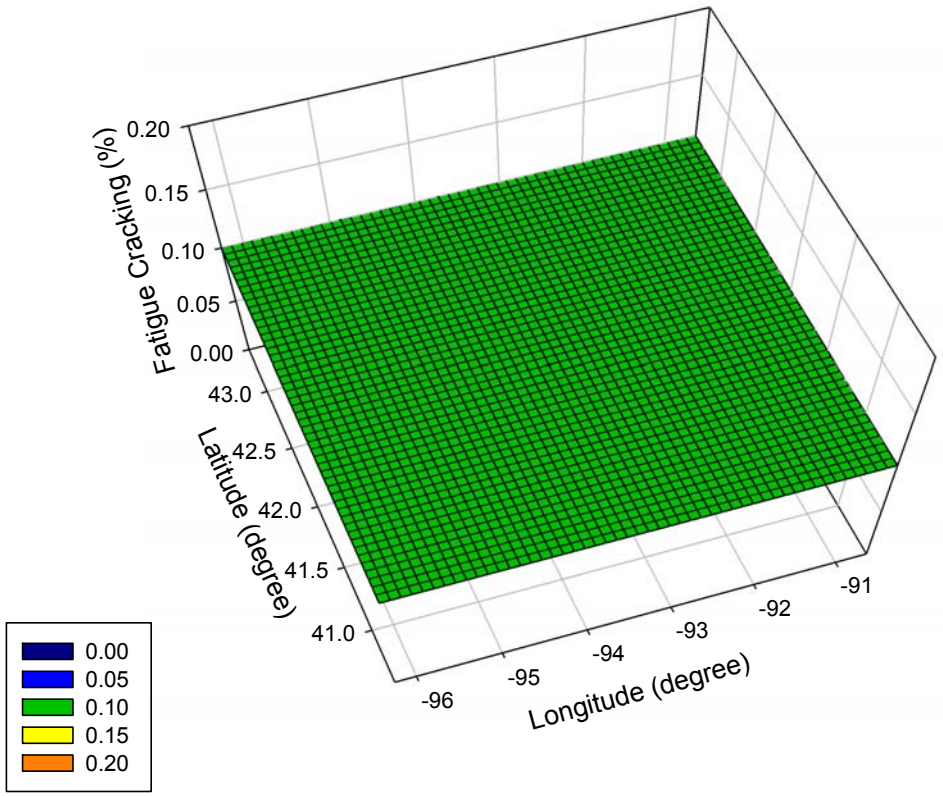

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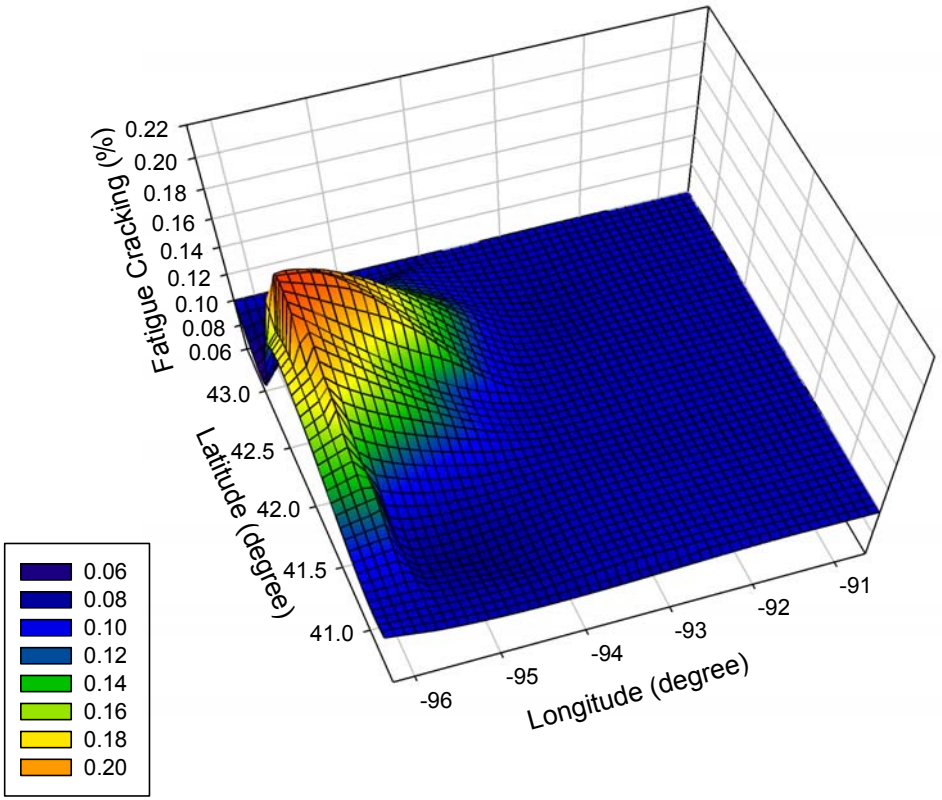

