Investigations in Support of Flood Strategy Development in British Columbia

Issue C-2 Report – Emergency Response

Fraser Basin Council

"a Province ready for, and resilient to, flooding and coastal change today, tomorrow and the future"

(quote adapted by Red Dragon Consulting from UK Flood Policy)

First Nations acknowledgement

We would like to acknowledge that this report was authored on the unceded and Traditional Territories of the Ktunaxa, Syilx, Okanagan, Coast Salish, and Secwepemc people.

Fraser Basin Council acknowledgement

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This report was written by Paul Edmonds (Principal) of Red Dragon Consulting Ltd., Chris Marsh (Principal) of Clear Sky Consulting Ltd., and Steve Newton, Mike Andrews and Greg Kanya provided research, engagement, and report review support.

The Fraser Basin Council provided the preamble for this report.

Cover Photograph: Source Red Dragon Consulting Town of Osoyoos 2018

SUMMARY SHEET

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Purpose	Investigations in Support of Flood Strategy Development in British Columbia Issue C-2 Report – Emergency (Flood) Response

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Executive Summary

The Fraser Basin Council retained Red Dragon Consulting Ltd (Red Dragon) to investigate two significant emergency management topics, one of flood emergency response (C-2 report) and a second investigation into flood recovery (C-3 report).

Emergency Response is only one component of a successful provincial program to address flood hazards, but it is key in providing an understanding of the many intricate parts that are required to be implemented to improve flood risk initiatives. Flood Response is defined as the actions taken in an imminent or occurring emergency in order to manage its consequences. [Provincial Flood Response Plan 2019, Ministry of Forests, Lands, Natural Resource Operations and Rural Development]. During planning for and responding to floods, all organizations should capture essential learning by sharing with peers to improve responding together.

The following report investigates five principal issues concerning flood response during emergencies with valued input from federal, provincial, First Nations and local governments. This issue investigates and identifies recommendations relating to roles, plans, and capabilities for flood response and describes opportunities for improving emergency response. The five investigations are summarized below:

I. **Investigate the future direction of the Federal government related to a National Flood Risk Strategy**.

1. There is no National Flood Risk Strategy; however, the federal government has adopted an all-hazards approach that incorporates flood risk [Emergency Management Strategy for Canada. Toward a Resilient 2030]. The investigation identifies that the national strategy should illustrate and guide the Province (and territories), ministries and all organizations in delivering an integrated and collaborative flood strategy. The integrated approach is required to balance national consistency and strategic decisions with local knowledge, respect for provincial considerations and accountability at all government levels.

II. Investigate the Province's expanding role in providing flood response to First Nations.
There is a need for the Province to enhance its strategic collaboration and co-development with First Nation Governments by learning and sharing together. Emergency flood response is only one component and should be addressed at the strategic Indigenous partnership's tables, as well as the four emergency management pillars. Strategic work should include an enabling (action) plan to set out the activities and tasks for all partners to clarify the importance of activity responsibilities. The investigations identified areas of good practice where the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development staff, has co-developed community binders with specific First Nation Governments to recognise traditional and community knowledge alongside scientific flood management principles; and Emergency Management B.C advanced planning work should be integrated together. Further work is acknowledged in the report to deliver opportunities for sharing and increasing hazard risk knowledge and flood emergency response.

III. Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.
Flood response plan standards ranged widely throughout the sample engagement population with concerning low numbers of governments holding instantly recognizable flood response plan documentation. The investigations established the need to develop and provide incentives for a consistent approach by First Nations and local governments across the Province for appropriately hazard and risk scaled flood response plans. Such plans should be informed by flood risk assessment, mapping studies, flood history and knowledge of community exposure and vulnerabilities.

IV. **Investigate flood response capabilities considering different flood hazards and different regions of the province.**
The federal government is already discussing the requirement for capability assessments with provinces and territories, but this initiative should be dramatically widened for all provincial ministries, First Nations, local governments, Diking Authorities and utility providers. Interconnected with investigation three, insufficient capability levels require greater collaboration and support to deliver practitioner-led flood response planning and activities.

V. **Investigate opportunities for improved organizational planning for emergency response in all levels of government.**
Three themes were investigated related to improving the organizational response and included understanding risk, the potential for a single flood authority and improvements to the existing organizational structures. Interviewees and research led the Red Dragon team to confirm that there is currently no commonly shared flood risk assessment at the provincial level. Areas of concern are noted on the provincial website[1], but some have not been updated since the 1990s. Emergency flood response should always be risk-based and scalable [Abbot and Chapman 2018, US Army Corps Engineers]. The initial step in designing or improving organizational response is understanding and comparing risk levels and complexity. Findings highlighted the need to improve collaboration, knowledge, and resources to support the Province's emergency flood response ambitions.

Existing approaches for the emergency flood response in British Columbia have been developed through our response and increasing knowledge of the natural hazards surrounding us. It is identified that there are 1.2 M properties in B.C., and insurance data suggests that 280,000, a quarter of the total number are at risk from flooding [Insurance Bureau of Canada 2020]. Flood response planning should not be reactive, and decisions should be reliant on scientific triggers and modelling, probability, potential consequences, ability to act, and historical and cultural knowledge.

Emergency flood response is a complex, shared responsibility across our whole society, and resilience is framed in terms of the capacity of people and places to plan for, better protect, respond to, and recover from flooding and coastal change [Environment Agency 2015]. It was evident from these investigations that representatives interviewed from federal, provincial, First Nations and local governments displayed integrity and a collective vocation to continually improve.

This report has the potential to provide thought-provoking information and the stimulus to develop a strategic approach to a more resilient future.

[1] https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/flood-hazard-land-use-management/floodplain-mapping/floodplain-maps-by-region

Preamble

About This Initiative

Many communities in BC are working to better manage their river and coastal flood risks through a wide range of flood management activities. But current approaches to managing flooding are not always efficient, coordinated, equitable, or cost-effective.

The Investigations in Support of Flood Strategy Development in British Columbia is a province-wide initiative aimed at developing a comprehensive understanding of current challenges and opportunities relating to flood management across BC. The focus is primarily on riverine, coastal, and ice jam floods, although other types of flooding are recognized where appropriate. This initiative recognizes that flood management is a multi-faceted, ongoing process requiring the coordination of many organizations, agencies, and orders of government and linked with broader processes, including climate change adaptation and disaster risk reduction, among others.

The BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development retained the Fraser Basin Council to manage and coordinate research and engagement across a broad range of flood management issues relating to governance, hazard and risk management, forecasting, and emergency response and recovery. Consulting teams were retained to undertake research and technical analysis with input from experts, practitioners, partners and stakeholders from all four orders of government, the private sector, and other organizations. Each investigation produced recommendations to inform flood management program improvements at multiple scales and across many jurisdictions.

Investigations were undertaken across 11 interrelated issues under four themes:

Theme A – Governance		
A-1	**Flood Risk Governance**	Review current governance and delivery of flood management activities in BC involving all four orders of government and non-government entities, identify challenges, and recommend changes to improve coordination, collaboration, and overall effectiveness.

Theme B – Flood Hazard and Risk Management		
B-1	**Impacts of Climate Change**	Investigate the state of climate change information and new and existing tools that can support authorities in integrating climate change impacts in flood management.
B-2	**Flood Hazard Information**	Examine the state of flood mapping and dike deficiency information and recommend ways to fill current gaps in flood mapping and manage and maintain information about flood hazards and dike deficiencies.
B-3	**Flood Risk Assessment**	Explore approaches to completing flood risk assessments at various scales, methods for prioritizing risk reduction actions, and standards- versus risk-based approach to flood management.
B-4	**Flood Planning**	Examine the ability of local authorities to undertake integrated flood management planning and opportunities to improve capacity.

B-5	**Structural Flood Management Approaches**	Assess the potential for improvements to dike management, improve the capacity of diking authorities, and implement innovative structural flood risk reduction measures.
B-6	**Non-Structural Flood Management Approaches**	Investigate current and alternative approaches to managing development in floodplains and opportunities for implementing non-structural flood risk reduction actions.

Theme C – Flood Forecasting, Emergency Response and Recovery		
C-1	**Flood Forecasting Services**	Identify gaps and opportunities for improvement in the Province's flood forecasting services.
C-2	**Emergency Response**	Investigate roles, plans, and capabilities for flood response and opportunities for improving emergency response.
C-3	**Flood Recovery**	Examine approaches that would support recovery efforts and help reduce future flood risk.

Theme D – Resources and Funding		
D-1	**Resources and Funding**	Investigate resource and funding needs associated with actions to strengthen flood management and evidence in support of proactive flood mitigation.

1.0 Introduction

Floods are the most frequent natural hazard in Canada [Public Safety Canada 2019 Emergency Management Strategy]. They can occur at any time of the year and are most often caused by heavy rainfall, rapid melting of a thick snowpack, ice jams, or, more rarely, the failure of a natural or human-made dam.

This initiative responds to recent studies, such as the 2018 Auditor General report and the Abbott/Chapman review of the 2017 wildfire and flood seasons [Abbot & Chapman 2018], that highlight the need for changes to the current flood management approach in B.C. to reduce the flood risk faced by communities, particularly considering a changing climate. Engagement with experts, partners, interested parties and stakeholders will help this work align with current initiatives, such as B.C.'s Climate Preparedness and Adaptation Strategy [Government of B.C. Climate Ready] and Emergency Program Act Modernization [Government of B.C. 2020] and the Federal Flood Mapping Guidelines[2], advancements in methods and technologies and lessons learned from local, regional and First Nations flood mapping, planning, and mitigation projects.

With climate change, both the potential (likelihood) and consequences of flooding are increasing. It is expected that summer precipitation will likely decrease, and winter precipitation will increase. Snowmelt will occur earlier with lower meltwater runoff due to more rain generated runoff during the winter. Magnitudes of extreme peak flows are projected to grow and will add to existing risks. Rising sea levels and storm surges will contribute to coastal erosion, with levels rising by 30 cm (approximately) in the next century. Due to climate change, it may not be possible to improve fixed defences sufficiently to maintain or raise protection standards [Government of B. C. Sea Level Rise in BC].

This project explores the federal direction of national flood risk initiatives and where the provincial alignment of those approaches can provide synergies from a national to the local levels. An all-hazard approach is favoured nationally, and this report outlines how flood strategies are integrated into emergency management and response for First Nations and Local governments. The status of flood response planning and how flood emergencies are managed in First Nations and local government communities are examined across British Columbia to seek an understanding of the issues, challenges and solutions perceived by different communities.

To achieve this, the project team conducted approximately 65 consultations across various governments (including First Nation, local authority, provincial and federal governments), subject matter experts, emergency managers and others to gather a diverse array of data. From this, themes and clear recommendations were developed for future direction and flood response initiatives.

Developing improved flood risk strategies is part of building a sustainable B.C. These investigations will support the development of a path forward for flood management that best serves communities in B.C.

1.1 Project Description

Flood risk strategies should have three major long-term goals, which are underpinned by anticipated future risk, and investment programs including:

- Climate-resilient populations and organizations.
- Development and infrastructure are resilient in tomorrow's climate.
- Educating communities and residents to be ready to respond and adapt to flooding and coastal change.

These in turn, need to be supported by influential leadership, policy, guidance, regulation, and investment programs.

[2] https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgtn/ndmp/fldpln-mppng-en.aspx

Flood management program improvements are recognized as a partnership between the government and the community using various measures to educate and reduce the risks to people, property, and infrastructure. First Nations and local governments hold the primary responsibility for identifying and managing flood risks. These local decisions illustrate the need to manage flood risks using the latest data and science. Provincial and federal governments have a crucial role in supporting these local decisions and applying consistent approaches to strengthen partnership working.

Fraser Basin Council has retained red Dragon Consulting Ltd (within a Ministry of Forests, Lands, Natural Resource Operations and Rural Development funded initiative) to coordinate a series of investigations and provide recommendations to inform flood management programming in relation to flood emergency response and flood recovery. The C-3 Flood Recovery report captures all respective flood recovery issues and content has not been duplicated in this report. Within the scope of the project, Fraser Basin Council identified the need to consult different levels of governments, partners, interested parties and stakeholders to obtain findings and ground-truthing to identify opportunities for improving and guiding emergency response.

1.2 Project Scope and Context

In Canada and British Columbia, the historical absence of evidence and data and relatively high development growth rate over the last 150 years has led to differences in investment programs to climate resilience infrastructure with inadequate standards and inconsistent developmental controls. In the last 20 to 50 years, engineering standards and hydrological issues concerning community and rural planning themes have steadily come to the forefront [Dobson Engineering 2021]. In addition, the vast topography has led to gaps in understanding hazards and risk levels for the population and the flood risk that surrounds them. Communities were established near or on water sources for transportation, economic and environmental reasons.

A flood event does not respect boundaries or jurisdictions, and as such, the emergency response should include collaboration, coordination, and consistency to provide mitigative and protective strategies.

This project focuses on five investigations to provide recommendations for all governments and partners' overall future direction, as follows:

- C-2.1 Investigate the future direction of the Federal government related to a National Flood Risk Strategy and the future of Disaster Financial Assistance Arrangements
    - Scope: Consult with the federal and provincial governments to explore national direction, hazard initiatives, guidance and support that can be translated into opportunities for British Columbia to embrace areas for evolutionary change.
    - Explore how the Sendai Framework is altering the national emergency stage and seek best practices to align an all-hazard approach to the flood response within British Columbia.
    - Seek consultation to explore the Disaster Financial Assistance changes while comparing initiatives from other provinces and other emergency response models to identify fundamental principles and recommendations for improving our communities' safety and resilience.

- C-2.2 Investigate the Province's expanding role in providing flood response to First Nations.
    - Scope: Consult with the federal and provincial governments to explore current initiatives and identify current and future supportive mechanisms for First Nations.
    - Seek consultation with First Nations that have occurred through other project investigations to understand how support is received and identify mutual opportunities.

The following C-2.3 and C-2.4 investigations were combined.

- C-2.3 Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.
- C-2.4 Investigate flood response capabilities considering different flood hazards and other regions of the province.
    - Scope: The combination of these two investigations allowed for efficiency in seeking consultation with local governments and First Nations.
    - Create a comprehensive assessment of capabilities questionnaire for Local governments and First Nations to participate in and explore corporate directions, support, standards, training, and resilience of these organizations in developing or delivering flood response planning.
    - Seek consultation with EMBC Senior Regional Managers regarding existing and proposed work to assess local governments and First Nations' resilience and capabilities and identify mutual best practices activities to pursue improvements to flood response planning.
    - Develop Class D estimates in how the Province could deliver improvements to flood response planning.

- C-2.5 Investigate opportunities for improved organizational planning for emergency response in all levels of government.
    - Scope: Consult and explore with appropriate participants areas to improve the Province's holistic organizational response for flood events. Seek particular emphasis on the Provincial flood response plan and how the organizational model supports the operational response at local government and First Nation levels.
    - Develop Class D estimates in providing recommendations or enhancements to the current organizational planning structures for a response.

Out of scope findings from the interviews were also captured during the interviews and are listed in Appendix B.

This project's results will facilitate an enhanced understanding of findings from other issues investigated through the broader Fraser Basin Council flood management project investigations.

1.3 Interdependencies with Other Themes and Projects

The Fraser Basin Council-led investigations, described in the preamble, aim to develop recommendations to inform provincial, local and First Nations flood strategies and programs to support more detailed planning and implementation (this study). These recommendations may inform the Province of B.C.-led Flood Strategy, which aims to clearly articulate a vision, principles, and outcomes for flood management across the Province to bridge current and future flood management states and governance.

The project team assessed other investigations interdependencies that have the ability to influence the C-2 investigation activities. The other Fraser Basin Council investigations are listed in Appendix C. The following table provides a high-level overview of strong and lesser interdependences with the related Fraser Basin Council investigations.

Table 1 Project Interdependencies

C-2 Emergency Response Project Investigations (summarized)	Strong dependency with project investigation outcomes	Less dependency with project investigation outcomes
C-2.1 Future direction of the National Flood Risk Strategy	▪ A-1 Flood Risk Governance	▪ C-3 Flood Recovery
C-2.2 The Provinces' expanding role in flood response to First Nations	▪ A-1 Flood Risk Governance	▪ D-1 Resources and Funding
C-2.3 The status of local flood response plans and adequacy	▪ A-1 Flood Risk Governance ▪ C-3 Flood Recovery	▪ B-2 Flood Hazard Information Assessment and B-3 Flood Risk ▪ D-1 Resources and Funding
C-2.4 Local flood response capabilities	▪ A Governance ▪ D-1 Resources and Funding	▪ B-2 Flood Hazard and B-3 Flood Risk ▪ C-1 Flood Forecasting ▪ C-3 Flood Recovery
C2.5 Opportunities for organizational improvements for emergency response	▪ A-1 Flood Risk Governance ▪ D-1 Resources and Funding	▪ B-2 Flood Hazard and B-3 Flood Risk ▪ C-1 Flood Forecasting ▪ C-3 Flood Recovery

It is essential to consider that many other government drivers, that can influence the investigation activities illustrated above. Examples of these include Federal and Provincial legislation, the Emergency Program Act Modernization; the update of a wide variety of regulations; Federal and Provincial policy refresh and new policies; the agreement of tripartite agreements; current and future ministry mandates; the differences in service level legislation between regional Districts and municipalities; First Nations government structure; First Nations historical and traditional knowledge; trend analysis of historical and current emergency events, and the emergency management culture in B.C.

2.0 Applicable Policies, Legislation and Guidance

2.1 Key National Emergency Management Legislation and Strategy

At the Federal level, the Emergency Management Act 2007 sets out the roles of all partners and stakeholders who participate in Canada's emergency management system. At this national stage, the Act sets out the minister of Public Safety and Emergency Preparedness's leadership and responsibilities, including coordinating emergency management activities among government institutions and in cooperation with the provinces and other entities.

To set a course for Canada, An Emergency Management Framework for Canada was revised and approved in 2017 [Public Safety Canada 2017]. This framework aims to guide and strengthen the way governments and partners assess risks and work together to prevent/mitigate, prepare for, respond to, and recover from the threats and hazards that pose the greatest risk to Canadians.

In addition, given that each Federal, Provincial and Territorial (FPT) government has a responsibility for emergency management and public safety in Canada, The Framework aims to strengthen FPT collaboration and ensure more coherent, complementary actions among the FPT governmental initiatives.

To strengthen the approach to Canada's Resilience an Emergency Management Strategy for Canada: Toward a Resilient 2030, the document was approved and released in 2019 [Public Safety Canada. 2019. Emergency Management Strategy for Canada]. This strategy document's core priorities aim to strengthen Canada's ability to assess risks and prevent/mitigate, prepare for, respond to, and recover from disasters.

This investigation reviewed the five strategic priority areas of action within the strategy and formulated questions to explore the federal government's future direction, the significant, consistent messages for provincial and first nation and local government collaboration, co-ordination, and implementation to support an all-hazard approach. The five priority areas are:

- Enhance whole-of-society collaboration and governance to strengthen resilience.
- Improve understanding of disaster risks in all sectors of society.
- Increase focus on whole-of-society disaster prevention and mitigation activities.
- Enhance disaster response capacity and co-ordination and foster the development of new capabilities; and
- Strengthen recovery efforts by building back better to minimize the impacts of future disasters.

Within the Province of B.C, Emergency Management B.C. (EMBC) is modernizing the Emergency Program Act (EPA) to support more effective management of emergencies by incorporating international best practices, including the United Nations (U.N.) Sendai Framework for Disaster Risk Reduction [United Nations Sendai Framework]; the U.N. Declaration on the Rights of Indigenous Peoples (the Declaration); and the draft principles that guide the Province's relationship with Indigenous Peoples.

In October 2018, B.C. adopted the Sendai Framework to encompass an "all of society" approach to emergency management to help build resilience at the individual and community levels. At the time of this report, the Province is refining its legislative framework to build on these measures, which will position B.C. as a leading jurisdiction in emergency management.

The new Act will reflect the lessons learned from the unprecedented flood and wildfire seasons in 2017 and 2018, address all four pillars[3] of emergency management, and place more emphasis on disaster risk reduction to prevent events from happening and to lessen the impact when they do occur. This EMBC project seeks to deliver a

[3] The four emergency management pillars include preparedness, mitigation, response, and recovery.

modernization of B.C.'s emergency management legislation that is required to move forward into a resilient future together [Government of B.C. 2020].

2. 2 Compensation and Disaster Financial Assistance Regulation

Disaster financial assistance regulation (DFA) programs are a means for provincial and territorial governments to aid those who have experienced disaster and have not had the opportunity to be covered by insurance. DFA programs are not a replacement for insurance or a means for those who cannot afford or choose not to be protected by insurance, but rather, assistance in situations where insurance is not readily available.

The Compensation and Disaster Financial Assistance Regulation [B.C. Reg. 124/95] is made under the Emergency Program Act. In particular, the Regulation establishes the framework for the provisions of disaster financial assistance. The provincial program is to help individuals and local governments recover from uninsurable disasters. Individuals (primary residence only), small business/farm owners, charities and local governments are eligible to claim up to 80% of a total amount of $300,000 per claim.

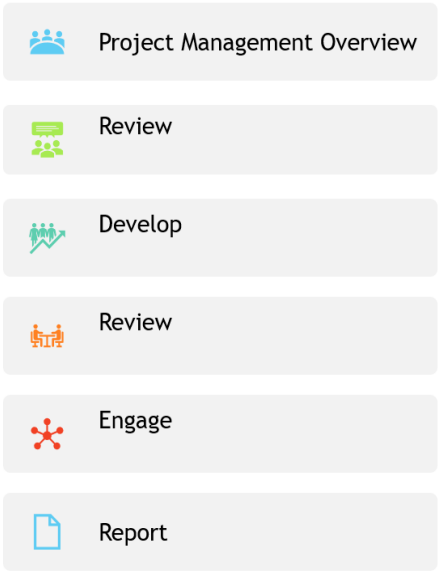
In B.C., all DFA claims are assessed by representatives of the DFA program. These representatives evaluate the cost of restoring the essentials and making recommendations to the DFA program to recommend compensation amounts. The DFA program assesses these claims for their expected impact (was the loss because of the event that is DFA eligible?), and any prior claims. Claimants are provided with a one-time lump-sum amount that they may use as they see fit to support their recovery. Claimants are able to submit in the following years if they are impacted by other emergencies. DFA programs exist for farms, commercial enterprises, non-profit societies, and local governments, but it must be noted that these kinds of claims are more complex requiring more information from the applicant.

Disaster Financial Assistance programs are described and investigated in more detail in the C-3 Flood Recovery project report.

3.0 Method

The project management approach for the project includes reviewing, developing, revising, engaging, and reporting activities, as illustrated in figure 1 below. This systematic review process allows the capture of different governments and First Nations' direction, policies, approaches, and challenges in addressing the advancement of flood response activities.

Figure 1 Project Management Overview



The team identified best practices both in regard to the consultation tasks and engagement with federal and provincial levels to provide meaningful sharing and clarification of policy direction and outcomes. The team used evidence-based decision-making from the structured interviews, observations and comments to base report recommendations while incorporating research and clarification of findings.

In the design of this project team, recognizing that all team members are good communicators and understanding the need for engagement, skills needed to be utilized to yield maximize return of investment from all participants. Agile project management processes were helpful in this project as they allowed for identifying new issues or opportunities to be brought into the investigation outputs.

Within the project timeline, the 2020 provincial election impacted several partners within the ministries. Interviews were scheduled to provide these interviewees flexibility. The COVID-19 pandemic was not expected to be a major issue as all the interviews and meetings would either be video link or telephone.

A number of interviews took place with multiple interview participants to ensure the project team respected the attendee's time, commitment and schedule constraints. This approach worked best with federal and provincial colleagues as conversations were expanded upon by the other call participants. Wherever possible, data collection efficiencies took place to ensure interviewees received structured questions and engagement for all actives without any duplication of efforts and time.

Opportunities for re-engagement were identified to clarify areas and themes for reporting purposes. The team approach provided a capability to review the interconnected project investigation for the C-3 Flood Recovery issue. Observations and identify inter-dependencies were shared with the Fraser Basin Council project manager.

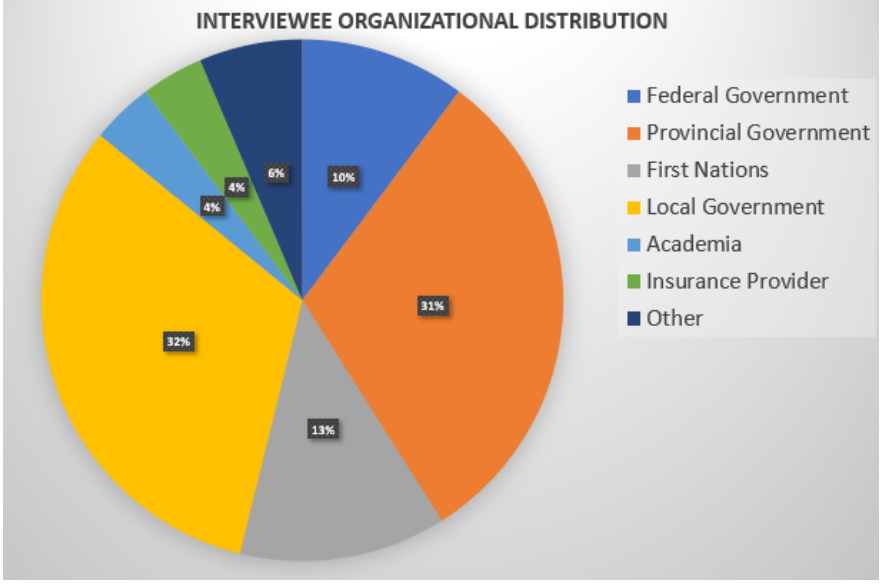
The project team managed a continual review process to share and identify themes and observations for additional research through the sharing of files, structured team meetings and virtual communication.

