



City of Merritt

Flood Mitigation Planning



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Presentation Outline

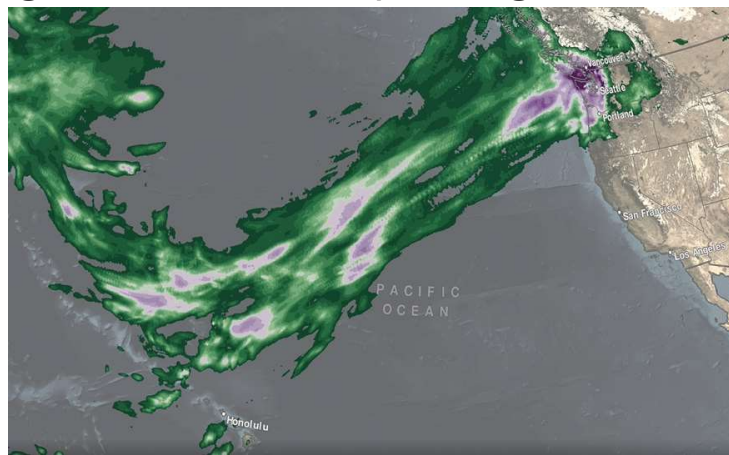
1. Review of November 2021 Flood Event
2. Project Objectives
3. Scope of Work
4. Funding
5. Flood Mitigation Planning



1. Review of November 2021 Flood Event

Atmospheric River Event

- Long, narrow stream of high water vapour concentration
- Moisture generated from tropical regions



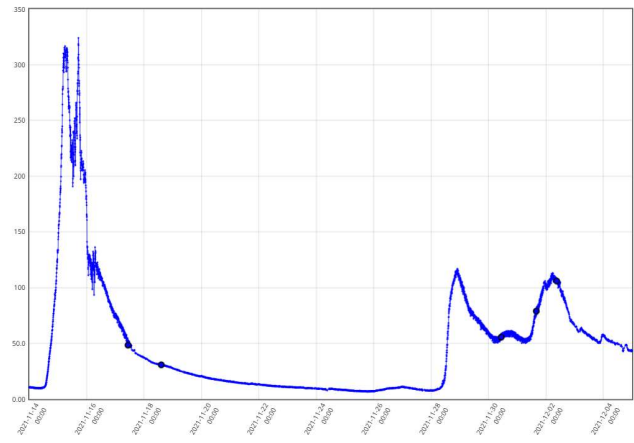
Source: NASA IMERG



Coldwater River Flow

WSC Station No. 08LG010

- There has been uncertainty in the flow rate from November 15, 2021
- WSC will soon be publishing **320 m³/s** as the final quality controlled data
- Estimated, not measured
- **Flood of Record**