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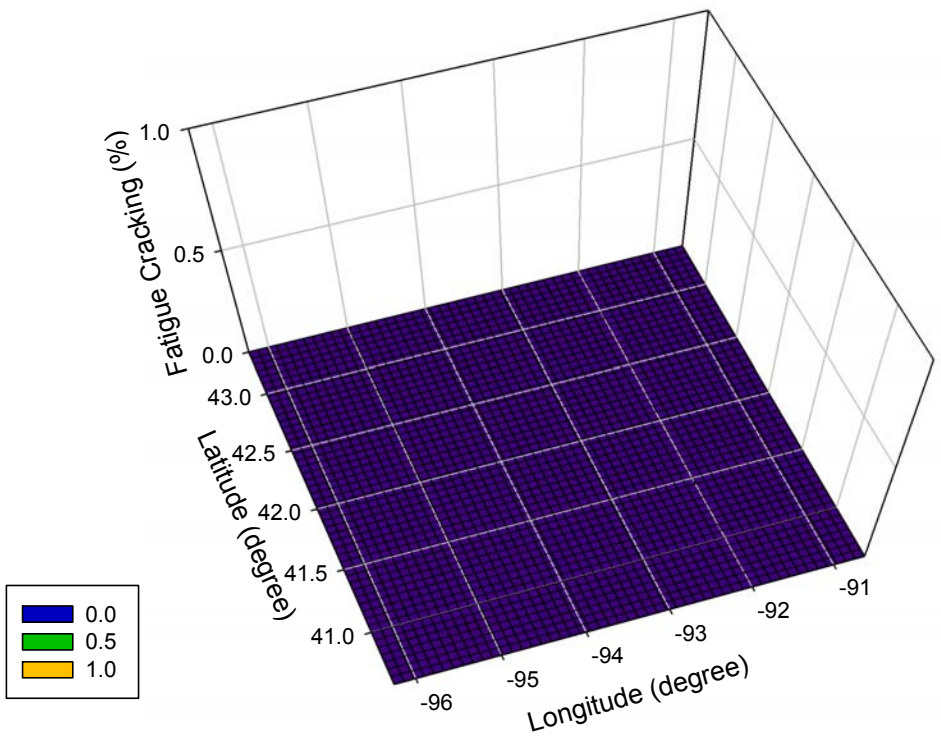

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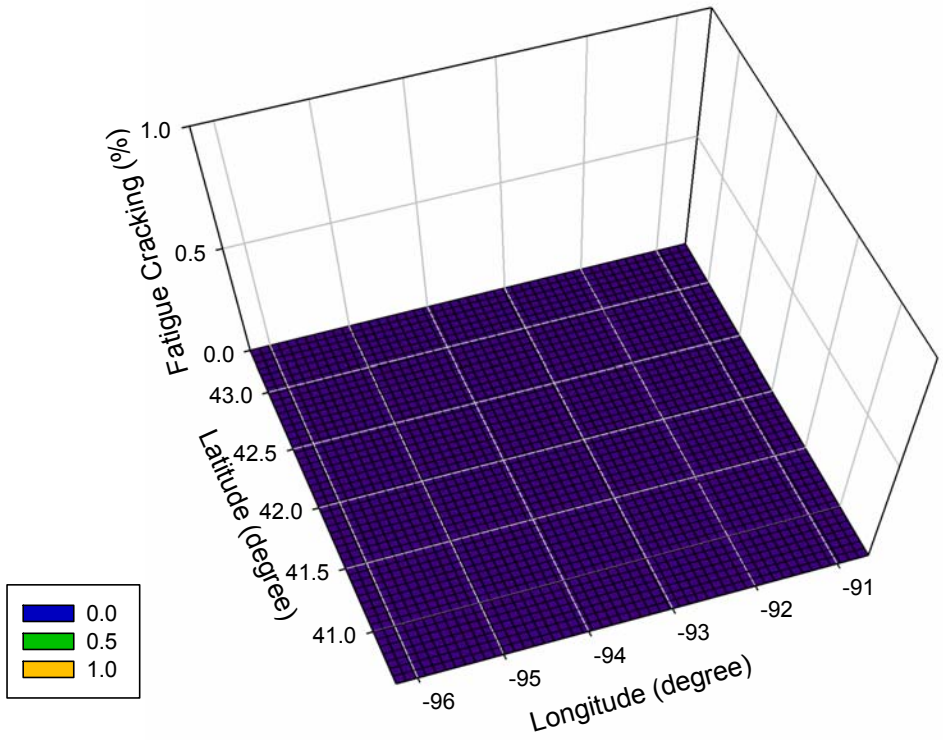