3.1 Engagement Process

A comprehensive interviewee list was vital in providing thoughtful and inspiring engagement. The Red Dragon project team collectively reviewed the Fraser Basin Council's partner, interested party and stakeholder list, utilized for other investigations, and expanded different areas for engagement. In the design of the engagement, there was a need for a broad list of partners to capture significant differences of approach across all levels of governments and create a

demographic spread of participants across British Columbia. The areas for engagement were linked with the five investigations within this project's C-2 issue.

Figure 2 Interviewee Organizational Sectors



Existing professional relationships were nurtured to identify key demographic participants within First Nation Governments and Tribal Councils at operational and senior levels. Federal and provincial government participants were identified by Fraser Basin Council, other members of said governments and the connections of the established consultants as part of the project team.

Through their existing networks and information from other networks, a substantial list of participant nominees was created and refined to provide demographic participants wherever possible, subject to scope and timescale. The initial list had to be considerably refined to complement the investigation reports' work plan schedule and delivery. In total, Red Dragon conducted over 65 interviews with either single or multi-participants. The final partner and interested party's organizational distribution are illustrated in figure 2 above, the project team had planned for equal engagement with First Nations and local government representatives however availability of staff and workload was a contributing factor.

There were three distinct engagement phases leading up to the formal consultation:

Phase 1: Design of the engagement list.
The engagement list was sorted into representation sectors, and a matrix was developed to show which investigation themes would be asked to each respective interviewee.
This process was important to ensure efficient use of the project team and identify the interviewees who possessed the most knowledge in relation to the respective investigation, and this principle also did not waste participants' time by asking questions that were of no relevance.

Phase 2: Scoping the revised engagement list.
This activity was done in parallel with investigation research and consultation question development to ensure the questions were pitched correctly to the engagement list.

Phase 3: Consultation development
The project team came together to discuss issues, challenges, and solutions to create a managed consultation process. The final desired approach was to appoint a single point of contact to each interviewee, so they did not receive multiple communications regarding the investigations. Participation agreement and the scheduling of interviews followed a systematic approach.

These approaches took account of interviewee spatial organizational structures, knowledge, and expertise, and in fact, volunteers who wished to be part of the investigation. The team used evidence-based decision-making from the structured interviews, observations and comments to base report recommendations while allowing research and clarification of findings.

A main challenge identified in this engagement process was the ability to provide a two-stage interview process with the option of a third clarification stage to allow for the opportunity for reflection and clarification of comments. Time was a limiting factor during the investigations as interviewees would need to account for a compressed timeline, interviewee workloads, the provincial interregnum and Christmas holidays.

3.2 Development of Consultation Questions

The project aimed to create nominally ten themed questions per investigation. A broad research phase was initiated to create a set of themes for exploring which, when refined, produced draft questions by Red Dragon for all the investigations. These questions were shared internally to review and refine to ensure maximum contribution from receiving interviewee.

Flood emergency response is a broad topic, and, wherever possible, the consultation questions were written in an open format to allow for participant feedback. Early on by the Red Dragon team, these questions would require clarification to provide the interviewee with an answer key.

Figure 3 Example of Engagement Question (all questions found in Appendix D)

Question Example: Are you familiar with the national emergency management strategy and the provincial flood risk initiatives? If yes, do you agree that this document goes far enough to address all hazards and provide a framework for increasing resilience in the provinces? Prompts: What areas would you like to see enhanced/developed? If no, have you any general comments regarding all-hazard strategies? What are your thoughts on how the Province implement this national policy?

Two investigation themes were combined due to extreme overlapping issues and the potential of substantial repetition with asking the questions to the interviewees. The combination of C-2.3 and C-2.4 flood response plans and capabilities provided effective responses both from Emergency Management B.C. regions and interviewees.
Once internal review took place, all questions were shared with the Fraser Basin Council Project management team for further comment and subsequent amendment.

3.3 Research Phase

The team conducted a research and review phase to initially highlight all research areas utilizing the investigation deliverables. In this early phase, it was decided to combine C-2 and C-3 Flood Recovery research areas to provide shared

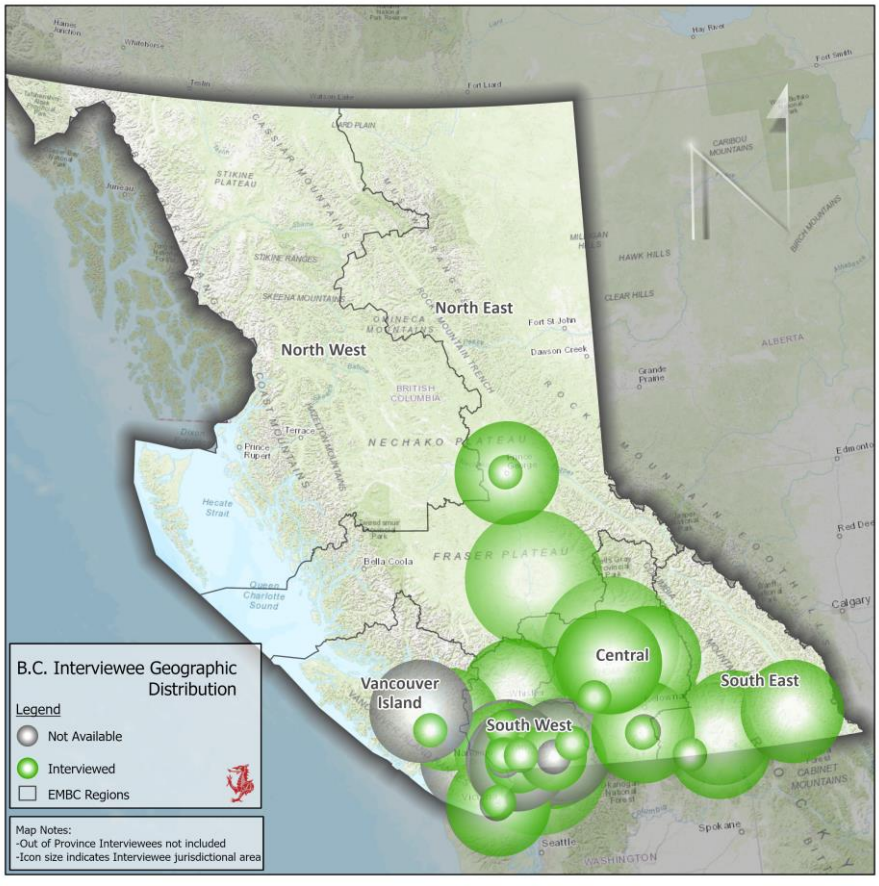
team resources and project resources efficiency. The web research focused on several key headings; as outlined below, further research was required to obtain information relating to each subheading.
Key areas of focus included:

- Fraser Basin Council reports and from previous projects.
- Flood status reports from academia and government.
- Federal strategy documents and Public Safety Canada collections.
- British Columbia government frameworks and the Emergency Program Act Modernization.
- Federal and Provincial flood response and recovery arrangements.
- INAC/EMBC agreements, tripartite agreements, and UNDRIP documents.
- Sendai Framework documents and associated documents with United Nations Office for Disaster Risk Reduction.
- Flood insurance and Insurance Bureau of Canada associated reports.
- Other UK, European, Australian, New Zealand and USA web sources.

3.4 Geographic Distribution of Interviewees

Figure 4 Geographical representation of requested and conducted interviews.

Note: There is a large range in the size of the areas of responsibility among the people interviewed. This is approximately illustrated by the size of the circles shown in Figure 4. The larger the circle, the larger the area of responsibility.



4.0 Key Findings from Consultations and Research

4.1 Investigation C-2.1 - Investigate the future direction of the Federal government related to a National Flood Risk Strategy

4.1.1 Future Direction

The Emergency Management Strategy for Canada: Toward a Resilient Future 2030 is an all-hazard strategic approach to guide and facilitate the provinces and territories' approach to collaboration and governance to strengthen resilience.

The strategic direction aligns itself with creating a consistent and holistic approach to emergency management without implementing a suite of prescriptive conditions. It was recognized that the provinces' and territories' priorities and geographical differences allow each respective jurisdictional entity to set their preferences and objectives to achieve an all-hazard approach to emergency management.

The collaboration with provinces was identified as a vital objective in delivering foundational principles to support the different approaches to the various hazards and risks that impact Canadian lives. Several provinces are currently undertaking or planning emergency management legislation reviews, alongside which the Federal Government is reviewing the Disaster Financial Assistance arrangements. Federal colleagues recognized this as an opportunity to align previous emergency management approaches with a more sustainable, resilient strategy. The United Nations Sendai Framework is at the heart of those approaches to provide disaster risk reduction in place of reactive processes, to emplace learning after all events to create a culture of build back better [United Nations Office for Disaster Risk Reduction 2015. Sendai Framework] and risk reduction for people, communities, infrastructure, businesses, and the environment.

Build back better is defined as the use of the recovery, rehabilitation, and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures in the restoration of physical infrastructure and societal systems and into the revitalization of livelihoods, economies, and the environment [United Nations General Assembly 2016. Report of the Open Ended Intergovernmental Expert Working Group on Indicators and Terminology Relating to Disaster Risk Reduction].

It is important to note that many federal departments collectively incorporate the principles for a more resilient future. Examples of such departments include Public Safety Canada, Environment and Climate Change Canada, Indigenous Services Canada, Natural Resources Canada, Fisheries and Oceans Canada, Infrastructure Canada, and many more. The significance of a multi-department approach to emergency management and the build back better principle must occur at the most senior government level. This policy methodology of many different departments will provide a change mechanism across government structures. Such policies support the whole-of-body collaboration and governance to strengthen Canada's resilience with examples of consistent messaging across all federal departments.

An all-hazard approach can be read in the Prime Ministers' mandate letter, where there are general references to resilience and sustainability, with two points having a more direct association with strategic flood actions. The intention to create a new Canada Water Agency to work together with the provinces, territories, Indigenous communities, local governments, and others to find the best ways to keep our water safe, clean, and well-managed, has potential flood specific future actions. Well-managed water can have various meanings, perhaps regarding increasing projects that value natural assets in flood alleviation and mitigation while also reducing risk exposure and response to floodwaters' contamination to potable water sources (surface and groundwater).

The second reference, to work with the Minister of Natural Resources and provinces and territories to complete all flood maps in Canada, is closely aligned with the national strategy. There are many projects underway across Canada to provide

a standard way of collating and illustrating flood maps [University of Waterloo Intact Centre on Climate Adaption 2021]. The flood maps can offer every department, ministry, local government, and First Nation a consistent method to understand disaster risk that can impact all societies.

One such objective underway is specifically around flood hazard identification and flood mapping guidance documents, including building appropriate maps to ensure the highest quality standards [Engineers and Geoscientists British Columbia, guidelines, and advisories practice resources]. The achievement of consistent and transferable flood hazard maps across government structures would be one of the ultimate goals for all provinces, territories, First Nations and local governments.

An associated objective of creating useful baseline information is interconnected with creating an assistant deputy minister forum to assess the economic impacts and the policy implications of a federal flood hazard designation area. These programs will need to be linked back to the provinces and territories to fill in the patchwork of flood hazard maps. It is predicted that this data will add to the national flood hazard data layer; and, in turn, will be widely available for access.

There is the critical importance of recognizing who the end-user is of the flood hazard maps, which provide a historical and potential probability of flood events and flood risk maps that provide a combination of flood consequences with flood hazard. The standardization for such maps must be recognized as a priority to allow analysis and compatibility between geographic jurisdictions regardless of government level [Centre for International Governance Innovation. 2018. Flood Risk Mapping in Canada & University of Waterloo Intact Centre on Climate Adaption 2020]. The development of up-to-date flood risk maps (that illustrate the consequences of a flood) and their accessibility is key to allowing greater understanding for the public who live, work, and visit areas at risk from flood and environmental events. It is essential to understand the complexity and interdisciplinary nature of floods, the ability to do something or not do something [Edmonds. Environment Agency. 2015] Understanding how decisions are made at different levels of public policy impacts a specific individual's disaster.

Public education campaigns are necessary to inform people of their disaster risk. Public education and awareness of flood hazards and, importantly, flood risk levels will need to present complex data in informative and straightforward ways. The complexity is added to by the public perception of a community living within a flood hazard area, climate change factors and limited mitigation. In turn, this has the potential for the public to raise the issue of flood mitigation with elected officials, local governments, and the appropriate First Nations Councils to initiate risk mitigation to some degree.

All government levels should put in place flood risk management strategies to identify hazards [Emergency Management BC Government's Action Plan 2018]. Appropriate and necessary mitigation work must follow depending on the ability to put in place the mitigation measures. Such initiatives as managed re-alignment, working with natural resources to increase riparian areas, sustainable drainage, and set-back dikes must be assessed in structural and non-structural mitigative programs [Engineers & Geoscientists. Legislated Flood Assessments in a Changing Climate in BC. Version 2.1 2018]. Comprehensive cyclic work programs for provincial and federal grants should be explored to address long-term issues rather than reactive funding when federal funds become available on short notice and reactive emergency response. Understanding risks through flood hazard assessments at the provincial level can be used to provide a high-level work plan. A transparent process for a systematic approach of hazard identification, risk management and subsequent mitigation and recovery will empower work programs and identify risk levels through flood risk mapping and planning, including at the local levels [Department for Environment, Food and Rural Affairs 2014]. Utilization of the federal and provincial cost-share programs like the National Disaster Mitigation Program and Disaster Mitigation and Adaptation Fund will support the evolution of build back better (and the rebuilding in lower-risk areas) [Clinton 2016].

In enhancing capacity and coordination, there is a need to complement and respect each of the provinces' and territories' priorities, regardless of how far along organizations are in their scientific data collection and strategic flood actions. The

economic variances and levels of flood hazard differences are unique across Canada, and a priority for the federal government is to invest in climate adaption and flood-resilient infrastructure. These cost-sharing programs need to respect each province's economic preferences, the people within each jurisdiction. What future resilience measures can be accomplished in year one, year ten or year 50.

Federal initiatives to help and promote resilience include the flood grant programs and the national risk profile. The importance of the disaster financial assistance program and how all governments are mitigating against hazards are seen in the context that no one organization can fix all [United Nations Office for Disaster Risk Reduction 2017]. The significant reliance for enhanced joint working between the appropriate government levels to address these fundamental programs is a substantial task that can be achieved with short, medium, and long-term objectives.

The future enabling work plan and program of the Emergency Management Strategy for Canada: Toward a Resilient Future 2030 will need to be formally implemented. This enabling plan is anticipated to set sustainable actions to manage flood risk and an integrated process with provinces and territories. This will require close collaboration and a structured planning process that creates the space and time needed to consider any competing needs and reach informed decisions.

4.2 Investigation C-2.2 - Investigate the Province's expanding role in providing flood response to First Nations.

Flood risk management is a partnership between governments and the community using various measures to educate and reduce people, property, and infrastructure risks. The historical establishment of First Nation reserves has presented a complicated model in addressing flood preparedness, mitigation, response, and recovery within the First Nation jurisdictions. First Nations communities traditionally would have moved dependent on the seasons and cultural knowledge, predominantly moving their camps from season to season to specific places and areas where they would hunt, gather, fish and trade. This seasonal movement of camps also lessened or removed the flood hazard proximity to their camp locations due to the First Nation environment knowledge. Settler government emergency response programs do not address this intricate and sensitive matter.

4.2.1 Provincial outreach

Common messages emerged from the investigation where First Nation interviewees identified that outreach should focus on what can be achieved *with* First Nations communities, rather than the Province determining what can they provide for First Nations.

There was common agreement that while the Province approached all partners with a transparent, fair process to provide the broadest choice of support to general emergency response, there was a need to enhance the specific outreach. Interviewed representatives were not aware of any particular outreach programs where flood response guidance or offered support were shared from the First Nation and provincial Regional Partnership tables to the community. Representatives mentioned that most communication is delivered during and after flood events. Ministries assist in initiating emergency operations centres, staff resourcing through expenditure authorization forms, and the deployment of provincial assets, such as temporary flood barriers.

The Regional Partnership tables (a forum with Indigenous people to enhance services to acknowledge Indigenous ways of knowing, sharing, and engaging to identify benefits of working together towards resiliency and preparedness for disasters), were described as having mixed success where information was shared back to communities. The investigations identified that information sharing on occasion is undertaken without outreach, and messages from the First Nations interviewed suggested that the term outreach should be replaced with information sharing.

Emergency management tripartite agreements, an approach to emergency management that recognizes First Nations as equivalent partners in emergency management governance and operations, was also identified as a method that provided the foundations of working together equally but did not go further to enhance working jointly [Union of British Columbia Indian Chiefs (UBCIC) 2019].

The five principles of cultural safety (Partnership, Personal Knowledge, Protocols, Process and Positive Purpose) should be enhanced in all opportunities of working better together. Working together opportunities, from project inception, was a strong driver in interviews, and the communities would welcome the co-drafting and co-developing of strategies, work plans, and flood response planning guidelines.

The Tripartite Emergency Management working group is comprised of almost 20 First Nation representatives, and there is an opportunity to enhance the current experience within the group concerning flood response and holistic flood management. Other hazards such as wildfire, landslides and other environmental events were also mentioned to bring the working group into an actual all-hazard group with appropriate member experience.

The B.C. First Nations Climate Change Strategy and Action Plan engagement sessions were noted to discuss flood management and response matters. While the opportunity was recognized as cross-pollinating for other groups, there was confusion in who does what within the provincial ministries.

Good initiatives such as the EMBC spring seasonal readiness events were identified as broad in scope to all First Nations and local governments. Investigations found that this information sharing was helpful to discuss “what to do,” but expectations are for the sessions to be more focused on the “what and how to do.”

The MFLNRORD Community Binder project (A tool described to support, guide, provide information and communicate flood hazard, flood risk and culturally scared values in the community areas) in the Lower Mainland with First Nations was referenced several times in the interviews with MFLNRORD interviewees. These binders created opportunities for relationship building, gathering, and sharing information alongside a two-way process of sharing flood-specific information. This investigation did not assess the community binder's content; however, the principle of collating this information and a resource to present the information was a good practice. Challenges were noted that some First Nations know how they would like to be supported, and resources were not available from all parts of the government. The roles and responsibilities within the binders were seen to promote this conversation, even though provincial ministries' boundaries are fundamentally different than the First Nation boundary, for instance, based on a watershed or geopolitical boundaries.

First Nation interviewees identified an assumption from different divisions/sections of the Province that the First Nations governments should understand the technical and sometimes complex hazard and risk information presented to them. The First Nation illustrated the requirement for greater working together to share understanding and confirm knowledge levels. The investigation noted similarities among smaller governments when limited staff capacity and knowledge was a primary challenge in not seeking new programs or grants to address flood response. The absence of knowledge, time and understanding of the issues was a barrier to commencement.

The provincial MFLNRORD Emergency Program has not yet been defined when staff were interviewed, and this was seen as an opportunity (sharing flood information) and a challenge (resources) to provide more focus on disaster risk reduction. Reference was made to the Emergency Program Act Modernization due to the published papers identifying MFLNRORD as the ministry leader for flood hazards. The documents define the role as “to provide expertise and direct support.” Investigations noted that this support was in place currently but with a different focus in different geographic areas, with varying levels of resources.

The many different work plans at the provincial ministries and department scale provided a blurred approach through the different work streams in not only flood response but across the four pillars of emergency management to First Nations interviewed. Anecdotal comments identified that there is a tendency for large local governments to go ahead without comprehensive consultation with the smaller First Nation communities.

Emergency Management B.C. applies a triage approach during response activities to identify appropriate funding from provincial sources or available federal Indigenous Services Canada sources with clear working together policies. This triage approach was beneficial. However, federal funds' access was identified as more practical in supplying First Nations with funds with the autonomy to fund what the Indigenous community needed.

There was a strong direction for a sustainable approach from First Nations as the knowledge and capacity landscape is so fragmented. Providing skills, training, and resources for the community to undertake flood response planning activity would be advantageous and deliver long-term benefits for First Nations Governments. Example topics provided for training and development included trained volunteer firefighters in installing temporary flood barriers; joint programs with local governments; and knowing what is needed to protect the community. The absence of an emergency program coordinator resource was seen as an absence of delivering these projects in some communities. An objective shared by an interviewee was one of accepting capacity improvement in whatever way fits best for that community; this would allow autonomy in delivering tasks, increasing preparedness, training, and knowledge to respond.

There was a stark difference in funding allocation success rate from more extensive First Nation collaboration to smaller communities. The partnerships' ability provided examples of where grant writers have successfully secured flood risk assessment and flood mitigation grant programs. Flood response was a significant part of the work plan, but with no current resource to undertake the activity. A challenge associated with this was that First Nation communities could not “compete” with local governments in grant writing because it is a competitive allocation process (the person usually writing the application has no previous experience in this activity). Small communities are continually overlooked in the absence of broader partnerships and with the Province not using “community risk” as a criterion for such funding programs but more with scoring on how well the application has been compiled.

The valuation of natural assets or natural resource management was identified as a driver that worked in partnership with First Nation interviewees' flood response ideals. Differences were noted that flood mitigation measures also allowed for the restoring of old waterways and sloughs so reducing the need for the flood response in certain circumstances. If the rivers were allowed space to flow, then less flood response would be needed. The need to re-think flood response planning was identified to ensure the collective does not do the same thing repeatedly. The community impact of climate change was also recognized as a factor that required attention alongside flood response due to the flood risk vulnerability of First Nation land (reserves historically located near watercourses).

4.3 Investigation C-2.3 - Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.

The investigation focused on three primary areas when investigating First Nation and local government flood response plans' status.

- Investigation into the required content of flood response plans bearing in mind the differences in First Nation and local government communities' varying capacities and circumstances. Capability questions were also linked to these investigations as they are so strongly interdependent.

- Preliminary investigations with three sample regions from Emergency Management BC: South West, Central, and North regions. Discussions were time-limited to assessment interviews and collaboration via sharing of valuable parameters for flood response planning.

- Interviews with a geographic sample of local governments and First Nations representatives. Due to the time of year and COVID-19 priorities, many requested interviews did not take place. However, the team interviewed 35 representatives from First Nations and local governments, with additional interviews with crown corporations and academic institutions. Some interviews had multiple attendees, and two First Nation interviews were representatives of regional collaboration groups with six to 11 member communities. For report purposes, a sample population of 50 representatives from First Nations and local governments was used (65 individuals were interviewed in total, but these included multiple representatives from some organizations).

4.3.1 Flood Response Plan Content

The investigation chose an expanded view of what was meant by 'robust plans' and 'response,' not just looking at written plans, but the whole process of how the First Nations and local governments understood flood risk, make plans and coordinate the roles of the many partner organizations involved [Department for Environment, Food and Rural Affairs 2011]. As part of this process, it is essential to know how they train, exercise, respond, learn lessons, and keep informed with evolving good practice. As well as how they coordinate with Emergency Management B.C, MFLNRORD, nearby governments and organizations to bolster local arrangements if needed and indeed to aid others.

Plan sections that were investigated include:

- Hazard, risk, and impact understanding.
- Associated organizational flood programs.
- Plan contents:
  - Strategic objectives for the organization during flood response.
  - Information sources for decision-making.
  - Response escalation procedures.
  - Locations that require action and resource criteria.
  - Communication for informing and warning.
  - Partner and Stakeholder communication.
  - GIS of all critical assets.
- Plan maintenance.
- Organizational accountability of a flood response plan.
- How are the plans assured – what training and exercising go on?
- How are cross-boundary flood risks linked to the plans?

- When does the provincial government provide information, advice, guidance and even leadership?
- What funding and resources are available?

The Red Dragon team concluded that interviewees required a series of questions that provide relevant detail in understanding what should be included in a flood response plan. It was also identified that flood response procedures do not necessarily need a standalone flood response plan but can be incorporated into an organizational emergency plan. An example of a high-level flood response plan assessment tool was also developed by the Red Dragon team to be shared explicitly with Emergency Management B.C. to aid the investigation discussions [Department for Environment, Food and Rural Affairs 2011, Edmonds. Environment Agency 2012, Major General (Retd) Tim Cross CBE 2018, & Australian Disaster Resilience Handbook Collection 2020]. Several out of scope parameters were included in the assessment tool to provide a complete overview of a response to a flood event.

4.3.2 Preliminary collaborative work with Emergency Management BC

Emergency Management BC within all three regions interviewed recognize and understand the need for a coordinated approach to a flood event. The ability to link many partners, stakeholders and provide liaison with facilitated discussion was one of the most valuable assets identified from the interviews.

