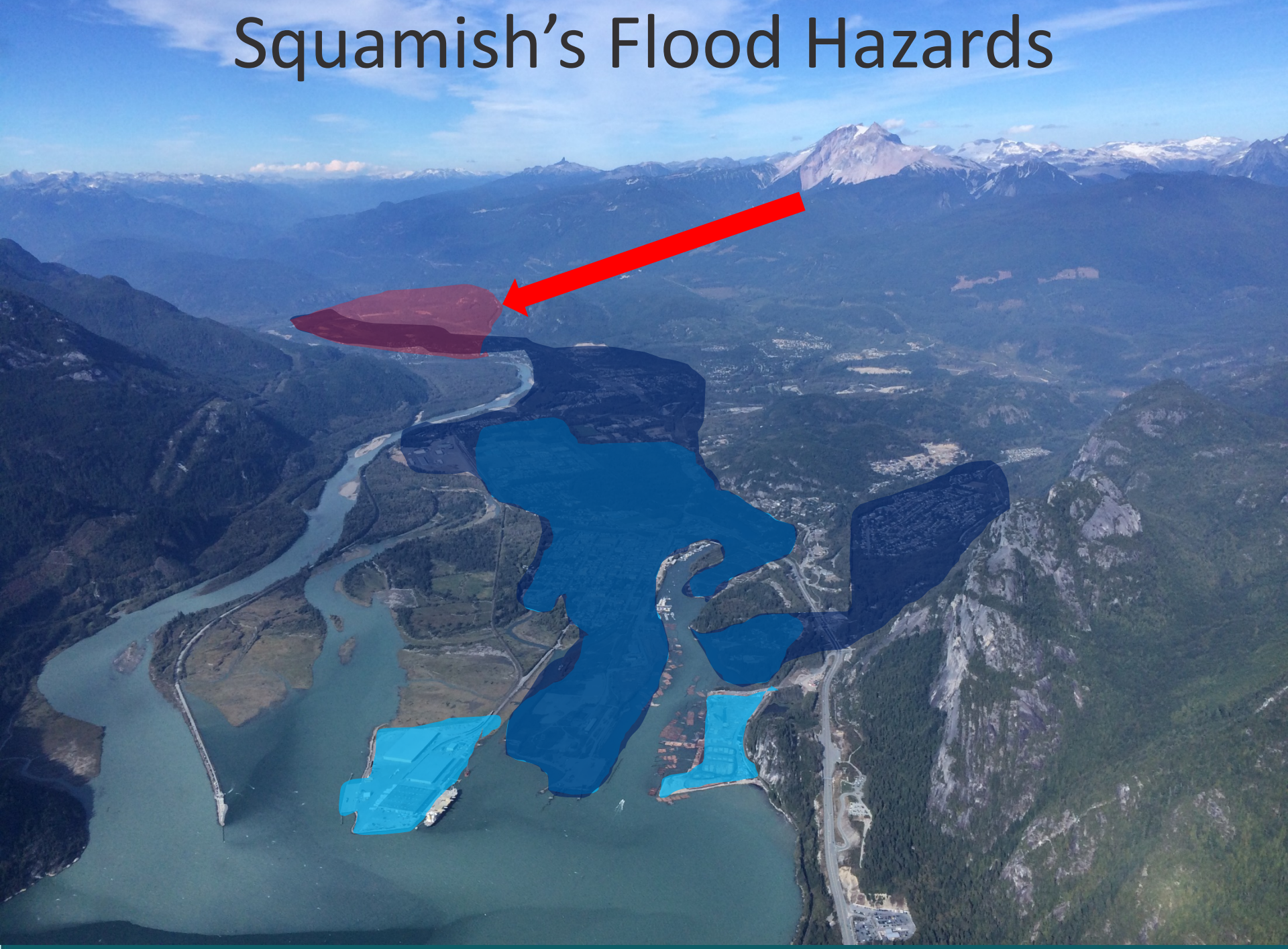
District of Squamish
Climate Adaptation in Flood Planning and Decision Making

February 2020

SQUAMISH

Squamish's Flood Hazards



A History of Flooding

The recorded history of the Squamish community shows a constant struggle to protect human settlement from the natural forces that have frequently led to flooding. Over the past century, Squamish has experienced numerous floods as outlined below.

1890s
Squamish River
rst River Dike proposed

Sept 1906
Squamish River
"Many settlers were completely wiped out" (Myrtle Herndl)

Oct 1921
Mamquam River
Squamish River
Flood covered valley floor

Dec 1932
Howe Sound
Overtopping of the sea dike in Downtown

Oct 1940
Squamish River
Evacuations from Brackendale to Downtown

Dec 1951
Howe Sound
Sea dike was breached in two places

Oct 1950
Squamish River
Damage to roads and rail bridges

Oct 1955
Mamquam River
Mamquam Bridge washed out for 10th time in 28 years

Aug 1958
Cheekeye River
Major debris flow following a sudden rainstorm

Oct 1958
Squamish River
Four feet of water over the main road in Brackendale

Dec 1967
Howe Sound
Sea dike was overtopped & Downtown Squamish flooded.

Nov 1968
Mamquam River
Flooding damaged a trailer park, highways and the railway

Dec 1980
Squamish River
Cheakamus River
Mamquam River
Stawamus River
Logjams on 3 rivers led to damages to 200 homes and closure of Highway 99

Oct 1981
Squamish River
177 mm of rain in 48 hours

Oct 1984
Cheekeye River
Cheakamus River
Stawamus River
Log bridge across the Cheakamus River destroyed and damaged homes

Aug 1991
Squamish River
Cheakamus River
Cheekeye River
15 houses on Cheakamus I.R. No. 11 were flooded and the access road to Paradise Valley was washed out

Oct 2003
Cheakamus River
Largest flood in 50 years (369 mm in 4 days) caused District evacuations and damaged the BC rail line
Dikes were not overtopped

1890s 1900s 1910s 1920s 1930s 1940s 1950s 1960s 1970s 1980s 1990s 2000s 2010s

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Climate Change Impacts

1) Sea Level Rise

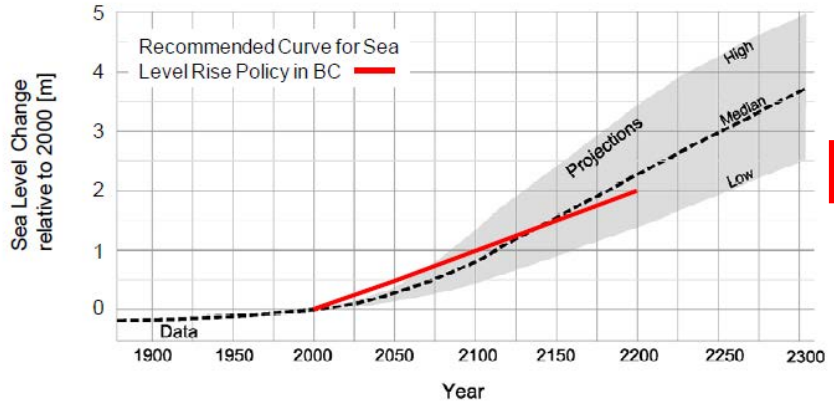
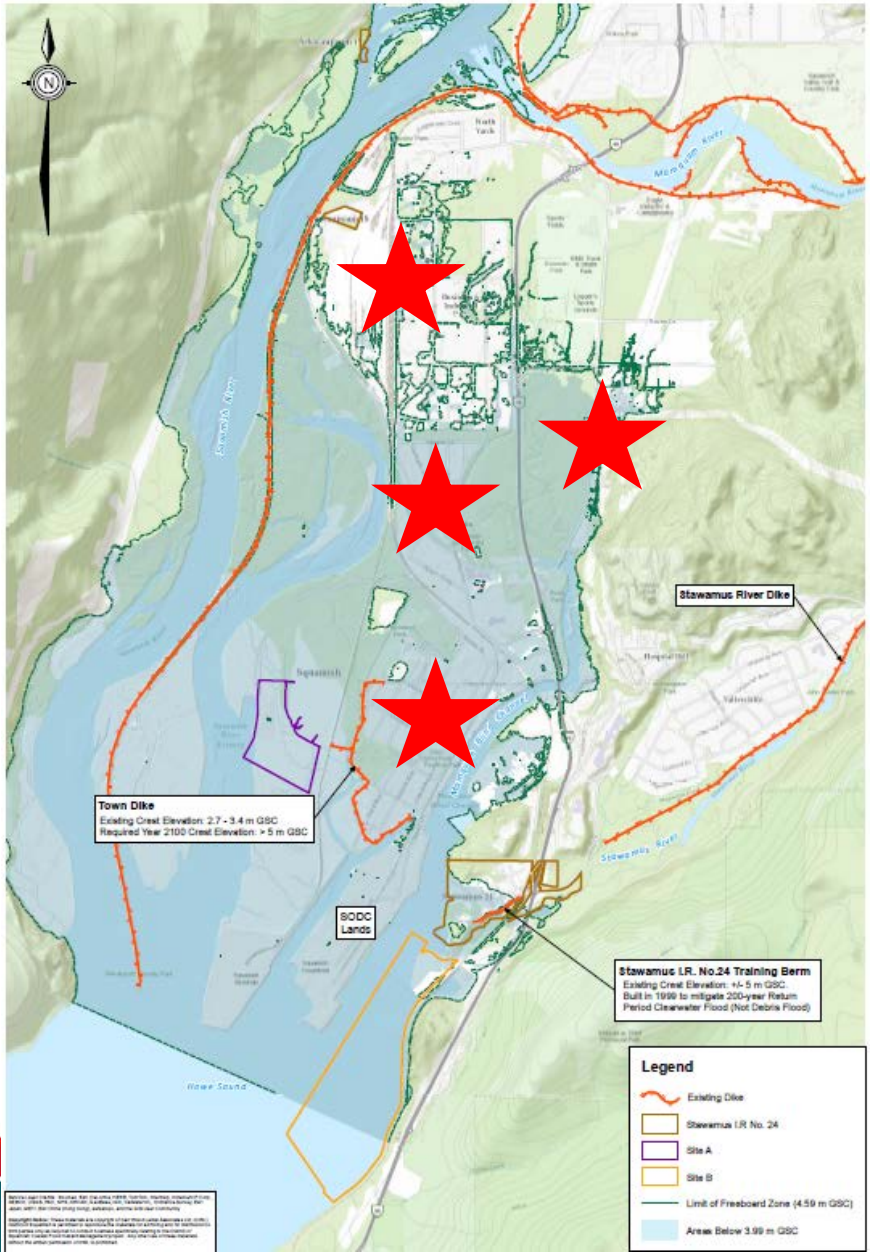