Low Volume Traffic

- Longitudinal Cracking

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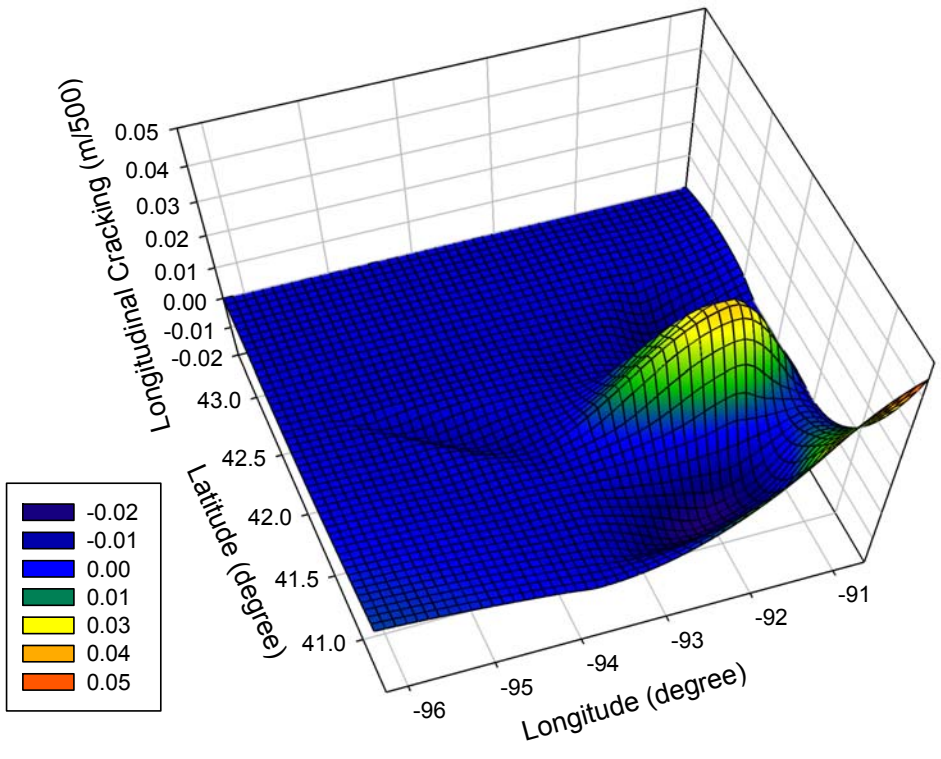

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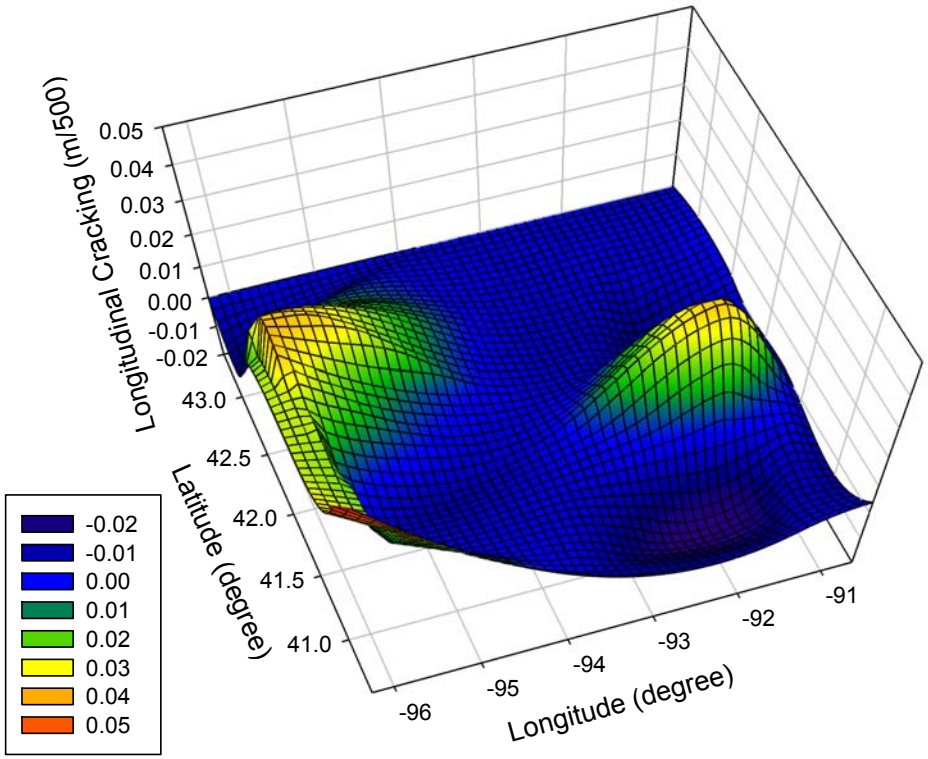

