University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

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BEng(University of Victoria, 2017)

"Understanding Marine Transport Resilience to the Cascadia Subduction Zone Earthquake Through Recovery Modelling in South-Coastal British Columbia"

Department of Civil Engineering

February 5, 2020
1:00 P.M.
Engineering Office Wing
Room 430

Supervisory Committee:
Dr. David Bristow, Department of Civil Engineering, University of Victoria (Supervisor)
Dr. Madeleine McPherson, Department of Civil Engineering, UVic (Member)

External Examiner:
Dr. Zuomin Dong, Department of Mechanical Engineering, UVic

Chair of Oral Examination:
Dr. Jordan Stanger-Ross, Department of History, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Marine transportation systems provide a vital lifeline to coastal communities. Coastal British Columbia (BC) is dependent on marine transportation for goods distribution, public transportation, and tourism. This marine transportation dependence can challenge the region's capability to withstand large disruptions. This work seeks to gain a detailed understanding of the southern British Columbia marine transportation system, with regards to food and public transportation to Vancouver Island. This includes the public ferry corporation, BC Ferries, and the private cargo trailer transporter, Seaspan Ferries Corporation. To do this, a model is presented that graphically simulates the system response and recovery timelines following disruption. The model is created using the python-based Graph Model for Operational Resilience (GMOR) platform. The model includes the interdependent relationships of systems and provides results with respect to cascade failure. The disruption scenario used in this case study is the region's projected M9.0 Cascadia subduction zone earthquake.

The step-by-step recovery timeline produced by the model is intended to provide stakeholders with a concrete example of how recovery could unfold for their operations. The results indicate that berth infrastructure recovery is the limiting factor for terminal recovery, in most cases. For the public, these results show that it would be prudent for Nanaimo households to ensure they have five days' worth of food, water, and medicine in their earthquake preparedness supplies, and seven days' worth for Victoria households. This work builds on the existing GMOR platform to provide re-usable dependency templates for marine transportation infrastructure. Future work includes sensitivity analyses of risk treatments and stakeholder review. Finally, this model may be applied to other disruption scenarios or incorporated with other models to cover a larger disruption recovery scope.