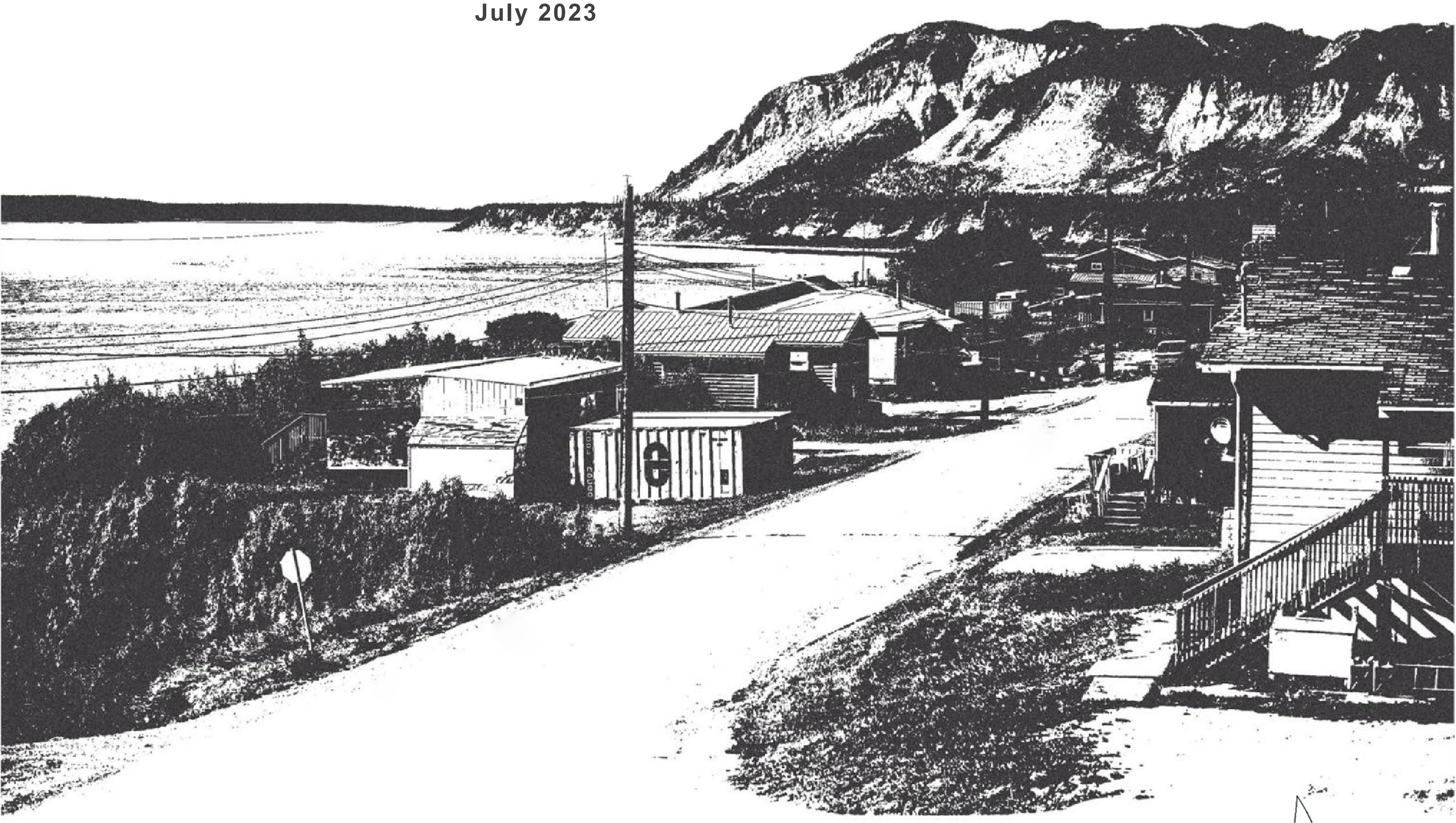
Closing the Infrastructure Gap by 2030

PRIORITIZATION AND IMPLEMENTATION PLAN

July 2023



This document was prepared by a multidisciplinary team led by the Assembly of First Nations and Indigenous Services Canada. We would like to acknowledge the support of First Nations Engineering Services, BTY Group, Associated Engineering, Planetworks Consulting, Longhouse Capital Partners and Yallee Designs for their contributions to the development of this report. .

Assembly of First Nations
Irving Leblanc
Grace Martineau
Matthew George
Dan Gaspé

Indigenous Services Canada
Jessica Gordon
Stephen Tierney
Robert Ransom
Manon Tasse
Lorne Younghusband

First Nations Engineering Services
Craig Baker
Taylor Martin

BTY Group
Nicholas Jackson
Neill McGowan
Michael Gabert
Hannah Owens
Travis Cheung
Saira Muzaffar

Associated Engineering
Owen James
Craig Macdonald
Shane Thompson
Ryan Hennessey
Graham Lang

Planetworks Consulting
Susanna Reardon
Melanie Reardon
Duncan Sharp

Yallee Designs Art and Graphic Design
Darren Yallee

Longhouse Capital Partners
Paul Cugno
Alfredo Di Blasio

Contents

Executive Summary

Canada has an unprecedented opportunity to make meaningful progress toward its commitments to First Nations, leverage its leadership in infrastructure delivery, unlock economic opportunities at a national scale, and implement a viable path towards social and economic reconciliation.

The Prioritization and Implementation Plan provides a practical framework to Close the Infrastructure Gap for Canada's First Nations (CTIG), currently estimated at $349.2 billion.

This report builds on the Assembly of First Nations led national cost estimate, co-developed with Indigenous Services Canada, and supported by a team of industry experts, which quantified the infrastructure deficiencies currently faced by more than 600 First Nations across the country

Given the scale, geographic range, national construction constraints, *and lack of recent Government of Canada investments* — the federal mandate to "Close the Infrastructure Gap by 2030" may not be achievable until the year 2040 — this still being dependent on significant investments to *Close the Gap* being included in Canada's Budget 2024 fiscal framework.

Program Prioritization & Implementation Plan Framework Highlights

The key components of this framework include understanding the cost of delaying action, developing a process to prioritize projects, building a program schedule and strategic sequencing of projects, analyzing the yearly cash flow, and appropriate procurement and financing options.
Highlights of these components are as follows:

The Cost of Maintaining the Status Quo Approach — Cost of Inaction

It is important to note that any delay in Closing the Infrastructure Gap will simply increase the costs to reduce it in the future. Delaying the implementation of CTIG to 2040 is estimated to increase costs by approximately 51%, bringing the total to $527.9 billion (see, section 6.3). The status quo approach will also have larger ramifications, in addition to the increased cost of delivering infrastructure. These include:

- Compounding social, health, and economic inequities that First Nations face as one of the fastest-growing demographic populations in the country.
- Canada's ongoing failure to meet its fiduciary responsibilities and provide access to infrastructure in First Nations communities equitable to non-Indigenous communities in Canada.
- Canada will not meet its obligations as a signatory to the United Nations Declaration of the Rights of Indigenous Peoples.
- Canada will fail to achieve its national targets for Net-Zero Emissions by 2050, including the objectives and goals of Canada's Canada's National Adaptation Strategy for 2030 and 2050, respectively.