Figure 3-1: Projections of Sea Level Rise
source: Policy Discussion Paper (2010)



Climate Change Impacts

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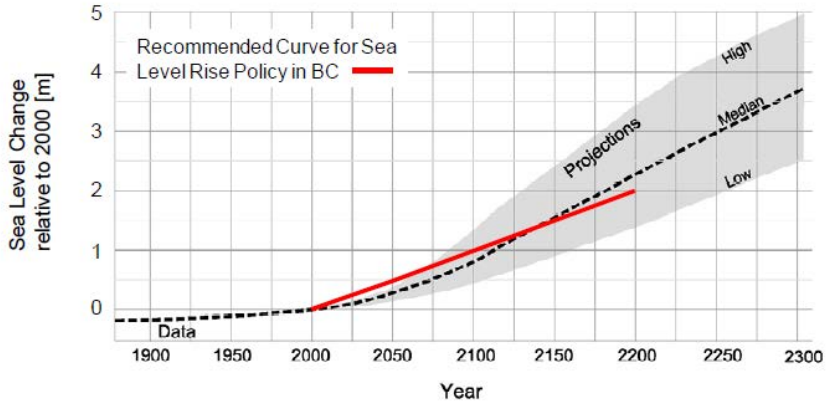
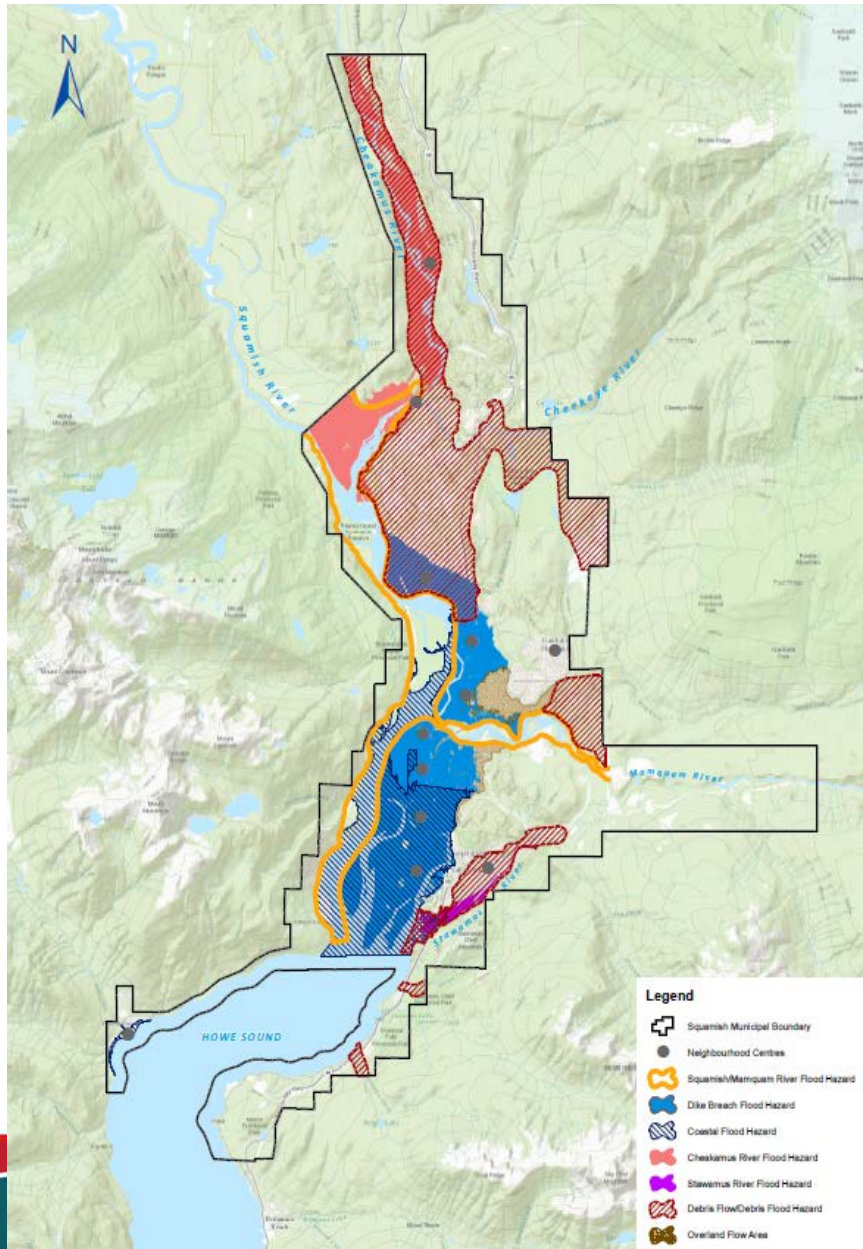


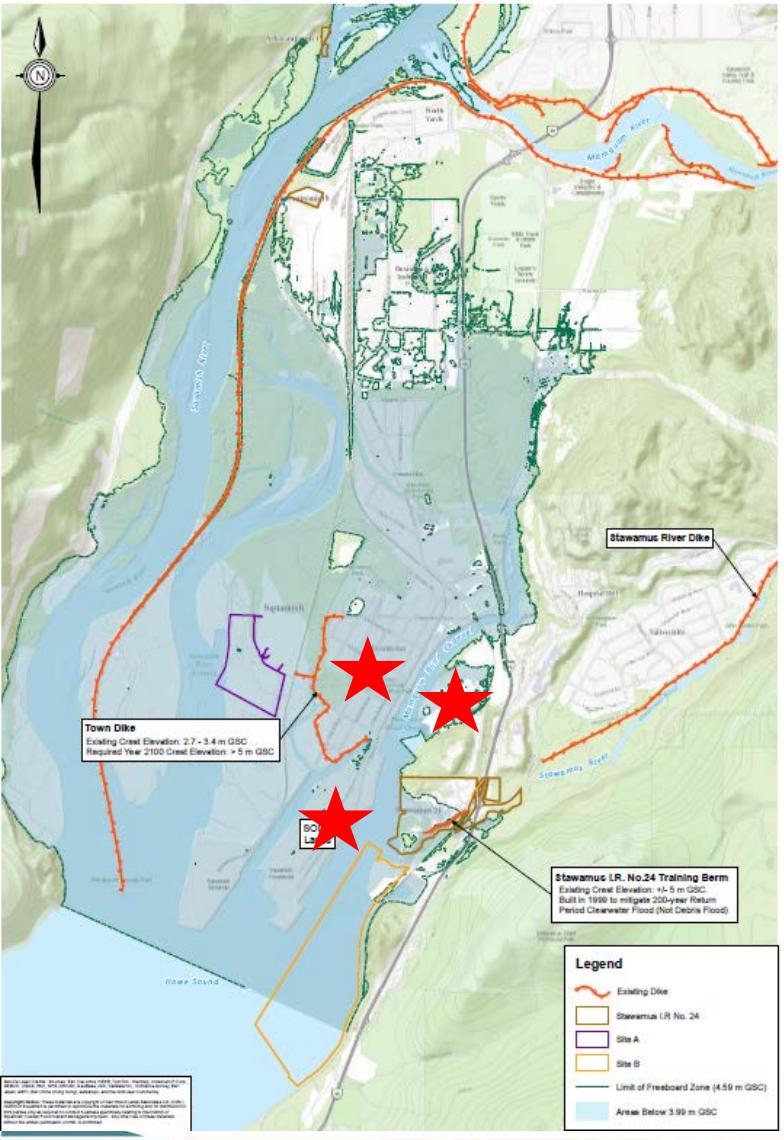
Figure 3-1: Projections of Sea Level Rise
source: Policy Discussion Paper (2010)