Source: Water Survey of Canada

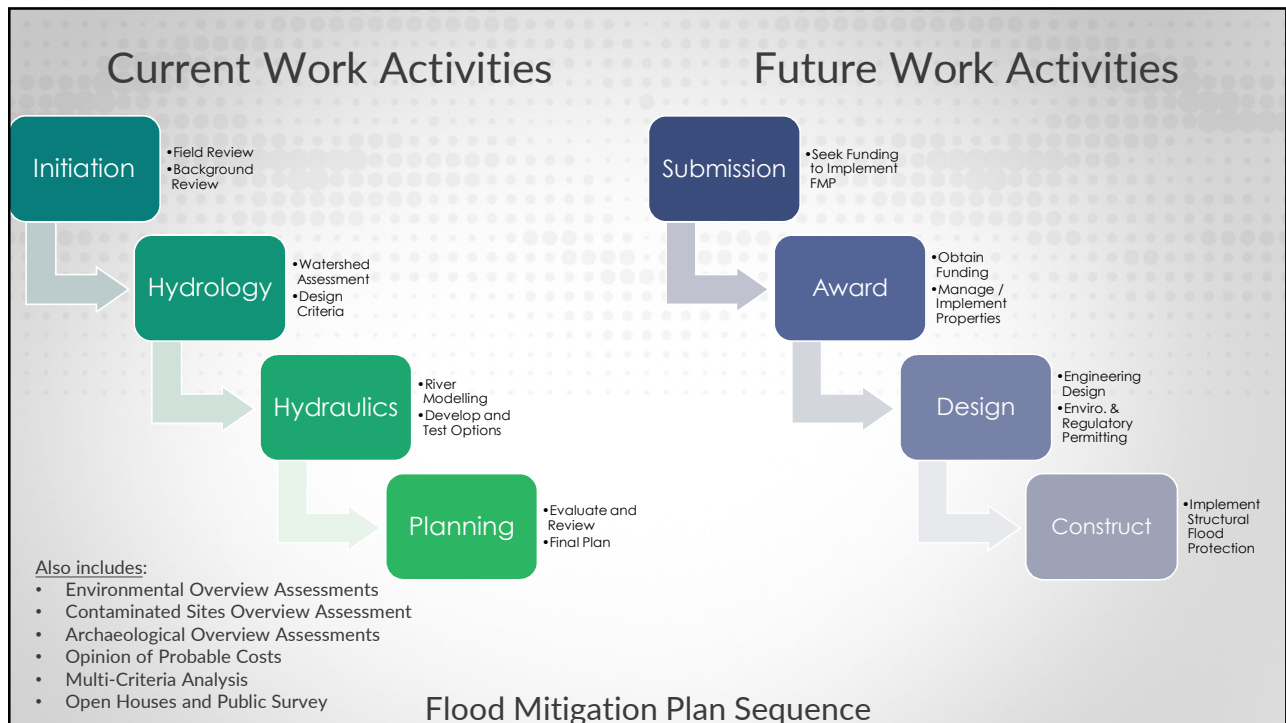


November 2021 Flood Impact Summary

- Widespread overland flooding
- Water and wastewater system damages
- Dike failures and bank erosion
- Middlesboro bridge failure
- Extensive damages to properties and buildings
- Temporary loss of services to the community
- Incredible amount of effort put into emergency response
- Evacuation Order for entire City of Merritt



2. Scope of Work



Scope of Work

Two parts:

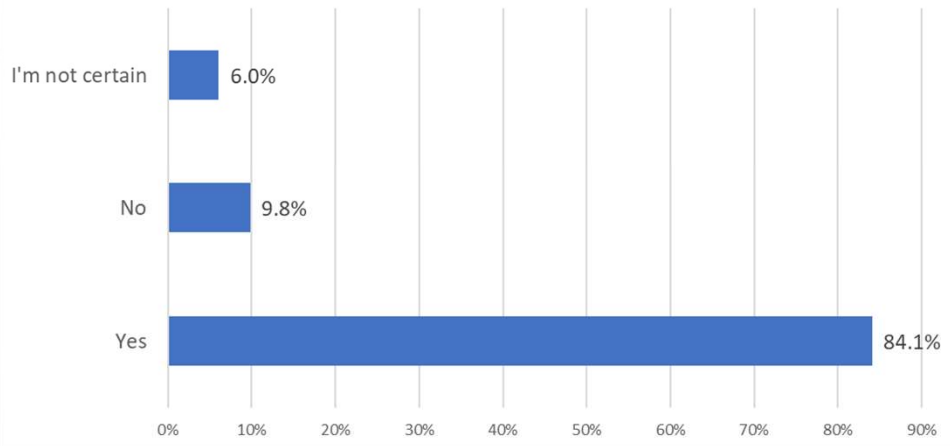
1. DMAF Application (postponed)
2. Flood Mitigation Planning
 - a) This is a planning study and it does not include engineering design or regulatory permitting
 - b) Development, testing, and comparison of options
 - c) Opinion of probable costs
 - d) Provide recommendations for flood protection