Key findings highlighted that, in principle, all the regions have the same priorities and a clear mandate of improving flood response for all communities that have and potentially may be impacted by a flood event. It is self-explanatory that EMBC is assessing numerous other hazards, and flooding was only one of them.

Concerning flood response, several good practice initiatives have been underway or about to commence at the time of the interviews. The collation of advanced planning information in the Lower Fraser Valley provides an example of good practice and structured support for First Nations and local governments to facilitate response [Emergency Management BC. (2020). Advanced Planning Framework]. Similar outreach and working together were in process or being planned in the other regions.

Findings illustrated a diligent process of capturing planning assumptions regarding flood hazard information and individual plans' status. This process was focused on a risk register for all government jurisdictions that allowed provincial staff access to high-level strategic information related to each jurisdiction, historical information including previous impacts and asset deployments, state of readiness, resources, and values at risk or areas of note.

Discussions and reviews centered around the confidential information collated by EMBC that this critical work was evergreen in nature (continually under review), requiring a continual update, maintenance with a high emphasis on collaboration and partnership approaches in addressing flood risk and emergency response activities.

Interviews and the data shared are comparable with the findings of direct interviews through this investigation in assessing where jurisdictions are within flood response planning.

Figure 5 EMBC Flood Response Plan Exists

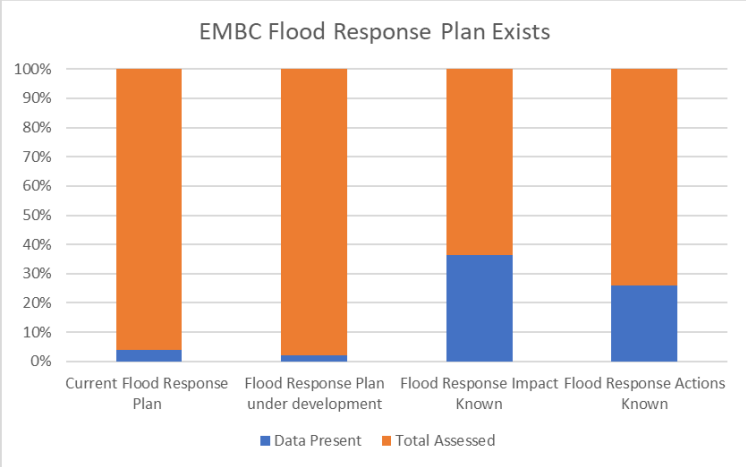


Figure 5 illustrates the percentage of First Nations and local governments working on flood response plans at different levels. However, the reviewed data was not complete, and in some communities, no data was available, meaning it is only a snapshot in time, and EMBC was continually amending the risk register documents. The illustration graph must not be misinterpreted as a complete assessment of First Nations and local government flood response planning. The sample population reviewed was 47 local governments, of which 30 were First Nation and 17 were local Authority Governments. Nevertheless, the data does provide the investigation with areas of flood response that require further focus and coordination. These areas are further discussed later in the report.

Data Disclaimer: EMBC South West Region provided data to the Red Dragon team in December 2020. This data was currently under review by EMBC, and the above figure illustrates a snapshot in time.

The other two regions interviewed provided similar findings that a range of First Nations and local governments have undertaken Flood Response Planning activities. Historical flood impact was not always a factor in the jurisdiction undertaking such flood response planning. Larger communities with government resources had undertaken public education activities about flood mitigation work and flood response work. The differences of Regional Districts and municipalities were noted due to the different legislation relating to service level provision and emergency management structures. First Nation's capacity and availability of resources were identified as a substantial factor in the amount of flood response planning that took place and general emergency management.

The interviews also noted that climate change and the potential and actual flooding outside of the freshet season had initiated awareness of the need for advanced planning work by approximately one-third of the different organizations, even though they did not hold a flood response plan or document where actions are required. Due to climate change, both the potential (likelihood) and consequences of flooding are increasing and should initiate more work focused on disaster risk reduction [Arros 2010. Treading Water & Dobson Engineering 2021].

4.3.3 Consultant Interviews with local government and First Nations representatives.

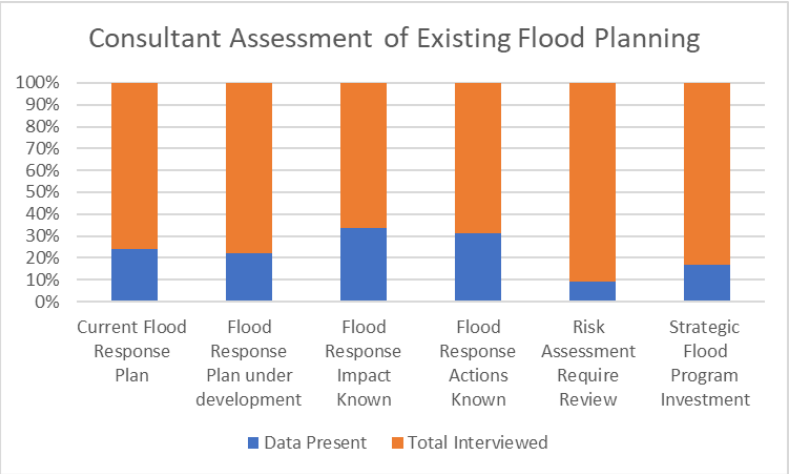
A comprehensive list of questions was asked of the interviewees during each session to build a picture of the organization and how it undertakes flood response planning. Several questions were out of scope, but these led to a greater understanding of each organization's culture in tackling disaster risk reduction and emergency management.

The investigations highlighted several areas comparable to the EMBC confidential data, and Figure 6 provides a graphic of the findings. The consultant team's ability to ask additional questions directly to the organization's representative was valuable to explore themes and link flood response planning to capabilities.

Key findings include:

- All organizations understood the flood hazard concept and appreciated the probability of an emergency event impacting level within their jurisdictions, with only a limited number requiring additional examples to present the Red Dragon team with knowledge and understanding in plain English.
- Approximately 20% of those interviewed possessed a flood response plan (FRP) or flood response procedures within their Emergency Plan. There was a substantial range of descriptions given as to the desired content of a flood response plan, which ranged from tables of river levels and bullet points for flood stage actions to comprehensive documents outlining specific information procedures for public and partner warning, escalation procedures and actions, detailed references to community risk and operational planned deployment of resources to protect people and infrastructure.
- A similar percentage to those who held a flood response plan were also undertaking development or a review of the plan. For those who already had an FRP, the latest data from the previous year's flood was being used to refine the current procedures and impact areas. For others who said that the FRP was under development, it was either a proactive action from the previous year's flood event or an organizational staff change independent of a recent flood event. Several organizations informed the interviewers that the questionnaire would assist them in initiating a flood response planning review.
- Only approximately 30% of the organizations interviewed could reference documented assessment of known flood impacts. It was noted, however, that most organizations could verbally provide an overview of general flood impacts. Still, only 30% had undertaken a qualitative and quantitative assessment of those impacts and what values (properties, infrastructure, assets, etc.) were at risk.
- A similar percentage (30%) of the organizations had undertaken a detailed record of flood response actions relating to trigger points, communication, and operational measures. Again, most of those interviewed could verbally provide an overview, but no record had been made.
- A small percentage (less than 10%) were currently or planning to review their Hazard Risk Vulnerability Assessments (HRVA). A more significant number was aware that the HRVA required an update but had no plans in progress.
- Less than 20% of the organizations had an active strategic flood program relating to flood risk assessment, flood mitigation plans and federal grants. Some organizations raised the issue that there were insufficient internal capacity and funding available to pursue said grants.

Figure 6 Consultant Data Flood Planning Status



Additionally, there were many discussions regarding the Province's roles and authority in flood response where interviewee expectations differed.

The EMBC regional seasonal preparedness presentations were considered helpful gatherings and professional networking opportunities. However, more information sharing was required from provincial ministries to understand the holistic picture of response planning with increased access to subject matter experts. Collaboration at the First

Nation and local government levels also were identified for enhancement.

Many of the interviewees mentioned that collaboration and partnership working standards are good during the response phase. Organizations identified that they needed to undertake more proactive flood response planning to assist in the political aspect of policy and directions at the Board and Council levels and receive guidance and support from the ministries.

There was a significant difference noted between First Nation, Municipal and Regional District Governments regarding how emergency management program priorities are identified and resourced. Within the First Nations interviewed, initiatives are taking place to create more sustainable resources to coordinate emergencies, initially funded by federal grant programs. Flood response planning was mentioned as being listed within the work plan, but the COVID-19 pandemic was taking priority. The different service levels and development policies within rural areas and the lack of financial capacity (the tax-base) of Regional Districts were identified as an issue with currently no solution or workaround. This was a genuine concern with those Regional Districts interviewed who have substantially large geographic jurisdictions with low population.

The provincial flood emergency plan was referenced within interviews, but some organizations saw the plan as having no reference to them. It was understood what while its purpose reflects the provincial government's role, and it should reflect all levels of government in British Columbia, i.e., a provincial plan. Interviewees identified that the language that explains the roles and responsibilities was vague, which allows for opinion and differences of expectation at the local government levels and even within different ministries. Interviewees recognized the need for descriptions and graphics to show decision making authorities during flood response and where the authority resides regarding the Lead Responder as stated in the Emergency Program Act. Interviewees also noted the need for more access to flood assessment units and strategic direction to assist in emergency management response activities.

4.4 Investigation C-2.4 - Investigate flood response capabilities considering different flood hazards and different regions of the Province.

There was clear support in all the investigations that written Flood Response Plans were required to address the hazard and risk of the flooding and provide guidance in how the operations unfold during flood response.

Capabilities were asked of the interviewees during the discussions regarding their status of flood response planning. The investigation noted that these activities are so closely intertwined that it was beneficial to align them for the interviewee's benefit. The findings highlighted considerable differences of capability found within First Nations, Regional Districts and Municipalities.

First Nations: While this investigation represents a small subset of the number of First Nations within the Province, there were differences in capability identified. Several areas were highlighted:

- Regional Collaboration groups were identified and explored as potential ways to enhance capacity in whatever way fits best for the communities. Sustainable principles to support the whole process of emergency management being employed to allow each respective First Nation to be prepared and trained instead of doing the work for them. "Stronger together" was identified as a reoccurring message from First Nations.
- Regional Collaboration Groups provided a forum to discuss different hazards and formulate plans and strategies in how First Nations understood all the various components of flood response and the multitude of ministries and federal departments requiring liaison. Several initiatives identified where support was being provided for

the flood grant programs currently on offer and general emergency management for HRVA assessment and gap analysis of member First Nations emergency planning work, including flood response.

- In general, the First Nations' actual capability was lower than most local governments and dependent on the individuals within specific departments undertaking additional work (on the side of their desk) to address flood response work. Specific departments such as Natural Resource teams were catalysts for improving capability while other First Nations had limited resources due to extensive and competing workloads.
- There was a majority opinion that training initiatives were required, with some excellent examples where First Nation Volunteer Fire Crews have been formally trained proactively and reactively. It was interesting to highlight that some local governments had initiated such formal training with First Nations during a flood response during provincial assets' deployment. This led to the fire crews being available as a resource not only for their First Nation but also to assist nearby governments. This trained workforce also had a financial value where the First Nation was compensated for their deployment time via an EMBC process.
- It was also highlighted that flood response planning and respective actions were not known to be available to some First Nations regarding resources and provincial/federal support. The suite of proactive and reactive options was scarce in planning terms due to limited access and help for those options. First Nations commented that evacuation for the flood event seemed to be the only option available for their community.
- First Nations communities situated outside of the protection of diking authorities provided examples that no type of capability during flood response would assist them due to the flood hazard's proximity. On the opposite end of the scale, one community provided an example of becoming a diking authority which was intricately linked to their experience as a successful government (i.e., business-minded organization to tackle issues at root cause).

Local governments: Regional District and Municipality capabilities highlighted substantial differences in approaches:

- In general, emergency planning was resourced to varying degrees, with examples either on the side of the desk or a small team of staff to undertake different roles. Flood response plans were highlighted as one of the workload priorities in a comprehensive work plan.
- Of those interviewed, the larger municipalities were more prepared for flood planning and response due to their economic situation, the size of emergency management teams and support from such departments as Public Works and Engineering. The capabilities ranged from their own trained workforce's ability to undertake proactive and reactive emergency measures to a flood event. They were predominantly centered around the protection of people, community, and infrastructure assets. These governments described structured training programs, emergency operation centres, routine exercising and a history of responding to flood events.
    - In some of these examples, it was noted that the larger municipality could manage a flood event within their capacity before seeking aid from the Province. Some of these governments possessed limited stocks of temporary flood barriers, mostly again for infrastructure protection.
- Smaller municipalities with limited resources were remarkably similar in their responses to First Nations. Staffing and resources would be quickly overwhelmed during a flood event, and the village or town government would seek provincial support very quickly. There was a correlation with this statement that if a strategic flood investment program was in place and supported, the smaller municipalities felt more reassured that they had a plan of intent.
- Diking authorities and smaller municipalities. Some of the smaller governments took pride in maintaining the dike that protected their residents and felt that their capabilities were limited. Out of scope comments also included orphaned dikes that posed a risk to the community.
- Regional Districts that had experienced past flooding on the whole provided examples of increased preparedness for floods, with some exceptional examples from across the province of well-structured and detailed emergency programs.

These regional districts were either updating their flood response plans or working with others to develop a flood response plan. However, the capabilities to respond were limited as the government structure, and authority to provide services are different than municipalities.

- Within Regional Districts, the lack of a suitably trained workforce, mutual aid agreements and regional emergency programs could impact their response. There was a reliance on provincial support in accessing subject matter experts, resources to participate in emergency operations centres, field equipment, and contractors to provide a trained workforce and staff.

Differences of geographical hazards: The different type of flood events and contrasting timing and severity allowed some of the First Nations and local government to holistically assess what type of flood response actions were available to them:

- Steep creek drainages were recognized as a completely different hazard to a lake or river flood. Governments tended to present a reactive response to public safety primarily due to the significantly limited actions that could prevent or temporary protective measures in such an event. This was also the case for debris flows.
- Lakes and rivers had the ability for individual governments to put in protective measures both from public safety and temporary deployments of assets. There was a firm reliance on provincial assets such as sandbags, tiger dams, and gabion baskets.
- Coastal flooding was described from a public safety perspective with capabilities focused on public communication and partner/stakeholder liaison. Specific municipalities had organized and funded joint partnerships in delivering remote sensing, including tidal monitoring, to partners. Such projects were highlighted as a success of mutual collaboration and the identification of the lack of provincial support in providing monitoring information.
    - Tsunami alerts were areas that these governments wished to see more access to information, more monitoring and resilient systems by the provincial and federal governments.

Most governments relied on the provincial ministries for awareness of river levels and snowpack to assist in preparedness, advanced planning, and flood response activities. There was minimal capability in the range of governments to put in place their self-funded remote sensing equipment, except for the sizable municipalities with robust engineering and public works teams. Table 2 on the following page, provides a high-level view of the capability of First Nations and local governments from the sample population interviewed to respond to different flood impact events.

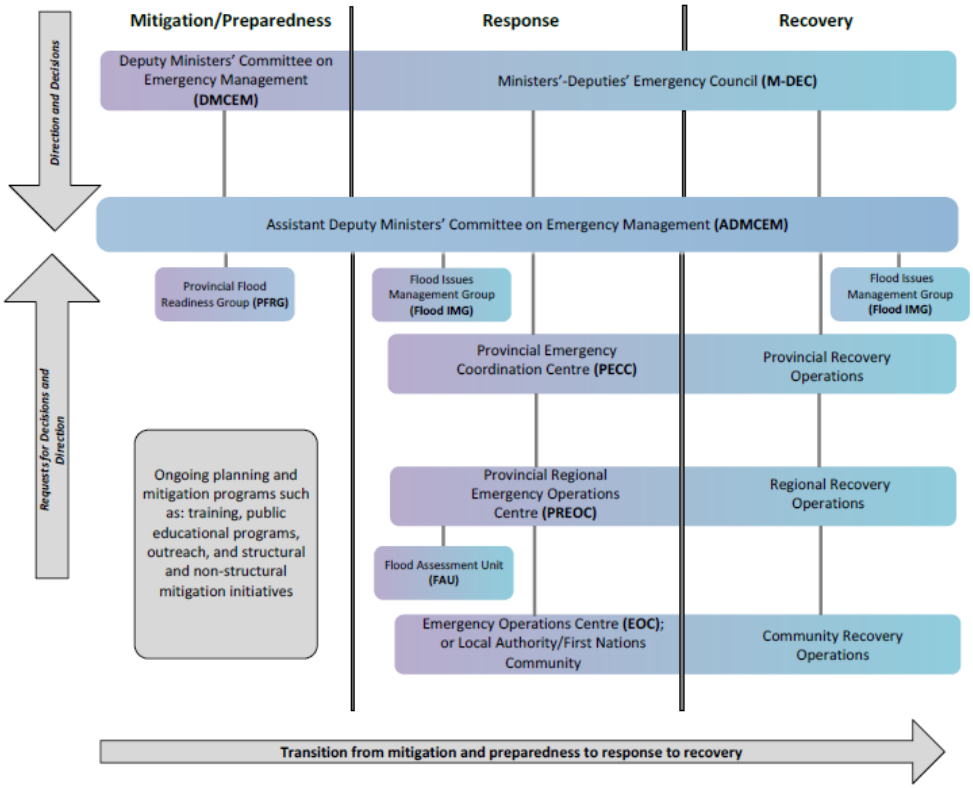
Table 2 Flood Event Capability

Flood Event Severity	Capability
Small to medium flood incidents, e.g., up to fifty properties.	"Yes" - overall, most local government areas are likely to be able to respond, mostly reactively, with provincial assistance. "No"– overall, most First Nations are only likely to respond with provincial or partner guidance. However, a rapid onset incident like sudden surface water flooding has the potential to overwhelm local response arrangements, particularly in areas not used to flooding or where response arrangements are disjointed or have not been exercised recently. Depending on the nature of the flooding, local arrangements for recovery are likely to be able to manage the flood consequences, but most of the houses flooded will take months to fully recover.
Large flood incidents, e.g., the flooding of one hundred properties with consecutive events happening in different areas, that have the ability to tie up provincial assets	"Maybe"' – Local government, provided outside assistance is available, and the flooding is forecast well in advance so precautionary measures can be taken. "No"– overall, most First Nations are only likely to respond with provincial or partner guidance. In responding, isolated governments, both First Nation and local government are unlikely to be able to manage alone and will rely heavily on assistance. Potential for federal assistance providing surge capabilities. A rapid onset flood would be likely initially to overwhelm local capabilities, and recovery is expected to pose substantial challenges - lasting for months, if not years.
Very large scale, widespread and enduring flood incidents e.g., high hundreds/thousands of properties, as seen in the lower mainland in 1894, 1948 and Grand Forks 2018	"No' – even with reasonable notice and current regional and national resources being made available, there is a high probability that First Nations and local governments would struggle to deal with the problem. Recovery will pose long-term severe challenges.

4.5 Investigation C-2.5 - Investigate opportunities for improved organizational planning for emergency response in all levels of government.

The investigations utilized the Provincial Flood Emergency Response Plan 2019, the British Columbia Emergency Management System, and the Canada Incident Command System to provide open discussions and feedback regarding current organizational planning for emergency response.

Figure 7 Illustration of the Provincial Emergency Management System as it transitions through the phases of emergency management. This graphic has been extracted from the Provincial Flood Emergency Response Plan 2019.



The investigation highlighted a moderate number (40%) of interviewees who were unaware of the provincial flood emergency plan and the organizational model above the EOC and respective Provincial EOCs (PECC and PREOCs). In contrast, others (25%) lacked any detailed knowledge of the plan, and a small number mentioned that the plan did not apply to them as it was too high level.

All interviewees who had been impacted by flooding were aware of the Flood Assessment Unit and their role in supporting advanced planning and technical decisions. These interviewees identified the need for more two-way dialogue with the Flood Assessment Unit and the Planning, Operations and Liaison section of the Emergency Operations Centre. It was also highlighted that water stewardship staff were deployed in the field; however, their roles were not explained in the plan.

Interviewees provided both limited and good examples of such field assessment, ranging from not being aware of provincial staff on-site during an event to working together and joint decision-making to assist in response actions.

A small number of interviewees provide good practice examples where either a semi-retired representative acted as liaison officers or where a water authorization specialist (with engineering flood experience) was directly involved in the Emergency Operations Centre (physically). Individuals worked alongside the First Nation/local government in guiding permitting measures, facilitating conversations with other departments, ministries, and federal colleagues. In parallel, the authorization specialist assisted in bridging the gap between EOC Operations, Field Operations, and the Flood Assessment Unit to design reactive emergency flood measures to protect public safety, infrastructure, and cultural sites.

The decision-making of operational responses was shared as requiring improvement as information and guidance flowed through several ministries, ranging from different departments within MFLNRORD to EMBC to the EOC at the First Nation or local government, with a complication raised by interviewees, of who responds on crown land if the flood has the potential to impact a community. At the time of the investigations, Premier Horgan had announced a potential review of the MFLNRORD Ministry. 30% of those interviewed expressed the need for a single flood and land-focused ministry to provide greater focus on flood response support and guidance to local governments.

There was speculation from some interviewed parties, based on observations of past flood events, that during a potential provincial-scale flood event, the provincial flood response priorities would protect the lower mainland only and not on a case-by-case community basis irrelevant of risk level for communities elsewhere.

There was an absence of evidence of federal and provincial strategic approaches observed in First Nations and local governments from the Flood Readiness Group and Flood Issues Group (an EMBC and MFLNRORD Group). A few interviewees commented that the plan was written as a strategic document, yet no strategy during flood response was shared during coordination calls. These groups at the higher levels were unknown entities. There was an expectation from interviewees that the ministries should demonstrate more strategic guidance and provide EMBC (who undertook a critical role as the coordinators and facilitators) with more information to be shared with First Nations and local governments. Interviewees added that there should be proactive identification of communities at risk from these groups, and strategic support and outreach should take place. One interviewee commented that these groups should be consulting First Nations and local governments to identify any urgent response and mitigation measures required but had no examples or hearsay of any outreach. Interviewees also noted the absence of any federal colleagues during flood response when there would be an outreach benefit for preparedness and mitigation grants reminders.

An additional example included the difference in organizational planning where flood response was different from fire response. An EOC usually supports field operations; however, in flood response, an enhanced role for the EOC was to support and guide field operations in providing strategic and tactical objectives concerning the identification of risk areas and strategically directing operational response priorities (including evacuation triggers) due to field operations not having sufficient knowledge.

All interviewees understood the British Columbia Emergency Management System (Government of B. C. 2016 BCEMS) and the goals around responding using these sets of priorities to organize their emergency response (i.e., Health and safety of responders, save lives, reduce suffering, protect public health, protect infrastructure, protect property, protect the environment, and reduce economic and social losses). Interviewees believed that the BCEMS model was well established and helped set goals for the emergency operations centres. Some interviewees mentioned that the BCEMS guidance on the provincial website is out of date and refers to the previous version, “BCERMS”.

First Nation interviewees offered insight into how the BCEMS model may not be the most appropriate set of priorities for First Nation Communities. This was also explored with federal colleagues who also offered a similar observation.

A small proportion of interviewees offered opinions of the Canada Incident Command System (ICS), initially an American fire response system and why British Columbia had developed BCEMS. The B.C. model has roots within ICS, and interviewees thought it was time to refresh to include best practices from the Incident Command System.

First Nations representatives also provided examples of parallel emergency response systems when comparing the provincial emergency response to flood and a wildfire event. The differences in approaches seemed confusing to the representatives, one being community-led and the other led by a provincial agency. It was noted that the outcomes of both operational resources were good but still required more liaison, community engagement and inclusion of traditional and cultural knowledge.

Those interviewees who previously had a high degree of interaction with the River Forecast Centre found either a) the information was well presented and easily accessible or b) not helpful in setting out how their community should respond to the flood event. Interviewees identified the need to have more dialogue with the River Forecast Centre staff and increased training to understand the forecast products. Several interviewees identified the need to link the current high streamflow advisories and flood warning to operational decisions in the First Nation and Local government EOC rather than information provision.

The Flood Hazard Statutes Amendment Act, 2002 was provided as an example where the interviewee perceived a shift in response planning. Interviewed representatives mentioned that the perceived “downloading” of flood management had created barriers to managing flood hazards within the government land base and managing flood events. Interviewees described there was previously a good interaction with provincial experts in deciding how to respond to floods pre-2003 regarding a group of professional hydrologists and engineers who provided a high technical expertise level. At the same time, post-2003, and implementation of this act, there was a perceived lack of provincial engagement.

Reference was also made to the Ministry of Transportation and Infrastructure role as the previous primary responding provincial agency for floods as the agency had access to workforce and equipment.

Little reference was made to Diking Authorities' roles other than the maintenance and inspection regimes in place for managing the existing dike infrastructure. However, a significant concern shared was that the Diking Authority only had a simple right of way permission for infrastructure maintenance and flood management, rather than owning the infrastructure land base.