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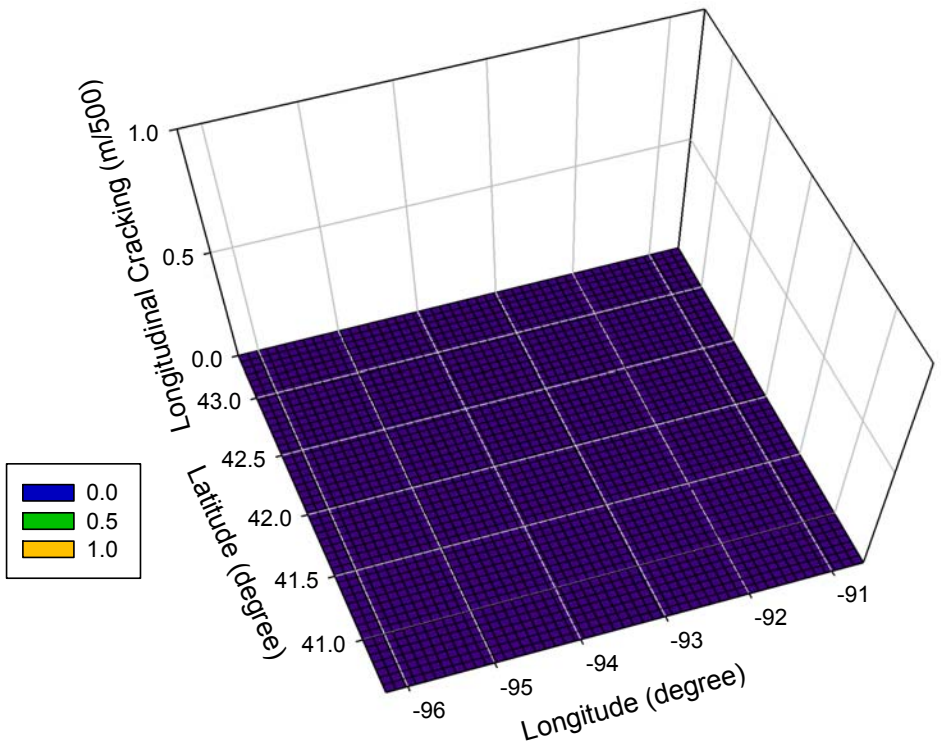

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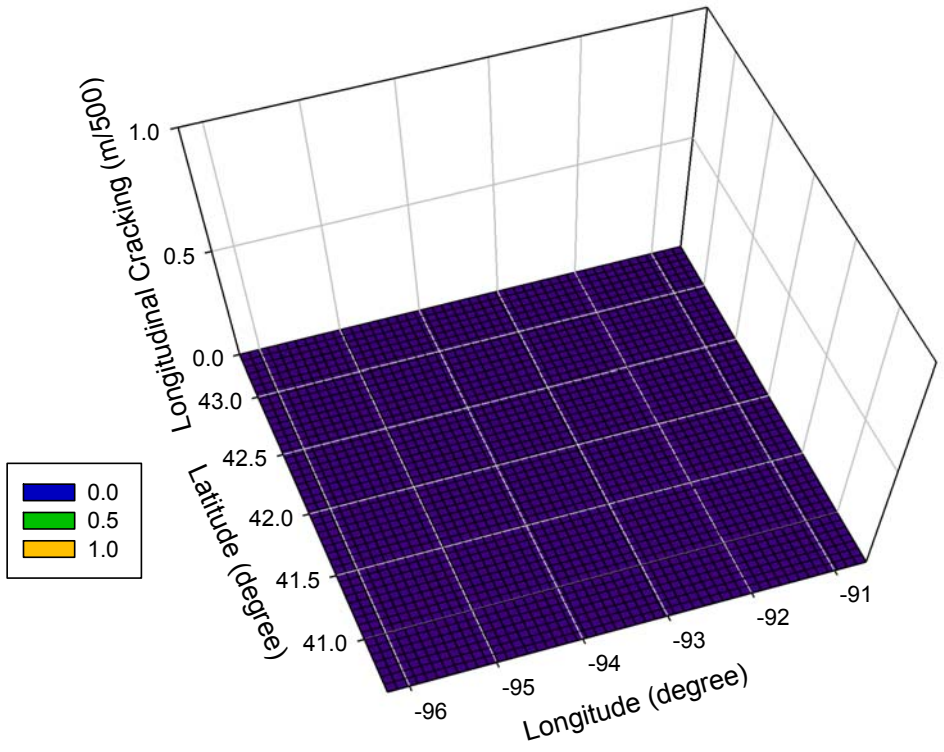