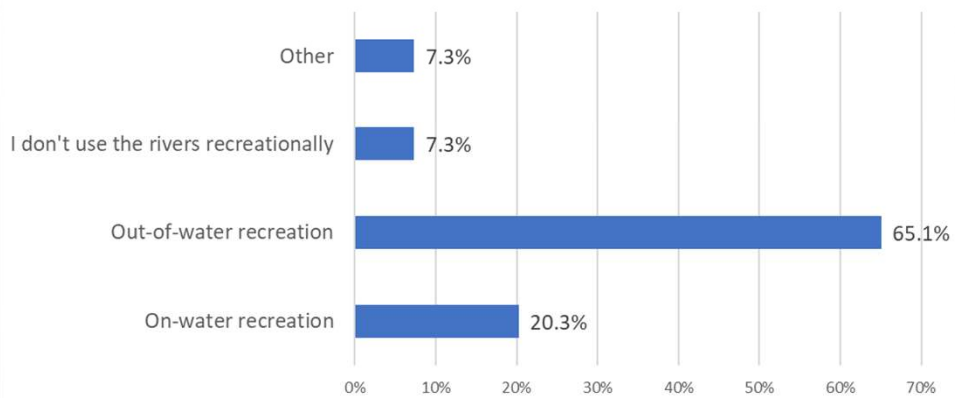
Public Survey Results

315 Respondents

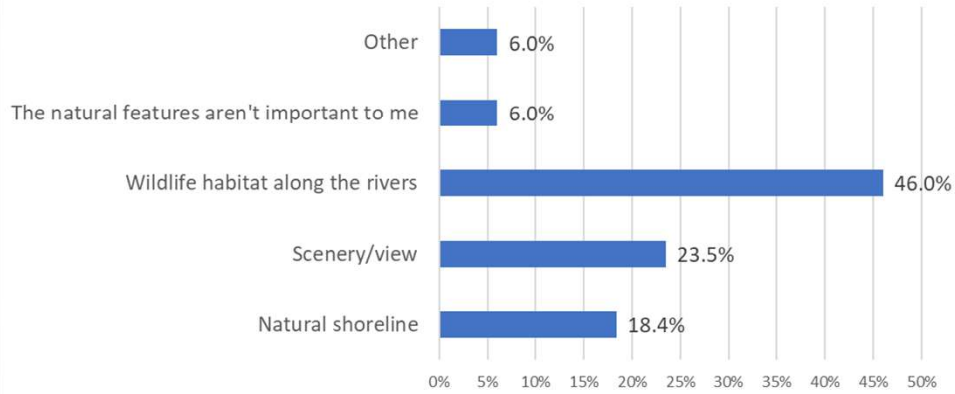
Q2: Is access to the Coldwater and Nicola Rivers important to you?



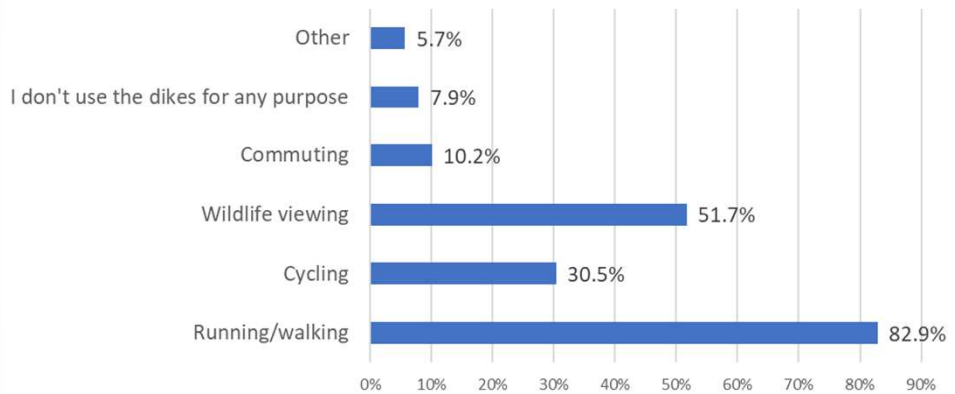
Q3: Which of the following recreational uses of the Coldwater and Nicola Rivers do you value most? (select one)



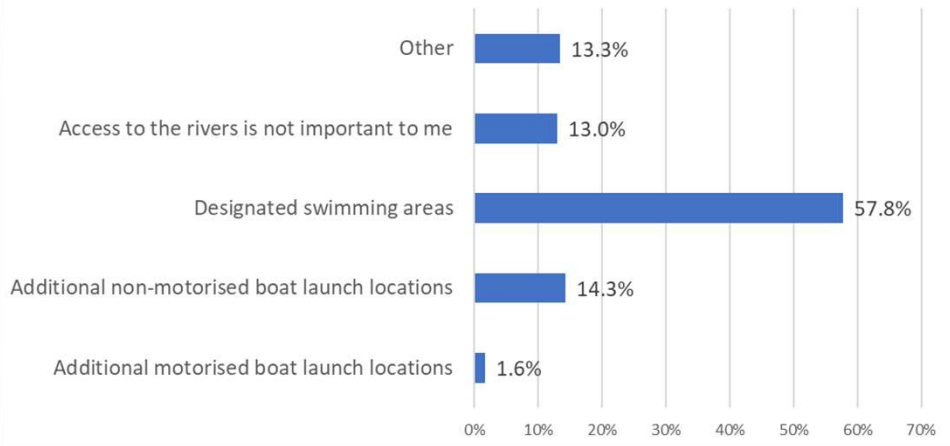
Q4: Which of the following natural features of the Coldwater and Nicola Rivers do you value most? (select one)



