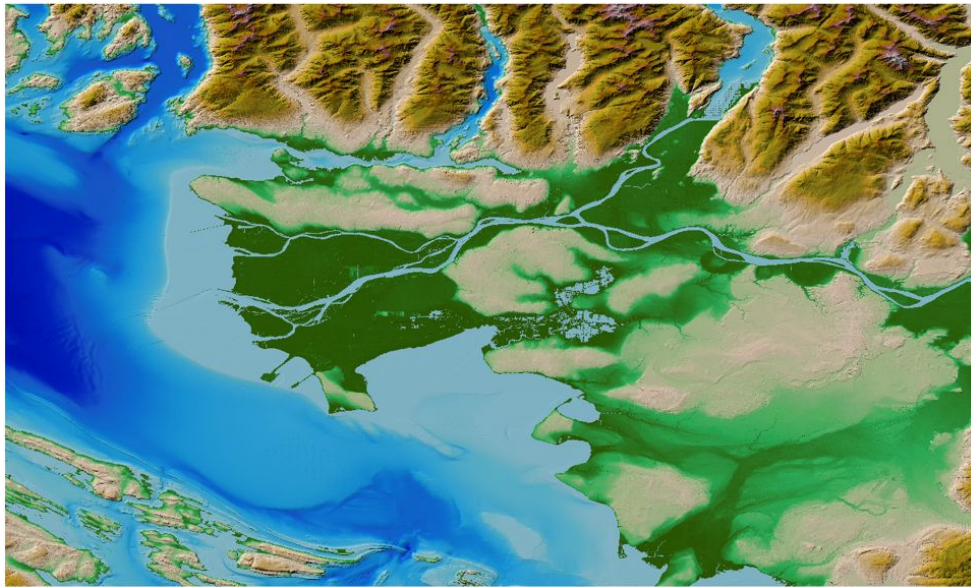
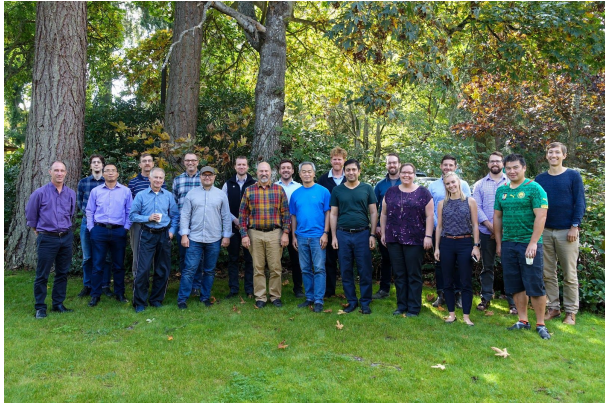


Canadian Safety and Security Program - Coastal Flood Mitigation Digital Elevation Model Workshop Report



Natural Resources Canada Ressources naturelles Canada

Canada



**National Centers for
Environmental Information**

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

**OCEAN
NETWORKS
CANADA**

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Summary

Ocean Networks Canada (ONC) signed the project charter with the Canadian Safety and Security Program (CSSP) on December 3, 2018, along with other partners including: Natural Resources Canada, National Research Council Canada, Fisheries and Oceans Canada, Defence Research and Development Canada's Centre for Security Science, Indigenous Services Canada, Emergency Management BC and the University of Victoria. The project number for this charter is CSSP-2018-CP-2352.

The main objective of the project is to “collect, compile, model and assess tsunami and storm surge data for regions and communities from Canadian coasts to better understand disaster risk in coastal regions of Canada” (CSSP Project Charter, 2018). The Semiahmoo First Nation was selected as the first study area for the pacific coast. Two other communities will be selected, one in the Atlantic region and one in the Northern region.

ONC's milestones are to (delivery due dates in brackets):

1. Compilation of Input datasets (July 30, 2019)
2. DEM Development and Workshop (February 28, 2020)
3. Tsunami Modelling (September 30, 2020)
4. Partnership and Community Engagement (August 30, 2021)
5. Guidelines and Reporting (December 17, 2021)

For the workshop milestone, ONC subcontracted two instructors, Matthew Love and Christopher Amante, from NOAA's National Centers for Environmental Information, to facilitate the workshop. The workshop was separated into two sessions:

Session 1: September 23-27, 2019

Session 2: October 21-23, 2019

Attendees and Instructors

Invitation letters were sent out to organizations and municipalities in the Lower Mainland and Greater Victoria. See the invitation letter attached in Alfresco.