Prioritization & Implementation Plan Framework Highlights Continued

Prioritizing Assets the First Nations Need Immediately

First Nations' immediate priorities vary based on the existing conditions of community infrastructure, their exposure to the risks of climate change, floods, and wildfires, and their location and accessibility to surrounding developed areas.

The prioritization model presented in this report is based on the requests in the ISC First Nation Direct Ask Survey. Furthermore, infrastructure needs are grouped by similar construction types to take advantage of potential synergies and efficiencies under one program of delivery.

Visualizing Realistic Cashflows and Schedules for 2040

Delivering projects effectively within the established timeframe will require careful packaging and sequencing of work to leverage efficiencies and utilize the available capacity of the private sector.

Establishing cashflows for capital as well as operations and maintenance is critical to planning and sequencing projects effectively.

Schedule efficiencies are available, such as bundling road projects with fiber optics infrastructure initiatives to accelerate timelines.

Innovations in Procurement & Financing

Innovative solutions and working collaboratively with the public and private sectors will be key to procuring and financing the projects needed to Close the Infrastructure Gap.

This report summarizes leveraging different procurement and financing strategies to provide First Nations pathways to building capabilities delivering and maintaining infrastructure assets, and reliable and sustainable funding mechanisms to maximize the value for money of the CTIG Program.

1.0 Introduction

1.1 Previous Work

The Assembly of First Nations and Indigenous Services Canada co-developed a report to quantify the capital and operating costs to "Close the Infrastructure Gap by 2030" (CTIG 2030). The federal funding required to Close the Infrastructure Gap by 2030 represents a critical step towards urgently needed economic reconciliation between First Nations and the Government of Canada.

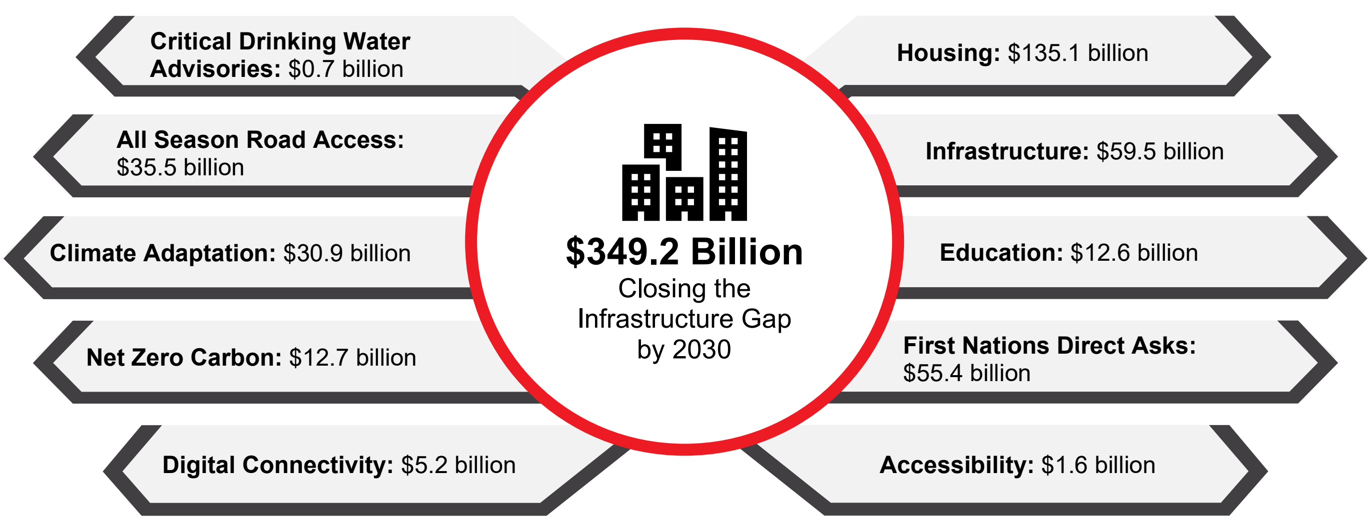
Limited access to essential infrastructure including housing, education, healthcare, connectivity, and other capital buildings and services across First Nations communities has resulted in long-standing intergenerational inequalities compared to the social infrastructure services that are regularly and consistently provided to most Canadians.

The federal investments called for in this proposal are supported by extensive AFN technical studies which comprise decades of national data, including:

- AFN Report: Cost Analysis of Current Housing Gaps and Future Housing Needs in First Nations
- AFN National First Nations Assets Needs Study
- AFN First Nations Education Infrastructure Capital Needs Assessment
- AFN First Nations Education Infrastructure Operation and Maintenance Needs Assessment

The AFN led a team of industry experts to utilize this research and expand upon it to determine the federal investments needed to Close the Infrastructure Gap by 2030. The AFN detailed the investment required in the November 2022 report titled *"Closing the Infrastructure Gap By 2030 – A Collaborative and Comprehensive Cost Report Identifying the Infrastructure Investment Needs of First Nations in Canada."*

One of the key results of this report is a first-ever national quantitative analysis of the First Nation infrastructure gap that also aligns with Government of Canada federal commitments and strategies, as outlined in the summary diagram below:



The next steps outlined in this report included an evaluation of methodologies that could be utilized to deliver the CTIG program. The following document explores the various considerations and strategies that may be used to implement the CTIG program.

1.2 Report Purpose

This report builds upon the information outlined in the previous CTIG deliverables and is focused around broadly evaluating approaches to prioritize and implement the infrastructure projects needed to close the gap. This includes:

Developing an approach to prioritizing, sequencing, and implementing the infrastructure projects needed to close the gap.

- Analyzing the different ways project financing could be raised to ensure the capital needed for projects is consistently available.
- Creating a program-level schedule and cashflow that visualizes how the CTIG program could potentially be delivered.
- Exploring procurement mechanisms and how they could be used to deliver the wide range of infrastructure projects needed.
- Assessing the cost impact of the present status-quo approach to First Nations infrastructure development as well as the socioeconomic benefits of CTIG investments
- Detailed analyses of key priorities including digital connectivity, all-season roads access, and climate adapation.

The scope of this report is informed by the previously identified infrastructure gap of $349.2 billion and the associated asset classes. The core objective of this report is to better understand potential options, methodologies, and impacts of the CTIG mandate and how it could be feasibly implemented. It has been developed in collaboration and under the guidance of AFN and ISC and aims to explore options and next steps for implementing the CTIG plan.