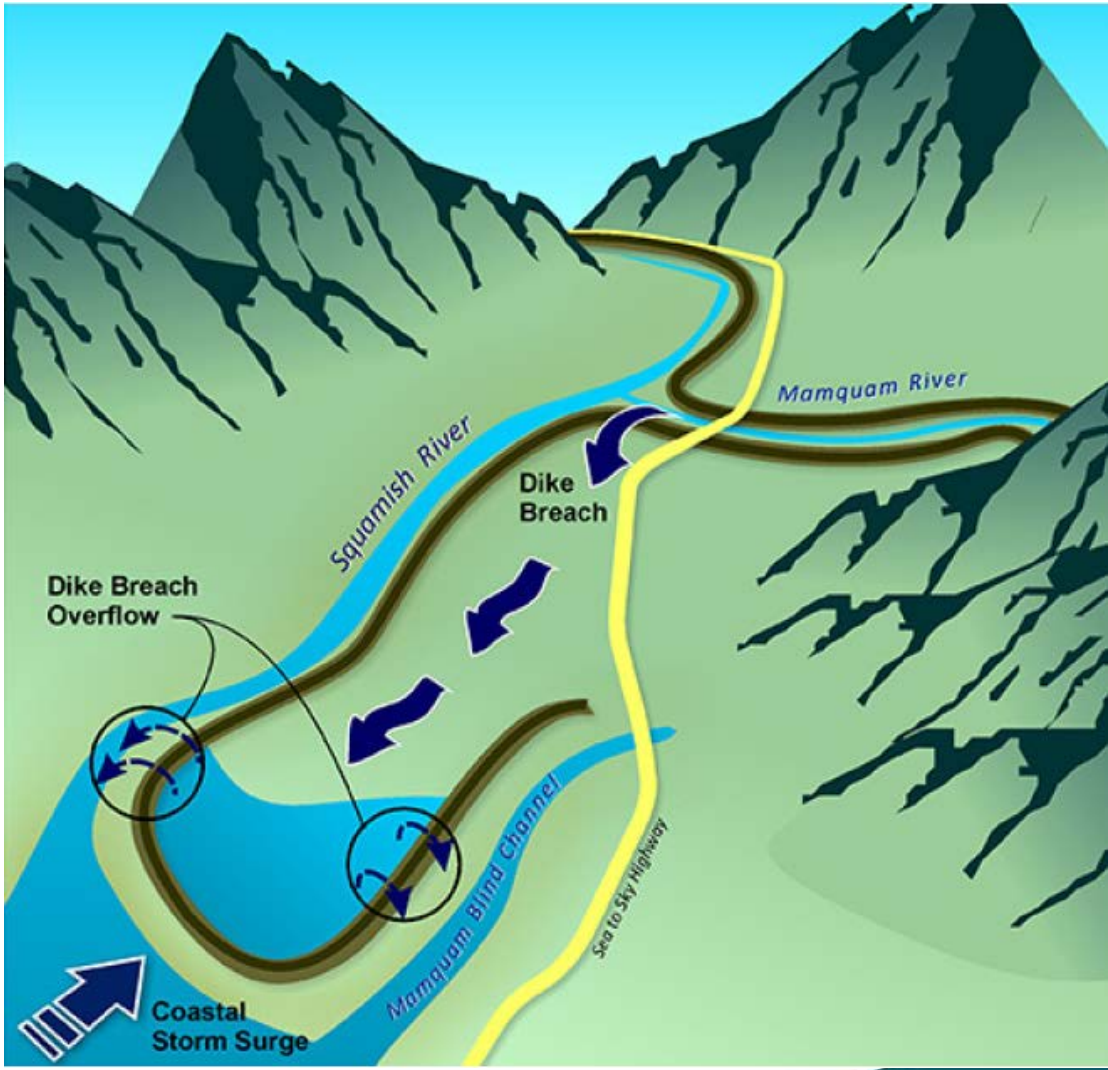
2) Increasing River Flows

EGBC guidance is to apply 10% increase or greater where evidence of increase



Integrated Flood Hazard Management Plan





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Objectives

Equitably reduce flood risk

Identify development opportunities

Integrated Flood Hazard Management Planning

Promote sustainable decisions

Create community supported solutions

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Integrated Flood Hazard Management Plan

Phase 1
- Background/Gap Analysis

Phase 2
- Coastal Flood Mitigation Strategy

Phase 3
- River Flood Mitigation Strategy

Phase 4
- Integrated Flood Hazard Management Plan

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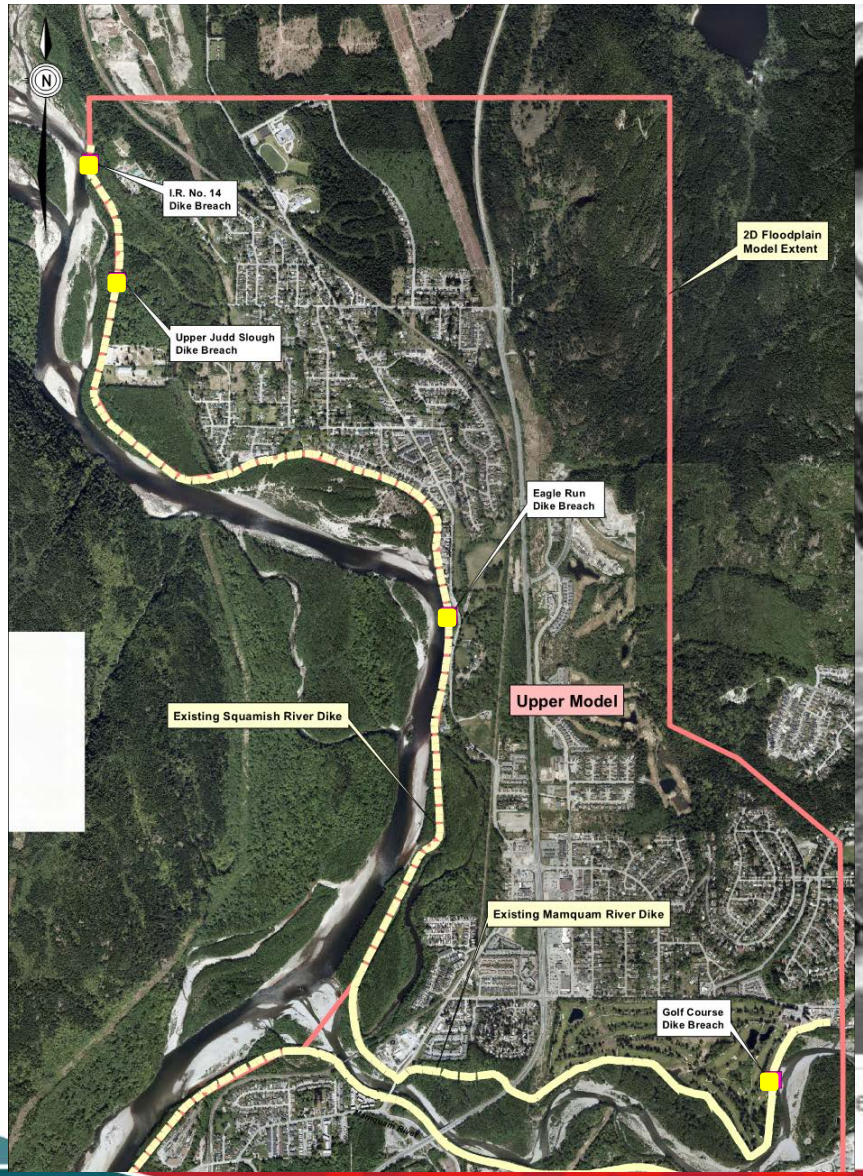
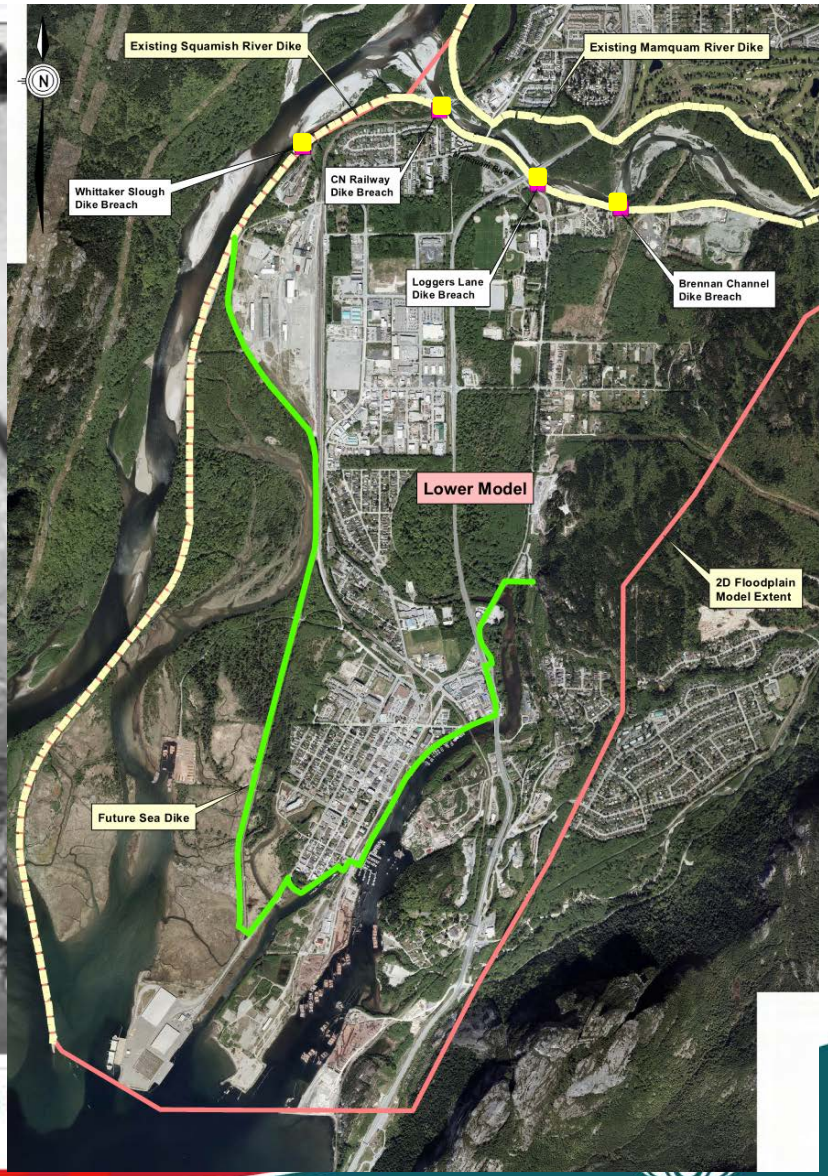
River Dike Breach Modelling