Table 1: Attendees and Instructors

Name	Email	Organization	Role	Attendance
Matthew Love	matthew.love@noaa.gov	NOAA Colorado, Cooperative Institute for Research in Environmental Sciences, University of Colorado at Boulder	Workshop Instructor	Session 1+2
Christopher Amante	Christopher.Amante@noaa.gov	NOAA Colorado, Cooperative Institute for Research in Environmental Sciences, University of Colorado at Boulder	Workshop Instructor	Session 1+2
Sean Mullan	smullan@oceannetworks.ca	Ocean Networks Canada	Workshop Facilitator. GIS Specialist.	Session 1+2
Mark Rankin	markrankin@uvic.ca	Ocean Networks Canada	Workshop Facilitator. GIS Specialist.	Session 1+2
Nathan Grivault	ngrivault@uvic.ca	Ocean Networks Canada	Tsunami Modeller	Session 1+2
Reza Amouzgar	ramouzgar@oceannetworks.ca	Ocean Networks Canada	Tsunami Modeller	Session 1+2
Robert Kung	robert.kung@canada.ca	Geological Survey of Canada, GSC Pacific, Natural Resources Canada	GIS Specialist	Session 1+2
Alex Urquhart	alexurquhart@gmail.com	Hydrographic Services Office Esquimalt, Canadian Armed Forces	Sgt. Team Leader - Digital Response Section (RC Navy)	Session 1+2
Christopher Moore	christopher.moore@noaa.gov	NOAA Center for Tsunami Research (Pacific Marine Environmental Laboratory)	Tsunami Oceanographer/Systems Developer	Session 1
Stephanie Blazey	SBlazey@victoria.ca	City of Victoria -Engineering and Public Works Department	Senior GIS Specialist	Session 1+2
Olympia Koziatek	okoziatek@victoria.ca	Victoria Fire Department, City of Victoria	Deputy Emergency Program Coordinator	Session 1+2
Brian Goble	bgoble@sooke.ca	District of Sooke	Head of Geographic Services	Session 1+2

Yan Jiang	yan.jiang@canada.ca	Geological Survey of Canada, GSC Pacific, Natural Resources Canada	Research Scientist - Geodetic techniques	Session 1+2
Drew Rotheram-Clarke	drew.rotheram-clarke@canada.ca	NRCan Vancouver	GIS Scientist	Session 1
Charles Papasodoro	charles.papasodoro@canada.ca	NRCan Sherbrooke, QC: Canada Centre for Mapping and Earth Observation	Professional Project Officer	Session 1
Alex Tang	Alex.Tang@esquimalt.ca	Township of Esquimalt Development Services	Planner	Session 1+2
JP Bezeau	jpbezeau@crd.bc.ca	Capital Regional District	GIS Technologist	Session 1+2
Janusz Krawczynski	jkrawczynski@oakbay.ca	District of Oak Bay	GIS Specialist	Session 1+2
Hannes Hannesson	HHannesson@oakbay.ca	District of Oak Bay	GIS Specialist	Session 1+2
Josef Drechsler	JDrechsler@nhcweb.com	Northwest Hydraulic Consultants (Surrey Rep)	GIS Analyst	Session 1+2
Chris Wiens	CWiens@surrey.ca	City of Surrey	GIS Specialist	Session 1+2
Jun Ying Qu	Junying.Qu@gov.bc.ca	Flood Safety Section, Water Management Branch Ministry of Forests, Lands, Natural Resource Operations and Rural Development	Senior Hydrotechnical Engineer	Session 2
Paul Gadbois	pgadbois@semiahmoofirstnation.org	Semiahmoo First Nation	Emergency Coordinator	Session 2

Workshop

We had our first session in the Chapel at Queenswood with a thin client for two people. We worked with ITS (Claudio, Rob and Tashinga) and they set up Virtual Machines (Windows and Linux) so that the attendees could connect to either. Each computer had 100 gb of space to work with, and we also connected to one of our network drives which has 5 TB of capacity.



Computer set up in the Chapel at Queenswood. Photo credit: Duncan Lowrie

ITS recorded video and audio from the workshop and stored the videos on YouTube as unlisted links. These can be found here:

<https://www.youtube.com/playlist?list=PLDR4DwEugdSLwfK3nkgKoQ8nHwk2YOHQz>

Deanna Rach, a GIS specialist at the Sto:lo Nation, watched the streams live and provided us with feedback on the audio. It will be useful to rewatch the video to verify workflows and commands used.

Session 1 comprised of setting up computers, establishing our area of interest, converting bathymetric and topographic datasets to a common vertical datum, creating hillshades and other products.

