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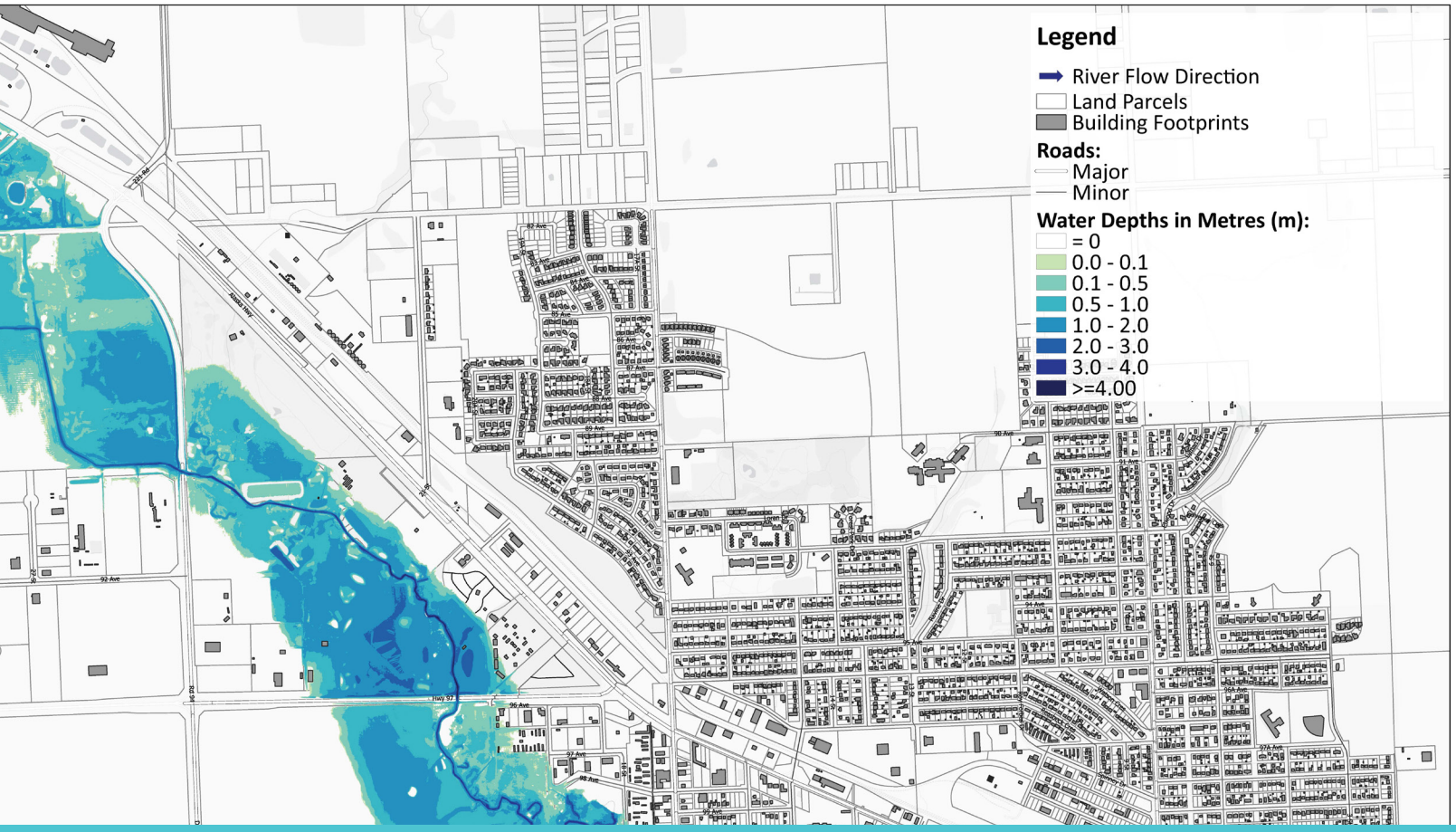