1.3 The Cost of a Status Quo Approach

First Nations across the country have endured more than a century of severely underfunded and ineffectively connected programs aimed at improving self-determination and socioeconomic outcomes. This status-quo approach is a primary contributor to the significant infrastructure gap that exists today. Given present economic conditions as well as available historical data, the gap will only continue to grow if major systemic issues remain unaddressed. The following diagram includes facts and figures that help frame the critical need to improve First Nations access to infrastructure:

The Indigenous population is one of the fastest growing groups in Canada, According to Census 2021, the First Nation population sits at 1,048,405 and could reach as high as 1.8 million by the year 2041.
https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2021067-eng.htm

In 2021, the total spend across all levels of government in Canada reached $969.5 billion, which could fund the entire CTIG 2030 Program almost three times over.
https://www150.statcan.gc.ca/n1/daily-quotidien/221125/dq221125a-eng.htm

Between 2010 and 2031, it is estimated that there will be a backlog of 130,000 units, 44% of the existing units will require major repairs and 18% will require replacement due to population growth, overcrowding, poor construction, and mold.
AFN National Housing Strategy Document

Budget 2022 outlined a contribution of $4.3 billion over a seven-year period to improve Indigenous housing compared to CTIG 2030's identified need of $135.1 billion.
https://www.budget.canada.ca/2022/home-accueil-en.html

Since the start of AFN's Closing the Infrastructure Gap by 2030 project in January 2022 until its completion in July 2023, the Government of Canada has publicly announced over $370 billion dollars of investments in the military industry — more than required to Close the First Nation Infrastructure Gap.
https://www.canada.ca/en/public-services-procurement/news/2023/01/canada-finalizes-agreement-to-purchase-new-fighter-jets-for-royal-canadian-air-force.html

https://www.cbc.ca/news/politics/frigates-pbo-canadian-armed-forces-1.6631702

The disparity between the infrastructure needs identified by First Nations and the support provided by the Government of Canada exemplifies the decades of underfunding of programs that First Nations rely upon to preserve their way of life. These examples represent the Government's status quo approach that has directly led to the infrastructure gap of $349.2 billion that First Nations across Canada face.

The Result of Inaction

As outlined in the CTIG 2030 Proposal to the Federal Government, the current cost to close the infrastructure gap is $349.2 billion and spans infrastructure including housing, education, healthcare, connectivity, transportation, and other asset classes that First Nations communities across Canada need to maintain growth and improve socioeconomic outcomes.

The cost of the CTIG 2030 Program is the result of the failure of the status quo approach to inadequately funding social infrastructure for Canada's First Nations over past decades. Despite various government declarations, commitments, acts, and the Truth and Reconciliation Commission of Canada's calls to action, First Nations continue to endure challenges and hardships such as drinking water advisories, overcrowded homes, lack of safe all-season road access to remote communities, lack of digital connectivity, and severely deficient education and community facilities.

Natural population growth and the increasing impact of climate change is adding tremendous strain on these already deficient infrastructure assets.

It is widely accepted that First Nations members are showing an increased desire to return to their traditional homes and lands. However, without access to reliable infrastructure such as housing, high-speed internet, and clean drinking water, many individuals cannot feasibly return to their communities. As time progresses with little significant change, the cost to close the infrastructure gap will only grow exponentially.

The result of inaction has created compounding barriers in attracting private sector engagement, innovation in financing, and lack of healthy competition in delivering high quality infrastructure projects Canada is known for globally. These barriers include:

- Access to reliable funding to get capital projects initiated;
- Procurement requirements that limit engagement from private sector partners; and
- Inconsistent support programs that cause projects to stall or become unfeasible.

As many infrastructure projects involve multi-year and multi-phase delivery timelines, circumstances that cause undue delay have significant ramifications and compounding effects on project delivery. Without structured change in the way First Nations infrastructure is planned, funded, developed, and maintained, present and future generations will lack the resources needed to grow and prosper. The CTIG mandate will help the Federal government deliver on many of the commitments made publicly to First Nations on behalf of Canada to fulfill its fiduciary responsibilities to its First Peoples, unlock socioeconomic prosperity for First Nations and Canadians alike, establish First Nations as a key partner on the path to Net Zero, and elevate Canada's reputation globally.

Access to Community Goods and Services and its Impact on Socioeconomic Outcomes

To better understand the link between infrastructure and socioeconomic outcomes, BTY has conducted research into past studies that examine this relationship. One example of relatively recent research was published in 2017.

This study[1] explored the relationship between accessibility and socio-economic development of human settlements. Accessibility, in this case study, was defined as a resident's ability to reach desired goods, services, activities, or destinations. Research was conducted to better understand potential benefits of improved access based on infrastructure development, especially for remote areas and for cities and towns with many socioeconomically disadvantaged populations. This study focused on 1,814 settlements across Australia and evaluated differences between major urban population centres and smaller, more remote settlements.

One of the study's key findings was that "Unequal access to opportunities has a strong association with socio-economic characteristics, particularly for the dispersed and remote areas. With decreasing accessibility, median age and unemployment rate tend to increase and median household income tends to decrease."

This research is significant as the remoteness of First Nations communities and Canada's relatively low population density (when compared to the size of its land mass) is similar to the characteristics of Australia. It is therefore reasonable to assume that the outcomes of this study would be applicable to First Nations communities in Canada, namely, that improving accessibility would improve socioeconomic outcomes for individuals within communities located in remote areas.

Case Study – Telecommunications in Canada

Another example of how the "status quo" approach contributes to the growing infrastructure gap is the challenges that private sector telecommunications providers face when attempting to participate in the development of modern communications infrastructure projects in Canada.

AFN has engaged several industry leaders in telecommunications to understand areas of opportunity to engage the private sector to tackle one of the First Nations' current priorities: digital connectivity. This is a technological resource that a majority of non-First Nations individuals utilize daily. Access to reliable high-speed internet unlocks a wide range of socioeconomic benefits including business and employment opportunities, digital education, connected healthcare systems, and capabilities to communicate with friends and family over significant distances.

Based on the findings AFN has received, there are several recurring themes to improving First Nations' access to digital connectivity services, these include:

- Change funding eligibility and include provisions for operating expenditure;
- Open funding streams for in-community cellular coverage;
- Shorten funding approval timelines;
- Explore solutions for interim broadband relief for communities with no service;
- Leverage the Government's telecom buying power;

[1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5479555/

- Develop annual quotas for service providers to connect unserved First Nations;
- Appoint a task team to investigate spectrum ownership; and
- Continue refining data accuracy.

Based on this feedback, it is clear that there are many actionable measures that the Government can take to improve the feasibility of telecommunications infrastructure projects across Canada. As the Government of Canada has publicly committed to the goal of connecting 98% of Canadians to high-speed internet by 2026 and connecting 100% of all Canadians by 2030. First Nations, who are over-represented in Canada's digital connectivity gap, must not be neglected as part of Canada's goal of achieving 100% digital connectivity by 2030 — the AFN's Digital Connectivity Gap Annex warns of the high risk of First Nations being left out of Canada's 2030 targets — should broadband fund policies fail to subsidize 100% capital costs and allocate funding to the expensive operations and maintenance of this type of digital infrastructure in rural and remote areas.

The Cost of Delay

It is reasonable to believe that access to public infrastructure corresponds directly with improved socioeconomic outcomes. Without sustainable and reliable funding to enable the planning and delivery of key infrastructure projects across the country, First Nations will continue to face socioeconomic challenges as the dilapidated infrastructure they have access to continues to age and further deteriorate.