e the dike

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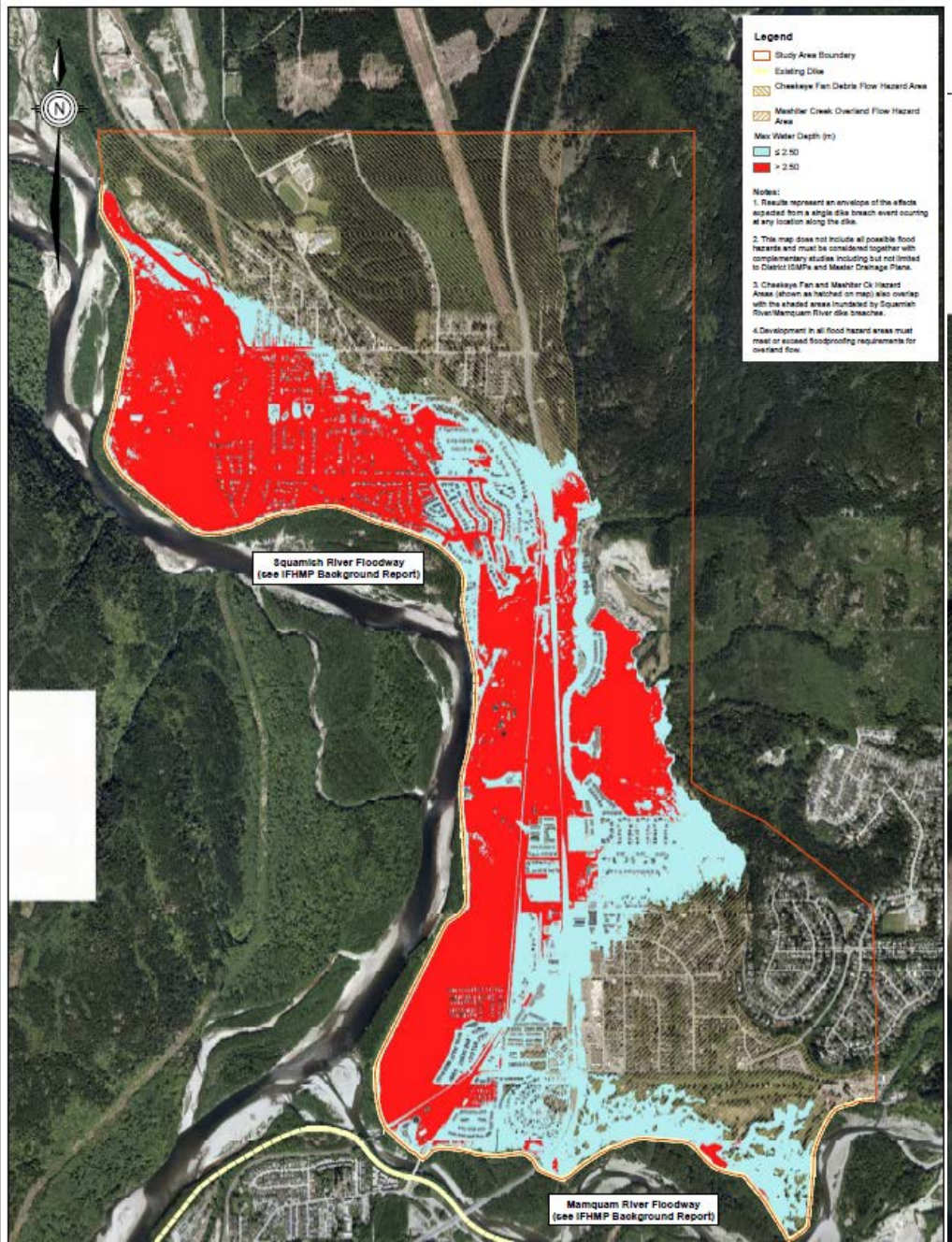
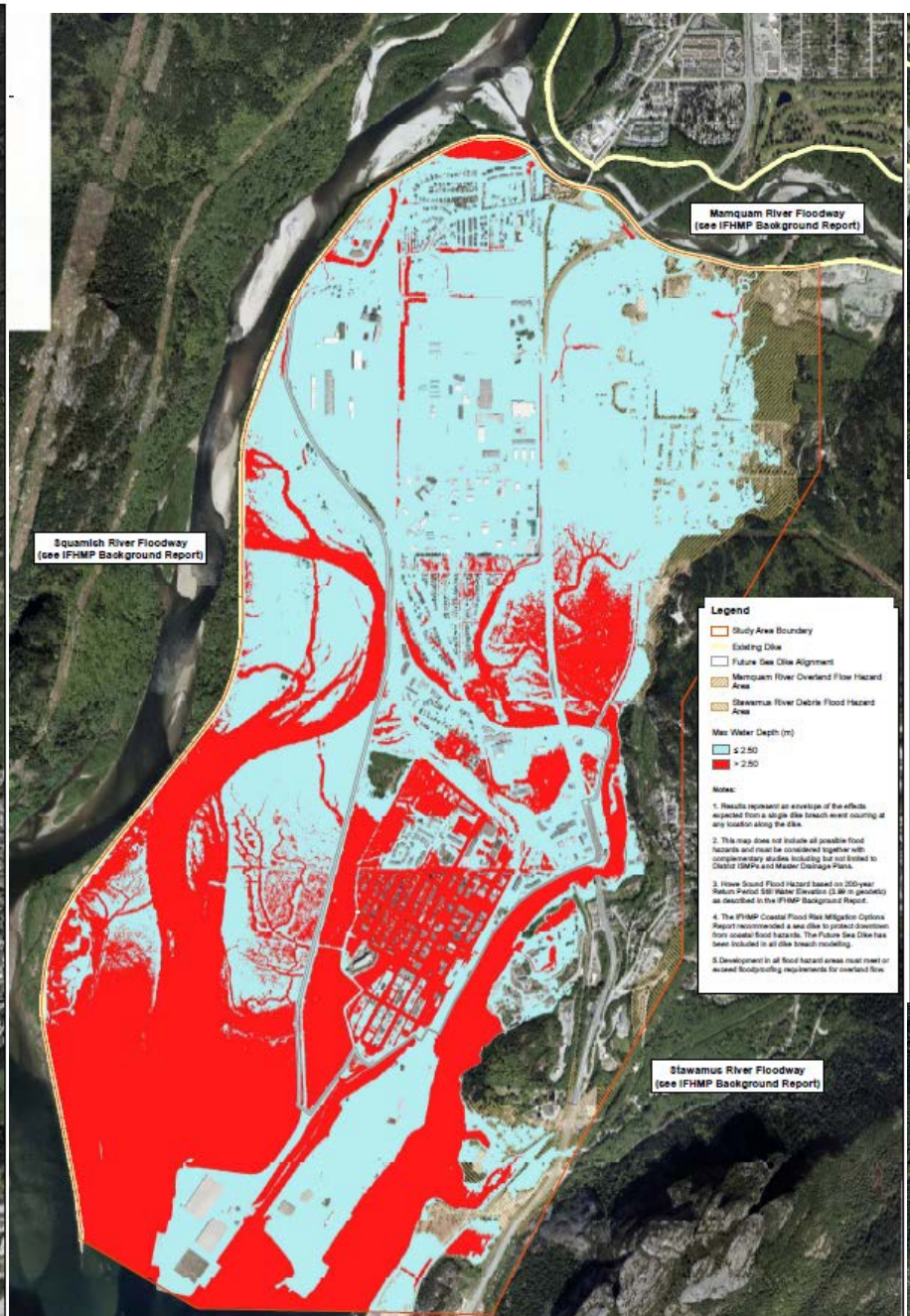
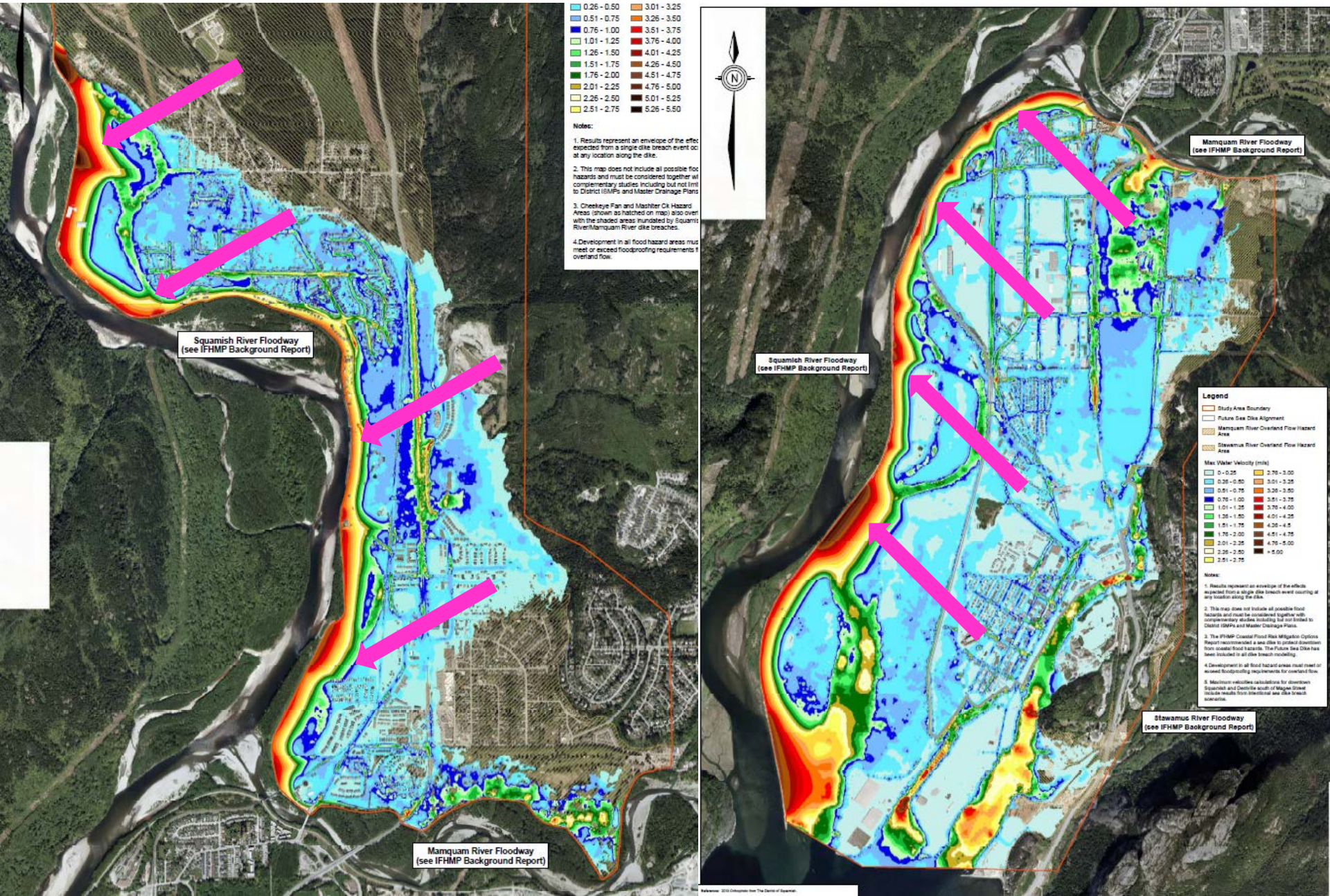
Floodplain Mapping – Water Depth

