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

of

ADAM WICKS

BSc (University of Victoria, 2013)

“Coastal Storm Surge Identification and Classification at Red Dog Dock, Alaska, 2004 - 2014”

Department of Geography

Monday April 20, 2015
2:00 P.M.
David Turpin Building
Room A136

Supervisory Committee:
Dr. David Atkinson, Department of Geography, University of Victoria (Supervisor)
Dr. Ian Walker, Department of Geography, UVic (Member)

External Examiner:
Dr. Dustin Whalen, Natural Resources Canada

Chair of Oral Examination:
Dr. Gordon Fulton, Department of English, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

The southern Chukchi and Bering Sea region regularly experiences powerful storms that bring high winds that cause positive and negative water level set-up (storm surges) events. Positive set-up events can cause coastal inundation, sometimes extending far inland for low-relief locations, and negative set-up events can be problematic for shallow-draft marine equipment, such as barges. A ten year record (2004-2014) of water level data is available from a NOAA tide gauging station situated at the Teck Alaska Inc. Red Dog Mine port facility located to the north of the Bering Strait on the southwest Chukchi Sea coast. This thesis uses these data to develop a database of water level set-up (storm surge) events using a novel identification methodology. The surge event database is then analyzed to identify primary types of events, to derive seasonal patterns and frequencies of occurrence, and to determine likely atmospheric driving mechanisms. There were 44 surge events identified – 21 positive, 23 negative – that tended to occur during the months of November, December, and January; none were recorded in the months May through August. The event typing work suggested four distinct surge patterns. Analysis of weather drivers, performed visually and using an Empirical Orthogonal Function (EOF) analysis, suggested favored locations for storm systems – the far eastern Chukotka Peninsula for positive set up events (west of Red Dog), and the Alaska Peninsula for negative set ups (south of Red Dog). A storm system situated to the west of the port generates southwest winds that drive positive set up events, and a storm situated to the south generates easterly winds that drive negative set up events. The sea level pressure weather patterns for positive set-up surge events are much stronger and shorter lived than for negative set-up events.