

Disclaimer:

This document has been prepared by **Northwest Hydraulic Consultants Ltd.** for the benefit of **Cowichan Valley Regional District** for specific application to the Chemainus River Flood Mapping Program. The information and data contained herein represent **Northwest Hydraulic Consultants Ltd.** best professional judgment in light of the knowledge and information available to **Northwest Hydraulic Consultants Ltd.** at the time of preparation, and was prepared in accordance with generally accepted engineering and geoscience practices. Despite these efforts, actual flood levels and extents may vary from those shown; **Northwest Hydraulic Consultants Ltd.** and **Cowichan Valley Regional District**, including officers and employees, do not assume any liability for such variations, or for use of the maps or data for uses other than that intended.

General Notes:

1. Please Refer to the Disclaimer.
2. The flood maps were prepared under the Cowichan Valley Regional District's "Chemainus River Flood Mapping Program" by Northwest Hydraulic Consultants Ltd (NHC) in 2021-2022. This study's final report should be consulted prior to use of the flood maps.
3. The maps delineate potential flooding caused by a designated flood event. Two types of floods are assessed:
 - a. Riverine floods, having a 200-year return period event with a 20% climate change allowance.
 - b. Coastal floods, having a 200-year return period event + 1 m global sea level rise (with an adjustment for local tectonics) and local wave effects.
4. The future climate change scenario represents plausible conditions in the year 2100. However, the actual time frame for the changes is uncertain.
5. The Flood Construction Levels (FCL) shown on the maps include a freeboard of 0.6 m. It has been added to account for local variations in water level and uncertainty in the design event estimates.
6. All elevations are referenced to Canadian Geodetic Vertical Datum 2013 (CGVD2013).

Data Sources:

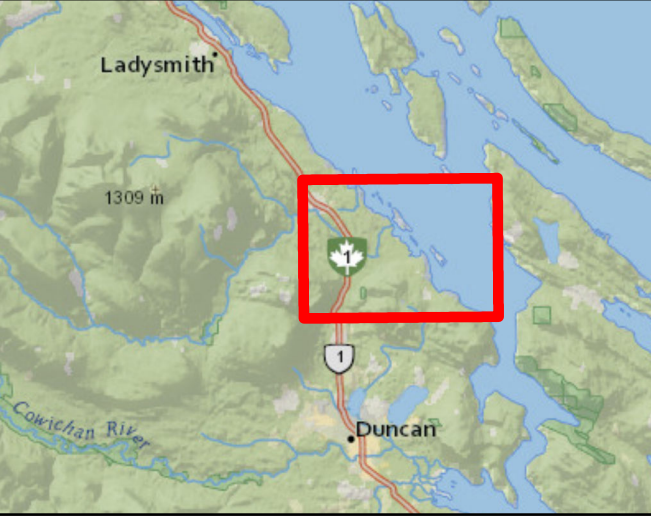
1. Floodplain topography is based on Lidar flown by GeoBC between October 14, 2018 – October 1, 2019. Chemainus River and immediate overbank topography is based on Lidar acquisition by the Cowichan Watershed Board on March 27, 2021 and was provided to NHC by the CVRD.
2. River channel bathymetry on Chemainus River and Bonsall Creek were surveyed by NHC on various dates from May 2021 – June 2021. Offshore bathymetry in Stuart Channel was supplied by Canadian Hydrographic Service (CHS) Non-Navigational 10 m Gridded Bathymetric Data (NONNA-10).
3. Municipal boundaries and cadastral information were provided by the CVRD and GeoBC.
4. High-resolution orthoimagery flown in June 2019 was provided by the CVRD and displayed on the maps where it exists. 2020 orthoimagery from Esri is displayed where the high-resolution data does not exist.

Use and Limitations of Floodplain Maps:

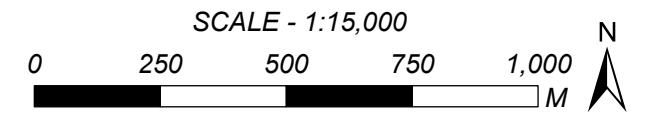
1. Floodplain maps are an administrative tool that depict the potential flood extent and minimum recommended Flood Construction Levels for the adopted designated flood. A Qualified Professional must be consulted for a site-specific engineering analysis.
 - a. FCLs are shown on the map as smoothed isolines to create a user-friendly interpretation of FCL. The upstream face or point of any structure should be used to determine the structure's FCL. The FCL can either i) be determined as the next upstream isoline (next greatest) or ii) calculated through interpolation by distance between the isoline upstream and downstream of the upstream face or point of the structure.
2. The maps depict the flooding conditions at the time of surveys. Future changes to the river channels, floodplain, and future climate change/sea level rise will render the maps obsolete. The information on the maps should be reviewed after 5 years have elapsed since publication or after any extreme flood occurrence.
3. Underlying hydraulic analysis assumes channel and shoreline geometry is stationary. Erosion, deposition, degradation, and aggradation are expected to occur and may alter actual observed flood levels and extents. Roads, railways, bridges, new dikes, and future developments on the floodplain can restrict water flow and increase local water levels. Obstructions such as log-jams, blockages, local storm water inflows, groundwater, other land drainage or tributary flows beyond those indicated were not modelled and may cause flood levels to exceed those indicated on the maps. Additionally, flooding may occur outside of the designated boundaries caused by ponding from rainwater on the floodplain, groundwater seepage, or local drainage courses.
4. The floodplain limits have not been established on the ground by legal survey. The accuracy of the flood boundaries is limited by the Lidar base mapping and orthophotography.
5. Isolated areas of inundation smaller than 100 m² and some manually flagged areas larger than 100m² were removed from the maps. Holes in the inundation extents with areas less than 100 m² were also removed.
6. The flood maps do not represent hazards due to erosion, avulsion, or channel migration. Details on those hazards can be found in the Erosion Hazard Maps prepared in the same study (NHC, 2022).
7. Industry best practices were followed to generate the flood maps. However, actual flood levels and extents may vary from those shown. Residual flood risk beyond that mapped exists for flood events more extreme than the design events; Northwest Hydraulic Consultants Ltd. (NHC) and the Cowichan Valley Regional District do not assume any liability for such variations.



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1:5,000 MAP SHEET
FIRST NATION ADMINISTRATIVE BOUNDARY
ELECTORAL AREA BOUNDARY



Coordinate System: NAD 1983 CSRS UTM Zone 10N
Units: Metres; Vertical Datum: CGVD2013

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|------------|---------|------|-------------|----------|-----|
| Engineer | VCCM | GIS | BLH | Reviewer | DGM |
| Job Number | 3006373 | Date | 20-OCT-2022 | | |



CHEMAINUS RIVER
FLOOD MAPPING PROGRAM

FLOODPLAIN MAPPING
INDEX SHEET

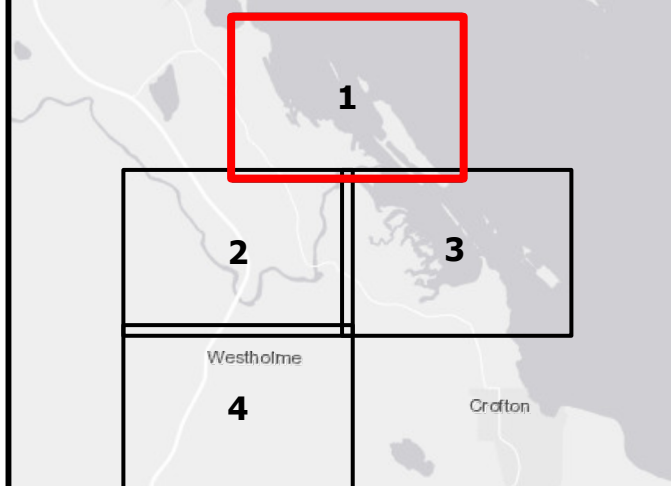


SHEET 2 ↓

↓ SHEET 3



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1
2
3
4
Westholme
Crofton

RIVERINE FLOOD CONSTRUCTION LEVEL (FCL) INCLUDING FREEBOARD *Labelled with FCLs in metres*

COASTAL FLOOD CONSTRUCTION LEVEL (FCL) ZONE INCLUDING FREEBOARD *Labelled with FCLs in metres*

INUNDATION EXTENT - DESIGN WITH FREEBOARD (FCL)