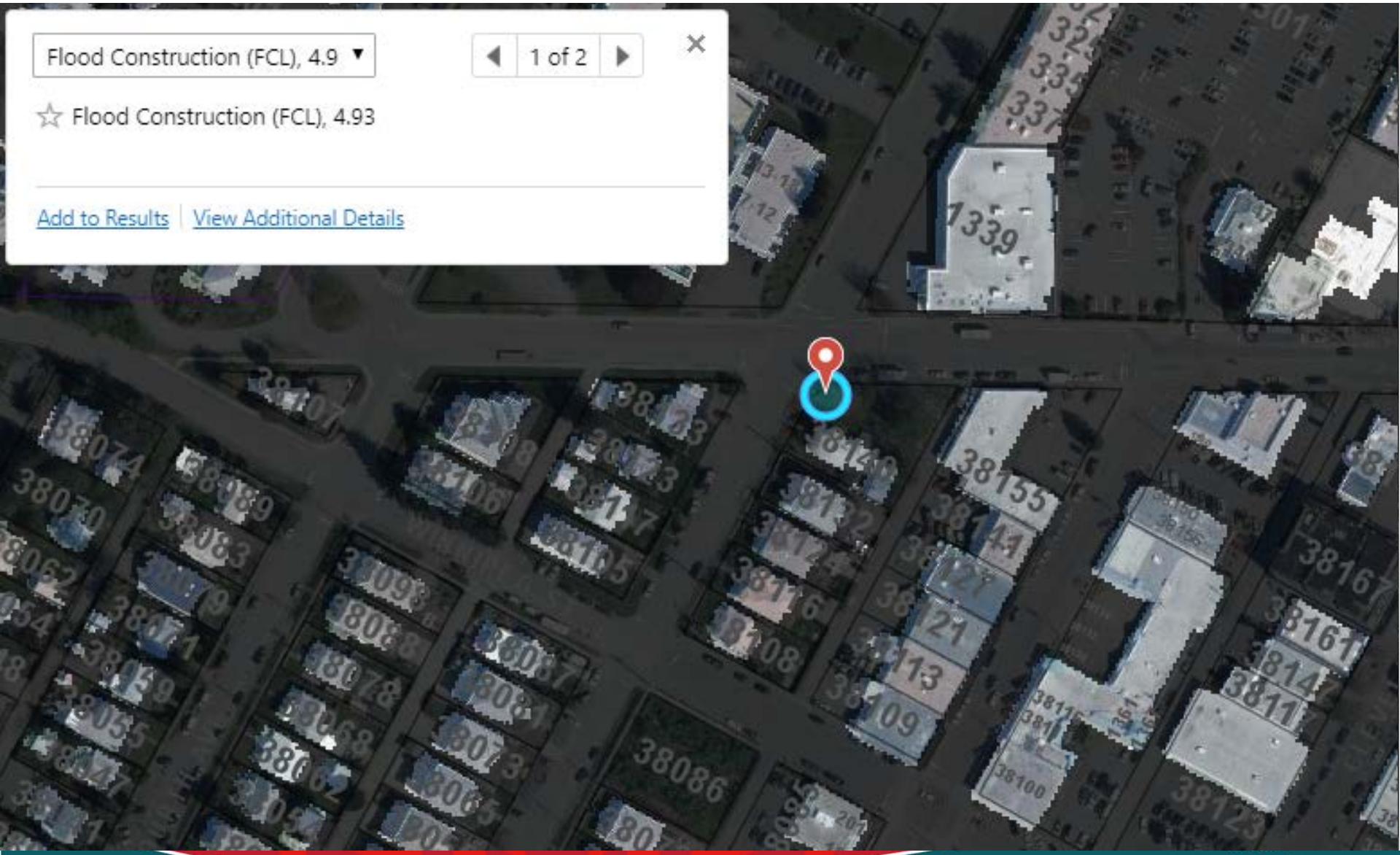




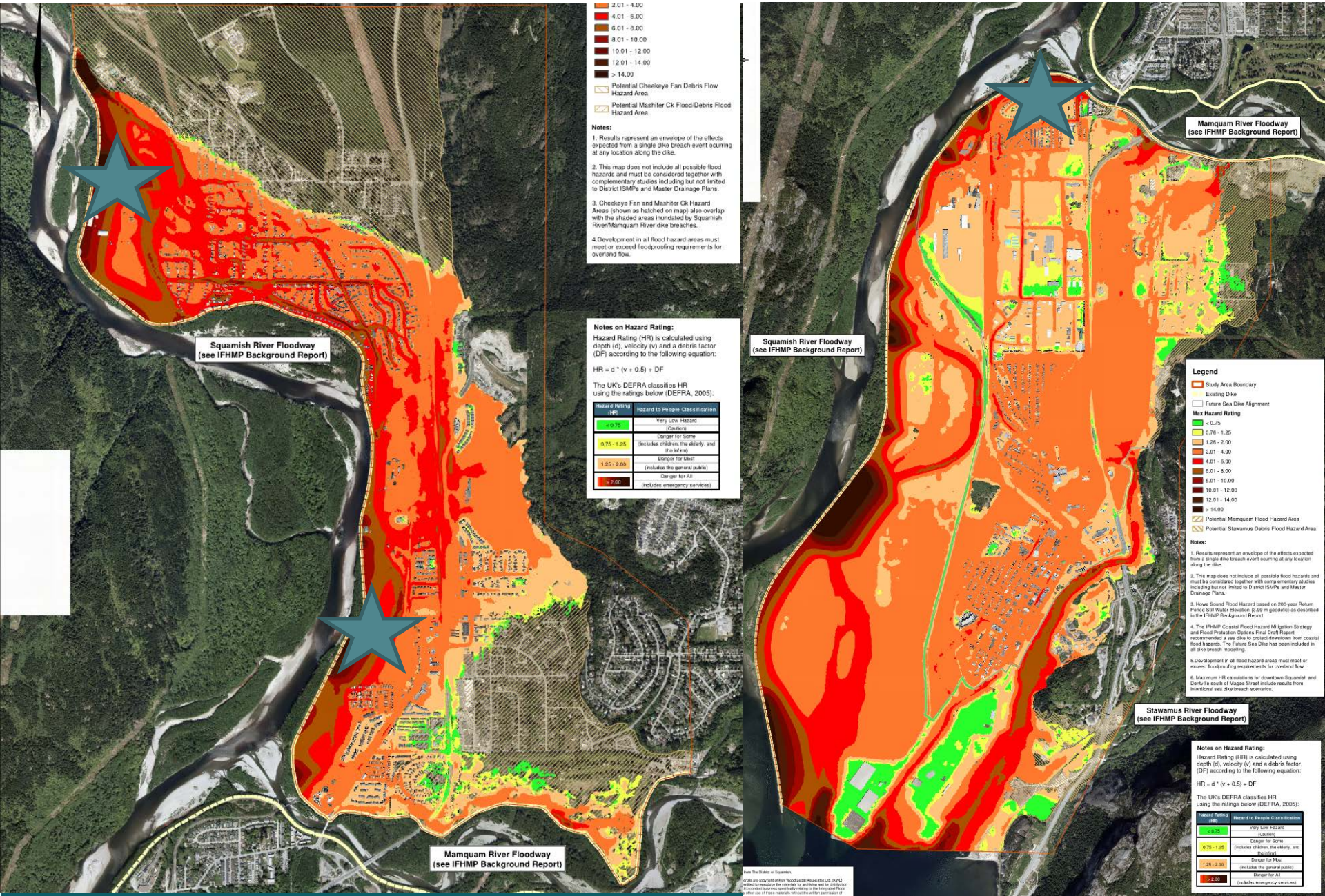
Floodplain Mapping - Velocity



Floodplain Mapping – Flood Elevation

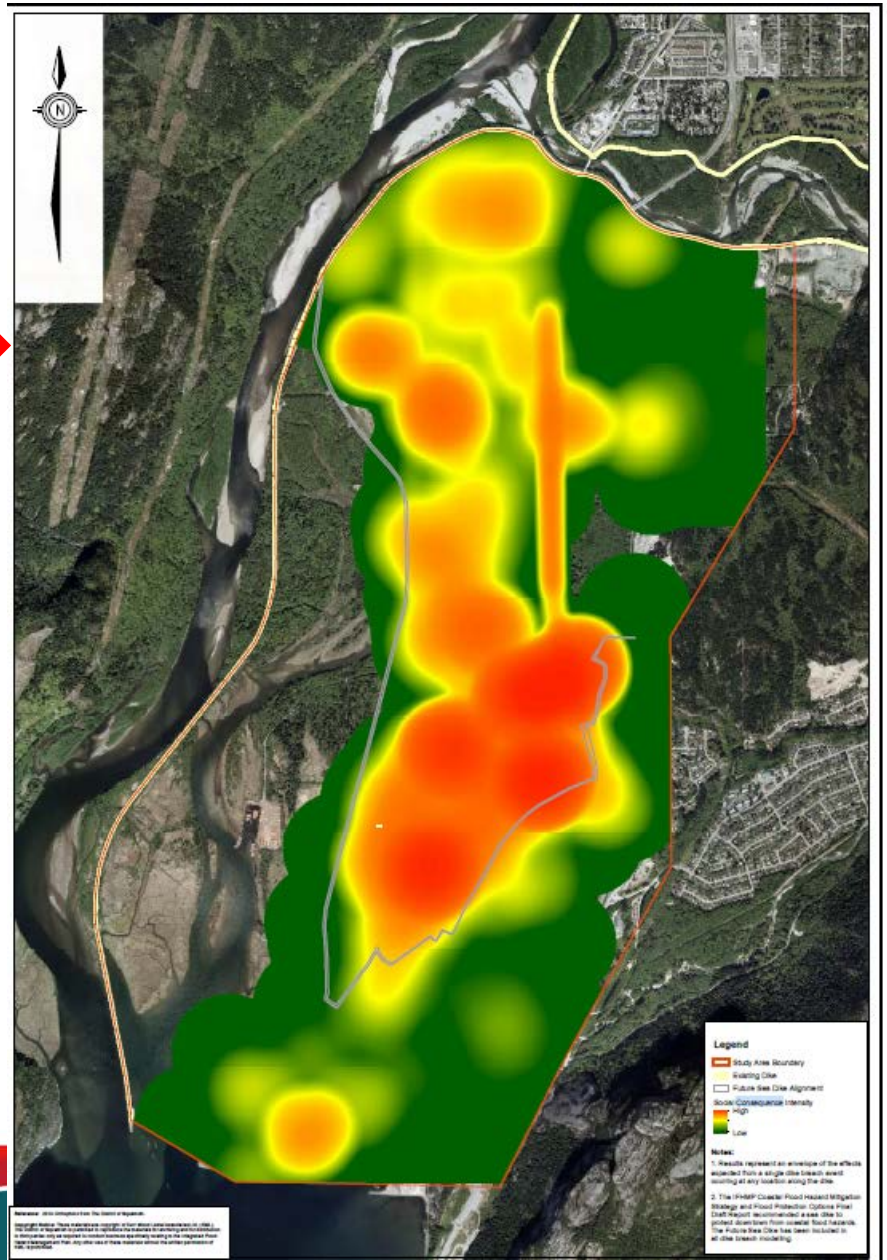


Floodplain Mapping – Hazard Rating

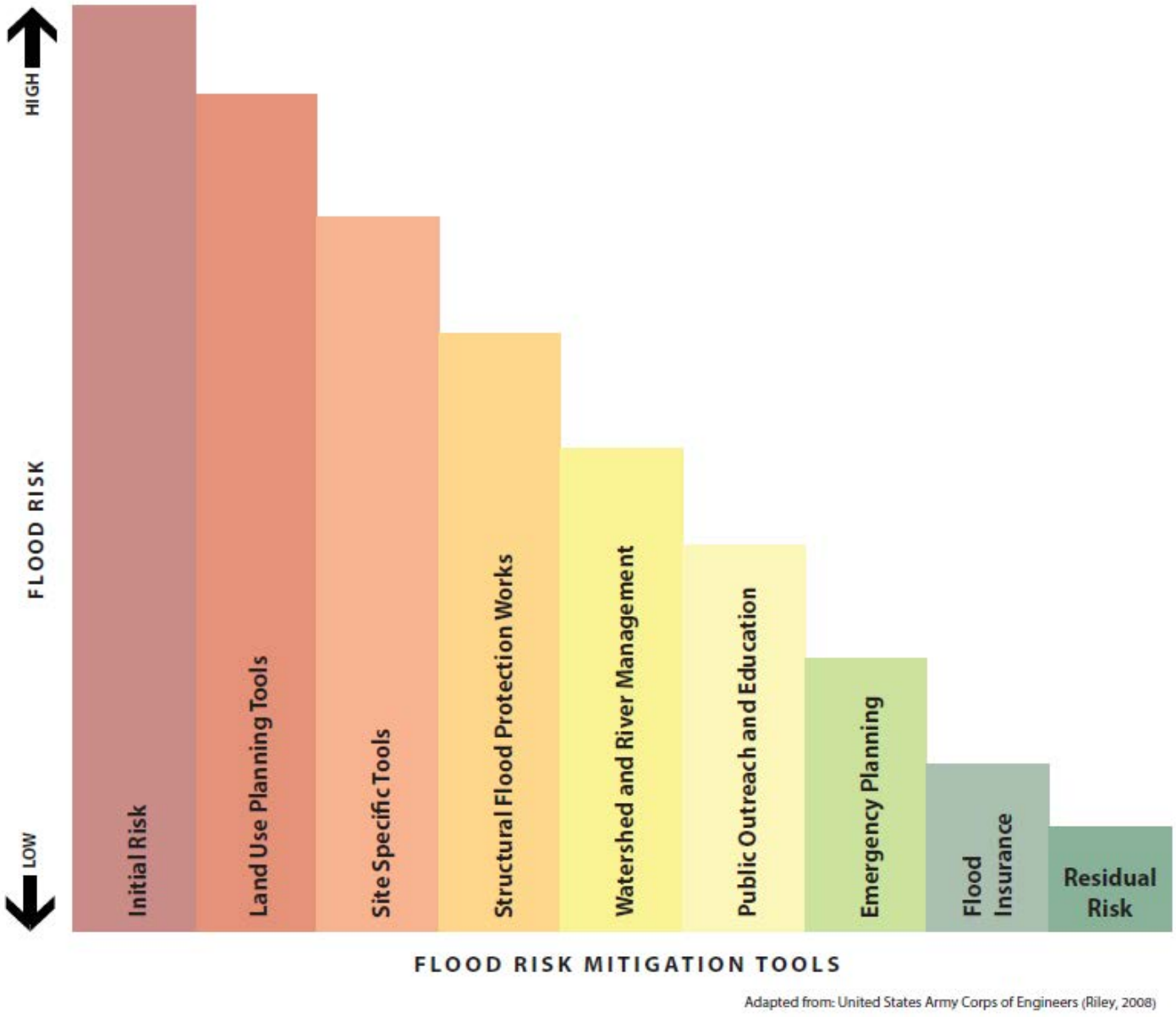


Consequence Assessments

- Physical → Risk to loss of life
- Social → Over 50% of community displaced + employment disruption
- Economic → $500 million in direct damages
- Environmental → Contaminants mobilized and dispersed into sensitive areas