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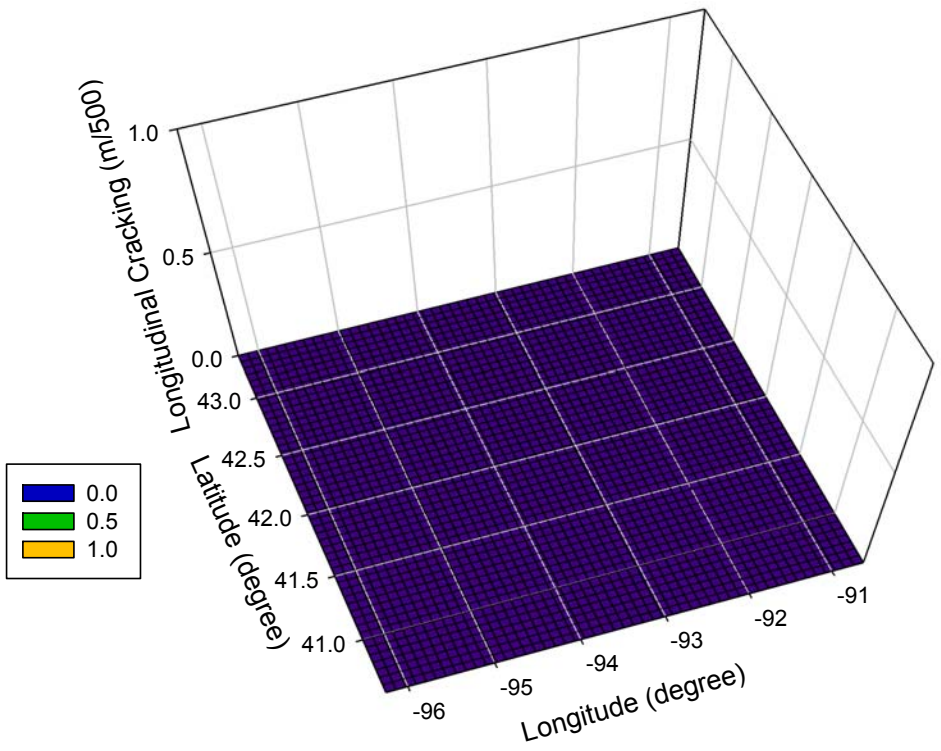

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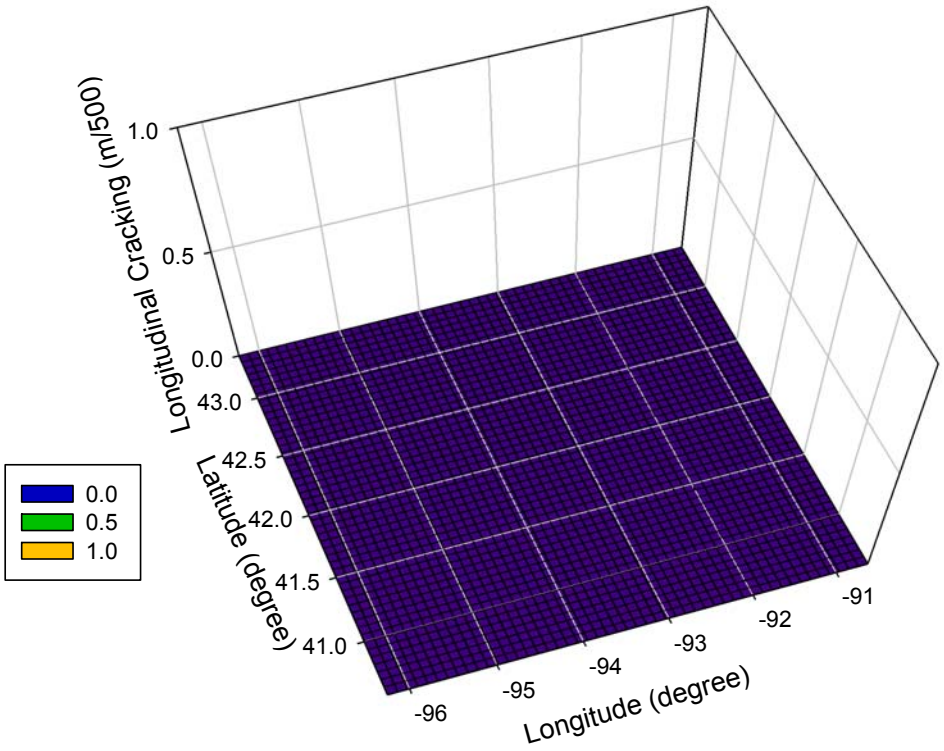
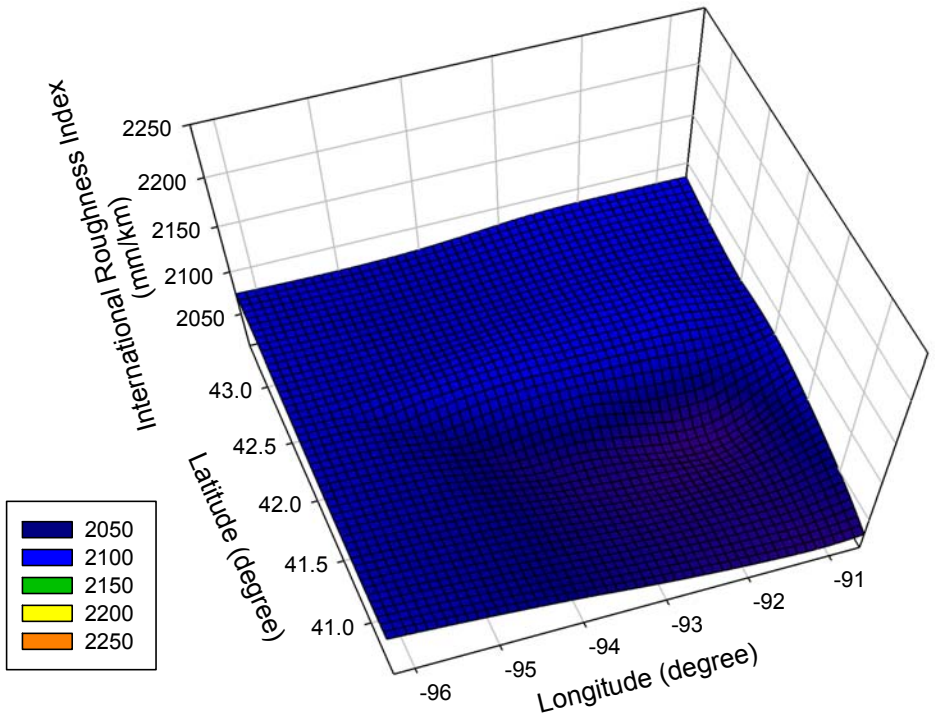