INUNDATION EXTENT - DESIGN WITHOUT FREEBOARD

FLOW DIRECTION

EXTENT OF STUDY

FIRST NATION ADMINISTRATIVE BOUNDARY

CVRD ELECTORAL AREA BOUNDARY

MINOR ROAD

MAJOR ROAD

RAIL

PARCEL BOUNDARY

REFER TO GENERAL NOTES AND LIMITATIONS ON INDEX MAP

SCALE - 1:5,000

0 100 200 300 M

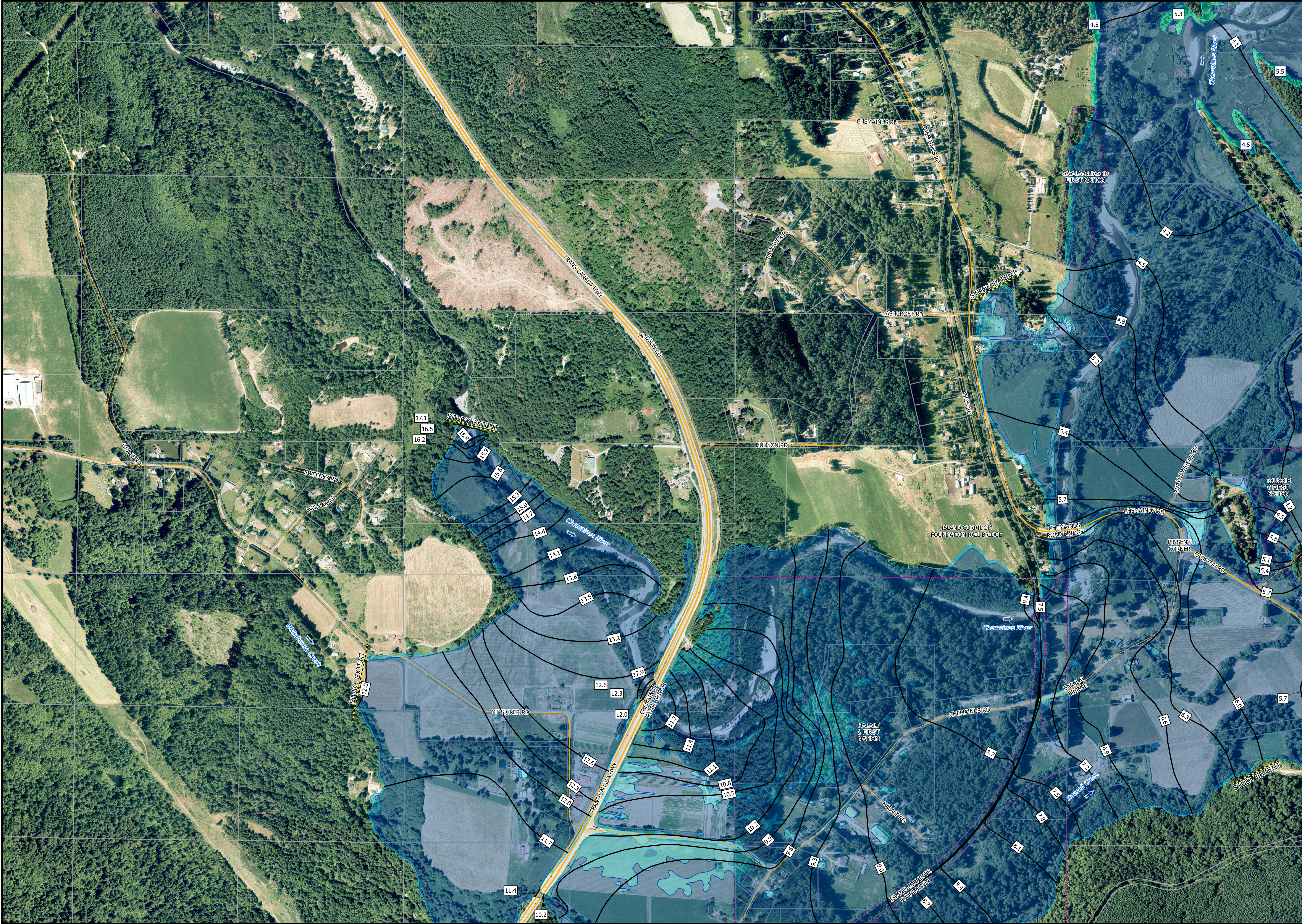
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Units: Metres; Vertical Datum: CGVD2013