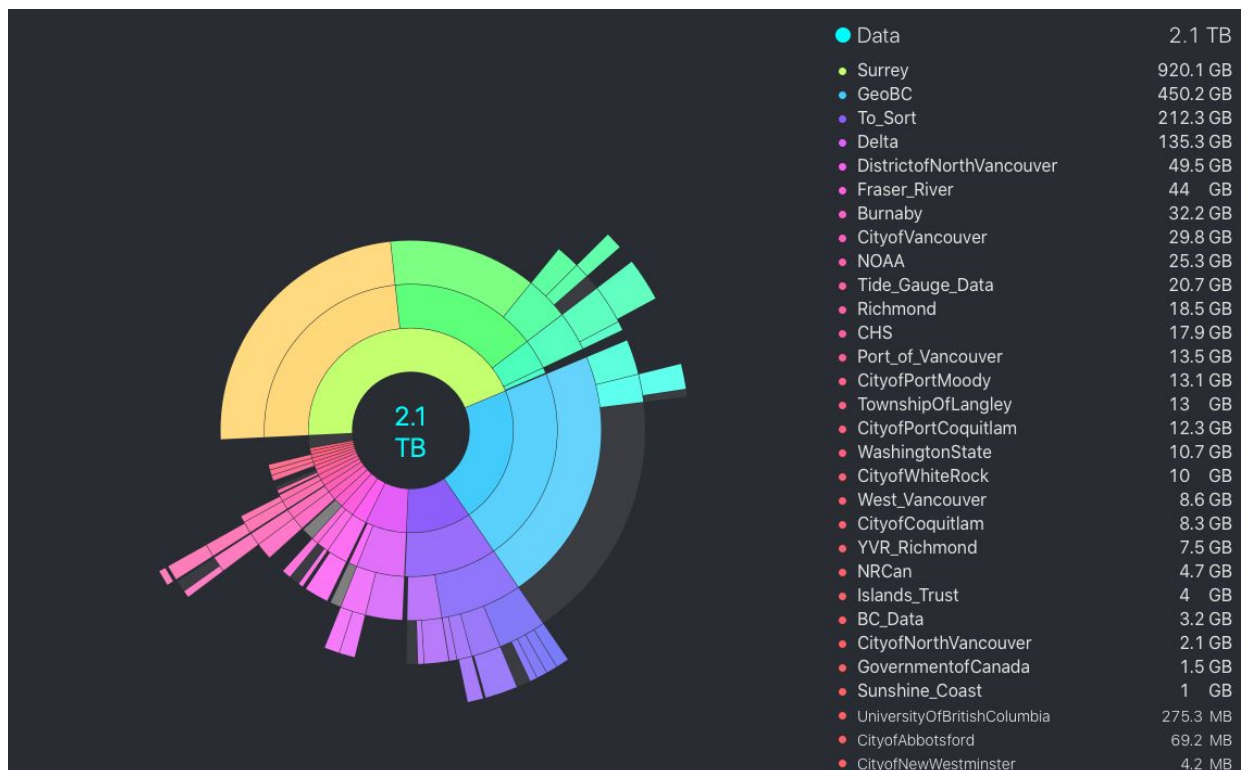
Our initial area of interest was the area surrounding Semiahmoo First Nation including White Rock, Surrey and Boundary Bay. At the workshop, we decided to expand our area to the entire Lower Mainland, including some of Sunshine Coast and Gulf Islands. Sean and I spent a lot of time contacting organizations to provide us with data and surprisingly, most gave us their data after we signed a data agreement with them! ITS created temporary Google accounts so municipalities could upload data and then we downloaded it to our network drive. We acquired over two terabytes of data and integrated it into our model.

The agreements are stored in Alfresco here:

Operations Documents>Documents>Technical Documents>GIS Data>Agreements>2018-2022 CSSP Digital Elevation Model Agreements

The data is stored on our network drive here:

E:\DEM\Semiahmoo\Data



Graphic showing organizations and amount of data used for the workshop.

During the first session, Charles Papasodoro gave us a presentation on Canada's National Elevation Data Strategy. We learned about what data is provided and what they expect to share

in the next year. They will be releasing 1m resolution products and already have shared lots of others online. You can find this presentation in the Alfresco folder, entitled "National_Elevation_Strategy_September2019_Victoria.pdf".

We completed the first session and created a model for the Boundary Bay region. But since we had expanded our study area, we had a lot more work to do for the next session in October.

By Session 2, we had acquired much more data so lots of time was spent converting data so that it could be integrated into the model. Even though we were interpolating between elevation points for more than 29 million locations, the computers were able to manage the processes. Once the model was created, each pair of attendees selected an area to QA/QC. This was beneficial to the whole group as we were able to see artifacts in the model. We modified the data and then re ran the process.

In order to verify our model, we downloaded ground control points. We compared these values to our own model and noted the difference was a matter of centimetres for some locations. Our instructors took our feedback from viewing the DEM and made final modifications. They sent the final model to us in November, 2019.

Results

Our final deliverables from the workshop include the digital elevation model (3 GBs of 15 .tif files), command functions used on linux, processed topographic data (including bathymetric and topographic sources), shapefile of dataset extents and accompanying metadata.

These products will primarily be used by tsunami modellers but we hope these products will be shared publicly so that everyone can take advantage of this data. NRCan will have the final say on this as there are data agreements that need to be complied with. Although most of the data is already in the public realm, there are some datasets that are private and only shared with us as per our agreement with them.