In addition, inflationary monetary forces and market pressures such as labour shortages and supply chain disruptions mean that the cost of construction continues to escalate over time. Our preliminary analysis shows that by extending the CTIG mandate to 2040, costs are estimated to increase up to 51%.
This represents the continued cost of delaying real action and a continued status quo failure to close the infrastructure gap.

As First Nations grow, the demand on their community infrastructure will increase with time and the costs to close the already widening gap will simply multiply (**see figures starting on 6.3, pp. 32**).

2.0 Process to Prioritize and Sequence Projects

When determining the prioritization of projects for First Nations infrastructure development, several key factors have been taken into consideration. These factors include:

- Enhancing the digital connectivity of communities to improve access to essential services and create opportunities for economic development.
- Incorporating feedback from First Nations communities is also an important factor to highlight the specific needs and priorities of each community.

Evaluating the needs of Northern communities, including the challenges posed by harsh weather conditions and limited physical access, is also a critical factor in determining project priorities.

Additionally, factors such as the availability of funding, the feasibility of project implementation, and the potential impact on the local economy and community well-being are also considered. By considering these factors and incorporating the perspectives of First Nations communities, decision-makers can develop infrastructure projects that meet the unique needs of these communities and support their socio-economic development.

2.1 Access to Digital Connectivity

First Nations communities, especially in rural areas, can benefit greatly from modern telecommunications infrastructure in several ways. Firstly, access to high-speed internet and reliable connectivity infrastructure will help them bridge the digital divide and provide these communities with equal opportunities to participate in wider local markets as well as the overall global economy. This has the potential to provide First Nations with business and employment opportunities and can also offer options to reduce the need for migration to urban areas in search of work.

Modern telecommunications technology also plays a key role in supporting the delivery of essential services such as healthcare and education, improving the quality of life for First Nations. Modern connectivity infrastructure also has the potential to attract businesses and entrepreneurs, leading to economic growth and job creation across First Nations communities.

Overall, investment in modern telecommunications infrastructure can have a positive impact on the socio-economic development of rural communities. Planetworks Consulting has prepared a comprehensive report on the magnitude of the telecommunications infrastructure gap faced by First Nations communities across Canada. Please refer to Appendix 1 for a copy of this report.

2.2 First Nations Community Priorities and Implementation

To develop a more refined cash flow profile for implementing CTIG, it was necessary to develop implementation schedules for each region. The implementation schedules required prioritization of projects to establish the order in which the needs of First Nations could be addressed. To accomplish this, the asset categories listed below have been prioritized based on the dollar values of the requests in the ISC Direct Ask Survey. Furthermore, these asset categories are grouped by similar construction type to take advantage of potential synergies and efficiencies under one program.

Using this approach, the Asset Categories and definitions are prioritized (with 1 being the top priority) as follows:

Asset Category	Abbreviation	Priority	Description
Community Assets	CO	1	Community centres, community costs and studies, libraries, community workshops and storage areas, ATR additions to reserve, administrative buildings. All vehicles for the community
Electronic Connectivity	EC	2	Electronic/Digital Connectivity
Housing	HO	3	Housing
Drinking Water		4	Source waters, abstraction, treatment, storage, transmission, and distribution of water
Community Accessibility Assets	CA	5	All-weather roads to connect communities, includes hydro and related assets to connect to communities (does not include in-community hydro), external bridges. All assets are external to the community
Water, Wastewater & Utilities	WW	6	Water treatment plants, lift stations, water and wastewater pipes, lagoons, in-city hydro and connections
Education & Training	ET	7	Schools, vocational training, Indigenous language training
Health	HS	8	All Health-Related Assets, nursing stations, clinics, long term care homes
Transportation & Infrastructure	TR	9	Roads, Bridges, Waterways, Airports and Tunnels within the community
Social Programs	SP	10	Social Work, Child Care, Men's and Women's Shelters, Elders' Complexes not identified as Long-Term Care homes
Emergency Services	ES	11	Fire, ambulance, police
Recreation Assets	RA	12	Trails, arenas, baseball diamonds

Solid Waste & Recycling	SW	13	Waste processing areas, landfills, garbage trucks
Climate Adaptation	-	14	Buildings, housing, transportation, utility, and emergency preparedness. Preservation and enhancement of natural assets, i.e., firebreaks
Net Zero Carbon	-	15	Improving energy efficiency of residential and non-residential buildings, vehicles & fleet infrastructure & utilities systems and building renewable systems
Accessibility	-	16	Grab bars in bathrooms, widening corridors, upgrading change rooms, vanities & kitchen counter heights, elevators, stairlifts, exterior ramps & secondary exits
Cultural Assets	CU	Incl.	Cultural centres, ceremonial grounds, powwow grounds, museums
Economic Development	ED	Incl.	Gas stations, hotels, storefronts

Note that three Asset Categories have been added here as they did not appear in the ISC survey: Accessibility, Net Zero carbon and Climate Adaptation.

2.3 Special Considerations for Northern Communities

First Nations communities located in northern remote areas in Canada face several significant challenges that impact their quality of life and ability to participate in the economy. One major challenge is the limited physical access caused by the dependence on ice roads, which are only usable for a short period of time each year and can be difficult to traverse. Another challenge is a lack of modern telecommunications infrastructure, which limits access to essential services and opportunities for economic development. Shortened construction seasons due to harsh weather conditions also pose difficulties in building and maintaining infrastructure, including housing and transportation networks. Finally, due to their location, the lack of a robust supply chain to support the basic needs of these communities often causes a shortage of essential goods and leads to a lower standard of living. These challenges, combined with other social and economic factors, create significant barriers to the prosperity and well-being of Northern First Nations communities.

2.4 Model Communities and Estimated Cost

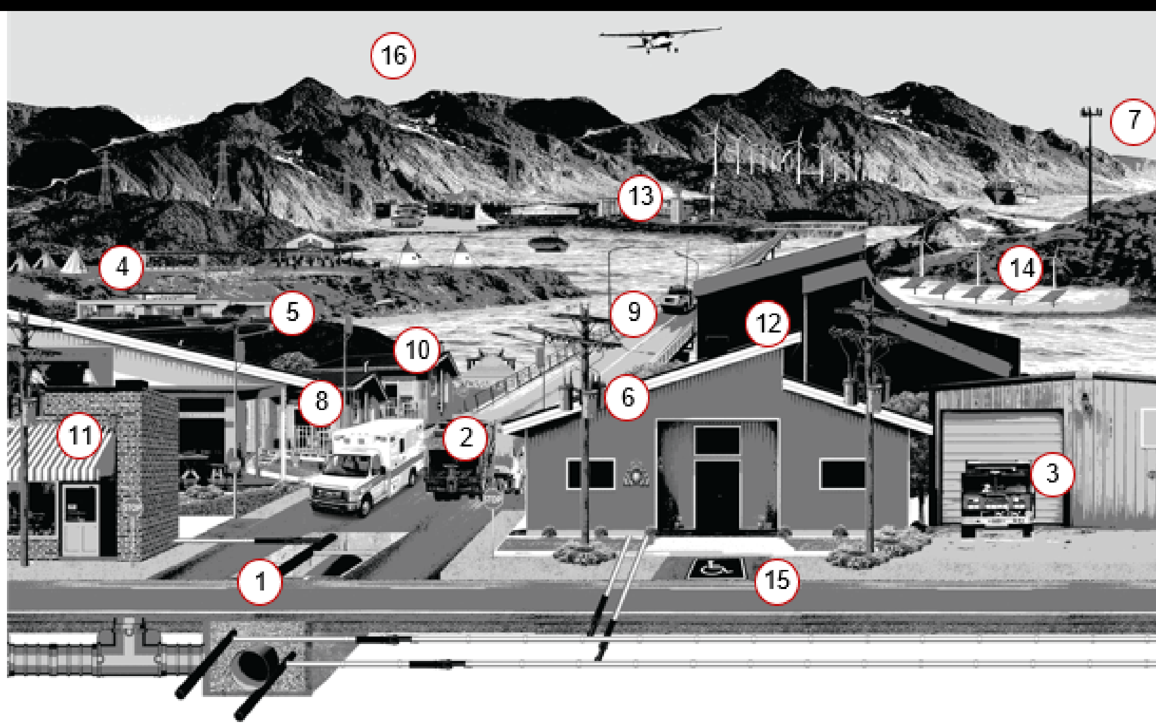
First Nations communities are typically located considerable distances away from the major metropolitan centres within Canada.