FLOOD MAPS

Overview Report
APRIL 2020

Prepared for:
City of Dawson Creek

Dawson Creek
BRITISH COLUMBIA

FLOOD MAPPING IN DAWSON CREEK

INTRODUCTION

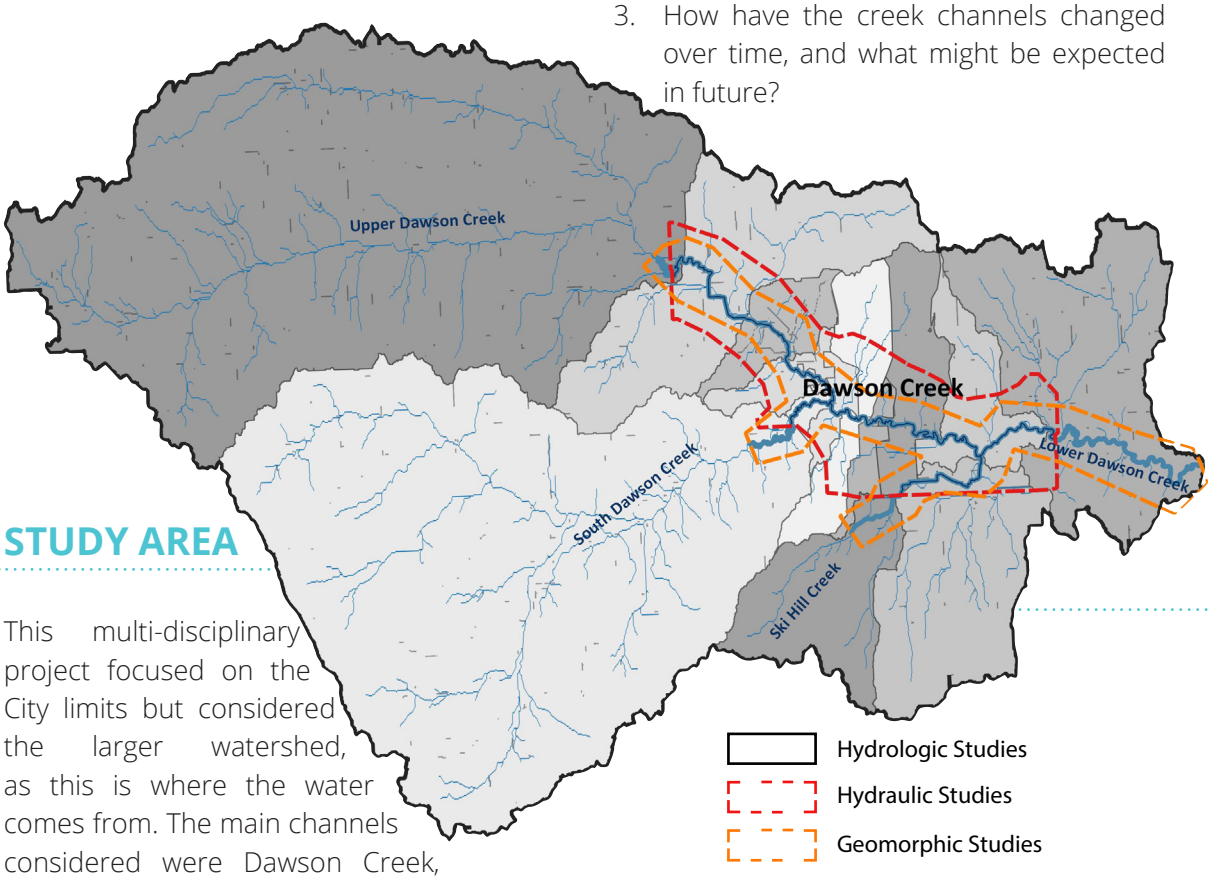
The community of Dawson Creek has felt the impacts of floods in recent years. In response, the City of Dawson Creek (City) has made a significant effort to manage and better understand flood impacts through various actions, including crossing upgrades and the development of a preliminary risk assessment. However, until now, the City has not had reliable information on where and how often flood waters are expected. With funding from the Province of BC, the City initiated a project to **develop modern flood mapping that meets regulatory standards and guidelines**.

Flood maps are a foundational tool to support planning and infrastructure decisions as well as emergency response activities. A good understanding of where and how deep water will be in a flood event enables sound choices flood flood risk reduction. To complement the flood mapping, a fluvial geomorphological assessment identified future erosion hazards. Specifically, in this study, we asked:

1. Where and how deep might it flood during different flood events? And how does this change with climate change?
2. What is a suitable elevation for design of structures, including residences, to ensure that damages are limited during a flood?
3. How have the creek channels changed over time, and what might be expected in future?

STUDY AREA

This multi-disciplinary project focused on the City limits but considered the larger watershed, as this is where the water comes from. The main channels considered were Dawson Creek, South Dawson Creek, and Ski Hill Creek. The figure above shows the boundaries for the various assessments that were completed.