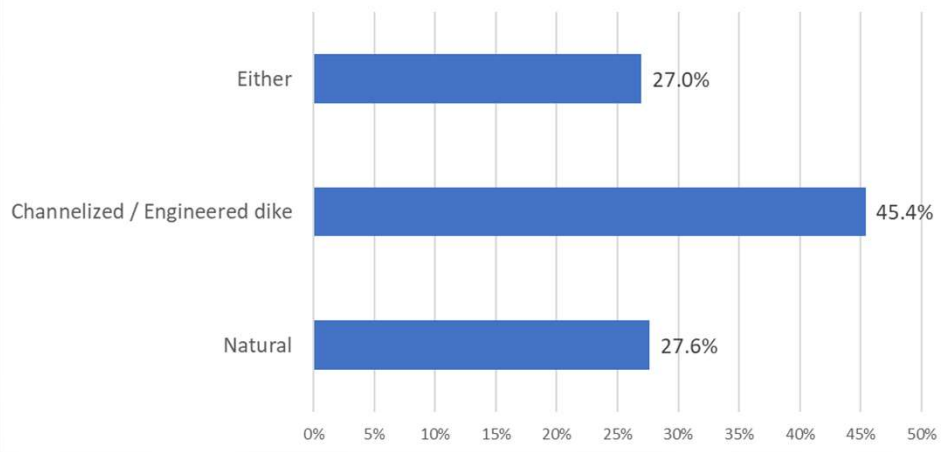
Q5: Which of the following activities do you enjoy along the City's existing dike system? (select all that apply)



Q6: How could the access to the Coldwater and Nicola Rivers be improved?



Q7: What type of river channel would you prefer on the Nicola and Coldwater Rivers?



Project Objectives (Flood Mitigation Planning)

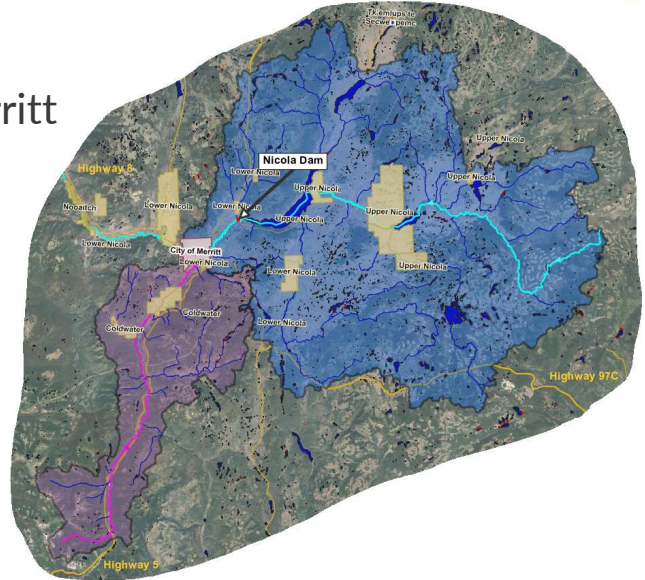
- Provide robust flood protection and reduce future risk
- Have low capital and operation and maintenance costs
- Limit impacts to property and environment
- Maintain river access and provide recreation opportunity
- Develop plan that considers ease of implementation
- Provide room for the rivers where feasible



3. Flood Mitigation Planning

Watershed Hydrology

- Two important rivers in Merritt
 - Nicola (3,238 km²)
 - Coldwater (917 km²)
- Nicola is larger, regulated
 - Snowmelt-dominated
 - May-June typical
- Coldwater is unregulated
 - Mixed regime
 - May-June and November-December



Watershed Hydrology (continued)

- Flooding history in Merritt from both watersheds
- Flood mitigation needs to consider risks of both rivers
- Peak flows for concept modelling in planning study:
 - Nicola River = 130 m³/s
 - Coldwater River = 533 m³/s
- At detailed design, hydrological design flows can be refined
 - WSC No. 08LG010 data recently confirmed
 - Consideration for watershed modelling



Hydraulics

- River modelling completed using HEC-RAS
- Base model prepared by BGC Engineering
- All concepts were modelled
- Conceptual dikes 'stamped' into model to test effectiveness of flood protection and evaluate changes in river hydraulics



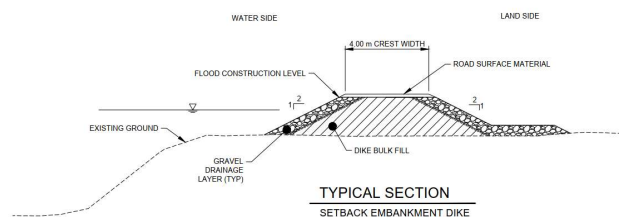
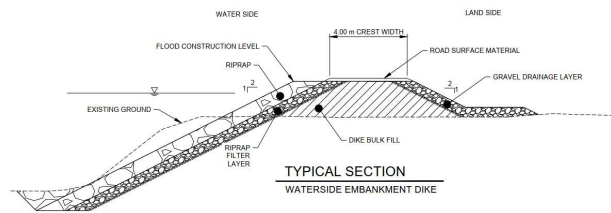
Types of Flood Protection Structures