The following diagram was created by Associated Engineering and outlines the average cost to build the First Nation community infrastructure and housing needed to support a population of 1,000 people, or 300 homes, from a non-developed parcel of land to a full thriving community with access to traditional infrastructure facilities typically seen in a non-Indigenous municipality or township (i.e., a hypothetical First Nation community cost estimate from underground civil infrastructure to civil service buildings and etc.):

What does a First Nation Community Cost?

634
First Nation Communities across Canada

$967 M asset value
$74 M annual operations & maintenance
For an average community of 1,000 population



1 Water and Wastewater Asset Value: $75M Operations & Maintenance: $6M	**5 Education** Asset Value: $35M Operations & Maintenance: $10M	**9 Transportation** Asset Value: $76M Operations & Maintenance: $1.5M	**13 All Season Access / Airport** Asset Value: $402M Operations & Maintenance: $8M
2 Solid Waste Asset Value: $3M Operations & Maintenance: $250k	**6 Power and Distribution** Asset Value: $46M Operations & Maintenance: $4M	**10 Housing** Asset Value: $240M Operations & Maintenance: $30M	**14 Green Energy** Asset Value: $12M Operations & Maintenance: $250k
3 Emergency Services Asset Value: $3M Operations & Maintenance: $2M	**7 Digital Connectivity** Asset Value: $10M Operations & Maintenance: $200k	**11 Economic Development** Asset Value: $14M Operations & Maintenance: $5.5M	**15 Accessibility** Asset Value: $2M Operations & Maintenance: $100k
4 Community and Cultural Asset Value: $5M Operations & Maintenance: $500k	**8 Health and Social Services** Asset Value: $12M Operations & Maintenance: $4M	**12 Administration** Asset Value: $2M Operations & Maintenance: $600k	**16 Climate Adaptation** Asset Value: $30M Operations & Maintenance: $1M

Closing the First Nation Infrastructure Gap 2030

We often take for granted the infrastructure that we depend on every day. This community graphic is intended to help communicate how much an average community costs and support the understanding of the proposed investment needs indicated in the *Closing the First Nation Infrastructure Gap by 2030 Cost Report*.

The community in this graphic is completely fictional. However it is intended to represent a model community of approximately 1,000 people. It is perhaps a little more remote than many First Nations so includes an airport and an allowance for all-season road access. Features that many communities do not have. Many First Nations also may not have piped water and wastewater systems but might rely on trucked water and sewage disposal which will also create cost differences. There could also be numerous other differences between this community and specific First Nation communities. However, it should still give an idea of perhaps how some of the costs are built up.

The numbers indicated are not the same as the numbers in the *Closing the First Nation Infrastructure Gap by 2030 Cost Report.* The cost report numbers are the *investment needs* for the renewal, upgrade and maintenance of assets that may already exist and the creation of assets where they are insufficient to provide an adequate level of service. The numbers in this graphic are intended to represent the *value of the assets* in a community and not the investment needs over the 2023 to 2030 time period.

The table below highlights some of the key assumptions behind the numbers indicated in this graphic.

Legend Reference	Assets included and assumptions made
1. Water and Wastewater	Includes water intakes, treatment, pumping, storage and approx. 21km of water pipe. Also approx. 30km of sanitary& storm pipe, pumping, wastewater treatment and outfall facilities.
2. Solid Waste	Allows for a single landfill and a couple of garbage trucks and associated facilities.
3. Emergency Services	Includes a couple of fire trucks and associated fire hall, as well as staffing and paramedics and policing to support including associated equipment.
4. Community and Cultural	Includes a powwow ground and community lodge.
5. Education	Includes elementary/junior high school and high school and associated teacherages and school buses.
6. Power and Distribution	Includes generators and distribution lines across the community, and streetlighting.
7. Digital Connectivity	Internet and telecommunication services including LTE and 5G mobility, fibre backbone and FTTH last mile infrastructure.
8. Health and Social Services	Includes a clinic and ambulance, recreation facility and youth centre and associated staffing and equipment to support.
9. Transportation	Includes approx. 30km paved and 30km of unpaved roads within the community, plus a vehicular bridge and a pedestrian bridge.
10. Housing	Assumes 300 single family units and includes for lot development and lot servicing.

Legend Reference	Assets included and assumptions made
11. Economic Development	Includes for some commercial development including a gas station, commercial complex, motel and some eco-tourism with marina and charter boat. This would be highly variable community to community.
12. Administration	Offices and equipment to support the administration of the Nation community.
13. All Season Access / Airport	Assumes a nominal 100km of unpaved access road which is off-nation but for the Nation and a simple aerodrome with airstrip, beacons and sheds.
14 Green Energy	Allows for solar panels and wind turbines sufficient to power the community at 50% green energy.
15. Accessibility	Ramps, automatic doors, elevators or other measures to residential and non-residential properties as per the recommendations in the *Cost Report*.
16. Climate Adaptation	Actions to address risks including flood protection, enhanced ventilation and cooling, fire breaks and fire smarting, improved drainage and emergency planning as per the recommendations in the *Cost Report.*

3.0 Procurement Options

3.1 First Nations' Involvement

One component of this Implementation Plan for CTIG is to explore how First Nations can be more involved in guiding CTIG approaches and outcomes in a way that benefits their communities directly and develops intracommunity capabilities. CTIG has the potential to engage First Nations and empower them with tolls and capabilities to directly influence the long-term outcomes of the program. Several examples of this include:

Asset Management

Creating an asset management structure and process, derived from industry best practices, enabling First Nations to establish self-governed entities to catalog, monitor, and maintain existing and new First Nations infrastructure.

Specialist Expertise

There are numerous First Nations organizations with construction expertise that can contribute to the CTIG 2030 program; encouraging their participation also has the potential to drive the creation of new First Nations construction firms.