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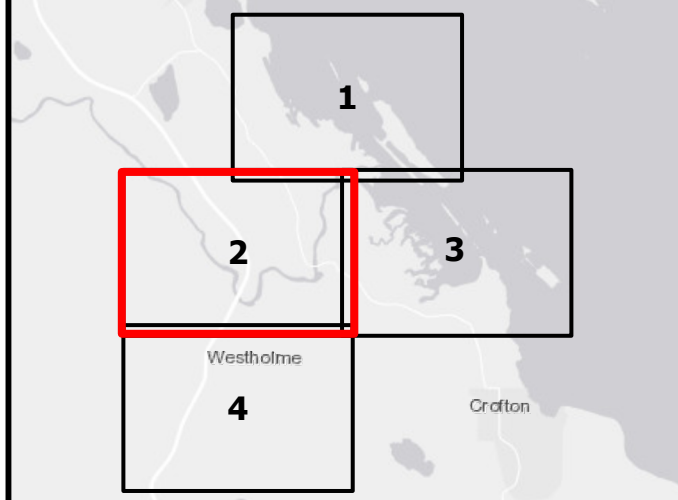
CHEMAINUS RIVER
FLOOD MAPPING PROGRAM

200 YEAR FLOOD WITH YEAR 2100
CLIMATE CHANGE SCENARIO
FLOODPLAIN MAP SHEET 1 OF 4



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- RIVERINE FLOOD CONSTRUCTION LEVEL (FCL) INCLUDING FREEBOARD *Labelled with FCLs in metres*
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 - INUNDATION EXTENT - DESIGN WITHOUT FREEBOARD
 - FLOW DIRECTION
 - EXTENT OF STUDY
 - FIRST NATION ADMINISTRATIVE BOUNDARY
 - CVRD ELECTORAL AREA BOUNDARY
 - MINOR ROAD
 - MAJOR ROAD
 - RAIL
 - PARCEL BOUNDARY
- REFER TO GENERAL NOTES AND LIMITATIONS ON INDEX MAP

SCALE - 1:5,000
0 100 200 300 M

Coordinate System: NAD 1983 CSRS UTM Zone 10N
Units: Metres; Vertical Datum: CGVD2013

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200 YEAR FLOOD WITH YEAR 2100
CLIMATE CHANGE SCENARIO
FLOODPLAIN MAP SHEET 2 OF 4



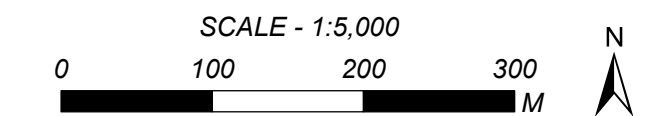
SHEET 2 ↑



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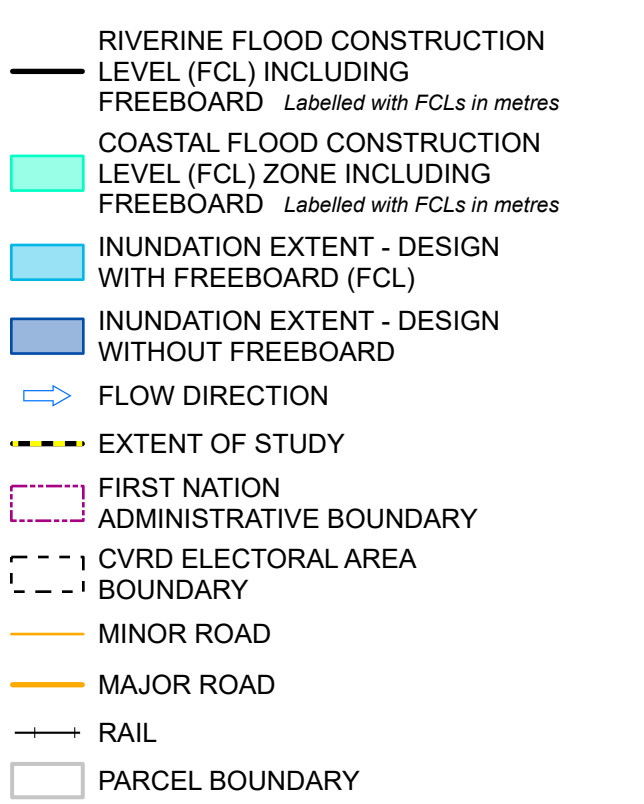


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CHEMAINUS RIVER
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200 YEAR FLOOD WITH YEAR 2100
CLIMATE CHANGE SCENARIO
FLOODPLAIN MAP SHEET 3 OF 4



SCALE - 1:5,000

0 100 200 300 M

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|------------------|------------|-----------------|
| Engineer VCCM | GIS BLH | Reviewer DGM |
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FLOODPLAIN MAP SHEET 4 OF 4