Low Volume Traffic

- International Roughness Index (IRI)

Design Guide Climatic Files



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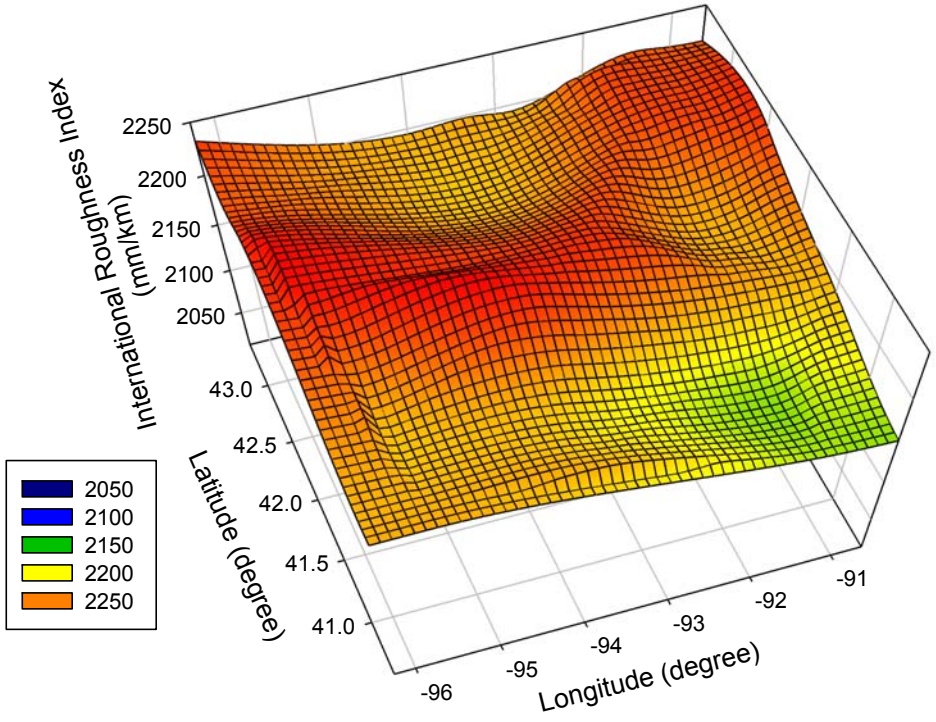