Community Engagement

Developing processes for engagement and feedback loops during the key stages of a project will provide opportunities for First Nations communities to ensure they have a say in the planning and delivery of critical infrastructure projects.

Skilled Trades

Demand for skilled trades is at an all-time high across Canada. CTIG 2030 is an opportunity to introduce capacity building programs and/or tax incentives to promote the need to build infrastructure on First Nations lands and encourage more participation in skilled trades.

Program Governance

First Nations can be incorporated into governance structures at both the program and project level to help guide decision-making and ensure outcomes are aligned with First Nations objectives.

3.2 Exploration of Procurement Options

Procurement model analysis and selection is a key component in the delivery of every project. Selecting the right procurement method is crucial for success, as it has a significant impact on the project's cost, schedule, quality, and overall outcome.

Broadly speaking, procurement model selection is a linear process which involves identifying the specific objectives of the project, evaluating the benefits and considerations of relevant models, assessing the market's current capacity for the project, and preparing a report that outlines the benefits and considerations of the proposed models. This involves weighing different factors like the potential risks, costs, timeframe, and quality standards associated with each model. This evaluation process needs to account for both immediate functional needs as well as long-term facility operations.

The following table highlights the primary procurement methods currently utilized across the construction industry and how each method will be relevant to Closing the Gap.

Methodology	Characteristics	Benefits and Considerations	Common Use Cases
Traditional Design-Bid-Build (D-B-B)	Owner and Designers plan the asset functionality Construction team is procured after design is complete	Widely understood process Clear separation of design and construction responsibilities Owner has significant control over design Competitive bidding can lower cost Risk of design errors and omissions, which can lead to change orders and cost overruns Lack of contractor's input during design phase Usually takes more time	Can be used on any project, efficiency typically decreases as project complexity increases
Design -Build (DB)	Designer and Builder operate as a single entity, usually with Builder as lead	Builder has constructability input from the start Designer is not independently accountable to the owner, who may need to compromise requirements Owner gets package deal Owner needs to hire an independent payment certifier	Was implemented on simpler industrial projects in the past, but has now migrated to complex projects such as hospitals
Construction Management (CM)	CM acts as owner's agent, with trades under contract to the owner Lends itself to fast-tracking Construction team is involved during the design stage, providing valuable input	Contractor's expertise is used early in design, which can contribute to better constructability, quality and cost management Open to competitive trade bidding process which might reduce costs More coordination required from the owner Potential for higher cost if the construction manager doesn't control costs effectively Less certainty about total project costs at the beginning of construction	Can be used on any project and offers options to be converted into fixed price contracts or at-risk structures

Methodology	Characteristics	Benefits and Considerations	Common Use Cases
Public-Private Partnerships (D-B-F-M)	Public sector provides outline specifications, private sector partially finances construction and operates and maintains the asset for a fixed period	Can provide public infrastructure without immediate public funding Risks are shared between public and private entities Private sector might bring innovation and efficiency Complex contract negotiations, often requiring specialized legal expertise Potential public opposition to private sector involvement in public services Profit-oriented private entity might not always align with public interest	Complex civil infrastructure such as roads and hospitals or large bundles of replicated works such as a portfolio of schools or public housing
Integrated Project Delivery (IPD)	A collaborative model where all participants enter into an IPD contract where participants are encouraged to find efficiencies and share in cost savings	High level of collaboration between all parties, often leading to innovation and efficiency. Shared risk and reward can align interests of the parties. More predictable project outcomes. Requires a high level of trust and willingness to collaborate between all parties. Not all clients, designers, or contractors are familiar with or willing to adopt this approach. Legal frameworks for IPD are not well-established in all regions.	Emerging model that could be used in a wide range of building scenarios

These delivery methods represent approaches used on virtually every construction project across Canada. A significant portion of closing any infrastructure gap will be to grow the understanding of these methods, in particular, amongst First Nations communities. By building capacity and understanding of these techniques, First Nations stakeholders will be better informed and engaged as project team members during the delivery of any project.

CTIG represents a precedent-setting challenge to Canada and its construction industry. There will not be a single procurement model that will satisfy the requirements of every asset class in every region, but expertise, innovation and sociopolitical will is needed to enable the appropriate means of implementing projects.

4.0 Financing Options

4.1 Existing Approach to Funding First Nations Projects

Presently, First Nations infrastructure projects are largely funded through government grants, investment programs, or through entities such as the Canada Infrastructure Bank. The challenge with this approach is that funding efforts are fragmented and inconsistent which causes challenges for planning, designing, and constructing the infrastructure that First Nations across Canada need to flourish. Another obstacle is that the current project-to-project financing model restricts First Nations' ability to plan larger scale and long-term mandates with efficiently phased and packaged scopes of work. This lack of sustainable and reliable funding causes multi-year mandates to be largely unfeasible to undertake.

Financial terminology is included in this section; for clarity they are defined as the following:

Grants / Social Transfers: Funding provided by a government body to support a specific initiative.
Debt Financing: The receipt of present-day capital in exchange for future repayment.
Equity Financing: The receipt of present-day capital in exchange for an ownership stake in an asset.
Impact Funds: Financing that focuses on generating a return on investment as well as specific objectives related to improving socioeconomic outcomes.

4.2 Sources of Financing

There are several options to consider when evaluating possible financing mechanisms for the CTIG program. Importantly, the success of any of the sources identified rests in the Government of Canada's willingness to reliably act as a back-stop for infrastructure investment. At a high level, the main options include:

- A complete social cash transfer to close the infrastructure gap between First Nations and the rest of Canada;
- A combination of total social cash transfers to First Nations that are presently below the poverty line, and leveraging partial social cash transfers and/or leveraging additional patient capital sources for First Nations with access to revenue generating assets; and
- An annual grant structure for a First Nations Infrastructure Fund to provide First Nations with a reliable financing stream for qualifying infrastructure works.

For a program of this scale, there is no singular approach that will satisfy the specific needs of every First Nation community in the country. A structured approach should be developed by the Government of Canada in collaboration with First Nations that creates reliable and sustainable funding models. This could include structures that focus grants and social cash transfers to First Nations communities with little wealth. First Nations communities with access to opportunities such as valuable land or natural resources would benefit from structures that unlock opportunities to partner with the private sector, such as sharing land access rights or mineral extraction rights while creating local infrastructure such as all-season roads, community assets, education, healthcare, etc.

Financing Criteria

Project financing to deliver the hundreds of projects that are needed to close the infrastructure gap will require numerous approaches based on delivery models and industry best practices. For example, traditional lenders are typically involved in residential asset development, whereas capital infrastructure development is often financed through a mix of public and private sector funding and may include revenue from operations (e.g., a toll road).

The following informational diagram was provided by Longhouse Capital Partners and highlights several key criteria debt or equity investors will seek to assess to evaluate investment decisions.