5.0 Preliminary Recommendations and Next Steps

5.1 Investigation C-2.1 - Investigate the future direction of the Federal government related to a National Flood Risk Strategy.

5.1.1 Future Direction

There is an undeniable need for more strategic flood management action across British Columbia, involving an all-hazard approach but detailing each specific hazard's required direction and policies. The complexity caused by different Ministry mandates and government levels of authority will need to be addressed to coordinate floodplain management Federally and across B.C.

Existing approaches for the flood response in British Columbia have been developed through societal responses and increasing knowledge of our communities' natural hazards. Data from IBC informs us that there are 1.2 M properties in B.C. and suggests that 280,000 (24%) properties are at risk from flooding.

A flood management strategy at national and provincial (and territorial) levels should influence what needs to be done by First Nations, local governments, Municipalities, diking authorities, and all organizations, including property owners within flood hazard areas. The national strategy should guide the provinces and territories to strategically demonstrate their direction, guidance and the integrated roles and responsibilities across government levels. All organizations that manage land and water should be involved, including crown corporations, utility companies, commercial organizations, and conservation agencies.

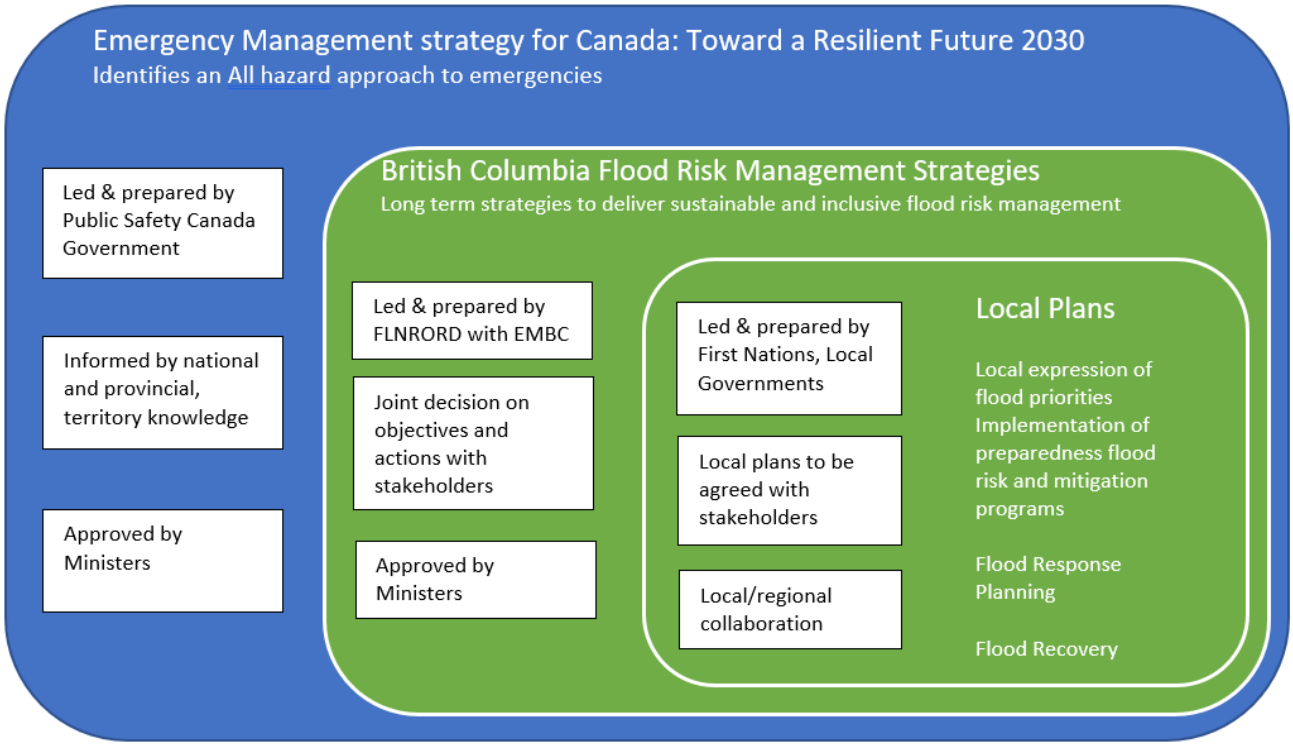
Recommendation 1:
The federal government's strategic leadership should be enhanced for flooding and coastal change. The national strategy should illustrate and guide how the Province, (and territorial) ministries and all organizations are integrated into providing flood strategy direction. These flood risk management strategies should establish the overall approach by identifying the most sustainable and most appropriate combination of actions.

Multiple organizations are involved in managing flood risk. Therefore, an integrated approach that balances national consistency and strategic decisions with local knowledge and accountability must be adopted. Guidance and direction for local and regional flood strategies will ensure that intergovernmental management gaps are addressed. This is in comparison to the current status quo of managing flood hazards in silos. This principle would better manage the risks and consequences of flooding from rivers, groundwater, reservoirs, watercourses, surface water and coastal sea level rise/erosion.

Figure 8 below is an example illustration of how national policy could guide the Province of British Columbia in providing leadership for all entities in delivering flood resilience priorities and objectives on the ground. The illustration explains how hypothetical local actions could be consistent with provincial and national (federal) policies.

Figure 8 Illustration of the integration of National to local strategies

Figure adapted by Red Dragon from UK flood policy.



Recommendation 2:

Federal Programs should enhance sequential flood measures guidance and best practice examples such as hazard mapping, risk assessments, public education, mitigation, and response plan activities at the national scale. These guides and best practice examples can then be appropriately adopted at the provincial and territory level to ensure consistent approaches.

The national direction and suite of measures should guide the development of guidelines and standards for building flood risk assessment and mitigation planning at provincial, territorial, First Nation and local governments levels. The identification at the national level for the need for local flood risk management plans will support engagement with local communities, increasing public understanding and resilience measures. At the same time, driving strategic investments within their communities that offer incentives for communities to consider flood programs for future resilience.

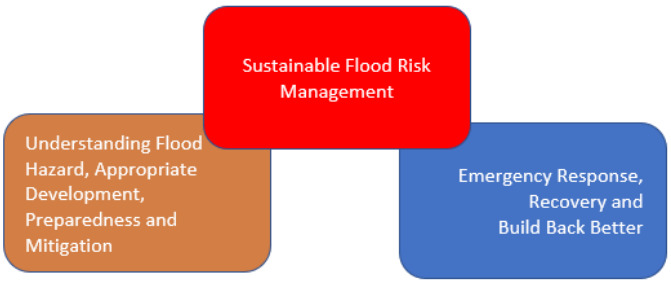
Consistent standards for assessment, mapping and display will connect with national programs such as the national flood hazard layer.

Recommendation 3:

The federal national strategy should be further developed than currently published to empower the Province and provide guidance to embrace and implement a broad range of flood resilience and sustainable actions.

This includes making the best land use and development choices, protecting people and places, responding to and recovering from flooding and coastal change while all the time adapting to climate change. Good practice provides users with a sequential (stepped) process to understand hazard, risk, probability of risk, the impact of the hazard and what measures can be implemented to reduce or mitigate the effects and consequences. Figure 9 [Environment Agency 2020] is an illustration of how flood risk management should be sustainable and be integrated within the whole process.

Figure 9 Sustainable Flood Risk Management



Greater integration of national priorities would remove isolated decision-making during emergency events and provide more sustainable strategic decision-making to identify and implement action to address the hazard.

Flood emergency activities in British Columbia are very response orientated without considering and identifying opportunities to reduce future impact [Government of British Columbia 2016. British Columbia Emergency Management System]. Isolated cases in the interior have successfully undertaken a cost-benefit analysis of response investment versus mitigation investment.

Recommendation 4:

Federal national guidance should guide and influence the Province to implement cost: benefit analysis assessments to response measures costs compared to a more suitable permanent solution. Flood grant programs should become adaptive and agile to address community needs.

The strategic overview (nationally and provincially) of where risks are would enable resilient decision-making when circumstances are allowed and the most appropriate course of action. Replacing the current reactive approach with one that is proactive and reduces or eliminates the issue's root cause will aid greater overall resilience. Such direction requires robust and consistent decision-making processes. There are many situations where some measures would not be appropriate, practical, and cost-effective to protect values at risk.

The Province and Canada have incorporated the United Nations Office for Disaster Risk Reduction, Sendai Framework, into the Emergency Program Act Modernization. This framework and other documentation (UNISDR 2017) reference that investment in disaster risk reduction generally represents a considerable saving in terms of avoided losses and reconstruction costs with a cost: benefit ratio ranging from 1:3 to 1:15 or higher in some cases. A ratio figure of 1:7 could be utilized as a median.

Recommendation 5:

The federal government should produce and enhance consistent principles, approaches, and methods at each step in managing flood risk. This will ensure a national (and in turn a provincial) comparable risk-based approach to inform management of structural and non-structural investment decisions. Consistency is crucial in the methods adopted to assess flood risk and consider future challenges (climate change, societal, cultural, and political changes) to apprise management options.

Areas to support the recommendation above where consistency should be promoted include, but are not limited to, the following outcomes:

- Assessing and quantifying flood risk.
    - The national strategy of increasing the "patchwork" of updates and the achievement of consistent and transferable flood hazard maps across government structures would be one of the ultimate goals at the federal level.
    - National empowerment of Provincial leadership would influence the understanding of risks and the methods to address sustainable flood risk management.
    - Understanding which communities are most at flood risk across the Nation and where provincial leadership and guidance are needed will help fulfill a strategic overview of where the most support is required. First Nations and local governments range in resources, tax base and service levels. These "smaller communities" are often more in need of enhanced support for understanding flood hazards and putting in place corporate actions to increase knowledge and disaster risk reduction.

- Considering the full range of social, economic, cultural, environmental impacts of floods.
    - National exploration of co-development and partnership in coordinating flood risk management planning work with other areas which affect or are affected by flood risk management, including land use planning systems, infrastructure planning, river and coastal erosion, insurance provision and emergency response.
    - Considering a full range of actions, paying particular attention to watersheds and the direct and indirect impacts of floods to an area. National, and in turn, Provincial leadership and guidance can encourage opportunities for the valuation of natural assets, particularly at a river catchment scale and net gains in environmental benefits.

- Examining current and future risk based on climate change scenarios and other long-term trends.
    - The federal government recognizes the impacts of climate change on organizations and residents, and long-term objectives are required to address flood risk. There should be a national direction to ensure that all new development is climate-resilient to flooding, protects and enhances the environment. Governments and organizations play a pivotal role in engaging and advising developers and planners to get the right kind of sustainable growth in the right places. They should utilize national guidance to address and implement climate adaption measures to contribute to a net environmental gain for development proposals. This includes avoiding inappropriate development in the floodplain and using nature-based solutions to achieve climate resilience. When growth is unavoidable, developers should undertake flood assessment, mitigation options and habitat improvement.
    - Climate science, coastal-change predictions, flood modelling, and tsunami modelling need to improve across Canada and integrate adaptation to flooding and coastal change into daily activities and projects. This integration and collation of national hazard information, education, warning, and informing mechanisms will better equip practitioners and provincial policymakers to make the best decisions to benefit people, infrastructure, the economy, and the environment.
    - In some locations, the scale and pace of future flooding and coastal change will be incredibly significant. Over a period, some of these communities will be faced with the need to assess transition

strategies and adapt. The inclusion of the Sendai framework and Build Back Better principles are significant to change our culture of understanding and proactive work. These areas require sensitive and transparent exploration at the federal government level with co-development with First Nations and the Province to address historical decisions in First Nation Reserve allocations, compounding modern-day development and limitations of specific communities to put in place any mitigation.

- First Nations and local governments should reference national direction and appropriate provincial policy to enhance the emphasis on flood hazard initiatives where land development decisions will reduce the need for flood planning and structural approaches in the future. Strategies should be innovative and future resilient, and the continuation of structural mitigation in the form of traditional structural engineering must be assessed in harmony with non-structural mitigation. The assessment of structural flood protection liabilities on the land base should also be incorporated into any decision-making process when constructing flood mitigation.
- The assessment of First Nation communities with limited land bases, potentially impacted by climate change, should be addressed through meaningful dialogue at the most senior levels to explore the roles of the federal and provincial governments with the First Nation governments. Joint identification of long-term strategic options should be discussed in terms of the future resilience of the specific community. These issues are not limited to First Nations reserves. Some other local government communities are similarly "land-locked" by water bodies and crown land with no areas available for adaptive and future development.

Recommendation 6:

The federal government should develop guidance for climate adaption plans to become commonplace for all First Nation, local government, and the Province to enable communities to deal with the impacts, risks and opportunities posed by a changing climate. A national policy would facilitate the development of provincial and territorial policies for such plans. The climate adaption process should prioritize consequences that should be mitigated and suggest adaptation actions or strategies. Climate change affects the entire community and will continue to influence it over the long term. Adaptation planning is not for one specific department or government organization but requires a national vision, cooperation, and partner co-development at a multitude of levels. The recommendations of such a plan should be implemented through the local government planning documents, emergency management, energy, infrastructure and transportation sector plans, the strategic plan, public works, the community land use/development plan, etc.

Recommendation 7:

Producing enhanced federal national guidance for First Nations and local governments on preparing strategic flood risk assessments, interpreting the latest climate science, undertaking site-specific flood risk assessments will be critical for future resilience.

A vital component of this resilience will be to help local people and businesses recover by 'building back better' after a flood. First Nations and local governments' ability to put in place flood-resilient measures will help people return to their homes quickly after flooding. Best practices such as FireSmart standards have been successfully developed but inconsistently incorporated into building design and materials across the country and elsewhere. Flood resilience measures are gaining traction but require consistent approaches and leadership from all levels of government.

Recommendation 8:

The Red Dragon team highlighted the need for a common location for all flood-specific programs, data, and information (this could be expanded for all-hazard). A suggested approach would be a federal government national "flood portal" that would deliver the national strategic goal of increasing the understanding of risk and flood mapping availability. Such a portal would provide information relevant to the public, developers, and all government levels for strategic flood activities.

Currently, federal, provincial, and other organizations' information sources on grant programs, project initiatives, snow surveys, river hydrometric and response information are spread throughout various web pages. The investigation noted that over fifteen different web pages are required to be opened to access “strategic flood information” that would assist First Nations and local governments.

Information could either be signposted to specific sources or multiple sites reviewed to identify efficiencies for displaying data and information through one portal. Such an approach would assist in a whole society approach in the formulation of a B.C. Flood Strategy Initiatives, the Emergency Program Act Modernization, and an all-hazard approach.

5.2 Investigation C-2.2 - Investigate the Province’s expanding role in providing flood response to First Nations.

5.2.1 Strategic Approach

There is a need for a clearly defined strategic process from the provincial ministries when working with First Nations. The different provincial ministries and First Nation representatives provided many good examples of various initiatives and work plans across the province.

Some of these work plans are related to specific departments and their engagement with First Nations, supportive work plans in accessing grant programs. Northern Development Initiative Trust, FN Emergency Planning Secretariat and Tribal Council(s) initiatives were identified as good practices. However, the work is fragmented across the province. It was apparent however that all work plans were being driven separately. Working in collaboration is required to show working with and not providing for First Nations will be important.

Recommendation 9:
It is recommended that the provincial government develop a holistic enabling plan to accompany the B.C. Flood Strategy to illustrate the activities required. This enabling plan can be themed to provide detail or overarching areas of work needed to achieve change. Each theme can provide additional information of the activities under flood response and others to describe components to either develop (from new), enhance (an existing activity) or continue. The enabling plan should be co-developed with the current leadership and working groups with the addition of a gap analysis of hazard knowledge and Canada-wide programs brought to the discussions. An added benefit of such an enabling plan can explain how the theme components will be achieved, why they are needed, who will implement and who will support them.

5.2.2 Partnership work

Recommendation 10:
There is further work required by the Province to develop relationships and enhance outreach before information is shared. A suggested objective would be to incorporate Indigenous knowledge into the actions and mechanisms of flood response. True reconciliation and relationship building expect to bring those final decision-making ministries and organizations to the discussion table equally.

The Tripartite agreements were mentioned numerous times in the interviews with all parties involved in First Nation flood response, and further work is required here for reconciliation and collaboration. There are differences of opinions concerning these agreements, related to what they mean on the ground, but all parties agreed that the tripartite process had supported momentum in providing collaboration. However, there was agreement that this could go much further.

The five principles of cultural safety were referenced and incorporated into working together with First Nations and ministries within the workplace. (Cultural safety five principles can include protocols, personal knowledge, partnerships, process, and positive purpose and treat people regarding cultural or individual differences).

Recommendation 11:
All four emergency management pillars should be presented for discussions at the provincial strategic Indigenous partnership's tables, particularly flood response. It was identified that the Province had adopted a transparent and fair process to provide the broadest choice of emergency response support, but this was not sufficiently comprehensive at the Indigenous partnership tables. The addition of flood specialists from the Province at this table discussion would enhance a sustainable future of working with First Nations to engage, share knowledge, and learn how to address future flood emergencies. This should be a joint initiative between the province and First Nations.

Recommendation 12:
The Province should enhance its strategic approach of collaboration and co-development by learning together. A method to be employed would be to apply 360 feedback to create a high-performance culture, trust, identification and learning of issues identified. Such an approach should be undertaken at an organizational level and not at an individual level. It could focus on the interactions of different ministries with First Nations, Tribal Councils and most significantly with the working groups. It will be essential to share respective investigation reports and work together across the various partners. A process of continual review and improvement should be in place going forward.

Recommendation 13:
There is insufficient understanding of how many First Nations have implemented flood risk and mitigation programs. The Province and First Nations should jointly develop a gap analysis to understand the landscape across First Nations of preparedness, leading to a better response. A gap analysis should be undertaken to look more strategically at hazard profiles, risk levels and state of readiness across Indigenous communities.

5.2.3 Roles and Responsibilities

The different provincial government ministries and federal departments' roles during flood response were identified as an area that required clarification. Who makes decisions, and what information is needed, the processes and expected support (service) levels are a few of the areas that left First Nations wondering who does what? Clearly defined roles between Federal and Provincial agencies need to be explained in more detail. First Nations commented on supporting the tripartite agreement if Federal Agency (Indigenous Services Canada) can fulfill obligations in a timely manner. This may require the Federal Government to transfer (or restructure) appropriate authority to a government department or program within their current multi-departmental and sometimes cross-ministry program structure. Currently, it was identified that authority is distributed throughout various divisions.

Recommendation 14:
The Province and all governments should clarify each other's respective roles, authority, and mandate clarify the "who does what and when during emergency flood response." A systematic and illustrated matrix format would allow an easily accessible guide to transfer knowledge to all staff and leadership levels within First Nations. The federal strategy guide "Building Back Better: Emergency Management Assistance Program Strategy Guide" approach is an example of good practice that should be adopted to describe flood response.

5.2.4 Flood Response Planning

Recommendation 15:
First Nations consultation and collaboration protocols exist, but more hazard-specific policies need to be jointly developed between the provincial government ministries and First Nations, followed by an educational information-sharing program. Cultural values are typically identified and addressed when responding to flooding in collaboration with

First Nations. Outreach and information sharing are taking place, such as Seasonal Flood Preparedness workshops and Dike Maintenance Act training events, to name a few, but the enhancement of these information-sharing sessions will increase shared knowledge.

Recommendation 16:
First Nation and provincial joint development of a consistent approach to incorporating traditional knowledge and western science through access to flood experts or professionals would improve the flood emergency response process. A mentorship program to build strategic emergency management within the flooding response activity, increase knowledge of hydrological models and provincial programs (River Forecast Center) to build skills (via academic and one-to-one coaching) will deliver on-ground results during flood response. First Nations' access to talk and discuss flood response issues in real-time would be advantageous in keeping knowledge and skills within communities.

Recommendation 17:
The MFLNRORD community binder approach should be expanded to cover the whole province with appropriate resources. Such information will allow First Nations, ministries, and local governments a collaborative space to equally share flood information, hazard and risk level information that will aid flood response planning. Watershed planning is key to providing a regional ability to provide mitigation or ongoing research and ongoing monitoring and then mitigation funding for risk reduction. This will enable a comprehensive that considers related regional projects. Linkages should be enhanced with other partners to ensure the collection of data once with many uses. It will be necessary to work alongside community representatives to share knowledge and on-job practices. Good practice was perceived as a regional coordinating body that can discuss and gather information to decide which areas are at most risk and which areas need flood response planning.

Recommendation 18:
The provision of a toolbox or a suite of products from provincial ministries would better enable First Nations to identify and document critical data such as historical flood observations, hydrometric data access, flood assessment checklists and identification of data gaps. This would help more accurately determine risks and potential mitigation projects while allowing two-way information sharing.

5.2.5 Capacity

Recommendation 19:
The provincial and federal governments should develop guidance to engage with First Nations to enhance comprehensive community emergency planning that includes the mechanism for funding a resource or collaborative space to engage First Nations to come together and share. Indigenous Services Canada has funded an emergency management staff position in the near past, but the approach should be more sustainable and strategic to allow for the integration of services without the reliance on grant money. The interviewees offered the examples of emergency program coordinators, territorial stewards, and Indigenous land guardians as examples.

Recommendation 20:
A federal and provincial initiative to provide all First Nations with access to funding to enable Flood Response Plans development. The plans should refer to guidance notes or standards that identify flood hazard areas, risks, trigger levels for preparedness, response, and communication (amongst others). This initiative should also include partners and stakeholders for consultation and development of the plan, so information can be discussed during proactive times, provide value to other programs and projects, resembling the community binders, to create a team approach to emergencies. This will propagate other discussions about the other four emergency management pillars, especially flood risk assessment and flood mitigation.

Recommendation 21:

It is recommended that a training initiative is piloted and developed across the province through provincial and First Nation regional collaboration groups to create a geographically spread skilled workforce situated in First Nation communities that can support flood response. During flood response, one of the activities that require a skilled workforce is the installation of temporary flood barriers such as tiger dams and gabion bins. Investigations highlighted that there had been joint initiatives to train First Nation Volunteer Fire Crews to deploy temporary flood barriers formally. Past years' events show an over-reliance on BC Wildfire Crews requested by any government to assist when the flood response activities exceed their capacity. In addition, if a train the trainer approach was undertaken, then the competencies would remain within each respective Nation. A cost-sharing provincial and federal program should be explored.

5.2.6 Funding

There are many different entities and partners in emergency management supporting First Nations, including diverse funding sources. From ISC, EMBC, Union of B.C. Municipalities (UBCM), First Nations Emergency Services Society (FNESS), Regional collaborative groups and associations, Trans Mountain Pipeline expansion funding (in specific communities only), which can be daunting for smaller First Nations when figuring out what to do in the world of emergency management; usually in the time of response.

The system is complicated and multi-faceted to identify the proper funding; if one community has been successful at applying this funding this way, then it should be shared with other communities to improve equitable access to resources.

Recommendation 22:

The Province should enhance (with conditions) funding programs that would assist in paying for third-party professional advice to work alongside First Nations and produce complex grant applications. Flood Risk and Flood mitigation grant programs are covered in the provincial UBCM and federal programs for those First Nations capable of producing successful grant applications. The current grant applications do not allow third parties to be funded to help write the grants, and funds need to be identified from other programs to support the service. The co-development of the grant process and a third party's ability to engage the community throughout and provide a “train the trainer” approach would be suggested as a condition of this approach and desirable to increase transferable knowledge.

Recommendation 23:

The development of a provincial grant program to create, train, and exercise a flood response plan within a community or regional community would deliver benefits to response actions and reinforce emergency management knowledge and other activities required in the four pillars of emergency management. Flood response plan creation, training and exercising is not a specific provincial or federal grant program. Federal programs allow for tailor-made grant applications, while the provincial grant programs are restricted to the current UBCM CEPF grants. The national strategy is to increase capability and competence for all hazards, and flood is a complex hazard to understand and respond to with many direct and indirect factors.

It must be noted that a suitable standard of flood response plan should first be developed to provide a consistent approach. An opportunity of working together in partnership to incorporate cultural values, traditional knowledge should be sought.

5.3 Investigation C-2.3 - Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.

There was clear support in all our investigations that written flood response plans, or a detailed flood annex of an emergency plan are required. The complex and diverse nature of flooding and the consequences that arise requires a comprehensive and often sustained response from a wide range of organizations. The investigation noted how different geographic regions perceived flood duration, some communities providing 14 days as a sustained emergency response. In contrast, other communities in a fundamentally different geographic area identified it was possible to have far excess of 100 days of operational activation.

When flooding occurs, those impacted wish the emergency to be dealt with effectively, irrespective of the cause. As the lead responder under the Emergency Program Act, First Nations and local governments need to assess and reduce flood risk, protect public safety, maintain their assets, and lead the recovery process. Such operations reference the priorities of the British Columbia Emergency Management System. Pre-planning is therefore crucial if all these organizations are going to respond effectively. A well-written Flood Response Plan does not necessarily equate to having an effective response capability; that depends on leadership, levels of staff training and the exercising of plans – and updating them in the light of experience.

5.3.1 Flood Response Plan Standard

A complementary provincial and federal support program should be explored to put in place standards and access to support or to fund the development of flood response plans.