Dike Maintenance Act

"dike" means an embankment, wall, fill, piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain or any other thing that is constructed, assembled or installed to prevent the flooding of land

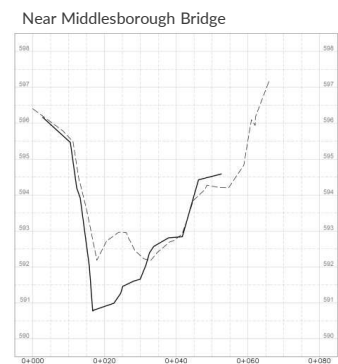
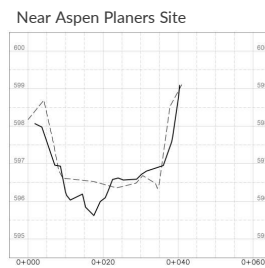
Flood Protection Structures

- Waterside Embankment Dike
- Setback Embankment Dike
- Narrow Dike (e.g., Wall)
- Wide Dike (e.g., Road)
- Erosion/Scour Protection



Other Flood Protection Structures

- Road raising (wide dike)
- Drainage pump stations
- Bridge replacements
- River channel dredging:
 - Some public feedback wants dredging
 - Pre-event vs. post-event survey does not indicate that there was widespread channel deposition in Coldwater River within City of Merritt



River Channel Dredging

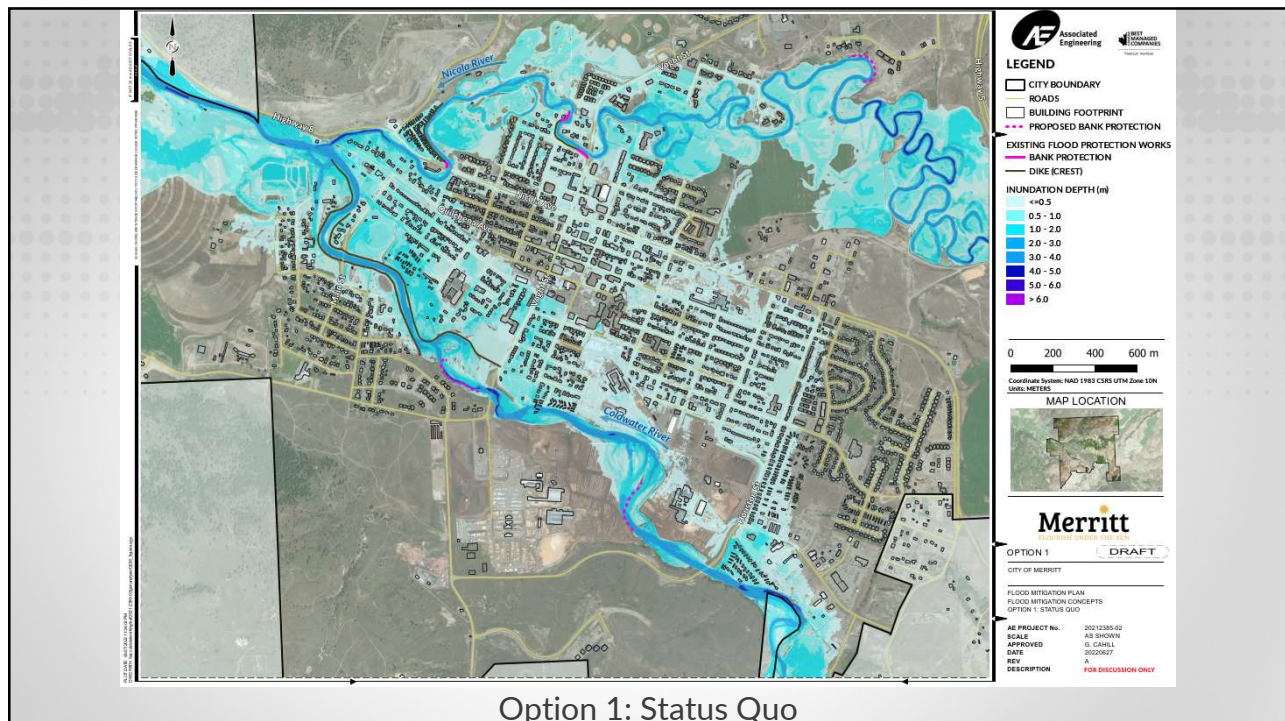
- Not a flood protection structure
- Sediment removal can be used as management tool
- Temporary measure and requires ongoing work
- Can destabilize banks and cause erosion in other locations
- Can result in loss of habitat, which can be permanent
- Expensive (especially over long distance in City)
- May not be practical and sustainable over the long term
- Discouraged by regulatory agencies