Risk Mitigation Strategies and Tools



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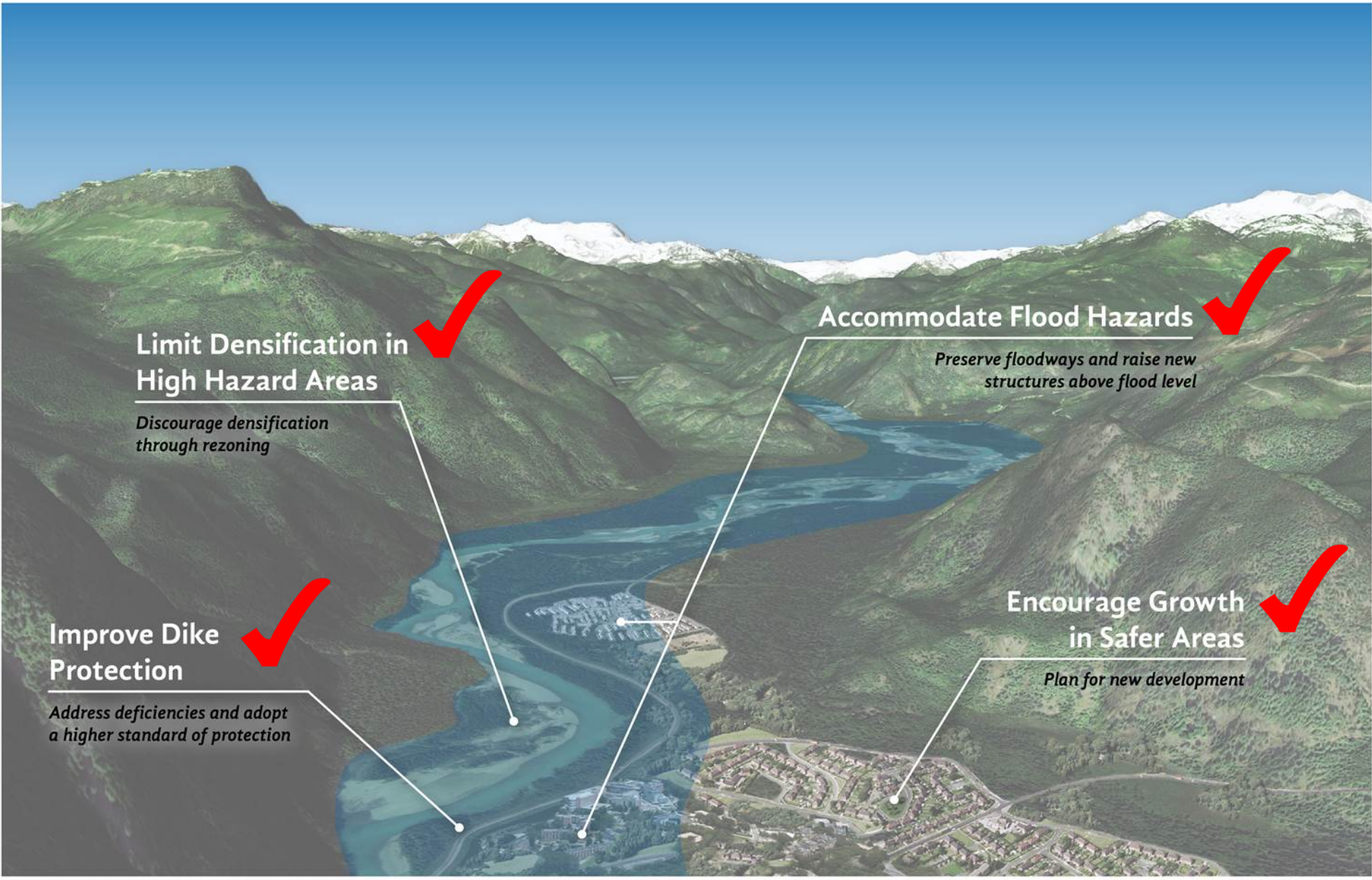
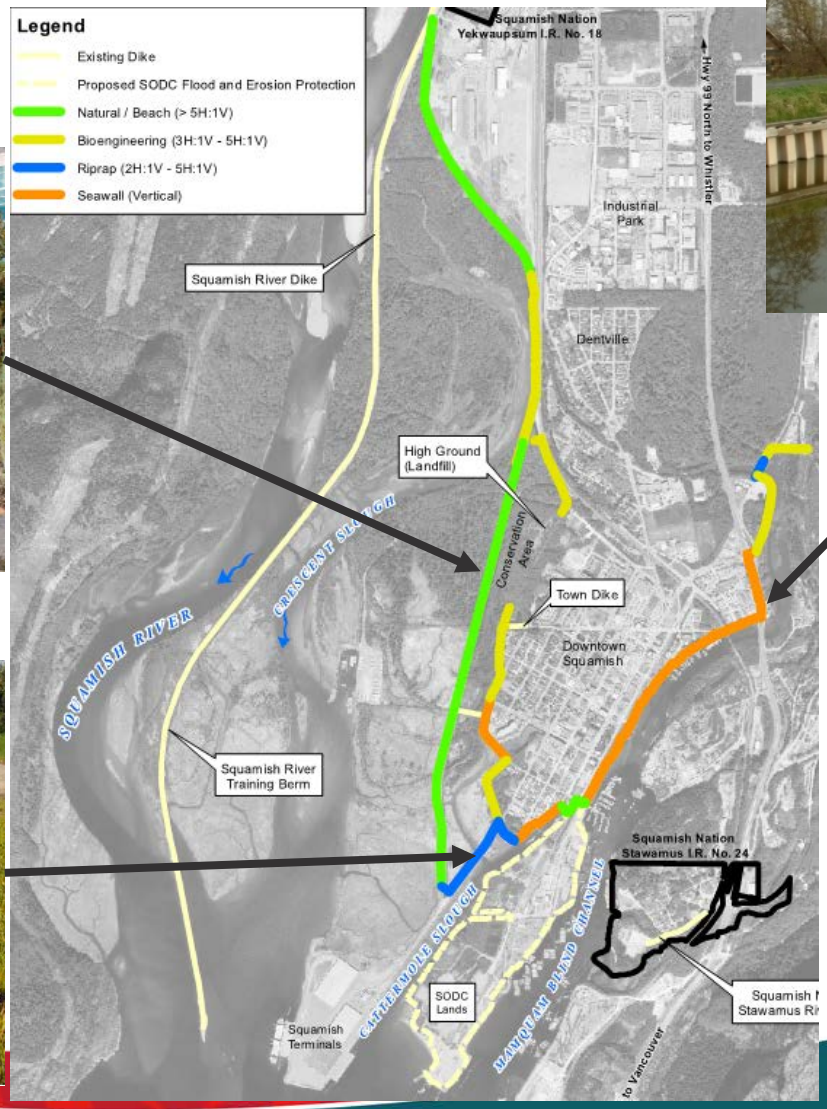
Mitigation Strategy Overview