HOW DO FLOOD MAPS GET MADE?

WHAT IS A FLOOD HAZARD?

Floods occur under a variety of conditions when large volumes of water cause a channel to exceed its capacity and overflow onto its banks and into the flood plain. This can occur in small streams or large rivers, and usually follows heavy rain and/or snowmelt. Blockages in channels, caused by debris for example, can make flooding worse.

HOW MUCH WATER?

Hydrologic Studies

The first question that is posed is "**how much water can we expect?**". This question is answered by hydrologic analysis conducted by hydrologists, who look at the physical characteristics of the watershed, like its shape and size along with historic records of flows. Using statistics and computer software, estimates are made of the volume of water expected in the Dawson Creek system. Probabilities, called Annual Exceedance Probabilities (AEPs), are assigned to these flows.

The AEP describes the probability of an event occurring or being exceeded in any given year and is written as a percentage. For this project, 6 AEPs were determined ranging from small and relatively common to large and much rarer floods. These were the 50%, 20%, 10%, 2%, 1%, and 0.5% AEP (2-, 5-, 10-, 50-, 100-, and 200-year indicative return periods, respectively) floods. The table below compares the AEPs and links them with their indicative return period, as well as their relative likelihood and size.

WHAT RESOURCES ARE NEEDED?

Flood mapping is developed by a team of professionals using a variety of data and software. The goal of this is to show on a map where water will go during a flood.

WHERE WILL THE WATER GO?

Hydraulic Studies

Once the question of how much water has been explored, the next question posed is "**where will the water go?**". This question is answered through hydraulic analysis and is conducted by hydraulic engineers, who take the results of the hydrologic analysis (how much water), and use computer models as well as detailed topographic information that describes the shape of the ground and creek channel, to figure out how the water will move through the system.

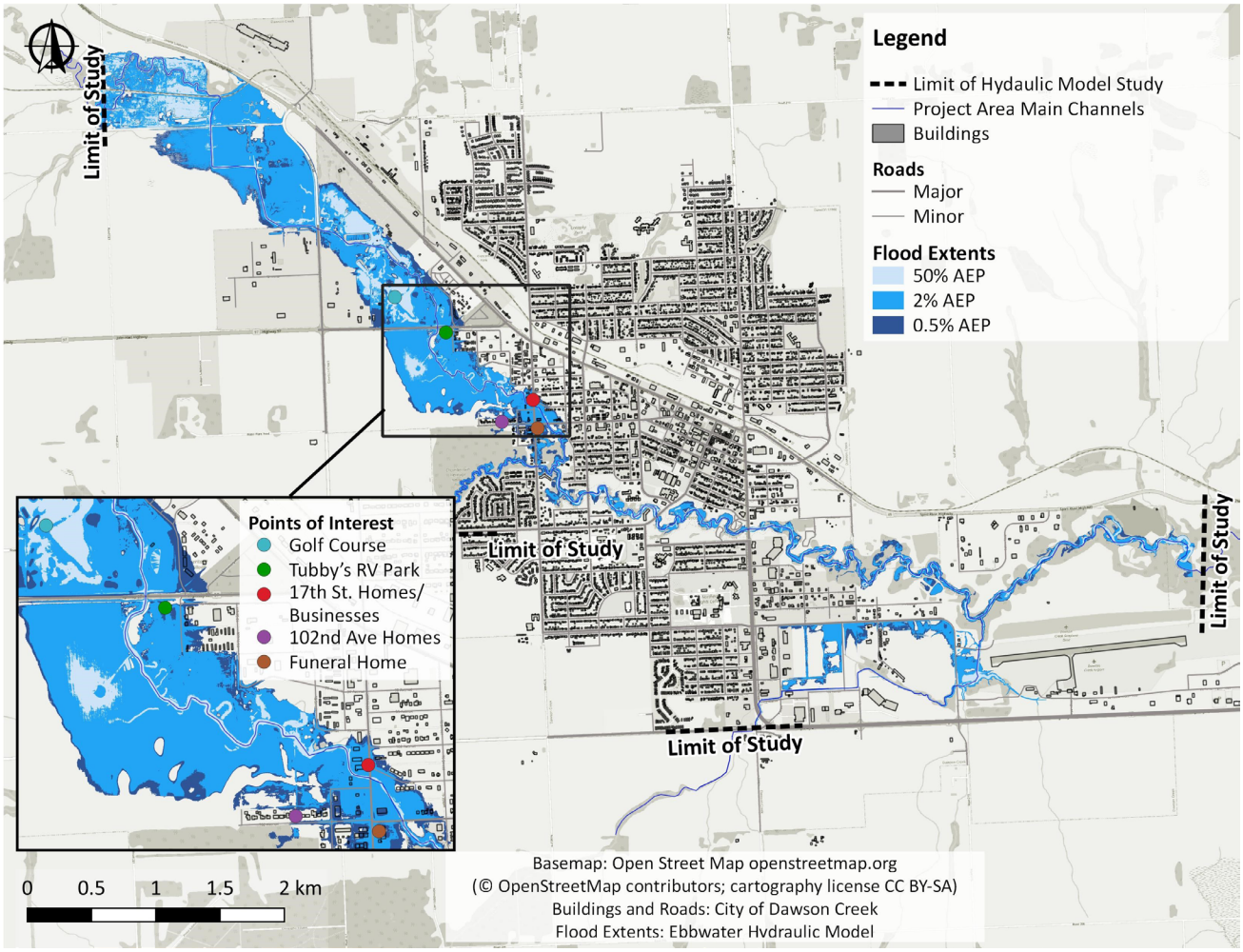
The hydraulic computer model for Dawson Creek also includes key structures such as major crossings such as John Hart Highway, 17th Street, 102nd Avenue, and 8th Street. The model was built and tested using observed flood extents from 2016.