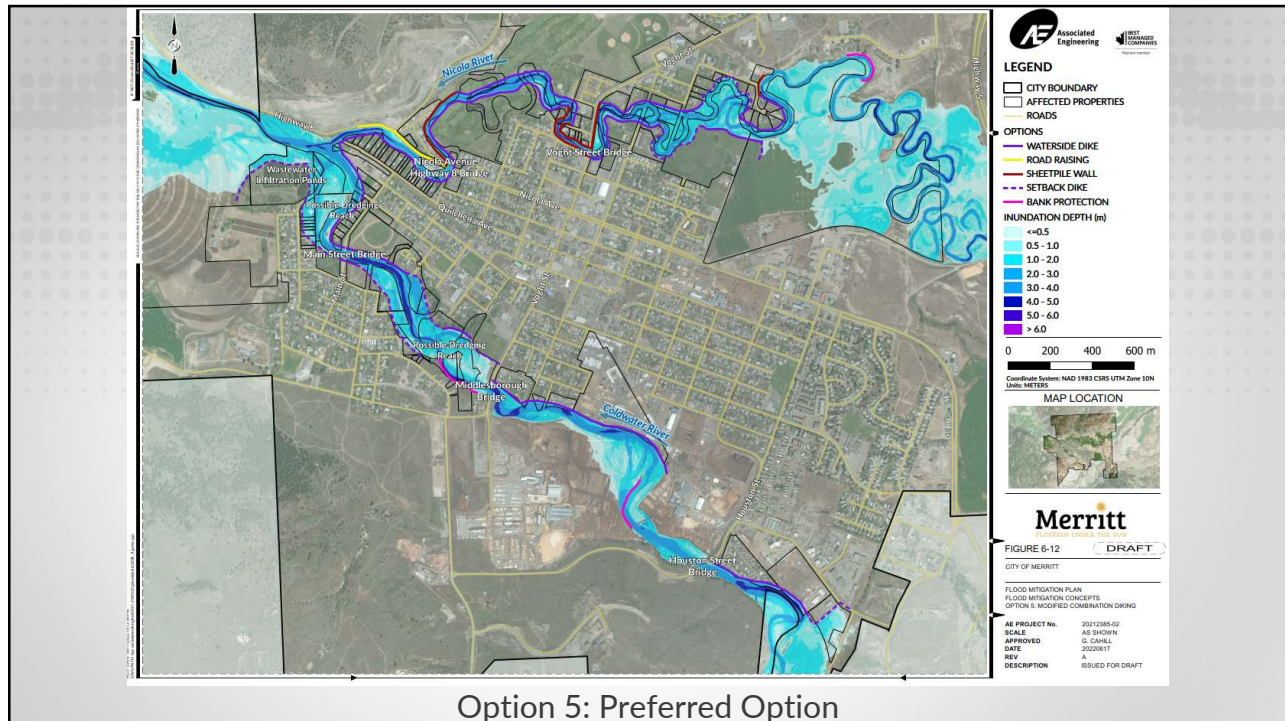


Flood Mitigation Conceptual Options

Conceptual Options

- Option 1: Status Quo
- Option 2: Full Floodplain Retreat
- Option 3: Waterside Diking
- Option 4A, 4B, 4C, and 5: Combination Diking
 - These options are all different combinations of waterside and setback diking
- Options are concept-level for planning purposes
- Flood mitigation plan is seeking funding for implementation (i.e., detailed design and construction)