Recommendation 24:
Flood response plan standards should be developed by the Province or Federal Governments to provide a consistent approach to flood response. It will be imperative that the standard incorporates an understanding and flexibility that not all governments will require comprehensive flood plans depending on their hazard and risk levels. Flood response planning should be a bridge from the Engineers and Geoscientist guidelines and emergency planning standards to develop a comprehensive guide or workbook to increase preparedness, advanced planning, flood response activity management, and interconnections with strategic flood investment programs.

Recommendation 25:
The creation of a provincial workbook or good practice indicators will assist First Nations and local governments in developing flood response plans. These guides must explain the background, relevant information sources, roles and authority during a flood event, and the interconnection with flood risk assessment and mapping within the geographical area. Allowing flexibility to reflect variation in different regions of the province, consistent guidance will help with wide-area incidents and cross-boundary collaboration, aid robustness and allow for more straightforward peer review and assurance. This workbook or guide will also enhance the provincial gap analysis process, recommendations 13 and 14, especially for the prevention, reduction, and response actions for floods, to provide confidence limits and detail of the measures in place, who is responsible for them, with forward action priorities in how to achieve actual disaster risk reduction.

Recommendation 26:
In reference to recommendations 24 and 25, flood response plans need to be risk-based and informed by flood risk assessment, mapping studies, flood history and knowledge of community exposure and vulnerabilities (where available). Such plans should be evergreen in nature and be continually reviewed based on the presentation of new

evidence or physical events. The flood response plan needs to be scalable, flexible, and importantly adaptable to all forms of flooding and the differing nature of floods that impact the geographic area. The government's capability and capacity need to be included to achieve realistic outcomes and considerations for requests for support from adjacent governments and the Province. Flood response plans must not act alone and require integration into emergency management and staff responsibilities within the respective government.

A flood response plan is a proactive element of flood preparedness and not reactive planning. These integrated plans must describe shared responsibilities in responding to floods. All levels of government should be included and their critical roles in protecting communities from flood events.

To enhance the recommendations of 24, 25 and 26 findings, a brief overview of a minimum standard of flood response plan content could consist of:

- Purpose aims and objectives.
- Related and interdependent plans.
- Triggers and activation.
- Flood risk and impacted areas, including risk levels, historical analysis, vulnerable communities, key infrastructure.
- Response roles of partners, stakeholders, key roles in the management of flood response.
- Equipment available and procedures.
- Communication to the public, partners and stakeholders, linkage with Emergency Plan.
- Plan maintenance.
- Training and exercise linked to emergency program and partner/stakeholder participation.

The following table is a generic recommended example of a First Nations or local government list of valuable components for a flood response plan. The table also illustrates the complexities in addressing flood response and the many facets required in the planning process.

Table 3 Flood Response Plan Content Descriptors

Flood Response Plan Content	Additional Descriptors
Strategic objectives for the EOC/organization.	Public safety, public alerting, media messages, resources, business continuity, priorities for temporary response measures, etc.
Decision making information sources and criteria.	References for up-to-date readily available data sources and actions; Exact triggers to activate different levels or types of response to flooding.
Checklists and flow charts for actions and decision making.	Functional and process tasks and actions (auditable).
Response escalation procedures for the organization.	Identified trigger actions for a response, including who is responsible, anticipated speed of progression, and quantifiable actions
Response escalation procedures detailing flood stage trigger actions.	Reference to the River Forecast Centre warning levels, tidal monitoring, Tsunami warning, as appropriate.
Response escalation procedures detailed snowpack trigger actions.	Reference to historical and/or statistical snowpack levels that cause flooding. Reference to Snow and Water Bulletin information.
Emergency Measures Plans.	Location-specific, detailed asset list and methodology for implementing temporary flood measures – tiger dams, gabions, stop logs, sandbags etc.
Public communication messages for different flood stages.	Templates and pre-identified public information sources for dissemination and communication schedule.
Procedures to communicate with other responding organizations.	Maintained contact lists, actions per flood stage to notify/liaise with partners/stakeholders.
Roles and authority (mandate) of other partners.	Clearly articulated responsibilities to show who does what.
Recovery plan reference.	Recovery steps ideally initiated during response phase.

Flood Response Plan Content Descriptors continued

Geographic hazard information for at risk communities.	Detailed community risk profiles/assessments of what is at risk and priorities.
Location of groups of pre-identified vulnerable people.	E.g., care homes, hospitals, schools
Properties at risk.	Distinguishing residential from businesses and industries.
Key assets.	E.g., locations where key equipment is stored
Flood Response Plan content	Additional Descriptors
Major transportation and primary evacuation routes.	Or reference evacuation plan.
Critical responder/service buildings.	GIS mapped locations with information.
Locations of utility installations or linear infrastructure.	GIS mapped locations with information.
Other government infrastructure within your jurisdiction.	GIS mapped locations with information.
Communications infrastructure.	GIS mapped locations and known contingency measures in case of failure.
Buildings/ venues used for large events.	GIS mapped locations with information.
Business continuity/contingency measures for critical or essential infrastructure.	E.g., Loss of power to a pumping station
Other.	
Flood Response Plan Content: Data and Information	Additional Descriptors
Link to the River Forecast Centre information, River Models, Tidal Information.	-
Real-time river flow, level gauge, tidal monitoring information.	-
Real-time snow pillow information.	-
Organizational remote sensing (sensors, cameras, etc.) for flow and level gauges for potential inundation areas.	-
Weather Forecast information.	-
Coastal and tidal prediction information.	-
Other.	

Recommendation 27:

In reference to recommendation 24, there is the need for a signoff approval process with the development of any flood response plan either by the First Nation or local government. The Emergency Program Act Modernization discussion paper has removed the audit role of EMBC from emergency plans to one of coordination and facilitation. However, with the introduction of a support or funding mechanism, it would be able to include specific criteria in developing plans. An alternative process is to allocate a subject matter expert as part of the "plan developing committee" to provide oversight and professional approval that the plan content has been assessed, is consistent and acceptable for use would add real value. Such mechanisms ensure greater complementary planning expectations at the local and provincial levels in supporting flood response activities.

Red Dragon is conscious that the federal approach is an all-hazard one, and there is an opportunity to explore where subject matter expertise can be better utilized at the planning and response levels for other hazards. A strategy needs to identify where skill sets are easily transferable to different hazard responses.

5.3.2 Investment and Funding

Recommendation 28:

It is recommended that alongside the development of a flood response plan standard, a provincial and or federal government funding program is developed and established to support such plans. Principles of plan development should be risk-based, in collaboration with partners, support other initiatives like the MFLNRORD community binders and utilize emergency response and hydrological subject matter experts. The Union of B.C Municipalities facilitates a comparable existing program for Evacuation Route Planning. It will be imperative for standards and programs to align with federal initiatives and strategies. These programs should explore the flood response assessment process and seek to strengthen the capabilities of the First Nation and local governments more widely.

Recommendation 29

A regional collaborative approach between First Nations and local governments would assist in joint applications or simple support by sharing successful applications in actioning strategic flood investment. It is noted that land use and development must be jointly considered (out of scope) and, in many situations, have resulted in inappropriate historical land use.

5.3.3 Enhance Current Initiatives

Recommendation 30:

The community binder project within MFLNRORD and the collection of risk information by EMBC should be developed to become a collaborative project. It is recommended that these initiatives are combined, enhanced, and implemented across the Province.

The organization and coordination of the creation of community binders by provincial staff and engagement, primarily with First Nations in the Lower Mainland, and the risk assessment data and community liaison by the EMBC regions interviewed was identified as a best practice initiative. First Nations and local governments should also recognize the need to allocate resources to this recommendation in providing local knowledge, historical information, previous response issues, location of values at risk and so on. This recommendation would also address inconsistencies of approach and consolidate understanding of roles and responsibilities.

5.4 Investigation C-2.4 - Investigate flood response capabilities considering different flood hazards and different regions of the province.

The national strategy, and many doctrines, present the need for resilient communities. The definition of resilience is different for many different societies and organizations. The national strategy is clear that the resilient capacity should be delivered through the shared responsibility of all (from citizens to governments), strengthen our ability to respond, recover and learn from events. Capabilities are referenced as the second factor of resilience and are again strengths-based in being proactive and agile to reduce vulnerability and risk. The knowledge and ability of any person, organization, or government to be able to respond, mobilize and manage an event is vital to increase our collective "capability."

5.4.1 Capability Assessment

Recommendation 31:

There is a need to enhance the provincial and Canada-wide capability assessment of all ministries, First Nations and local governments, Diking Authorities, and utility providers. The federal government is already exploring working groups to discuss all-hazard capabilities. While the exact terms of reference have not been shared with the investigation team, there is an opportunity for the collective governments to align priorities. This investigation is a snap-shot of existing issues in a sample population of provincial partners. A provincial wide capability assessment should be developed in line with the suggested points, amongst others, below to provide a comprehensive state of readiness and capability.

- A state of readiness assessment would allow the Province to identify which First Nations and local governments have the ability, resources, organization (EOCs), and capacity to respond. There is a need for enhanced capability and identify geographical areas for improvement support.
- Knowledge and core emergency management competencies should be explored within the capability assessment, especially flood and all-hazard, to ensure that training programs' skills and competence are structured in the workplace. It is important to note any duplication of emergency management resources in organizations. The review and consideration of the emergency manager's resource planning were out of scope; however, further work is required to enhance resource capabilities across the province.
- Interlinked research during the development of such an assessment would include the flood grant programs' participation and connect with the national strategy to increase flood mapping across Canada.
- A role and authority assessment should be explored to provide more comprehensive (and legal) guidance to demonstrate how the local lead responder makes decisions with the Province's support during flood response. The investigation noted that the provincial flood response plan's language is provincial government centric, in terms of the mandate, with sometimes matrix management of response decision making (decisions are cross-functional and cross-ministry, e.g., River Forecast Centre guidance, MFLNRORD advice and direction, EMBC financial and logistic direction and the local lead responder managing the flood response). This highlighted a need for further clarification of roles. It is recommended that a decision flowchart be created, including roles, responsibilities, and authority, to show how decisions are supported from the field command through to the local Emergency Operations Centre who then requests support from the ministries and the coordination by EMBC. This removes assumptions and provides clarification.

5.4.2 Collaboration

Recommendation 32:

First Nations, local governments, Provincial Ministries, and Federal Governments should explore ways to increase regional collaborative groups' geographical distribution for meaningful sharing of practitioner-led flood response planning and activities. The federal all-hazard approach is also noted and should be incorporated. It will be essential to distinguish between existing working groups at more strategic levels of government and practitioner-led groups in addressing outreach and information sharing with First Nations.

- Collaborative groups should be regionally focused and locally driven with access to subject matter experts and attended by practitioners. The areas for exploration include sharing initiatives (community binders/risk registers), best practices to assist in flood preparedness, advanced planning, flood response triggers and where to seek information, roles, and responsibilities of all involved. Such regional focus groups will remove ambiguous expectations of all involved and respect the different stages of flood response planning development for each government.
- Collaboration at the local level has many opportunities, and the “operating area” of a group is best determined using a geographic watershed (to show understanding of the potential flood impact) rather than collaboration within a specific political government type. This would, in turn, enhance the alignment of all government levels in flood response, encourage cross-pollination of other projects, and drive consistency and interoperability.
- Joint training and exercising programs would lead to a stronger together approach and increase single and multi-organizational resilience. Training and exercises will validate the plans, train staff and test procedures. Such opportunities build proactive relationships, confirm the roles and responsibilities of responding organizations, and the adequacy of communications, resources, and equipment. The sharing of financial costs of such events is also advantageous and cost-effective for smaller organizations.

5.4.3 Asset management

Recommendation 33:

The mobilization of equipment to known flood-impacted geographical locations should be recognized as a primary required capability within the provincial government's advanced planning stages of an emergency response. A proactive and protective response is recommended rather than the current reactive one. When capacity is exceeded, a call for assistance is initiated by the First Nation or local government to the Province; in place of this, the provincial government advanced planning unit should proactively offer help before being inundated with actions.

- As part of a capability assessment, the Province should explore the need for strategic staging areas across the Province to mobilize equipment in shorter timescales. Comparable procedures exist within the BC Wildfire Service and Military when assessing hazard level and pre-identifying logistical locations for onward deployment.
- Preparedness and advanced planning activities should be enhanced to allow for First Nations and local governments the ability to plan for different scenarios. The provision of guidance would lead to the correct assessment of the type and quantity of temporary flood barriers and at what flood stage would deployment (including the lead-in time) be required. This would increase the local capability to understand what temporary and protective measures are applicable (if any) and highlight other areas for improvements. Such plans will allow for an estimate of equipment and a practical assessment of lead-in time required to deploy such assets on the ground.
- Provincial and federal programs and funding to allow First Nations and local governments to obtain suitable temporary equipment (with appropriate training) would enhance the capability of the government types and create more sustainable options for community resilience. It is recommended that such projects should be regional to facilitate joint working, shared and efficient use of resources and maintenance.

5.4.4 Access to knowledge

Recommendation 34:

Enhancement of the provincial Temporary Emergency Assignment Management System (TEAMS) program assists EMBC operations centres and BCWS fire centres in supporting communities affected by emergency events. The program goal is to ensure trained and skilled provincial employees are ready to help in all emergency aspects. The enhancement of this program would better enable the provision of knowledge for First Nations and local governments to support operations, especially in the initial stages of an event, formulate plans, facilitate liaison and create planning actions for the said governments.

- A component of this could allow First Nations and local governments the ability to provide resources to the TEAMS program (without compromising their work programs or emergency response) for short durations during flood response to provide peer support and facilitate sharing of best practice.
- Access to flood subject matter experts (through ministries and professionals) is also another suggested activity. The resource availability of Water Stewardship staff, hydrologists, and others within the Flood Assessment Units is vital in supporting ground operational roles. Such roles could be expanded to an all-hazard approach.
- The identification and access to a "Government Liaison Representative" should be explored to provide efficiencies of service and decision making (especially working in or around water authorizations), both provincially and federally. This approach has been the case for significant incidents within the Province (Grand Forks Flooding Event 2018, Tahltan Wildfire Event 2017). A whole-of-government approach can be adopted for statutory decision-makers and is a principle in different emergency management structures across the world. This initiative would allow for First Nations and local governments to propose planned actions to address flood response without the need for extensive consultations of ministry and federal departments and associated permit processes, et al.

5.4.5 Investment

Recommendation 35:

Federal and provincial support of grant writing and program development capability will assist smaller First Nations, and local governments access to flood emergency management resources and professionals (as well as other activities under the emergency management pillars). Larger communities have identified the value of grant workers and, in some cases, have permanent staff resources to look at opportunities for community improvement, while smaller ones often do not.

- Workshops to assist the smaller First Nations and local governments should be explored to provide best practices and detailed training in the content required and management of such programs.
- The adaptability of the funding programs should be explored to seek ways to provide staff time for project administration and professional support in the writing of said funding applications. A cost-sharing program from the Province to First Nation or local government would provide transparency and consistency across the province, resembling provincial and federal cost-sharing programs.

Recommendation 36:

The exploration of federal and provincial programs to provide support mechanisms (resource access and funding) should be explored to support this modernization and align with national priorities for an all-hazard approach. This recommendation is interconnected to recommendation 35.

The provincial and federal grant structure follows different program priorities, with alignment being witnessed with the drive to increase flood hazard understanding, flood mapping and appropriate mitigation projects. There is no direct flood response grant program in place. There is potential for federal funding of tailor-made projects for First Nations; however, this agility is not in place for local governments. With the rollout of the Emergency Program Act Modernization in British Columbia and the ministries identified, there will be an expectation on First Nations and local governments to enhance emergency planning.

Floods are the most devasting environmental emergencies across Canada but are not responded to in comparison with Wildfire events [Public Safety Canada 2019]. Programs should be explored to support the following areas to complement existing programs.

- Flood response planning program (as mentioned in section 5.3.1) in a similar program to the Union of B.C. Municipalities Evacuation Route Planning.
- Remote sensing programs for equipment and services, with particular attention to interoperability with provincial sensing.
- Training and regional equipment as mentioned previously with the mobilization of equipment recommendation.

5.5 Investigation C-2.5 - Investigate opportunities for improved organizational planning for emergency response in all levels of government.

The national direction of increasing understanding of risk, presenting more comprehensive flood information (flood mapping) and increasing all-hazard capabilities were presented as essential goals within recommending ways to improve organizational emergency response. There should be a focus on developing and implementing effective, risk-based land management and planning arrangements and other mitigation activities that complement disaster risk reduction, influencing response planning.

Collaborative emergency management policy with a high degree of outreach, consultations, and partnerships is a foundation for genuine organizational planning improvements. Interoperability should be further explored between federal, provincial governments, First Nations, local governments, agencies, the commercial sector, businesses, and communities to align strategic flood initiatives.

Three major themes were emphasized during the investigations for improving organizational response. These included:

- Understanding national, provincial, and local risk
- The need for a single authority for flood response planning
- The improvements to the existing response structure

5.5.1 Understanding Risk

There is no commonly shared understanding of flood risk across the province, and all information is presented and captured within different sources. Initiatives have taken place in the lower mainland and other isolated areas. The Okanagan Basin Water Board initiatives for improving access to flood mapping and quality of data were the only other regional project that provided this approach outside of the lower mainland. All other examples were based on local community boundaries only.

Recommendation 37:

There is a need for a provincial understanding of which communities are most at flood risk and where provincial (and other agency) support would be needed during emergency response. This recommendation is linked to recommendations within section 5.1. The need for additional support, greater resources of staff and equipment should be based on a flood risk assessment, what values are at risk, the scale of the hazard, what capabilities are in, the operating response structure of the community within the hazard zone, and importantly what are the direct and indirect consequences of the flood impact. In a flood event, isolated communities may require more support and guidance than a larger municipality, for instance, which had access to knowledgeable staff, workforce, and equipment. Provincial and local support in these areas may be overextended due to geographic remoteness and the type of hazard impacting the community. The movement of provincial assets, for example, should not be based solely on values at risk but the potential impact of the flood event's totality. A loss of a large employer's infrastructure in a small community due to a flood may have devastating consequences on whether the employer stays in operation.

5.5.2 Single flood response plan authority

Recommendation 38:

It is recommended that the Province explore if the current response models be enhanced by a single flood response authority that would have the ability to provide provincial subject matter experts, provide guidance and direction regarding flood warning and associated protection measures, providing a similar BC Wildfire Service taskforce approach, and facilitate critical ministry decision-making for permits.

Several interviewees mentioned a potential review of MFLNRORD by Premier Horgan. A moderate number of interviewees expressed the observation of a potential need for a single flood and land-focused ministry. It is unknown if this would include an emergency response function, and further detail was not available when writing this report. It was noted that the EMBC Emergency Program Act Modernization papers stated MFLNRORD as the ministry lead for flood hazard "to provide expertise and direct support to local authorities." Throughout all the investigations, there was a willingness to enhance and clarify all organizations' roles and authority and a comparison to pre-2003 legislation for more provincial leadership in flood response.

Flood response is organized through matrix management of responsibilities with the lead responder referenced as the First Nation or local government. Dependent on the governments' financial position and structure, most governments are not given full autonomy due to water and environmental permitting, financial eligibility considerations and decisions, and subject matter experts' availability. However, wildfire response planning sits with the BC wildfire service to lead operations, define tactics and strategic goals. Local responders undertake first-line responses until the ministry is on scene. The public safety evacuation measures reside with First Nations and local governments (unless a tactical or provincial state of emergency), but BCWS provides recommendations to the governments to put in place protection arrangements. Mutual aid and collaboration with a large variety of partners also take place. This organizational model is seen as generally effective by interviewees and provides tactical and strategic recommendations to First Nations and local governments.

The full analysis of such a single response authority was deemed out of scope for this investigation as the consultant team did not have access to all relevant information and limited project time. It is recommended that a comprehensive analysis should be explored to include, but not limited to the following sub-recommendations:

- To identify the desired direction of an all-government approach to the efficiency of provincial government services.
- The direction of the Emergency Program Act Modernization and the future role of MFLNRORD and EMBC regarding flood hazard. (Modernization papers provide a specific reference to flood hazard lead).
- Legislative review of all applicable acts and regulations.
- Current business area review modelling of all departments undertaking flood response planning and associated activities.
- Scope, costing, efficiencies, and organizational culture.

5.5.3 Existing organizational response improvements

The investigation highlighted several areas for organizational response planning improvements using the current planning structures from the provincial flood response plan.

Recommendation 39:

The Province to co-review and explore in partnership with First Nations the re-evaluation of the provincial BCEMS goals in specific reference to Indigenous priorities. Understanding Indigenous community priorities are fundamental in driving a consistent approach and bridging a perceived divide in setting emergency management priorities. For example, do the BCEMS goals align with First Nation goals? The investigations agree that life safety is essential, but there was significant importance in weighting for cultural safety (maybe more important than property protection), food security and sacred values. These goals need specific review with First Nation governments.

Recommendation 40:

The provincial government to enhance the purpose, language and clarity of the provincial flood emergency response plan to define each organization's role's scope. Interviewees mentioned the requirement of clarity of language and clear accountability for decision-making for each organization involved. The matrix management approach for flood response decision-making includes all levels of government. It should describe and illustrate information and guidance sources, who makes decisions, the rationales/justifications are used to agree with response measures, and who can support them. Sub-recommendations include:

- The provincial plan should be reviewed and re-written as a multi-organizational plan and not as a provincial government plan in responding to floods (as is currently the case). The Emergency Program Act Modernization project is a welcome opportunity to provide a review mechanism. A plan review will also differentiate between current assumptions and expectations of roles for all levels of government.
- Inter-linked to the provincial plan is an administrative review of MFLNRORD's role and responsibilities to deliver activities within the four pillars of emergency management.

Recommendation 41:

Enhancement of a provincial group of flood subject matter experts including hydrologists, geomorphologists, and engineers with flood response experience to support and guide all levels of government in interpreting weather, snowpack, river, tidal and geoscientific information to inform emergency response planning and actions. Group members would deliver direct advice to the Province and specific directions to the communities at risk. Group resources could come from within the provincial and federal government and subject matter experts.

- A sub recommendation is to review the terms of references for the Flood Issues Group and Flood Readiness Group to proactively analyze outreach, consultation and implementation of just-in-time response and mitigation practices that have taken place for First Nations and local governments.

Recommendation 42:

A provincial government capacity planning review should be developed to provide adequate resources within the flood assessment unit (a MFLNRORD resource) for each of the EMBC operational regions. Investigations highlighted the flood assessment unit's critical work and the over-commitment of resources versus the need to undertake proactive work to complement and support First Nation and local governments in flood preparations. The flood risk and complexity of the hazard information should also be factored into assigning resources within each region. In delivering this service to an acceptable standard, the exploration of access to the flood assessment unit to the First Nation and local government will need to be aligned with the Emergency Program Act's legal responsibilities.

Recommendation 43:

The provincial government to enhance the current resourcing level of MFLNRORD staff who become dedicated to flood emergency response. A pivotal role in flood response is operational field staff, and in recent years MFLNRORD staff have dedicated significant time to flood assessment and other functions, at the expense of day job continuity. The good examples provided in the investigation show that working together closely and joint decision making between water stewardship staff and First Nation/local government can sometimes make or break the emergency response. Further exploration will be required, particularly with the reference of MFLNRORD as the flood hazard lead in the Emergency Program Act Modernization project. Identifying seasonal resources brings uncertainty of the availability of staff with the correct technical expertise and experience. These staff's proactive work can be interwoven with the Flood Assessment Units and subject matter experts across departments to maintain a sustainable resource.

Recommendation 44:

The Province to review and explore the necessity to increase numbers of professional roles within EMBC regions to complement existing Regional Managers (whose resource should be protected to facilitate, liaise, and coordinate all events) to provide flood specialist knowledge for assessing all factors in decision-making. This investigation has identified the need for additional resources within EMBC's PREOC in each region. All regions interviewed were focusing a proportion of staff time on advanced planning and flood preparations. One region was dedicating a staff resource to this work. Interviewees highlighted that the EMBC role of coordination and facilitation was shadowed by financial policy guidelines and staff experience dependence. Specific resources would increase operational support, logistics, coordination, access to detailed data and information, with the potential for flood response advanced planning, recovery, and training initiatives. Exploring how these roles could support preparedness, mitigation, and recovery to First Nations and local governments would be in line with the Emergency Program Act Modernization Project's priorities.

Recommendation 45:

First Nations and local governments should review and enhance the role of Emergency Program Coordinator role to ensure it is resourced adequately in line with the community's hazard and required resilience level. Hazard and risk levels should be assessed to determine required resource levels and the Emergency Program Act Modernization project's expectation for such resources.