The results of the hydraulic models were put on maps. These maps show a variety of scenarios – from common smaller events, through larger rarer ones, and also consider climate change. The maps show a variety of different types of information – from just the extents (where there will be water), to flood depths through damage potential, where velocities and depths are combined. See below for some examples.

AEP	Return Period (indicative)	Likelihood	Magnitude
50%	2 year	Very likely	**Very small**
2%	50 year	Moderately infrequent	**Moderately large**
1%	100 year	Rare	**Large**
0.5%	200 year	Very rare	**Very large**

A FLOOD EXTENT MAP FOR DAWSON

A prediction of where water will go



Flood Hazard maps are used to represent the total water depth, extents, and velocity. The map above shows the differences in flood extents between very small, moderately large, and very large (50%, 2%, and 0.5% AEP) floods. The darker areas are flooded under larger events; the map includes points of interest that were identified by Dawson Creek residents. The other flood maps can be accessed in the Flood Hazard Map Atlas.

A NOTE ON THE 2016 FLOOD

The community has felt the impacts of flood. In 2016, a significant event damaged crossings, disrupted the community and affected many residents and businesses. This event has an estimated AEP of 1.3%; slightly larger than the 2% event presented on the map above.

A CONSTANTLY SHIFTING CREEK

Geomorphic Studies

Flood waters cause creeks and rivers to migrate gradually through time. This includes sudden changes, called avulsions, when a channel carves a new path across the floodplain, as well as longer-term changes, as meanders shift and migrate. These are natural processes and are healthy for the system. However, secondary hazards to people, buildings and infrastructure can result, especially from slumping and erosion.

Past human-caused changes to the system such as river straightening, and the addition of crossings (bridges and culverts) have reduced the overall volume of the channel and therefore the amount of flow it can accommodate.

Since 1959, the Dawson Creek has been straightened, mostly due to human-caused activities, by approximately 30% (a distance of 6 km within the project area). This has led to reduced water storage and faster-moving water in the creek, which exacerbates flooding and erosion. The figure below shows an area of Upper Dawson Creek, where the original creek alignment (1959 shown in red) had many meanders. Over the years, the alignment has straightened substantially (2019 shown in purple). The Flood Hazard Map Atlas includes mapping of erosion hazard zones, Appendix E.

… FOR MORE INFORMATION

This document provides a snapshot of the flood mapping and modelling project and its findings. More detailed information is available in the project reporting, which can be found along with more information on the City's current flood mitigation and disaster risk reductin activities at https://www.dawsoncreek.ca/departments/infrastructure/water-environmental/flood-mapping-mitigation.

LIMITATIONS

As with any study of this type, many uncertainties exist, and modelling and mapping can only provide a simplified representation of a complex reality. Please refer to the final report (Ebbwater Consulting Inc. Palmer, 2020) for a full discussion of limitations.