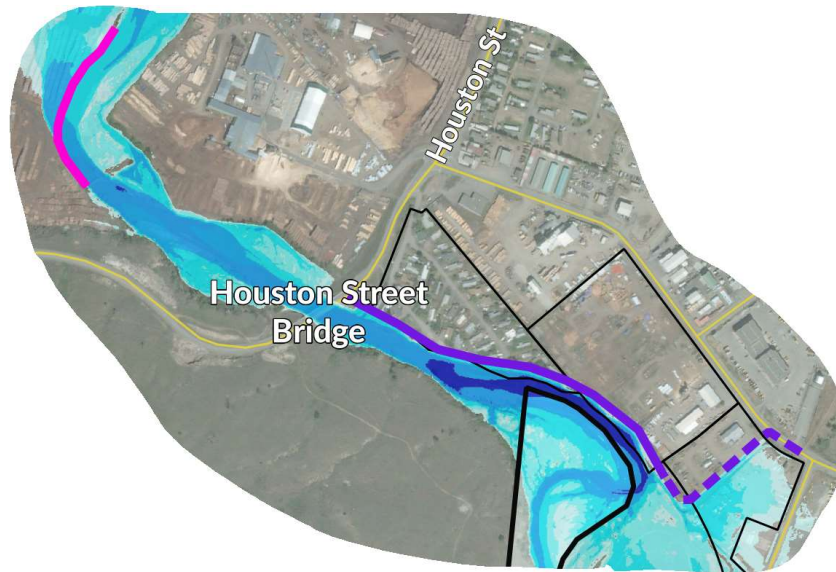


Option 5: Preferred Option

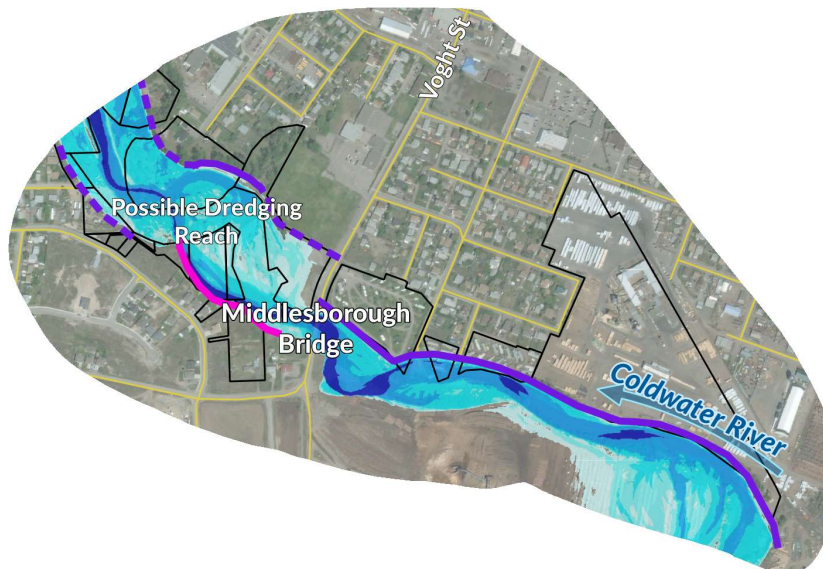
Option 5 Areas (Preferred Option)

(Note: the preferred option can still be refined)