Visibility of Future Cash Flows	▪ Future cash flow from the assets can reasonably be projected to service debt (interest and amortization) during the asset's useful life or during the agreed upon financing period ▪ Asset cash flows can also be supplemented by a government, corporate or other creditworthy entity loan guarantee
Certainty of Project Completion	▪ Completion guarantee from a creditworthy party or credit support from a government entity (i.e., federal or provincial loan guarantee program)
Clear Legal Title	▪ Clear legal title to the underlying collateral or a guarantee from a federal or provincial government entity ensuring repayment
Supportive Regulatory Environment	▪ Clear, supportive, and stable political and regulatory regimes must be in place to limit risk of disruptions to the asset's long-term, economic viability ▪ All government / regulatory approvals to own and economically operate the asset must be reasonably obtainable and maintainable, over the long-term
Market Based Returns	▪ Equity co-investors will typically seek visibility to market based financial returns with the ability to exit (i.e., sell their equity stake) ▪ Exit may be at a predetermined time and price and/or include the ability to engage in a sale to a third party, with first rights of refusal provisions

The core driver for these criteria is that investors are looking to balance profit and risk; the greater the risk in a project, the higher the profit margin would need to be to attract investment. If capital is available to wholly finance a project, this could be used to avoid these scenarios; however, there is an opportunity cost to this approach (the funding required for one project could have been used to partially fund several others instead).

As such, delivering these much-needed projects for First Nations will require a structured approach that balances available capital with opportunities to engage traditional lenders and private financial institutions to maximize the number of projects that can be financed and delivered in a specific period. A deep understanding of all available project financing models will be needed to deliver the critical infrastructure needed to “Close the Gap” for First Nations in Canada. In addition, some methods will likely need to be adjusted to meet the specific needs of First Nations.

4.3 Project Financing

A vital component of project financing is leveraging debt, equity, or both to obtain the initial capital needed for large infrastructure projects. For First Nations, this is often challenging as many communities lack the wealth to leverage, which leads to less private sector engagement as the risk profiles for these projects may not be attractive nor financially feasible. The following diagram outlines one potential approach to obtaining the initial capital needed to kick-start infrastructure development:

Challenge: First Nations communities often lack access to the capital needed to initiate infrastructure projects.

Opportunity: A relatively stable cashflow can be used as collateral and be leveraged to create debt financing, or an operating asset that generates revenue could be used as equity financing. Examples of this would include annual grant payments from the Canadian Government or First Nations communities that become equity partners in a power generation project that requires the use of their lands.

Solution: The Government of Canada should establish sustainable mechanisms that provide First Nations with access to stable funding streams. With access to stable cashflows, private investment firms and private infrastructure developers can provide the First Nations communities with debt and/or equity financing respectively.

This method provides a pathway for First Nations communities to become involved in infrastructure projects and helps to distribute wealth and resources more equitably. By leveraging future cashflows, the upfront equity investment requirement could be supported by engaging private sector financing, reducing the upfront capital burden on First Nations communities.

Infrastructure projects would offer several benefits for the First Nations communities beyond just the financial return. As equity partners, First Nations communities will have an active role in the project's operations and decision-making, which could provide opportunities for skills development, employment, and capacity-building.

To highlight the other various opportunities, techniques, and collaboration needed to support the delivery of the CITG program, the following chart highlights probable financing scenarios applicable to various infrastructure asset classes and which mechanisms can contribute to a mix of financing sources. The following diagram was produced in parallel with Longhouse Capital Partners and connects financing sources with project types, highlighting which sources of capital are traditionally associated with the asset class, which sources provide partial funding, and which sources have the potential to be included on future mandates.

Infrastructure Asset Categories	**Potential Financing Routes**					
	Social Transfer	Government Grant / Guarantee	Partnership w/ Private Sector	Debt Financing	Equity Financing	Impact Funds
Accessibility	●	●	○	N/A	N/A	◒
Climate Adaptation	●	●	◒	N/A	N/A	N/A
Community Accessibility Assets	●	●	◒	○	○	N/A
Community Assets	●	●	N/A	N/A	N/A	◒
Cultural Assets	●	●	○	N/A	N/A	◒
Drinking Water	●	●	◒	◒	N/A	◒
Economic Development	●	●	◒	N/A	N/A	◒
Education & Training	●	◒	◒	◒	N/A	○
Electronic Connectivity	◒	●	●	◒	◒	○
Emergency Services	●	●	◒	N/A	N/A	○
Health	●	●	○	N/A	N/A	○
Housing	●	●	◒	◒	◒	○
Net Zero Carbon	◒	◒	●	◒	◒	○
Recreation Assets	●	◒	○	○	N/A	○
Social Programs	●	●	○	N/A	N/A	○
Solid Waste & Recycling	●	●	◒	◒	◒	N/A
Transportation & Infrastructure	●	●	◒	◒	◒	N/A
Water, Wastewater & Utilities	●	●	◒	◒	◒	N/A

Sources of Funding			
N/A = Not Available	● = Traditionally Used	◒ = Partial Funding	○ = Potential for Use

It is important to reiterate that a “one-size fits all” approach to project financing is unfeasible for a mandate of CTIG’s scale and complexity. It is our belief that a solid understanding of each approach available is needed to create tailored financing structures for projects as they are planned and executed.

5.0 Economic Development

5.1 Job Growth

Real estate and infrastructure development requires a broad range of skills and expertise, from professions such as architecture and engineering to construction workers and equipment operators. As a result, investment in infrastructure can create and sustain jobs in a variety of sectors, including resource extraction, construction, manufacturing, and transportation. It is also important to highlight that this investment has a multiplier effect on the economy. For example, when new roads or bridges are built, it can improve transportation efficiency, which can lead to increased productivity and economic growth. This in turn leads to further job creation and economic benefits.

Statistics Canada Data

According to the Statistics Canada (StatCan) Infrastructure Statistics Hub (ISH), infrastructure investment has measurable outcomes associated with adding value and creating jobs within the Canadian economy.

These definitions are provided to better interpret the data presented by the ISH:

- Investment means spending by businesses or governments during a given year for the purposes of construction of structures (airports, roads, etc.), purchases of equipment (locomotives, turbines, etc.) and improvements to existing facilities, all for future use in production during more than one year.

- Value added refers to the contribution of a given business, or government, or an entire industry to domestic production, adjusted to remove double counting. Thus, if a business sold products worth $100 million and used inputs purchased from other businesses that were worth $30 million, the value added by that business would be $100-$30 = $70 million. Value added is the amount left over from product sales revenue that can be used to pay compensation to employees and potentially leave profits for the business owners. Gross domestic product is the sum of all value added in the economy.

- Number of jobs refers to the number of jobs as a result of the production of infrastructure assets.

The most recent data available shows that in 2021, total investment in infrastructure assets across Canada was over **$94 billion** across all functions. This added more than **$70 billion** in value and sustained more than **572,000** jobs.

Using this data, we could surmise that 1 job is sustained by approximately $164,294 of investment per year. This means that the CTIG program could help create more than **150,000** jobs per year.