5.6 Overarching Recommendations

These investigations have identified overarching fundamental areas that require additional thought, review and exploration for emergency flood response and management. Strategic key issues include:

- **Develop a provincial strategic vision for flood response. The investigations and research into the interdependencies have highlighted a need to illustrate the strong connections between the numerous policies, initiatives and projects that are taking place.** These projects have a wide range of themes from EGBC mapping guidelines for consistent mapping, review of emergency management legislation, and reviews of disaster financial assistance programs at national and provincial levels. The investigations noted a plethora of working groups at federal and provincial levels with limited inter-actions related to communication and liaison to demonstrate the "big picture."
    - It is recommended that the activities at local, regional, provincial, and national scales are interwoven to show the direction of flood hazard response and how they complement the national strategy's all-hazard response. The Province should illustrate the framework and the complex nature of flood management in flood plans.
    - A vision to be developed to guide all government levels, including First Nations, to follow in setting corporate objectives and service levels for the jurisdiction to strategically address flood emergency response, capabilities, and climate adaption measures. Flood response planning is just one piece of the jigsaw puzzle but integral to putting in place practical measures to make progress towards long-term objectives.

- **The development of defined provincial, local government and First Nations' roles so that they are integrated, effective and communicated in a clearly understood manner when preparing for and responding to a flood event.**
    - The provincial review of Emergency Management legislation identifies the lead ministry for a flood hazard as MFLNRORD with other events where EMBC is the lead ministry. EMBC is referenced as the province's lead coordinating agency for all emergency management activities. The provincial papers also recognize ministries' need to put in place plans and procedures for these events. There is a need to clarify the new legislation's lead organization and the decision-maker's responsibility and authority to enable lead responders to manage such emergency events appropriately.
    - These decisions are outlined in the current provincial flood response plan, which provides a framework for flood response management; however, investigations have identified the need to clarify existing plan language, decision-making authority, mandates, and organizational structures for flood response efficacy.

- **The provincial government to review the delivery of the vital flood roles identified in the provincial flood response plan to ensure they are integrated to deliver information, guidance, warning, and decision making during critical timeframes.**
    - The investigation noted the difference between the wildfire and freshet responses in the Province. The B.C. Wildfire Service, a provincial arm of MFLNRORD with a task force, initiates a response and allocates resources dependent on the potential scale, risk level and consequences of the event. Large-scale resources are mobilized quickly and effectively to provide emergency measures for a wildfire. The difference in a flood response is significant, where provincial assets are delivered to a site relatively quickly, with no workforce for deployment. The local government and or First Nations then requests support from EMBC (and federally dependent on the scale) to deploy the provincial assets to supplement public works crews, volunteer fire departments and staff (including requests for BCWS, etc.).

- The efficacy of decision-making and coordination should be reviewed to ensure appropriate allocation of resources during the provincial equipment deployment stage without waiting and delaying time-critical decisions.
- Provincial flood advance planning should be enhanced to encourage increased collaboration and coordination of the local governments and First Nations to strengthen local and provincial awareness of the hazard and risk levels. Such measures were noted as increasing preparedness and consistency of response actions.

- **The Province should enhance support from all ministries involved in provincial flood response activities to guide governance and consistent command and control.** The organizational emergency response model builds on the British Columbia Emergency Management System and Incident Command System principles of effective decision making in a disaster. First Nations and local governments, the lead responders, are identified under provincial legislation, adopt levels of command when responding to incidents, and the levels shown in the provincial flood emergency response plan (the organizational structure) should not convey seniority or rank but the level of command and responsibility of the "unit." The current decision-making references refer to provincial decisions of the supportive mechanisms available to the lead responders. They should be clarified and explained, and how they would be different during a declaration for a provincial state of emergency.

- Emergency Program Act Modernization policy papers state the direction to create a new modern culture of emergency management to strengthen all four pillars of emergency management (mitigation, preparedness, response, and recovery) and place more emphasis on up-front disaster risk reduction to prevent events from happening and to lessen the impact when they do occur.
  It is recommended the federal, provincial, First Nations, and local governments further explore and enhance the following:
  - **The need to increase collaboration across all levels of government**.
  - **Increase hazard and risk information (scientific) trend analysis to aid the hazard and risk understanding of First Nations and local governments.**
  - **Clarify decision-making to create provincial standards and consistency of responses for a more unified approach.**
  - **Particular focus to be addressed in the coming years to tackle the inconsistent and grant-driven "patchwork" of flood risk assessments, flood mitigation plans and gaps of flood response plans at the local levels.**

The recommendations and the organization who has lead responsibility are listed in Appendix F. Several of the recommendations are highlighted as joint initiatives however, it is essential that all contribute as appropriate with the respective leadership and guidance.

6.0 Class "D" Estimates for Investigations with Potential Costs

The project deliverables included Class D estimates in relation to Flood Response Planning and Organizational Planning Improvements. A Class D estimate is a financial estimate based on specific assumptions and is ± 50% of an actual cost; such estimating is used for projects in conceptual design stages or identifying strategic approaches as in this project. The following sections provide assumptions, comments and objectives for different deliverables and roles, which reference specific recommendations.

Please note that the preliminary cost estimates presented in this report will be compiled, reviewed, and potentially refined together with those from the other projects in this initiative as part of Issue D-1: Resources and Funding. For more information, refer to the D-1 report.

6.1 C-2.3 Flood Response Plan Capabilities

Assumption 1: Numbers of First Nations and local governments used in Class D estimate
198 First Nations, 162 Municipalities; 27 Regional Districts; Total 387.
Sub-total: 17 Communities >50,000 population.
Sub: total: 145 Communities <50,000 population.

Assumption 2: Consultant Investigation of a sample of First Nations and local governments approximated to 50 First Nations and local governments, accounting for interviewees representing regional groups. Of this sample, approximately 30% stated they held a flood response plan/ a flood preparedness plan or specific flood procedures. It is also assumed from the investigations that the plans are of differing qualities.

Table 4 Flood Response Plan Class D Estimate

Flood Response Plan at First Nation and local government levels	
Comments and Objectives:	**Assumption/ Class D estimate**
A low percentage interviewed held a comprehensive Flood Response Plan. Majority of governments recently impacted by floods held a document that includes flood response or preparedness actions. ▪ Plans should be evidence and risk based. ▪ There is a need to increase First Nation and local government's capability or produce a plan to acceptable assessment standard. ▪ Plans to be scalable and integrated. ▪ Expectation for emergency response and hydrological experience to be involved in development. ▪ Regional collaboration is desirable. ▪ Potential for agglomeration of funds for a regional approach. ▪ *Requires additional exploration regarding risk levels, hydrological complexities, and consequences of small communities in comparison to major communities.	Development of 387 local FRPs. Regional Collaborative approaches may reduce this figure.
Class D Estimated Cost	**$21.5M**
Complex geographic area. ▪ Regional District and Municipalities (>50,000 population) Plan: ≈$100K Simpler geographic area. ▪ Single Community (<50,000 population) Plan ≈$50K Additional factors for assessment ▪ Review of risk and evidence to decide the complexity of plan development (requires criteria). ▪ Site assessments, values at risk mapping. ▪ Emergency planning factors, considerations, and planning. ▪ Interoperability and partner/stakeholder consultation ▪ Assessment and development of temporary operational measures. ▪ Communication procedures to warn and inform. ▪ Training and exercise.	Additional assumptions: 17 Communities (>50,000 population) ≈$ 1.7M 145 Communities (<50,000 population) ≈$ 7.2M 27 Regional Districts ≈$2.7M 198 First Nation ≈$ 9.9M Potential for Regional Collaboration

6.2 C-2.5 Provincial Model Response

Assumption 1: Numbers of First Nations and local governments used in Class D estimate
198 First Nations, 162 Municipalities; 27 Regional Districts; Total 387.

Assumption 2: Six Emergency Management B.C. Regions, Six Flood Assessment Units, One Flood Issues Management Group, One Flood Readiness Group.

Assumption 3: Nominal EOC Flood Activations of First Nation/local government across British Columbia, Medium Impact Flood Event: 25, High Impact Flood Event: 45.

Assumption 4: Resource A assumed to be technical staff: B.C. Government Salary Grid Level 28, Step 4, $77,224.59. On costs for Federal and provincial taxes, pension scheme, health and dental benefits, overtime and expenses, office, and equipment, estimated at 35%.

Total full time equivalent cost estimate: $104,253.20.
Reference: https://www2.gov.bc.ca/gov/content/careers-myhr/all-employees/pay-benefits/salaries/salarylookuptool/grids.

Assumption 5: Resource B assumed to be professional staff: B.C. Government Professional Employees Association Salary Grid Level 5B, Step 5, $90,614.40.
On costs for Federal and provincial taxes, pension scheme, health and dental benefits, overtime and expenses, office, and equipment, estimated at 35%.
Total full time equivalent cost estimate: $122,329.44.
Reference: https://www2.gov.bc.ca/gov/content/careers-myhr/all-employees/pay-benefits/salaries/salarylookuptool/grids#pea.

Priorities have been assigned to each of the following activities to primarily provide support to First Nations and Local governments as the lead responder. However, it must be noted that all activities are interrelated and complementary to not only support and guide the lead responder but also to provide provincial oversight of the emergency event.

Table 5 Flood Issues Management Group/Flood Readiness Group Class D Estimate

Priority 1: Increase staffing of MFLNRORD Water Stewardship within local lead responder EOC	
Comments and Objectives:	**Assumption/ Class D estimate**
Increase the capacity of MFLNRORD staff, or equivalent, to populate local EOC to provide access to technical guidance of risk identification, response planning priorities, consequence identification and temporary emergency deployments. Resources require formalization to support Deputy Inspector of Dikes/Water Stewardship structure and local liaison as a flood specialist with EOC. *Role already exists but not recognized within the provincial flood emergency plan. Examples include semi-retired MFLNRORD staff that undertook an active role at the request of the Province at the local EOC. Potential to populate with qualified professionals on zero-hour[4] contract/qualified supplier (EMBC financial assistance eligible costs review required)	Staff Resource A (See Assumption 4)
Class D Estimated Cost	**$1.05M**
Medium Impact Flood Event 30 staff (locations risk based). Assumption seasonal retention and deployment of staff 1/3 of year. Seasonal retention of staff risk: staff availability and retention, technical competence. Creation of a specific TEAMS model or similar to provide additional 30 staffing to regional and local EOC. A special assessment should be made if additional staff should back-fill only and not assume the emergency response role therefore providing continuity of access to appropriate staff during non-flood years.	

[4] an employment contract which does not oblige the employer to provide regular work for the employee but requires the employee to be on call in the event that work becomes available.

Table 6 Flood Assessment Unit Resources Class D Estimate

Priority 2: Increase staffing of Flood Assessment Unit	
Comments and Objectives:	**Assumption/ Class D estimate**
Increase the capacity of MFLNRORD staff, or equivalent, to populate the provincial flood emergency plan. Increase the capability of MFLNRORD, or equivalent, to provide preparedness and mitigation guidance (community binders) Enhance collaborative works with EMBC (risk registers) for capability assessments and training. Increase the Province's capability to provide tactical and strategic direction to responding to local governments and first nations, as appropriate. Provision of liaison via organizational chart to the local lead responder. *Requires additional exploration of current calls received and service levels to be reviewed.	Staff Resource A (see Assumption 4)
Class D Estimated Cost	**$3.15M**
Medium Impact Flood Event 30 staff (locations risk based). TEAMS members and other staff can back-fill other positions to free experience staff to support high-impact flood Events. *Assumption staff could assist in proactive work, support flood response planning and preparedness, mitigation, and recovery work. A special assessment should be made if additional staff should back-fill only and not assume the emergency response role therefore providing continuity of access to appropriate staff during non-flood years.	

Table 7 Increase staffing of EMBC PREOC with Flood Specialist/Coordinator Class D Estimate

Priority 3: Increase staffing of EMBC PREOC with Flood Specialist/Coordinator	
Comments and Objectives:	**Assumption/ Class D estimate**
Increase EMBC PREOC's capacity to provide advanced planning, operational support, logistics, coordination, access to specific data and information. Potential to include flood response advanced planning, response and recovery training initiatives, and recovery liaison. Proactive specialist support role in comparison to Regional Manager role.	Staff Resource A (see Assumption 4)
Class D Estimated Cost	**$0.42M**
Medium Impact Flood Event 8 staff (locations risk based). Assumption seasonal retention and deployment of staff ½ of year (advanced planning). Seasonal retention of staff risk: staff availability and retention, technical competence. A special assessment should be made if additional staff should back-fill only and not assume the emergency response role therefore providing continuity of access to appropriate staff during non-flood years.	

Table 8 Flood Issues Management Group/Flood Readiness Group Class D Estimate

Priority 4: Increase staffing of Flood Issues Management Group/Flood Readiness Group	
Comments and Objectives:	**Assumption/ Class D estimate**
Current terms of reference and strategic priorities to be reviewed. Increase provincial staff capacity to populate this group within provincial flood emergency plan; assumption MFLNRORD, EMBC staff, or equivalent. Increase the capability of the Province to provide strategic direction to EMBC PECC and Provincial Recovery Operations. Enhance oversight and guidance within recovery, for example, Recovery Liaison in Grand Forks, 2018. Deliver strategic priorities for response and recovery (identify opportunities and support for communities to pursue flood grant program funding) Potential to populate with qualified professionals on zero-hour contract/qualified supplier.	Staff Resource B (see Assumption 5) Regional Approach with provision of program assistance
Class D Estimated Cost	**$0.98M**
Medium Impact Flood Event 8 staff (locations risk-based) TEAMS members and other staff can back-fill other positions to free experience staff to support high-impact flood Events. *Assumption staff could assist in proactive work, support flood response planning and preparedness, mitigation, and recovery work. A special assessment should be made if additional staff should back-fill only and not assume the emergency response role therefore providing continuity of access to appropriate staff during non-flood years.	

7.0 Out of Scope Findings and Issues for Future Investigations

Through consulting with over 65 different flood response, recovery and insurance subject matter experts, much data was gathered about the status of flood response and management within British Columbia. Not all the data gathered, themes identified, and findings formed were suitable within this report's scope. However, the project team felt it was important to ensure that this valuable feedback was relayed to the Fraser Basin Council and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development. These findings may be referred to in other project issues or referred to in future projects and investigations. Please refer to Appendix B.

8.0 Conclusions

The most common and costly environmental events to impact British Columbia and Canada communities are primarily floods followed by wildfires. Still, the response approach to the two different environmental events is quite different, with allocation of resources biased in favour of wildfire. The sample population of representatives interviewed as part of this project clearly articulated the need to clarify and enhance organizational planning for flood emergency response.

It is clear from the investigation engagement that there is a need for a broad range of resilient actions from all levels of governments. These will deliver an improved flood response to collectively understand hazards and risks, who is responsible, what can be done, and who takes action.

There is a requirement for leadership, firstly at the federal government level, to fully empower and encapsulate flood management policies and the nation's desired direction. Secondly, aligning the British Columbia Ministries, First Nations, and local governments who have flood response mandates with the national strategies. A provincial flood risk initiative or strategy will enable all "parties" to understand what is required and the flood risk management benefits. The Federal approach is evident from investigations on increasing understanding of hazards and risks, flood mapping and all-hazard capabilities while provincially there is fragmentation. Current flood programs are provided on many different web pages, divisions, and organizations. It is difficult to recognize what direction is required, what the steps are for consistency, what the goals are, and most importantly, where the gaps are. A provincial initiative will provide the "golden thread" of how all flood initiatives are related, integrated, help target investment and coordinate actions across all government and organization sectors. While out of scope for this report, core objectives of such strategies include public education and responsibility.

The Red Dragon project team identified a need for a strategic enabling plan and associated action plans to be co-developed with provincial representatives and First Nation Governments to increase knowledge of all flood-related programs and activities. Best practice initiatives should be captured, refined, and considered in line with strategic and First Nation Government goals. The findings also acknowledged the need for outreach and engagement review to enhance its strategic collaboration and co-development by learning together. The project team is aware of the Indigenous Engagement Sessions for the B.C. Flood Strategy and synergies between reports should be assessed.

It was identified through the investigations that a small portion of First Nations and local governments held a flood response plan, and interviewees possessed a broad range of working flood and emergency knowledge. There was clear support that such programs are required due to the complexities of flooding, the vast impact consequences, and the ambiguity of managing flood response. The differences of approach across the province were striking and interconnected with legislation, culture, and inability to set direction (for all involved) due to numerous competing priorities. Enhancing knowledge and establishing a provincial comprehensive flood emergency plan will encourage risk-based consistency and an ability to step forward together collaboratively.

Engagement interviews presented the need for a proactive approach in assessing the collective state of readiness and capability to replace a patchwork of reactive projects without support. It is apparent from the investigations that there is a need to implement recommendations to increase the collective capabilities of ministries, First Nations and local governments. Shared responsibility is a prerequisite that is closely interwoven with the government direction with the Emergency Program Act Modernization Project and any forthcoming reviews of ministry mandates. However, with careful and thoughtful considerations, the Province will be able to set goals and direction for a holistic flood risk strategy to manage collectively.

Flood response planning has progressed significantly in recent years with increased flood risk knowledge, but there are still activities to be implemented. Improving consistency and understanding the causes and consequences of floods and

locally informed emergency response staff will help address collective resilience. Individuals have a personal responsibility to protect themselves and their property from flooding. However, governments have responsibilities too, and all sectors of society need to work together to reduce the impacts of flooding, which improves flood response arrangements.

Effective emergency flood response helps to avoid the intensification of an event into a disaster. Appropriate and adequate management during the emergency response has the potential to reduce the impact of the situation, maintain and increase public confidence in governments, provide coordination and, most notably, provide information to warn and inform.

The response should always be risk-based, scalable and have access to appropriate resources to manage each event. Information is critical, and the decisions should be based on scientific triggers and modelling, probability, the potential consequences, the ability to act, and historical knowledge.

The federal government's empowerment to the Province of British Columbia to collectively produce a collaborative (non-silo-ed) flood risk strategy will guide all levels of government, including First Nations. This guidance will help set internal corporate objectives and service levels to address “a Province ready for, and resilient to, flooding and coastal change today, tomorrow and the future” (quote adapted by Red Dragon Consulting from UK Flood Policy) ultimately mitigating climate change consequences.

Emergency flood response planning is just one piece of the jigsaw puzzle but integral to putting in place practical measures to progress towards long-term objectives.

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APPENDIX A. Glossary

Activation: The act of initiating the emergency plan and different levels of support.

Adaptation: The practice of adjusting or taking actions to limit or reduce vulnerability to changing hazard risk. In the context of climate change impacts on coastal flood hazard risk, specific adaptation actions might include improved coastal zone management, changes to planning, permitting, codes and standards, structural design, and social preparedness.

All-Hazards: Referring to the entire spectrum of hazards, whether they are natural or human-induced. For example, hazards can stem from natural (e.g., geological, or meteorological) events, industrial accidents, national security events, or cyber events.

All-Hazards Approach: An emergency management approach that recognizes that the actions required to mitigate the effects of emergencies are essentially the same, irrespective of the nature of the incident, thereby permitting an optimization of planning, response, and support resources.

Assets-at-Risk: Refers to those things that may be harmed by hazard (e.g., people, houses, buildings, cultural assets, or the environment).

British Columbia Emergency Management System (BCEMS): An emergency management system founded on the principles if the Incident Command System. BCEMS is required to be used by all ministries and Crown Corporations and cross-jurisdictionally in B.C.

Build Back Better: A strategy aimed at reducing the risk to the people of nations and communities in the wake of future disasters and shocks. The approach integrates disaster risk reduction measures into the restoration of physical infrastructure, social systems and shelter, and the revitalization of livelihoods, economies and the environment

Business Continuity: An ongoing process by all type industries to ensure that the necessary steps are taken to determine the impact of potential losses and maintain viable recovery strategies, recovery plans, and continuity of services.

Coastal Flood Hazard: A potentially damaging flood event (or multiple events) in coastal regions, which may cause damage to buildings and infrastructure, and/or the loss of life, injury, property damage, social and economic disruption, or environmental degradation.

Coastal Flood Risk: The combination of the probability of a coastal flood hazard event (or multiple events) and the associated negative consequences.

Dike: An embankment designed and constructed to prevent the flooding of land. A dike is supported by related works, such as flood boxes, gates and pumps that serve to hold back floodwaters while continuing to discharge water from behind the dike.

Disaster: "A calamity that (a) is caused by accident, fire, explosion, or technical failure or by the forces of nature, and (b) has resulted in serious harm to the health, safety, or welfare of people, or in widespread damage to property." [*Emergency Program Act*]

Disaster Risk Reduction: The concept and practice of reducing disaster risks through systematic efforts to analyze and reduce the causal factors of disasters. Disaster risk reduction includes disciplines like disaster mitigation and preparedness.

Emergency: A present or imminent event that requires prompt co-ordination of action or special regulation of persons or property to protect the safety, health, or welfare of people or to limit damage to property.

Emergency Management B.C.: The province's lead coordinating agency for all emergency management activities, including response, planning, training, testing, and exercising.

Emergency management: An ongoing process to prevent, mitigate, prepare for, respond to and recover from an emergency or disaster that threatens life, property, operations or the environment.

Emergency Operations Centre: The physical location at which the co-ordination of information and resources to support domestic incident management activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction.

Emergency plan: A document developed to ensure quick access to the information necessary for effectively responding to an emergency.

Emergency Program Coordinator: The person responsible for the day-to-day management of an organization's emergency management program. May also be referred to as planner, manager, or director.

Engineers and Geoscientists B.C.: Engineers and Geoscientists British Columbia is the business name of the Association of Professional Engineers and Geoscientists of the Province of British Columbia. Engineers and Geoscientists BC regulates and governs these professions under the authority of the Professional Governance Act and the Engineers and Geoscientists Act.

First Nations: On-reserve communities that are supported by Emergency Management BC through a 10-year bilateral agreement signed in 2017 with the Federal Government. While the Federal Government, through the Department of Indigenous Services Canada (ISC), holds the legislated responsibility for emergency management activities on First Nations Reserve Lands, the agreement enables EMBC to provide First Nations with the full range of emergency management services that Local Authorities receive.

Flood and Flooding: The presence of water on land that is normally dry. Often used to describe a watercourse or body of water that overtops its natural or artificial confines.

Flood Risk Assessment: Evaluation of a flood hazard (including the expected flood extent, depth, and direction of flow) together with information about assets and people that are vulnerable to flooding to identify potential economic, social, cultural and environmental losses from flooding.

Flood Hazard: A potentially damaging flood event that may cause the loss of life, injury, property damage, social and economic disruption, or environmental degradation.

Flood Mitigation: Steps to reduce flood damage by structural measures (such as dikes), non-structural measures (such as keeping populations and assets away from flood-prone areas or requiring floodproofing), or a combination of these measures.

Forests, Lands, Natural Resource Operations and Rural Development: The Ministry responsible for the stewardship of provincial Crown land and ensures the sustainable management of forest, wildlife, water, and other land-based resources. The Ministry works with Indigenous and rural communities to strengthen and diversify their economies.

Hazard: A source of potential harm, or a situation with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these.

Hazard, Risk, and Vulnerability Analysis (HRVA): An assessment of:

• Hazards: These are sources of potential harm, or situations with a potential for causing harm, in terms of human injury; damage to health, property, the environment, and other things of value; or some combination of these.
• Risk: This refers to the likelihood that a hazard will occur, as well as the severity of possible impact to health, property, the environment, or other things of value.
• Vulnerability: This refers to the people, property, infrastructure, industry, resources, or environments that are particularly exposed to adverse impact from a hazardous event.

Impact: The physical/environmental, social, economic, and political consequences or adverse effects that may occur as the result of a hazardous event.

Indigenous Traditional Knowledge: A holistic system of knowledge that belongs to First Nations, embedded in culture and tradition, built through generations of living in close relationship with the land, and which can carry spiritual significance.

Incident Command System (ICS): Originally developed as a fire response management system by various jurisdictions in the United States, this incident management system has been widely adopted by first responders and emergency management programs throughout North America.

Local Authority: Municipalities, regional districts, and Treaty First Nations who have specific legislated emergency management requirements set out in the Emergency Program Act (EPA).

Likelihood: A general concept relating to the chance of an event occurring. Likelihood is generally expressed as a probability or a frequency of a hazard of a given magnitude or severity occurring or being exceeded in any given year. It is based on the average frequency estimated, measured, or extrapolated from records over a large number of years, and is usually expressed as the chance of a particular hazard magnitude being exceeded in any one year (i.e., the Annual Exceedance Probability, AEP).

Mitigation: Activities which reduce or eliminate the impacts of an emergency or anticipated emergency, before, during or after the emergency event.

Preparedness: Activities undertaken prior to an emergency to ensure an effective response to and recovery from the consequences of an emergency event.

Probability: In statistics, a measure of the chance of an event or an incident happening. This is directly related to likelihood.

Province: Pertaining to government of the Province of British Columbia.

Province: Pertaining to the geographical boundaries and all entities within.

Provincial Emergency Coordination Centre: The central emergency operations centre activated to provide overall co-ordination of the integrated provincial response to an emergency or disaster. The Provincial Emergency Coordination Centre manages the overall provincial government response, which includes the provision of support for the regional levels. This may include consultation with senior elected officials, management of emergency information for the public,

resource co-ordination and policy guidance. Communications and collaboration with external agencies such as crown corporations, federal emergency response agencies, non-governmental organizations and other provinces are managed at the Provincial Central Coordination level.

Provincial Regional Emergency Operations Centre: The Provincial Regional centre responsible for coordinating regional response activities, supporting local EOCs assigning regional (provincial and federally assigned) critical resources, providing regional messaging, and providing situational understanding to the PECC.