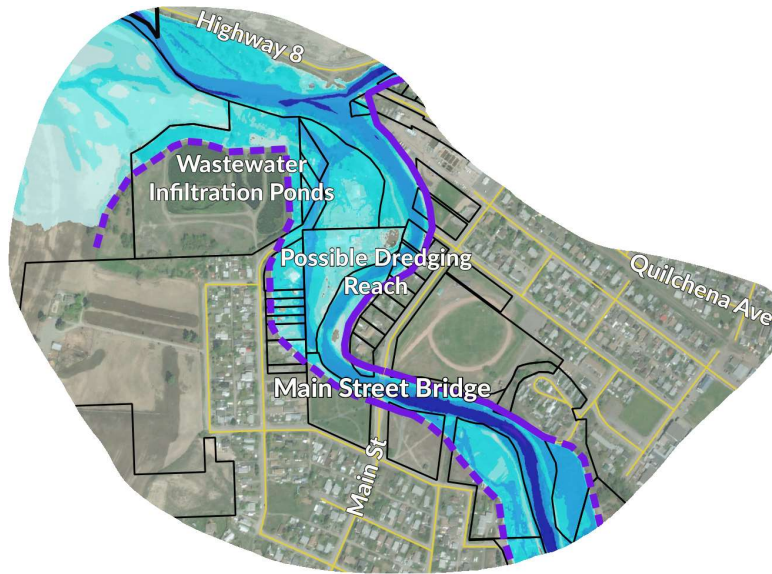
Coldwater River – Houston Street



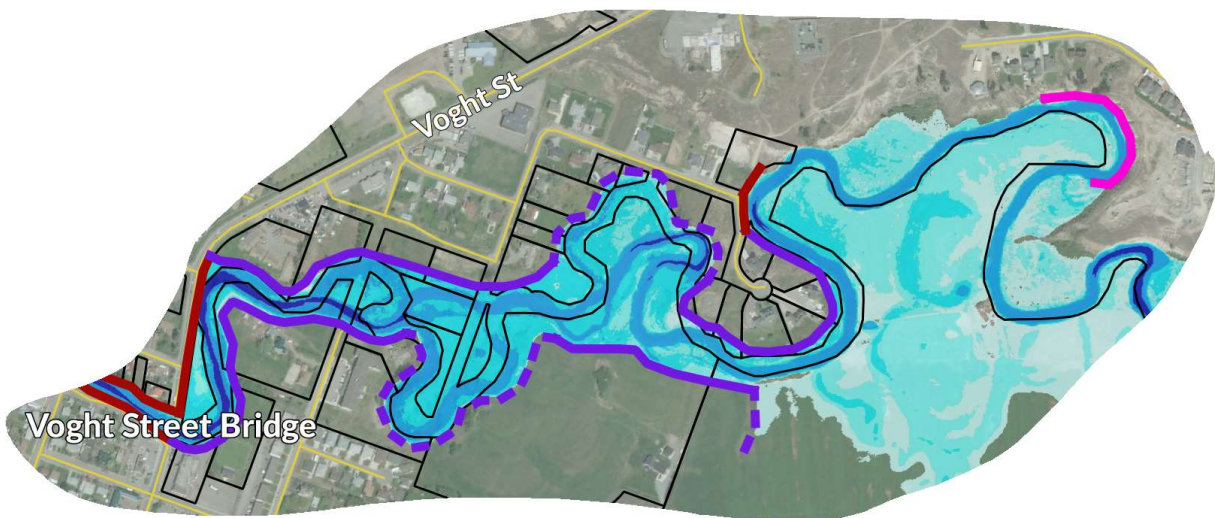
Coldwater River – Middlesboro Bridge



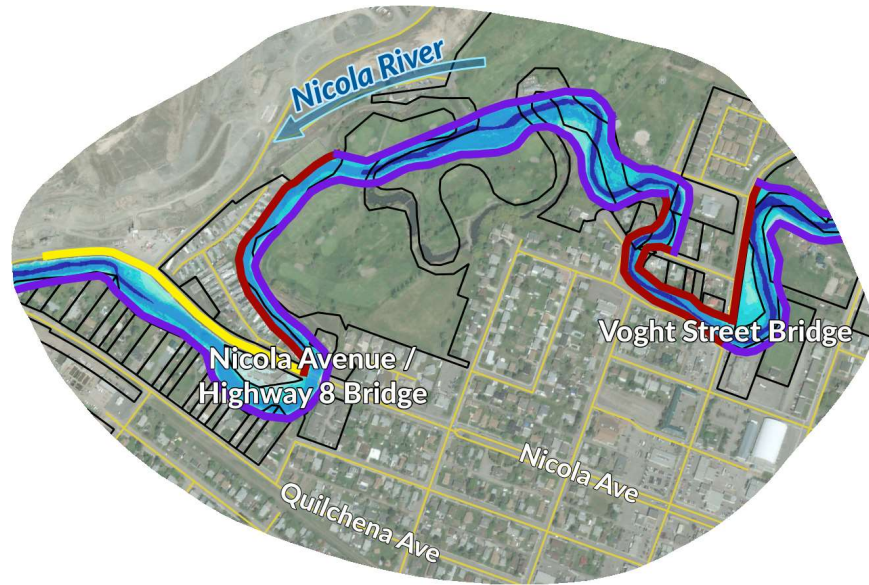
Coldwater River – Main Street Bridge



Nicola River – Voght Street Bridge



Nicola River – Hwy 8 (Nicola Ave) Bridge



Engagement and Consultation

First Nations and Community Engagement

“We will work to earn the trust and confidence of First Nations communities, residents, businesses, and community organizations by acting with integrity, acknowledging our shortcomings, and inviting meaningful participation” – Merritt OCP

Four Stage Engagement process proposed

1. Pre Planning (complete)
2. Post Planning
3. Detailed Design
4. Project Construction



Flood Mitigation Planning Summary

- 7 conceptual options were developed (Option 5 preferred)
- Evaluation and refinement of preferred option can still be completed during design
- Implementation costs are going to be high and phasing of multi-year flood mitigation program can be considered
- Funding is a priority to move forward with flood mitigation
- Once funding is secured, next steps will include:
 - Work with property owners in dike and setback areas
 - Consultation, design, permitting, and construction





Questions?

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