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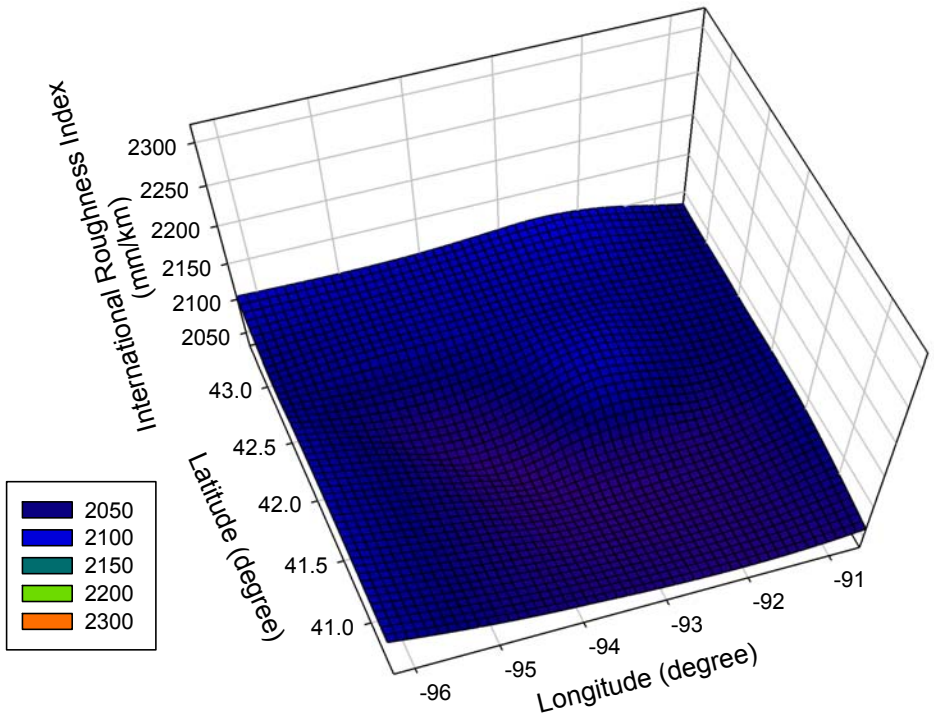

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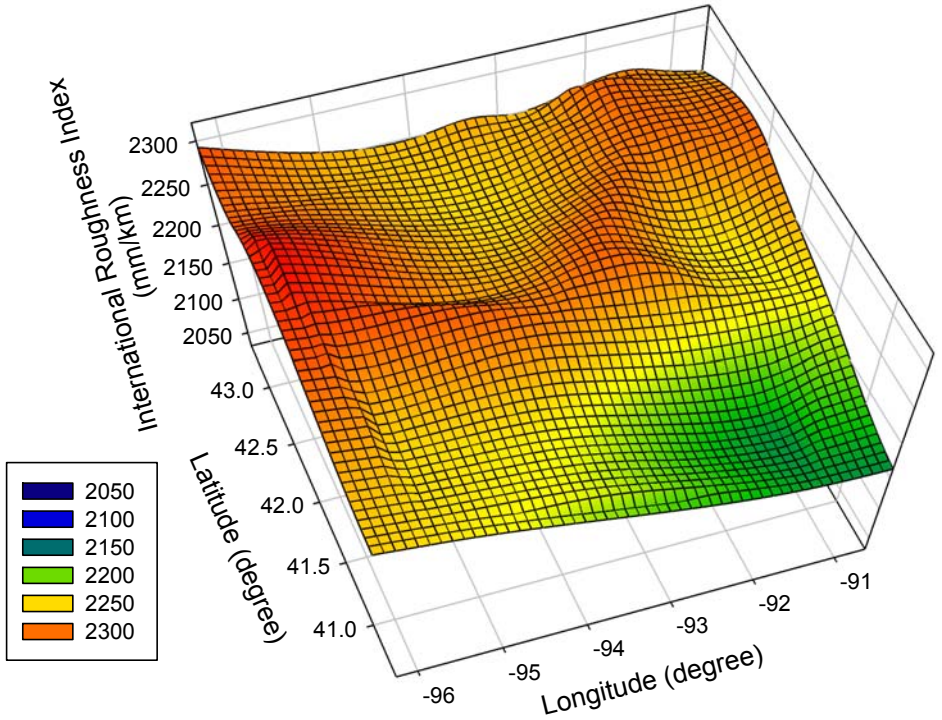