Improve Dike Protection: Sea Dike



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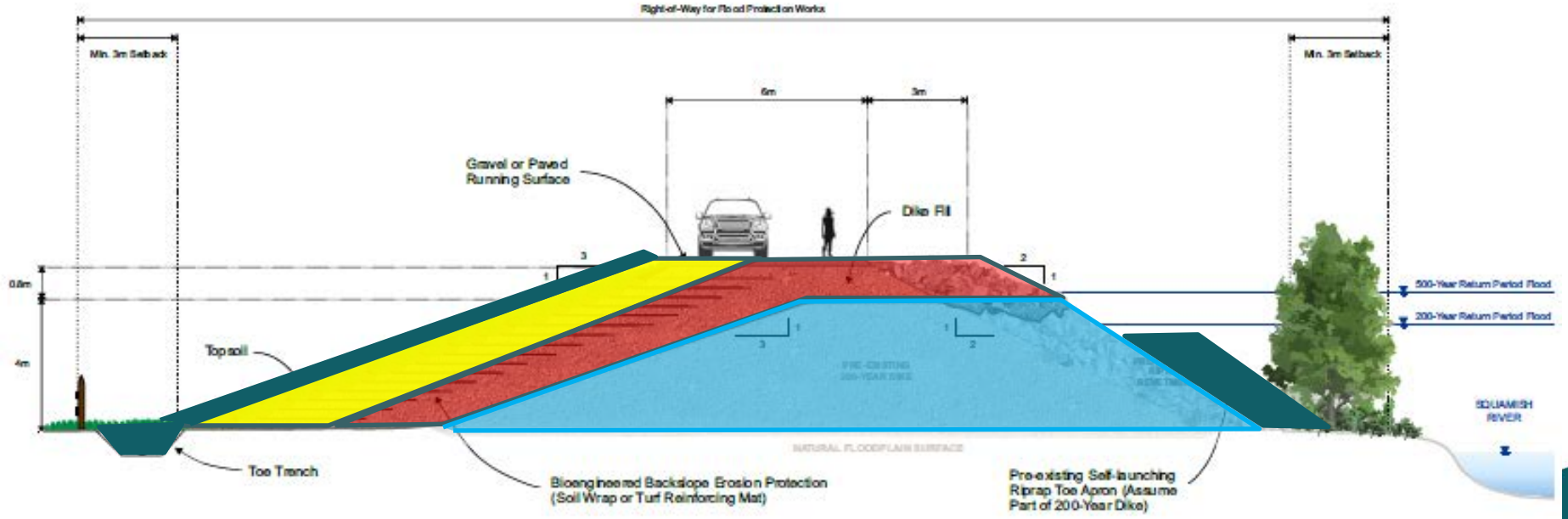
Improve Dike Protection - River Dikes

- First priority: Correct existing deficiencies
- Long term: Raise standard of protection for Squamish River Dike
  - Higher
  - Wider
  - Stronger



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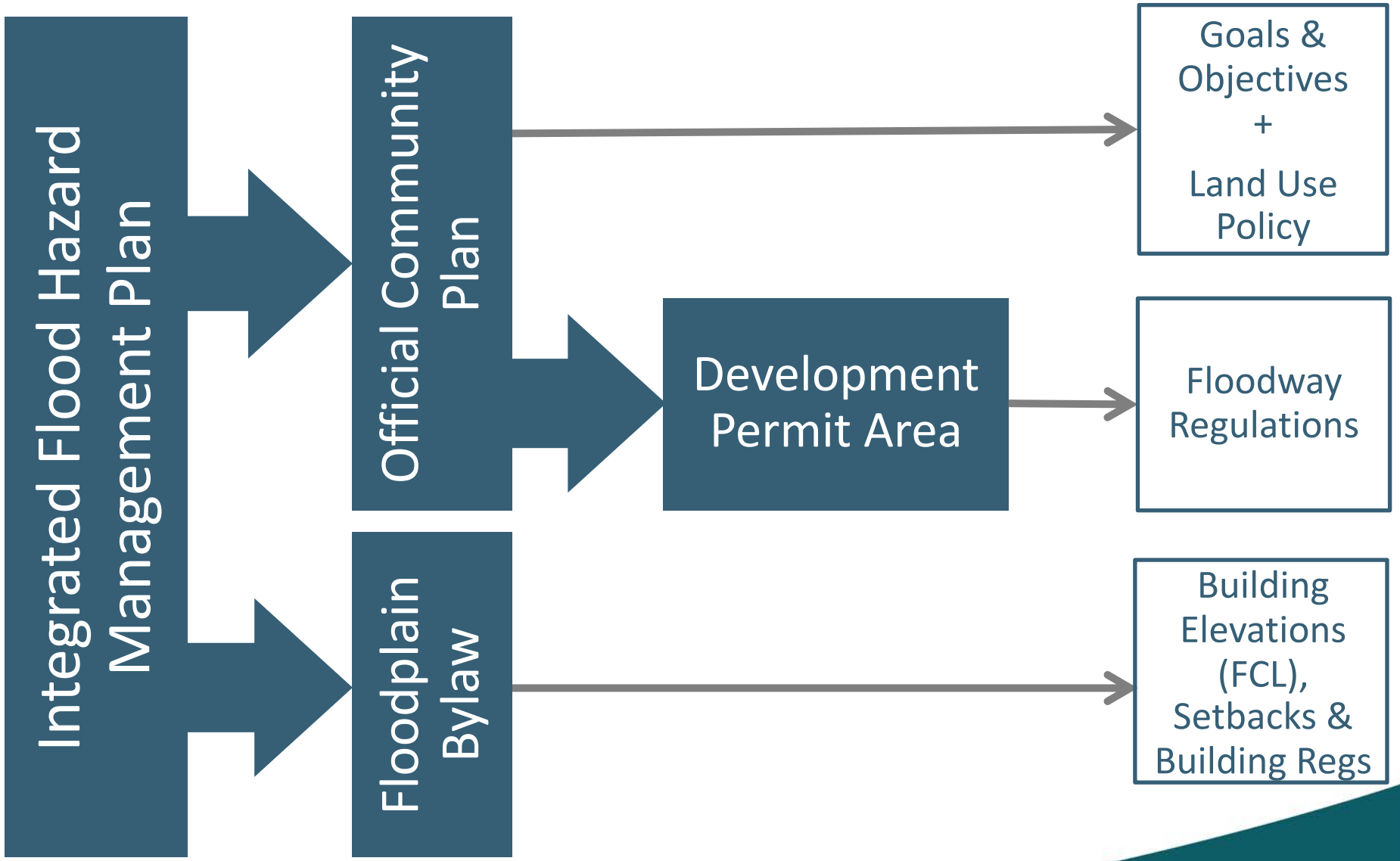
Flood Management Development Policy



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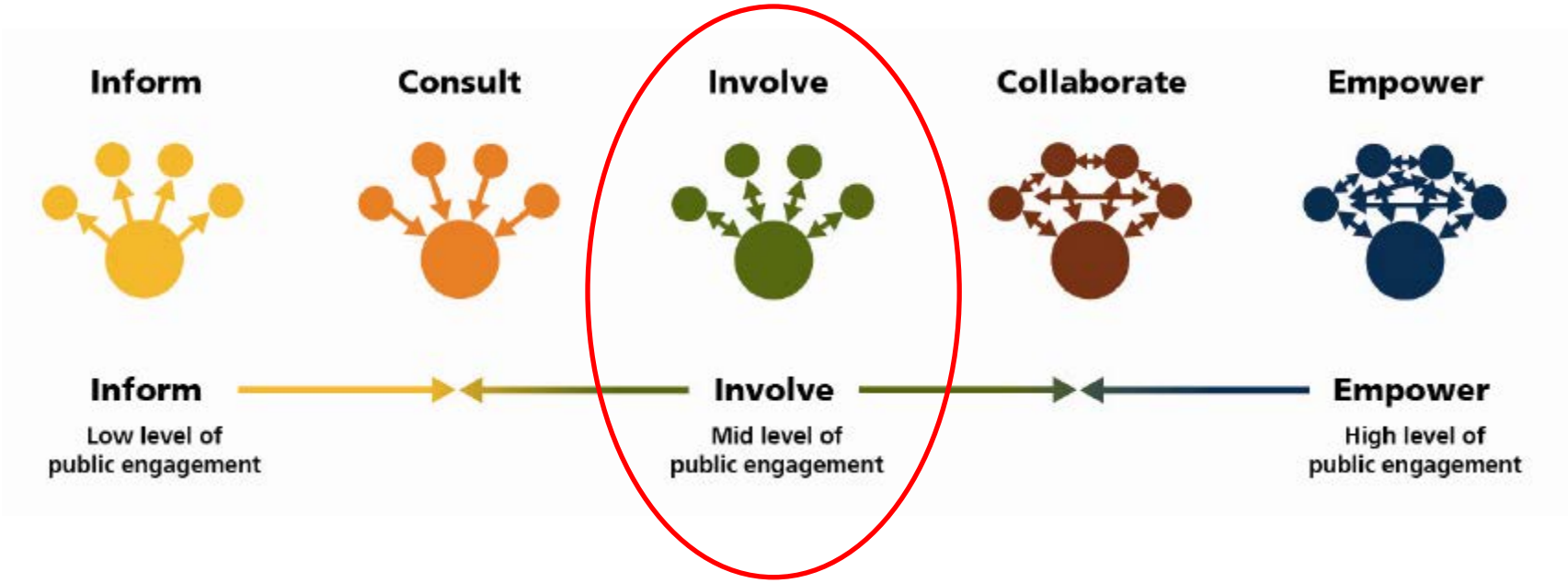
Community Engagement



Activities
3 Public Open Houses
3 Online Surveys
6 Technical Working Group Meetings
10+ Council Meetings
10+ Stakeholder Workshops

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Lessons Learned

- Resource appropriately
- Use “Integrated” approach
- It pays to plan

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Questions/Discussion