Recovery: Activities and programs designed to support communities to rebuild post-disaster in a resilient, culturally safe and appropriate way.

Resilience: The ability of a system (such as individual or multiple buildings or infrastructure assets), community, or society exposed to hazards to resist, absorb, accommodate, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.

Resources: Equipment, supplies, personnel, volunteers, and facilities available for assignment or staging in support of emergency management activities.

Resilience: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform, and recover from the effects of a hazard in a timely and efficient manner.

Resource management: A process for identifying and managing available resources to enable timely and unimpeded access to the resources needed to prevent, mitigate, prepare for, respond to or recover from an incident.

Response: The phase of emergency management during which actions are taken in direct response to an imminent or occurring emergency/disaster in order to manage its consequences.

Risk: A concept that takes into consideration the likelihood that a hazard will occur, as well as the severity of possible impact to health, property, the environment, or other things of value.

Risk Assessment: A method to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed buildings, infrastructure, people, property, services, livelihoods, and the environment on which they depend.

Risk assessments (and associated risk mapping) include: a review of the technical characteristics of hazards, such as their location, intensity, frequency, and probability; the analysis of exposure and vulnerability, including the physical, social, health, economic, cultural, and environmental dimensions; and the evaluation of the effectiveness of prevailing and alternative coping capacities, with respect to likely risk scenarios. This series of activities is sometimes known as a risk analysis process.

Risk Management: The systematic approach and practice of managing uncertainty to minimize potential harm and loss.

Sendai Framework: The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) was the first major agreement of the post-2015 development agenda and provides Member States with concrete actions to protect development gains from the risk of disaster. Canada and the Province of British Columbia have agreed to incorporate the framework into appropriate policies.

Situational Awareness: Knowing what is going on and what has happened with respect to the current incident, what could go on in terms of future impact or outcomes, and what options exist in terms of response actions.

Subject Matter Expert: Provincial, regional, or local experts with knowledge on a specific area of expertise, such as hazard(s) likelihood, consequences, environmental and economic impacts.

Tsunami: A series of waves caused by a rapid, large-scale disturbance of water. Tsunamis can be triggered by earthquakes, landslides, volcanic eruptions, meteor impacts, human activities (e.g., explosions), and meteorological/atmospheric phenomena (meteo-tsunamis).

Vulnerability: The characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of a hazard. For buildings and infrastructure assets, vulnerability is a product of both exposure and susceptibility to damage.

APPENDIX B: Out of Scope Findings and Issues for Future Investigations

Through consulting with over 65 different flood, response, recovery and insurance subject matter experts, much data was gathered about the status of flood response and management within British Columbia. Not all the data gathered, themes identified, and findings formed were suitable within this report's scope. However, the project team felt it was important to ensure that this valuable feedback was relayed to the Fraser Basin Council and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development. These findings may be referred to other project issues or referred to future projects and investigations.

Finding:
Undertake a program to catalogue and align federal, provincial, and local government flood risk strategy, framework, jurisdiction, etc.

Finding:
Public Education is a primary driver of any flood strategy.

Finding:
Increase First nation and local government of hazard, risk and threat definitions and assessments of consequences.

Finding:
Review of the Union of B.C. Municipalities Community Emergency Preparedness Fund and provincial funding programs strategic priorities to ensure alignment with the needs of First Nations and local government and the federal approach to future resilience.

Finding:
Increase structured emergency management training programs in ministries, First Nations, and local government. There is a need for applied and practical learning, not just academic training courses provided by one government supplier.

Finding:
There is a lack of consultation with the Emergency Program Act Project Public has high expectations and a review of sharing and communication of the project should be undertaken to provide more information.

Finding:
First Nations, local governments community services need to review the continuity of operations, especially during emergency response and recovery.

Finding:
There are opportunities to consider Indigenous knowledge along with scientific and engineering-based knowledge and trying to have a more balanced approach to managing the river so that there is not just engineering infrastructure but more emphasis on the natural assets, managed realignment, and ecosystem protection.

Finding:
First Nations and local governments need to explore and instigate strategic flood investment programs in line with their community priorities to enhance disaster risk reduction Flood risk assessment, flood mapping, flood mitigation plans, structural and non-structural mitigation planning relate to flood response plan assumptions and information. While the investigation noted that smaller communities need support with grant writing, it is vital for communities to be responsible for their community and put in place all appropriate steps whenever possible.

Finding:
First Nations. It is noted that land use and development must be jointly considered, and, in many situations, First Nation reserves have been allocated near hazardous areas (inappropriate historical land use decisions) and will require attention with climate change impacts.

Finding:
First Nations. All four pillars of emergency management should be addressed at the strategic Indigenous partnership's tables, in particular to flood response. The addition of flood specialists from the Province at this table discussion would enhance a sustainable future of working with First Nations to engage, share knowledge, and learn how to address future flood emergencies.

Finding:
A responsibility review is required of the orphaned dikes that posed a risk to the community.

Finding:
The resource planning of the emergency manager's role was not assessed; however, interviewees identified that further work is required here to enhance consistency across the province.

Finding:
The full analysis of such a single response authority was deemed out of scope for this investigation as the consultant team did not have access to all relevant information and limited project time. The need for a comprehensive analysis should be explored.

Finding:
Undertake a project to review potential lead times for mitigation projects which could have a direct effect on response and recovery should an event happen. Are there ways to fast track these projects? How the urgency of the situation gets conveyed in a manner that is helpful, and not just by the local authority advocating for itself?

Finding:
Commercial operators approach risk management, mitigation, with a continuity of operations and a building back better perspective to ensure business continuity.

Finding:
Further work needs to be done to understand the challenges, differences, roles and legal mandates between regional districts and municipalities. There is a significant difference in flood response and recovery between municipal-based floods and land-based floods in regional districts due to the government set-up. Respective governments are trying to manage them the same way, but the response needed is vastly different.
Land-based flood versus municipal flood response is quite different in a municipality where a "city" can monitor systems and have staff who monitor those systems day in and day out and can anticipate what they are going to need versus multiple calls with no workforce. Multiple impacts on multiple river systems compounded with road infrastructure failures in an environment where it is outside the jurisdiction to tenure of local government or to monitor use and impacts on a day-to-day basis. It is only the residential property owner that is within local government jurisdiction. Road and resource infrastructure roles and responsibilities need significant investment of effort in understanding.

Finding:
EMBC financial guidelines often recommend, that to increase staffing resources, that organizations submit an Expenditure Authorization Fund form to backfill positions. In remote or rural areas, often there is simply not other

resources available to backfill. This also leads to employment challenges (union concerns, additional costs, etc.). Would be much simpler if a streamlined process for short-term hire or contractors were put in place.

Finding:
Considerable response time is lost providing rationales and filling forms to request assistance. So much of response time is just advocating for resources time.

Finding:
There are many funding sources open to First Nations and local governments for flood investment programs and through EMBC financial eligible activities during emergency response. It is agreed that in the ideal world, flood mapping, risk assessment and mitigation should take place before the community experiences any potential flood impact. Unfortunately, with the increasing pressure of climate change and development within floodplains, governments are sometimes reactive. Agile and adaptable approaches to flood investment programs should be explored to open opportunities for communities suffering from flood impact, especially in recovery.

Finding:
The agility of flood investment programs would enhance local capability to put in place programs to improve communities when they require them. Streamlined programs in such circumstances would deliver funding streams that have adaptability in mind and provide benefits to those at greatest risk, not just those who have access to resources and grant writing skills.

It is essential to understand that it will be more cost-effective to undertake mitigation during the response phase when circumstances allow. To consider stopping something that is happening before full impact and remove cyclic effect without change. The concept of Build Back Better should be incorporated into a cost-benefit analysis of specific response/mitigation projects.

Finding:
There is too much “finger pointing” with different ministries and governments to argue that it is “not” their responsibility. A gap analysis of the legislation should be undertaken to clarify mandates. It seems that residents only receive clarified answers when they have pursued legal action to resolve an issue.

Finding:
Need for increased understanding between First Nations, local governments, and provincial governments, not just roles and responsibilities but who provides support/funding and the justification for it (or not).

Finding:
Ensure that funding streams are designed with what is needed in mind and make them more accessible to those who are at greatest risk, not just those who have access to resources.

APPENDIX C: List of All Fraser Basin Council Investigations

Theme A. Governance

Issue	Investigation
A-1 Flood Risk Governance	1. Identify the flood management services provided by each order of government in BC.
	2. Investigate the roles of non-government entities in flood management in BC.
	3. Identify challenges, gaps and limitations with current service delivery.
	4. Identify opportunities for improving collaboration and coordination within and across authorities and adjusting non-government entities' roles that would address challenges and improve efficiency and effectiveness.
	5. Recommend changes to support improved collaboration and coordination in flood management, including an analysis of benefits and costs/limitations for each recommendation.
	6. Investigate alternative options for distributing and integrating flood management responsibilities among authorities, including an analysis of benefits and costs/limitations for each option.

Theme B. Flood Hazard and Risk Management

Issue	Investigation
B-1 Impacts of Climate Change	1. Investigate the state of climate change science in relation to BC flood hazards and identify gaps and limitations in provincial legislation, plans, guidelines, and guidebooks related to flood hazard management in a changing climate.
	2. Identify current sources of information and models used by experts in the Province to predict future climate impacts and investigate opportunities for improved predictive modeling.
	3. Investigate the capacity of responsible authorities and other professionals and practitioners in the Province to integrate climate change impacts and scenarios to inform flood planning and management.
	4. Investigate the legislative, policy, and regulatory tools available to responsible authorities in all levels of government for integrating climate change impacts in flood planning and management.
B-2 Flood Hazard Information	1. Investigate the current state of flood mapping in the Province, including gaps and limitations. Recommend an approach to improve the spatial coverage, quality, utility and accessibility of flood hazard maps and other flood hazard information.

Issue	Investigation
	2. Investigate the approximate level of effort to prepare flood hazard mapping to address current gaps for existing communities and future areas of development (including floodplain maps and channel migration assessments).
	3. Investigate the current state of knowledge related to dike deficiencies and recommend an approach to improve the quality, consistency, review, utility, and accessibility of this information.
	4. Investigate the status of LiDAR standards for flood mapping and develop recommendations to improve standards if applicable.
B-3 Flood Risk Assessment	1. Investigate approaches to completing a province-wide flood risk assessment, addressing effort required, level of detail, types of flood risk, current and future scenarios, scale, and any information required and data gaps.
	2. Determine the effort required to undertake a local-scale comprehensive flood risk assessment for multiple types of flood hazards (e.g., riverine, coastal).and for varying degrees of available data on flood hazard, exposure, vulnerability, and risk.
	3. Investigate the effort required to develop and maintain a province-wide asset inventory and/or exposure dataset covering flood prone areas.
	4. Investigate the level of effort to develop a coarse local-scale flood risk map based on available flood hazard map(s).
	5. Investigate methods for valuing the benefits and costs/limitations of flood risk reduction actions in a holistic and consistent manner and develop a framework for project prioritization that could be applied or adapted across the province to reduce flood risk.
	6. Evaluate and compare the benefits and costs/limitations of taking a risk-based approach to flood management versus a standards-based approach.
B-4 Flood Planning	1. Investigate the ability of responsible authorities in the province to develop adaptation plans and strategies for flood management.
	2. Investigate opportunities to improve the knowledge and capacity of local authorities with regard to climate change adaptation and the benefits of proactive flood risk reduction.
	3. Investigate the potential content of a provincial guideline to support the development of local Integrated Flood Management Plans.
	4. Investigate the level of effort for a local authority to complete an Integrated Flood Management Plan and the possible role of the Province in reviewing and/or approving these plans.
B-5 Structural Flood	1. Investigate opportunities to incentivize or require diking authorities to maintain flood protection infrastructure and plan for future conditions such as changing flood hazards.

Issue	Investigation
Management Approaches	2. Investigate opportunities to improve the knowledge and capacity of local diking authorities with regard to dike maintenance.
	3. Investigate opportunities to improve coordination amongst diking authorities under non-emergency conditions.
	4. Investigate impediments to and opportunities for implementing innovative structural flood risk reduction measures, including the role of incentives and regulation.
B-6 Non-Structural Flood Management Approaches	1. Investigate past and current approaches to land use and development decisions in floodplains by local and provincial authorities.
	2. Investigate alternatives to the current approach to managing development in floodplains, including returning regulatory authority for development approvals in municipal floodplains to the Province, and provide an analysis of the benefits and costs/limitations of both local and provincial authority.
	3. Investigate impediments to and opportunities for implementing available non-structural flood risk reduction actions, including the role of incentives and regulation.
	4. Investigate the nature of an educational campaign for regional, local and First Nations governments to raise awareness of flood risk and possible risk reduction options.

Theme C. Flood Forecasting, Emergency Response and Recovery

Issue	Investigation
C-1 Flood Forecasting Services	1. Investigate current capacity, coverage, value, and gaps in flood forecasting services.
	2. Visualize where flood forecasting gaps exist and estimate costs for improvement to end users.
C-2 Emergency Response	1. Investigate the future direction of the Federal government related to a National Flood Risk Strategy and the future of Disaster Financial Assistance Arrangements
	2. Investigate the Province's expanding role in providing flood response to First Nations.
	3. Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.
	4. Investigate flood response capabilities considering different flood hazards and different regions of the province.
	5. Investigate opportunities for improved organizational planning for emergency response in all levels of government.
	1. Investigate the current status of coverage of existing overland flood insurance available to homeowners.

Issue	Investigation
C-3 Flood Recovery	2. Investigate the concept of "build back better" and impediments to implementation.

Theme D. Resources and Funding

Issue	Investigation
D-1 Resources and Funding	1. Investigate resource and funding needs associated with implementing recommendations to strengthen flood management in BC.
	2. Investigate evidence in support of investment in proactive flood planning and mitigation activities.

APPENDIX D: Engagement Questions

Question Topic C2.1 Investigate the future direction of the Federal Government related to National Flood Risk Initiatives and the future of Disaster Financial Assistance Arrangements

Note 1: The Federal Government has released the Emergency Management Strategy for Canada: Toward a Resilient 2030. In B.C., the Province will be delivering an Emergency Program Act Modernization project in 2022.

Note 2: Most of these questions are directed to federal or provincial governments, with some B.C specific questions, but please feel free to add any comments, observations, or findings to any item.

Question 1: Are you comfortable with your comments being shared, or is confidentiality required? It is not our intention to include direct quotes from individuals rather have organizational recommendations. If such a quote were appropriate, we would seek permission before, including in the report. This session will be recording for report writing processes only. All recordings are deleted after use.

Question 2: Are you familiar with the national emergency management strategy and the provincial flood risk initiatives? If yes, do you agree that this document goes far enough to address all hazards and provide a framework for increasing resilience in the provinces?
Prompts: What areas would you like to see enhanced/developed? If no, have you any general comments regarding all-hazard strategies? What are your thoughts on how the Province implement this national policy?

Question 3: What are your high-level thoughts about the senior government management of recent floods?
Prompts: Do you think that all government levels and organizations understand their roles and authority for decision-making responsibilities? B.C. Specific – Do partners/stakeholders with response responsibilities understand and utilize the Provincial Flood Response Plan 2019?

Question 4: Where do you see the provincial and federal government's role in identifying and supporting high flood risk areas, i.e., dwellings and development in flood-prone areas.
Prompts: Do you think that all partners/stakeholders (provincial, federal, local, F.N., industry, NGO etc.) participate at the expected levels in protecting public safety and infrastructure

Question 5: Based on your perspective or experience, do you feel that government roles (ministries, provincial and federal) complement each other, or are there conflicting policy and priority areas?
Prompts: Different ministry/government responsibility, no organized collaboration, matrix management of response and recovery.

Question 6: What are your plans for promoting and building resilience with your partner/stakeholders and partners?

Prompts: Can you explain how your flood risk priorities are incorporated into your existing and future emergency management policies? Do you have a "road map" for how your partner/stakeholders, partners and residents understand resilience and preparedness to access the information?

- Enhance whole-of-society collaboration and governance to strengthen preparedness and resilience.
- Improve understanding of disaster risks in all sectors of society.
- Increase focus on whole-of-society disaster prevention and mitigation activities.
- Enhance disaster response capacity and coordination and increase new capabilities; and
- Strengthen recovery efforts by building back better to minimize the impacts of future disasters.

Question 7: What are your thoughts for the future direction of flood risk initiatives regarding the current lack of mitigation investment (from the public to government partners/stakeholders) for development in flood hazard areas?

Prompts: Issues such as infrastructure, with poor land-use planning as well as inconsistent building standards, out date flood construction levels and public and developer understanding of flood risk (maps) have led to a lack of risk assessment and associated underinvestment.

Question 8. What are the challenges to provide consistent disaster financial assistance payments to public and private consumers, so they do not create perverse incentives by discouraging mitigation?

Prompts: Observations about the relationship of DFA payments, mitigation grants, response, resident's responsibility, and education of risk?

Question 9: The following statements are essential in future flood risk strategies; using a scale of one to five, where five is the most important, please rank these statements' importance. The statements are independent of each other.

Statement	Scale 1 to 5
Policies, strategies, and opportunities to include climate resilience measures in tackling hazard and risk?	
Growing economies, communities and infrastructure be designed and built to be resilient in tomorrow's climate	
Educating communities and residents to be ready to respond and adapt to flooding and coastal change	
A risk-based approach and assessment of all consequential impacts (people, communities, infrastructure, economy, and environment)	
Managed realignment of natural features– opportunity to explore an objective to achieve sustainability so that we prepare for longer-term flood risk	
Enhance the assessment and planning standards that organizations utilize in flood risk initiatives	
Adaptive and agile flood risk (and emergency management) initiatives to provide a dynamic review process to be proactive with the evolving risks?	
Have you any other comments or observations:	

Question 10: What other areas of flood risk initiatives would you like to see enhanced/developed?

Prompts:

- All-hazard approach versus hazard-specific initiatives.
- Improving the general emergency management policy.
- Holding more events to understand and listen to the issues at local levels and from different diverse groups of governments.
- Increase the sharing of best practice and developmental standards across the province.
- Increase education.
- Land use policy in flood risk areas.
- Funding.
- Location-specific flood risk assessments for public-private partnerships opportunities in reducing flood risk (assessing and incorporating mitigation at the development stage).
- Other.

Question 11: What do you think the priorities will be in adopting the National Emergency Management Strategy for Canada: Toward a Resilient 2030 and the Sendai Framework "Build Back Better" principles into provincial policy and programs?

Question Topic C2.2 Investigate the Province's expanding role in providing flood response to First Nations.

Note 1: The majority of these questions are directed to First Nation and provincial governments, but please feel free to answer them from your perspective and add any comments, observations, or findings to any item.

Question 1: Are you comfortable with your comments being shared, or is confidentiality required? It is not our intention to include direct quotes from individuals rather have organizational recommendations. If such a quote were appropriate, we would seek permission before, including in the report. Please note, these interviews are being recorded for report writing processes only and are deleted after use.

Question 2: What do you think are the main challenges in a successful flood risk outreach program with First Nations? Do you believe the Tripartite agreement has supported collaboration?

Prompts: Provincial outreach; Are all partners involved (including federal); Describe engagement methods.

Question 3: Based on your perspective or experience, have EMBC and MFLNRORD introduced a specific policy, procedures, or awareness training across B.C. to engage, support, and guide First Nations regarding flood response? If yes, explain with examples; if no, how else is this being achieved?

Prompts: What services/support/guidance is explicitly provided by the Province of B.C. for First Nations regarding emergency management and flood response support.

How have cultural and sacred values and other critical importance areas to First Nations been recognized in these processes? How have gaps in available data been addressed? (available data property, infrastructure etc. not been mapped)

Question 3: Have any pilot projects or the sharing of best practice initiatives taken place? Are these activities focused on the nation or tribal council levels? Explain, and provide examples.

Question 4: What are your thoughts for the future direction of flood risk initiatives regarding the current lack of mitigation investment (from the public to government partner/stakeholders) for development in flood hazard areas?

Prompts How has cultural and historical knowledge been integrated into the flood risk assessment process? If yes, please provide examples.

Question 5: Has EMBC provided training, guidance, and support for First Nations in supporting projects within their unceded territories for flood plain mapping, risk assessments and mitigation grants under the UBCM? If yes, please provide examples.

Prompt: First Nations have been included in the grant process for the last two years only. ISC has provided funding opportunities which EMBC share.

Question 6: For known First Nation flood impacts, both current and historical, in flood risk areas, are you aware of any outreach taking place to provide advice on available grant programs. If yes, please provide examples.

Question 7: Some First Nations have limited resources to complete grant applications. Are any specific project initiatives in place to provide additional support for this? Have provincial, UBCM or ISC grant statistics been considered with these assessments? If yes, please provide examples.

Question 8: Are you aware of EMBC and FLRNORD having any joint committees or groups that provide First Nations support to assess flood hazards and provide advice? If yes, are there any best practices that can be shared?

Question 9: What do you think the main priorities will be for EMBC over the next few years to increase First Nations flood risk programs? Please provide examples.

Question 10: Are there any areas or issues associated with this capability where you would like to see further guidance from the government? Please explain your answer.

Question Topics C2.3: Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.
C2.4: Investigate flood response capabilities considering different flood hazards and different regions of the province.

Question 1: Are you comfortable with your comments being shared, or is confidentiality required? It is not our intention to include direct quotes from individuals rather have organizational recommendations. If such a quote were appropriate, we would seek permission before, including in the report. This session will be recording for report writing processes only. All recordings are deleted after use.
Note 1: The majority of these questions are directed to First Nation, local government and provincial governments, but please feel free to answer them from your perspective and add any comments, observations, or findings to any item.

Question 2: Which of the following flood risk types are classed as High or Very High on your HRVA?

Hazard	Yes/No
Sea/coastal flooding.	
Riverine flooding (i.e., from creeks and rivers).	
Pluvial/flash Flooding (i.e., from sewers, road drains).	
Groundwater Flooding (i.e., from water table rising in porous rocks).	
Reservoir/dam failure collapse.	
Debris flow.	
Earthquake (e.g., tsunami or dike or dam failure).	
Other.	

Question 3: Has flooding impacted your jurisdiction in the past? What impacts are likely to reoccur?
Prompts: Property damage, people displacement, infrastructure, business and environmental. Do you believe these impacts are occurring more frequently?

Question 4: Please rank which categories below are at the highest risk from a flood event within your jurisdiction. Where 1 is the least impact, and 5 is the highest impact from a flood event (greater than 1:200-year return).

Impact Category	Sub-Category	Impact Ranking 1 to 5
People and Societal Impacts.	Fatalities.	
	Injuries.	
	Percentage of Displaced Individuals.	
	Duration of Displacemen.t	
Environmental Impacts.	Percentage of the sensitive area impacted.	
	Mobilization of pollutants from flooded sites.	
Local Economic Impacts.	Direct Economic loses.	
Local Infrastructure Impacts.	Transportation.	
	Energy and Utilities.	
	Information and Comm Technology.	
	Health, Food and Water.	
	Safety and Security.	
Public Sensitivity Impacts.	Anticipated perception of residents, population density.	
Reference: Public Safety Canada Risk Assessment Information Template.		
Note: Impact rating scores are for indicative purposes only.		

Question 4: Do you have an organizational emergency plan with flood specific procedures or a separate flood response plan? Please indicate which type or no document.

Question 5: If Yes, to question four.
Is your flood response procedure/plan based on risks identified in your HRVA, flood hazard map, other flood studies or solely on experience? Explain how you came to understand your flood risk.

Question 6 a: Are you or your organization working on developing updated flood mapping for communities at risk or updating your flood plan/procedures?
Question 6 b. Have you updated development guidelines, building bylaws, or flood construction levels? If not, are these activities planned? Provide a brief high-level explanation of the planned changes?
Prompts:

Question 7: Please indicate if your organization's emergency plan or flood response plan includes the following elements?

Plan content	Yes/No	All in place	Additional work required	Substantial work required
Strategic objectives for your EOC/organization. Prompts: Public safety, public alerting, media messages, resources, business continuity, temporary response measures, etc.				
Decision making information sources and criteria. Prompt: References to up-to-date readily available data sources and actions; Exact triggers to activate different levels or types of response to flooding.				
Checklists and flow charts for actions and decision making. Prompts: Functional and process.				
Response escalation procedures for your organization. prompts: Cleary identified trigger actions for your response, including who is responsible, anticipated speed of progression, and quantifiable actions.				
Response escalation procedures detailing flood stage trigger actions. Prompts: Reference to the River Forecast Centre warning levels.				
Response escalation procedures detailed snowpack trigger actions. Prompts: Reference to historical and/or statistical snowpack levels that cause flooding. Reference to Snow and Water Bulletin information.				
Emergency Measures Plans. Prompts: Location-specific, detailed asset list and methodology for implementing temporary flood measures – tiger dams, gabions, stop logs, sandbags etc.				
Public communication messages for different flood stages. Prompts: Templates, pre-identified public information sources for dissemination and communication schedule.				
Procedures to communicate with other responding organizations. Prompts: Maintained contact lists, actions per flood stage to notify/liaise with partner/stakeholders.				
Roles and authority (mandate) of other partners.				
Recovery plan reference (recovery steps initiated during response phase).				