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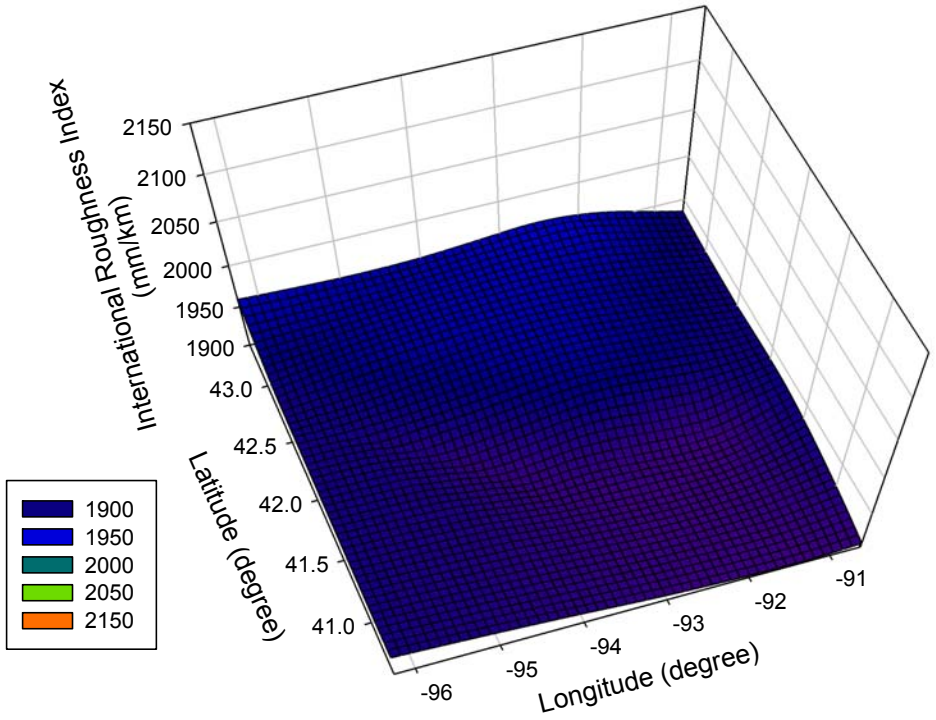

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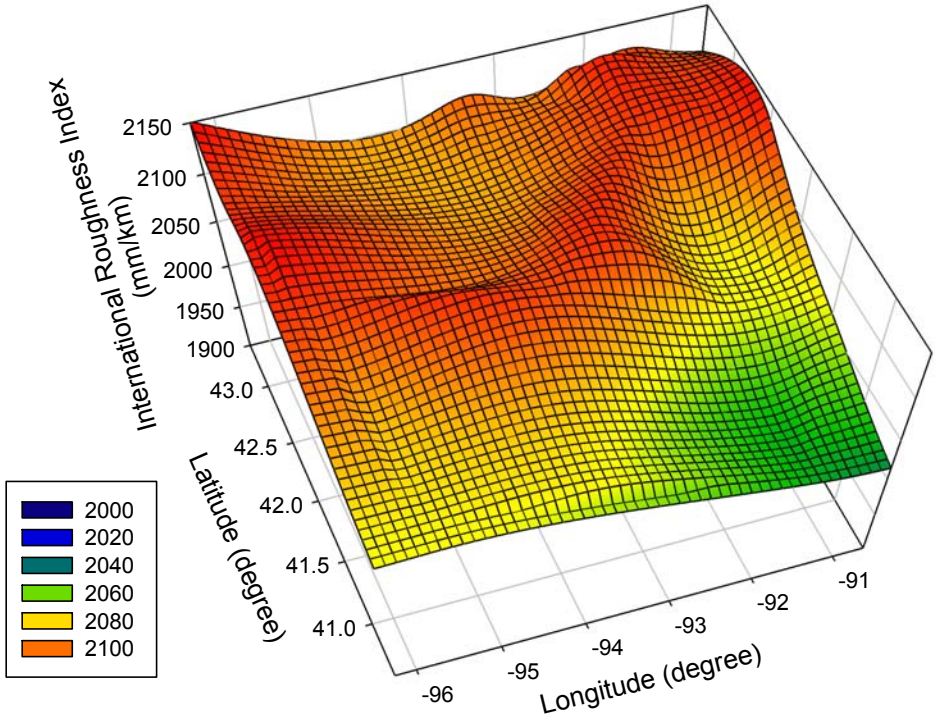

Conclusions

- Interpolated climatic files could not be created for three counties out of the 24 under analysis. The three counties (Fremont, Monona, and Pottawattamie) are in the western part of the state.
- The climatic files that were interpolated from the data available within the design guide predicted higher rutting for the northern part of the state compared to the files created.

Conclusions (Cont'd)

- The climatic files that were interpolated from the data available within the design guide predicted lower thermal cracking compared to the files created.
- The climatic files that were interpolated from the data available within the design guide predicted lower IRI compared to the files created.

Summary

- Climatic input in the Guide can shift the network level of pavement performance……. It should be more substantially considered!
- Forecast models show differences between historical data and the future……climate change has an impact!
- Implementing the Guide is a substantial undertaking.
  - Need to have appropriate equipment and personnel
  - Local calibration involves developing a substantial amount of information
- Once implemented, resources will need to be committed annually to ensure continued calibration and quality of input parameters.

Acknowledgements

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- Mike Heitzman, NCAT (formerly Iowa DOT)
- APAI and its members

Questions!