Question 7 continued

Plan Content: Data and Information Maintained data relating to GIS mapping (or lists) for sites at risk from flooding:	Yes/No	GIS/LIST	All in place	Additional work required	Substantial work required
Geographic hazard information for at risk communities. Prompt Risk profiles/assessments.					
Location of groups of pre-identified vulnerable people (e.g., care homes, hospitals, schools).					
Properties at risk (distinguishing residential from businesses/industrial).					
Key assets e.g., locations where key equipment is stored.					
Major transportation and primary evacuation routes (or reference evacuation plan).					
Critical responder/service buildings.					
Your utility installations or linear infrastructure.					
Other government infrastructure within your jurisdiction.					
Communications infrastructure.					
Buildings/venues used for large events (e.g., sports stadium).					
Business continuity/contingency measures for your critical or essential infrastructure, e.g., loss of power to a pumping station.					
Other.					
Data Sources					
Are there links to the River Forecast Centre information and River Models?					
Real-time river flow and level gauge information?					
Real-time snow pillow information?					
Your organizational remote sensing (sensors, cameras, etc.) for flow and level gauges for potential flooding areas?					
Weather Forecast information.					
Coastal and tidal prediction information.					
Other.					

Question 8: During actual/potential flooding, do you receive information from the provincial government? If not from the Province, how do you receive this information? If yes, which ministries?

Free field.

Question 9: If yes to question 8. Do you rely on this information to trigger a flood response? Explain how it enters the organization, who receives and what contingency the "duty system" is available to forward this information for decisions, evacuation alerts, and orders. What are the triggers for action?

Question 10: What proportion of your organization's personnel involved in emergency response (EOC staffing, public works etc.) identified in your organization's flood response plan have been trained in their role within the last two years?

a) None.
b) Very Low (E.M. team or a few individuals).
c) Low (E.M. team and a group of individuals, satisfactory to run a Level 2 EOC).
d) Medium (E.M. team and a member of different teams, satisfactory to run a Level 3 EOC).
e) High (members of all teams, management buy-in, sustainable staffing model for an event lasting more than five days).

Question 11: Have you assessed the required staff (the minimum number) to successfully operate your emergency operations centre for different EOC activation levels, e.g., such as in the event of a significant earthquake disrupting services? Please explain your methods.

Question 12: Who of the following has been engaged in the creation of flood response plan/document?

Organization	Yes/No
Ambulance Service.	
Diking Authorities.	
Specific: Deputy Inspector of Dikes.	
MFLNRORD.	
EMBC.	
Emergency Management Committee Members.	
Fire Depts.	
First Nations (in proximity).	
Local governments (in proximity).	
Health Authorities or Sector Representatives.	
Business/Industry.	
MOTI/Transit or other transportation (airport/rail).	
RCMP/Police.	
SAR or similar groups.	
School Board.	
Utilities – Electricity.	
Utilities – Gas.	

Utilities – Telecoms.	
Utilities – Water/Waste.	
Voluntary Sector.	
Other.	

Question 13: Have you taken steps or engaged owners/service providers and partners/stakeholders to assess the risks of flooding to critical infrastructure? Are these sites (and who to contact) listed in your plan/documents?

Question 14: How confident are you that your flood specific procedure/plan is up to date and robust?

a. None/No plan.
b. Very Low (I have significant concerns about accuracy, and it has not been tested).
c. Low (I have concerns as it dated, not updated, and not recently tested).
d. Medium (it is generally accurate but needs a review and an exercise).
e. High (highly accurate, up-to-date document/recently updated and exercised).

Question 15: What is the internal support/buy-in within your agency for flood mitigation, response, etc.?

a. Very low (just you).
b. Low (Your team and manager).
c. Medium (Your team, manager and other groups, with corporate measures).
d. High (all of above plus all groups/departments with reference in the corporate Plan). What are your most significant response challenges/concerns for a flooding incident?

Question 16: Do you have formal mutual aid arrangements in place with other organizations/authorities?

Prompt: Neighbouring governments, First Nations, part of a regional emergency program.

a. Yes, multi-agency arrangements in place.
b. Yes, single agency arrangements in place.
c. No, but generic or ad hoc arrangements are in place.
d. No.

Question 17: Have you taken steps (planning, non-structural or structural activities) to mitigate against known flooding risks to infrastructure and essential services?

Question 18: Is your organization a diking authority? If no, do you work with them to identify hazards, risk level and planning? Explain how?

Prompts: how are your diking authorities funded? What kind of dikes are in your region? Agricultural? Provincial standard? Orphaned?

Question 19: Is your emergency operations centre located outside of the flood risk area with no impact on significant transportation routes?

Prompts: Do you have contingency measures for communications, computer network, power and water, etc. Would it provide for safe access and egress during a flood event? Do you have a secondary location identified and tested. Can your staff work remotely for EPC activities? Please explain your answer.

Question 20: Without EMBC assets, which of the following equipment do you have access to use in flooding incidents?

a. Mobile pumping assets.
b. Electricity generators.
c. Temporary measures, tiger dams, gabions etc.
d. Flood gates.
e. Sandbags.
f. Other.

Question 21: Have you a maintained resource/supplier list? Do you have redundancy in your supply chain? Please explain.

Question 22: Do you think your organization receives the co-operation in emergency management activities that you need from other ministries and authorities? Please explain your answer.

Question 23: Are there any areas (regulations, roles, responsibilities) in place that you feel are constraints to your readiness efforts? Please explain.

Question 24: What are your most significant response challenges/concerns for a flooding incident?

Question 25: What are your most significant challenges in developing, updating and gaining support for a flood response plan/emergency management specific flood procedure.

Question 26: Have you identified any best practices for flood mitigation, response, and recovery that you are doing as an organization?

Question 27: Are there any other areas or issues associated with flood response capability for which you would like to see further government guidance? Please give examples.

Example Plan Assessment for discussion with EMBC Stakeholders Only							
Assessment Area/ Section	Sub-criteria	Priority	Assessment			Comments
			Satisfactory	Improvements required	Unacceptable	
Scope, objectives and background	Scope, objectives and purpose of Plan	L				
Location and proposal	Detailed site description, incl. location	M				
	Source of flooding	M				
	Flood zone	M				
	Proposed land use/ use of buildings	M				
	Critical infrastructure and vulnerable areas, people and equipment	H				
	Access/egress points	M				
Risk assessment summary	Community Profile	M				
	Flood maps	H				
	Flood hazard rating incl. assessment and maps	H				
	Impact of flooding, incl. Vulnerable people, structures, other hazards etc.	H				
Mitigation measures	Assessment of potential mitigation measures and products	M				
Flood Warnings	Assessment of available flood warnings	M				
	Advanced warning time	M				
Flood Watch	Dissemination of flooding watch information	M				
Triggers and Actions	Site-specific escalation plan based on flood warning	H				
	Flood Watch procedures	H				
	Snowpack procedures	H				
	Weather procedures	H				
	Emergency notification procedures	H				
Safe egress and evacuation routes	Safe access to and from communities	H				
	Evacuation procedures/reference	H				
	People/property	H				
	Evacuation routes (shown on map	M				
	Safe place of refuge (shown on map)	M				
	Welfare of people	L				
On site and/or temporary refuge	Details of refuge, including on-site and/or temporary	M				
	Quality of refuge	L				
	Flood kit	L				
Actions post evacuation	Welfare of people after evacuation	M				
	Contact details of relevant authorities	L				
	Post flooding cleanup Plan	L				
After a flood	Estimated time taken for return to normal use	L				
	Procedures required post flood	M				
Business continuity	Advice to businesses; Continuity plans	M				
List of key contacts	List all relevant key contacts	H				
Dangers of floodwater	Education on dangers of floodwater	M				
Plan usage and dissemination	Methods to raise plan awareness	M				
	Awareness policy	L				
	Exercise/test/practice of Plan and evacuation	H				
Document control	Document monitoring and review plan	M				
	Responsibility for plan maintenance	M				

Example Plan Assessment for discussion with EMBC Stakeholders Only			
Scoring Scheme			
Satisfactory	Meets requirements		
Improvements required	Needs some improvement		
Unacceptable	Does not meet the minimum requirements		
Priority for plan content	L = Low	M = Medium	H = High

Question Topic C2.5: Investigate opportunities for improved organizational planning for emergency response at all levels of government.

Question: Please share any observations of the current emergency response model for floods. Extracted from the Provincial Flood Response Plan 2019.

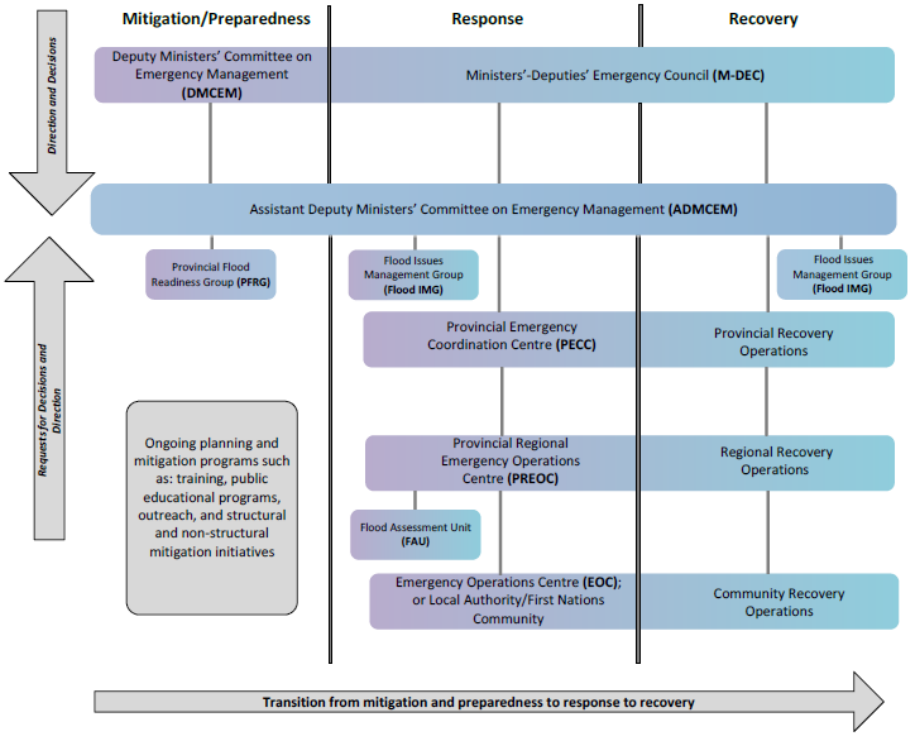

Figure 1: Illustration of the Provincial Emergency Management System as it transitions through the phases of emergency management

From your organizational perspective, please add areas for investigation regarding the current models, examples have been included using the Strengths, Weaknesses, Opportunities and Risk Method.

Strengths	Opportunities
Current collaboration Government support Information sharing	Agile programs New ways of working Efficiency
Weakness	**Risk**
Complex undynamic funding programs Unclear response roles Lack of line of sight (strategic direction)	Change Inclusivity Procedural and Financial

Please explain your answers

If time allows:

Based on experience:

A. Do you think your local and provincial flood risk priorities reflect the Sendai framework priorities in the mitigation, preparedness messages, response measures, and recovery processes to a flood event? Which areas should be enhanced? Please explain?
   - Understanding disaster risk
   - Strengthening disaster risk governance
   - Investing in disaster risk reduction for resilience
   - Build back better

B. Do you feel the existing and available provincial and federal grant programs address the needs of communities? How could they be strengthened or modified to suit current needs better?

C. Do you feel the provincial/federal government has a role in assisting local/ first nation government in identifying high-risk areas and facilitating support to provide mitigation and resilience projects?

D. Do you feel there will be policies regarding the use of natural resource flood assets (such as flood plains, channel migration, wetland creation, carbon sequestration, enhance riparian areas, etc.) to alleviate flood impact?

E. What is your observation for the capabilities and resources required for this ministry to support, provide guidance and coordinate with the local lead responding agency (the local authority) with the required support as stated within the legislation?

F. B.C. Specific: Following the Emergency Program Act Modernization Project's implementation - what decisions do you think will need to be made differently in the future?

G. Have you any additional comments? Is there anything else you would like to discuss that we may have missed? Are there any other useful contacts for these questions that you can think of? (inside your organization, or not).

APPENDIX E: Red Dragon Consulting Project Team

Red Dragon Consulting created a tailor-made project team for the emergency response (and recovery) themed projects. The creation of such a team is to provide breadth and depth of knowledge to investigate the different work streams, as well as provide experienced perspective from our collective understanding and knowledge. The consulting team members consists of recognized professional experts with significant involvement in delivering preparedness, mitigation, response, and recovery projects over many years in emergency management and public safety careers. The team prides itself on working together, agility to assist clients and has over 100 years of experience.

Table Reference: Red Dragon Consulting Project Team

Project member	Project Role	Project Specific Experience
Paul Edmonds	Project Manager	National Emergency Management Strategy and Policy (Preparedness, Mitigation, Response and Recovery) All-Hazard. Senior Government lead for emergency policy and legislative change. National all-hazard emergency management representation on variety of national groups including chairperson. National Flood Recovery Manager 2012 Strategic, Tactical and Operational Emergency Commander U.K. EOC Director B.C. Flood Recovery Adviser Flood Response Plan Developer Public Safety Canada & Emergency Management B.C Qualified Supplier 2019-2024
Chris Marsh	Deputy Project Manager	Emergency Operations Centre Director for Grand Forks and Boundary 2018 Flooding. Recovery Co-Manager for Grand Forks and Boundary 2018 Flood Recovery. Local government Emergency Manager (Preparedness, Mitigation, Response and Recovery). Provincial Government – Various Technical and Leadership Roles. Structural Firefighter, Instructor and Evaluator, including Leadership Roles and licensed emergency medical provider. Experienced Emergency Management Consultant.
Steve Newton	Consultant	Provincial Government Emergency Management. Provincial Operations Flood All-hazard experience with First Nation and local government impacts. Provincial Government Wildfire Service Associated Roles Emergency Management, wildfire and flood. Experienced Emergency Management Consultant.
Michael Andrews	Consultant	Emergency Planning, Preparedness, Response and Recovery associated roles. Local government Emergency Management. Provincial Government Emergency Management. Experienced Emergency Management Consultant. Justice Institute of B.C. Emergency Management Instructor.
Greg Kanya	Consultant	Emergency Planning, Preparedness, Response and Recovery associated roles. Local government Emergency Management. Provincial Government Emergency Management. Provincial Government Ministry of Environment associated roles. Experienced Emergency Management Consultant.

All consultants have a trust-based relationship and proven history of working together with others from different organizations ranging from ministries, First Nations, local governments, municipalities, and industries.

APPENDIX F: Recommendation Tables

Investigation C-2.1 - Investigate the future direction of the Federal government related to a National Flood Risk Strategy.		
#	Lead Responsibility	Recommendation
1	Federal	The federal government's strategic leadership should be enhanced for flooding and coastal change. The national strategy should illustrate and guide how the Province, (and territorial) ministries and all organizations are integrated into providing flood strategy direction. These flood risk management strategies should establish the overall approach by identifying the most sustainable and most appropriate combination of actions.
2	Federal	Federal Programs should enhance sequential flood measures guidance and best practice examples such as hazard mapping, risk assessments, public education, mitigation, and response plan activities at the national scale. These guides and best practice examples can then be appropriately adopted at the provincial and territory level to ensure consistent approaches.
3	Federal	The federal national strategy should be further developed than currently published to empower the Province and provide guidance to embrace and implement a broad range of flood resilience and sustainable actions.
4	Federal	Federal national guidance should guide and influence the Province to implement cost: benefit analysis assessments to response measures costs compared to a more suitable permanent solution. Flood grant programs should become adaptive and agile to address community needs.
5	Federal	The federal government should produce and enhance consistent principles, approaches, and methods at each step in managing flood risk. This will ensure a national (and in turn a provincial) comparable risk-based approach to inform management of structural and non-structural investment decisions. Consistency is crucial in the methods adopted to assess flood risk and consider future challenges (climate change, societal, cultural, and political changes) to appraise management options.
6	Federal	The federal government should develop guidance for climate adaption plans to become commonplace for all First Nation, local government, and the Province to enable communities to deal with the impacts, risks and opportunities posed by a changing climate.
7	Federal	Producing enhanced federal national guidance for First Nations and local governments on preparing strategic flood risk assessments, interpreting the latest climate science, undertaking site-specific flood risk assessments will be critical for future resilience.
8	Federal & Provincial	The Red Dragon team highlighted the need for a common location for all flood-specific programs, data, and information (this could be expanded for all-hazard). A suggested approach would be a federal government national "flood portal" that would deliver the national strategic goal of increasing the understanding of risk and flood mapping availability. Such a portal would provide information relevant to the public, developers, and all government levels for strategic flood activities.

Investigation C-2.2 - Investigate the Province's expanding role in providing flood response to First Nations.		
#	Lead Responsibility	Recommendation
9	Provincial	It is recommended that the provincial government develop a holistic enabling plan to accompany the B.C. Flood Strategy to illustrate the activities required
10	Provincial	There is further work required by the Province to develop relationships and enhance outreach before information is shared.
11	Provincial & First Nations	All four emergency management pillars should be presented for discussions at the provincial strategic Indigenous partnership's tables, particularly flood response
12	Provincial	The Province should enhance its strategic approach of collaboration and co-development by learning together
13	Provincial & First Nations	There is insufficient understanding of how many First Nations have implemented flood risk and mitigation programs. The Province and First Nations should jointly develop a gap analysis to understand the landscape across First Nations of preparedness, leading to a better response
14	Provincial	The Province and all governments should clarify each other's respective roles, authority, and mandate clarify the "who does what and when during emergency flood response."
15	Provincial & First Nations	First Nations consultation and collaboration protocols exist, but more hazard-specific policies need to be jointly developed between the provincial government ministries and First Nations, followed by an educational information-sharing program.
16	Provincial & First Nations	First Nation and provincial joint development of a consistent approach to incorporating traditional knowledge and western science through access to flood experts or professionals would improve the flood emergency response process.
17	Provincial	The MFLNRORD community binder approach should be expanded to cover the whole province with appropriate resources.
18	Provincial	The provision of a toolbox or a suite of products from provincial ministries would better enable First Nations to identify and document critical data such as historical flood observations, hydrometric data access, flood assessment checklists and identification of data gaps.
19	Federal & Provincial	The provincial and federal governments should develop guidance to engage with First Nations to enhance comprehensive community emergency planning that includes the mechanism for funding a resource or collaborative space to engage First Nations to come together and share.
20	Federal & Provincial	A federal and provincial initiative to provide all First Nations with access to funding to enable Flood Response Plans development. The plans should refer to guidance notes or standards that identify flood hazard areas, risks, trigger levels for preparedness, response, and communication (amongst others).
21	Provincial & First Nations	It is recommended that a training initiative is piloted and developed across the province through provincial and First Nation regional collaboration groups to create a geographically spread skilled workforce situated in First Nation communities that can support flood response`.
22	Provincial	The Province should enhance (with conditions) funding programs that would assist in paying for third-party professional advice to work alongside First Nations and produce complex grant applications.
23	Provincial	The development of a provincial grant program to create, train, and exercise a flood response plan within a community or regional community would deliver benefits to response actions and reinforce emergency management knowledge and other activities required in the four pillars of emergency management.

Investigation C-2.3 - Investigate the status of local authority flood response plans and recommend an approach to manage, update and improve this information.		
#	Lead Responsibility	Recommendation
24	Federal or Provincial (or jointly)	Flood response plan standards should be developed by the Province or Federal Governments to provide a consistent approach to flood response. It will be imperative that the standard incorporates an understanding and flexibility that not all governments will require comprehensive flood plans depending on their hazard and risk levels.
25	Provincial	The creation of a provincial workbook or good practice indicators will assist First Nations and local governments in developing flood response plans. These guides must explain the background, relevant information sources, roles and authority during a flood event, and the interconnection with flood risk assessment and mapping within the geographical area.
26	Provincial	In reference to recommendations 24 and 25, flood response plans need to be risk-based and informed by flood risk assessment, mapping studies, flood history and knowledge of community exposure and vulnerabilities (where available).
27	Provincial	In reference to recommendation 24, there is the need for a signoff approval process with the development of any flood response plan either by the First Nation or local government.
28	Federal or Provincial (or jointly)	It is recommended that alongside the development of a flood response plan standard, a provincial and or federal government funding program is developed and established to support such plans.
29	First Nations, local governments	A regional collaborative approach between First Nations and local governments would assist in joint applications or simple support by sharing successful applications in actioning strategic flood investment.
30	Provincial	The community binder project within MFLNRORD and the collection of risk information by EMBC should be developed to become a collaborative project. It is recommended that these initiatives are combined, enhanced, and implemented across the Province.

Investigation C-2.4 - Investigate flood response capabilities considering different flood hazards and different regions of the province.		
#	Lead Responsibility	Recommendation
31	Federal & Provincial	There is a need to enhance the provincial and Canada-wide capability assessment of all ministries, First Nations and local governments, Diking Authorities and utility providers.
32	All	First Nations, local governments, Provincial Ministries, and Federal Governments should explore ways to increase regional collaborative groups' geographical distribution for meaningful sharing of practitioner-led flood response planning and activities
33	Provincial	The mobilization of equipment to known flood-impacted geographical locations should be recognized as a primary required capability within the provincial government's advanced planning stages of an emergency response.
34	Provincial	Enhancement of the provincial Temporary Emergency Assignment Management System (TEAMS) program assists EMBC operations centres and BCWS fire centres in supporting communities affected by emergency events.
35	Federal & Provincial	Federal and provincial support of grant writing and program development capability will assist smaller First Nations, and local governments access to flood emergency management resources and professionals (as well as other activities under the emergency management pillars).
36	Federal & Provincial	The exploration of federal and provincial programs to provide support mechanisms (resource access and funding) should be explored to support this modernization and align with national priorities for an all-hazard approach. This recommendation is interconnected to recommendation 35.

Investigation C-2.5 - Investigate opportunities for improved organizational planning for emergency response in all levels of government.		
#	Lead Responsibility	Recommendation
37	Provincial	There is a need for a provincial understanding of which communities are most at flood risk and where provincial (and other agency) support would be needed during emergency response.
38	Provincial	It is recommended that the Province explore if the current response models be enhanced by a single flood response authority that would have the ability to provide provincial subject matter experts, provide guidance and direction regarding flood warning and associated protection measures, providing a similar BC Wildfire Service taskforce approach, and facilitate critical ministry decision-making for permits.
39	Provincial	The Province to co-review and explore in partnership with First Nations the re-evaluation of the provincial BCEMS goals in specific reference to Indigenous priorities.
40	Provincial	The provincial government to enhance the purpose, language and clarity of the provincial flood emergency response plan to define each organization's role's scope
41	Provincial	Enhancement of a provincial group of flood subject matter experts including hydrologists, geomorphologists, and engineers with flood response experience to support and guide all levels of government in interpreting weather, snowpack, river, tidal and geoscientific information to inform emergency response planning and actions.
42	Provincial	A provincial government capacity planning review should be developed to provide adequate resources within the flood assessment unit (a MFLNRORD resource) for each of the EMBC operational regions.
43	Provincial	The provincial government to enhance the current resourcing level of MFLNRORD staff who become dedicated to flood emergency response.
44	Provincial	The Province to review and explore the necessity to increase numbers of professional roles within EMBC regions to complement existing Regional Managers (whose resource should be protected to facilitate, liaise, and coordinate all events) to provide flood specialist knowledge for assessing all factors in decision-making.
45	First Nations & local government	First Nations and local governments should review and enhance the role of Emergency Program Coordinator role to ensure it is resourced adequately in line with the community's hazard and required resilience level.

Overarching Recommendations
Develop a provincial strategic vision for flood response. The investigations and research into the interdependencies have highlighted a need to illustrate the strong connections between the numerous policies, initiatives and projects that are taking place.
The development of defined provincial, local government and First Nations' roles so that they are integrated, effective and communicated in a clearly understood manner when preparing for and responding to a flood event.
The provincial government to review the delivery of the vital flood roles identified in the provincial flood response plan to ensure they are integrated to deliver information, guidance, warning, and decision making during critical timeframes.
The Province should enhance support from all ministries involved in provincial flood response activities to guide governance and consistent command and control.
It is recommended the federal, provincial, First Nations, and local governments further explore and enhance the following: ▪ **The need to increase collaboration across all levels of government**. ▪ **Increase hazard and risk information (scientific) trend analysis to aid the hazard and risk understanding of First Nations and local governments.** ▪ **Clarify decision-making to create provincial standards and consistency of responses for a more unified approach.** ▪ **Particular focus to be addressed in the coming years to tackle the inconsistent and grant-driven "patchwork" of flood risk assessments, flood mitigation plans and gaps of flood response plans at the local levels.**

Certification page

Red Dragon Consulting project team presents our findings in undertaking an investigation into flood risk initiatives pertaining to flood emergency response in British Columbia, Canada.
Respectfully submitted,

Sincerely,

Project Manager

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