Other Sources

In addition to the StatCan information, we have compiled several other sources of research that have explored the relationship between infrastructure investment and job creation. The results of our findings are summarized in the table below:

Statistic	Potential CTIG Job Growth	Source
$1 billion in infrastructure investment translates into approximately 11,000 jobs.	Approximately **275,000 jobs** could be created per year based on proposed CTIG funding schedule	Canada House of Commons Report of the Standing Committee on Transport, Infrastructure and Communities – Updating Infrastructure in Canada: An Examination of Needs and Investments[2]
3 to 7 jobs in advanced economies are created per $1 million of public spending on infrastructure.	Approximately **75,000 to 175,000 jobs** could be created per year based on proposed CTIG funding schedule	The Direct Employment Impact of Public Investment – International Monetary Fund[3]
$1 billion invested in public infrastructure supports between 8,000 to 36,000 person years of employment in North America.	Approximately **200,000 to 900,000 jobs** could be created per year based on proposed CTIG funding schedule	Canadian Council of the Federation Secretariat – Driving Public Infrastructure, Jobs and Economic Growth[4]

It is important to note that these figures all vary based on the factors included in their calculation. There are hundreds of considerations that need to be evaluated when analyzing the relationship between infrastructure investment and job creation, which makes assessing Closing the Infrastructure Gap's quantitative affect on Canada's economy difficult to predict with granular precision.

For example, the benefits of infrastructure investment vary depending on the type of infrastructure and the region in which it is built. Investments in public transit in urban areas may have different impacts than investments in rural roads and highways. This is especially important to First Nations, as many communities are located in rural areas that do not benefit from economies of scale that larger metropolitan environments may receive. Without infrastructure to facilitate the movement of goods and services between these communities and the more populous regions of Canada, such as all-season roads and high-speed internet, First Nations will continue to struggle to unlock their economic potential and to equitably participate in Canada's continued growth.

[2] https://www.ourcommons.ca/Content/Committee/412/TRAN/Reports/RP8042716/tranrp09/tranrp09-e.pdf

[3] https://www.imf.org/en/Publications/WP/Issues/2021/05/06/The-Direct-Employment-Impact-of-Public-Investment-50251

[4] https://csce.ca/wp-content/uploads/2018/08/Discussion-document-from-Premiers-meeting-on-Infrastructure-Aug-6-14-.pdf

5.2 Gross Domestic Product Growth

Beyond job creation, infrastructure investment and development also influence a country's Gross Domestic Product (GDP) by creating pathways to economic activity. For example, public education helps prepare youth to enter the workforce, where their salaries and their spending habits contribute to the National GDP. Healthcare infrastructure creates jobs for doctors and nurses, and keeps the general population healthy, and therefore, productive (from an economic standpoint).

Investing in infrastructure can increase productivity, efficiency, and competitiveness by facilitating the movement of goods and services, reducing transportation costs, and improving access to markets. This can lead to increased economic activity, job creation, and ultimately, higher GDP. However, quantifying the real impact of infrastructure investment on GDP growth is challenging. Economies are complex concepts that span the entire system of how goods and services are produced, distributed, and consumed in a country, with many factors to consider. This leads to a broad range of values that capture the relationship between infrastructure investment and GDP growth:

The investment needed to Close the Infrastructure Gap has the potential to add between $258 billion to $621 billion to Canada's GDP.

$0.74 of GDP per $1 Invested

The most recent ISH data available shows that in 2021, total investment in infrastructure assets in Canada was over $94 billion across all functions. This added more than $70 billion in value, equating to roughly $0.74 of GDP per $1 invested in infrastructure.

$1.14 of GDP per $1 Invested

The Conference Board of Canada estimated that from 2006 to 2014, the relationship of infrastructure spending to real GDP – including direct, indirect, and induced impacts – was $11.3 billion per year: for every $1 billion invested, GDP is boosted by $1.14 billion in the short-to medium-term.

$1.60 of GDP per $1 Invested

Finance Canada's "Seventh Report to Canadians" estimated the short-term economic multiplier effect of public infrastructure spending at a factor of 1.6.

This means the short-term impact on real GDP of a $1 billion increase in infrastructure spending would be $1.6 billion.

$1.78 of GDP per $1 Invested

The Canadian Centre for Policy Alternatives 2009 report suggested a slightly higher multiplier effect for public infrastructure spending, when it concluded that $1 billion spent on infrastructure stimulus would increase GDP by $1.78 billion.

6.0 Schedule and Cashflow by Delivery Program

After careful consideration and discussions with key stakeholders as well as inputs from industry contacts, it has become apparent that Closing the Infrastructure Gap by 2030 is highly unlikely. Due to external factors such as the cost of materials, the current inflationary environment, a persistent shortage of construction labour, and the scale of the infrastructure gap, a timeline to the year 2040 is more feasible. This approach has informed the development of our schedule and cashflow deliverables included in this report.

6.1 Implementation Schedule

Development of the schedules for each region is based on a number of factors including differing construction methodologies, First Nation community priorities, and total anticipated capital spend.

Each asset category has been grouped, as best as possible, into one of three following construction methodologies:

- **Prefabricated:** Prefabricated construction and variations of it are recommended for new buildings;
- **Linear:** Linear infrastructure, such as roads, services, including digital connectivity and transmission lines, which have the potential to be constructed concurrently with one another; and
- **Infrastructure and Renovation:** Projects that are less susceptible to standardisation or tend to be "one-off", such as civil projects (Wastewater plants, water treatment plants, airstrips), renovation of existing assets or climate resilience initiatives.

Grouping projects by construction methodology into defined packages allows for construction efficiencies, where possible. Applying this to the sequencing of projects results in three defined sections of the schedule.

As defined in Section 2.2, each of the asset categories has been allocated a priority level and this formed the basis of the project sequencing, ensuring that higher priority projects are scheduled to be delivered as early in the process as possible. This priority level sequencing is evident within each construction methodology section.

Anticipated durations for each of the projects have been defined for planning, design and approvals, procurement and construction. Such durations were determined initially based on anticipated capital expenditure and further fine-tuned using any additional information known at this time, as well as comparable benchmarking data.

The timing for delivery of all projects within each of the construction methodology categories has been further reviewed from an anticipated capital spend perspective. The reason for this is two-fold; to ensure market capacity to absorb the proposed volume of work, as well as maintaining a consistent spend approach in line with the cashflow. For instances where multiple projects were originally scheduled to occur concurrently, the timelines were shifted but remain aligned with the defined priorities.

The implementation schedules for each of the regions can be found in Appendix 2.

The Argument for Prefabricated Construction

The CTIG program represents a major challenge to Canada, to plan, finance and execute $349.2 billion of work, regardless of whether the deadline is 2030 or 2040.

Achieving this goal will require close collaboration with government, First Nations and the private sector to mobilize resources on a massive scale over multiple years. The industrialisation of the CTIG process offers the best chance of success. This means maximising off-site construction through prefabrication to make the best use of available resources.

Prefabricated construction is typically classified according to the degree of completeness of the adopted solution[5]:

- Full prefabricated buildings/systems: Completely fit out sections of a building (e.g., a fully finished hotel room or sections of a hospital patient wing); these are turnkey, fully finished products that are simply put in place and connected.
- Prefabricated components: Hotel or hospital bathroom pods, electrical rooms, central energy plants/central utility plants.
- Assemblies: Hospital patient room headwalls and footwalls, multi-trade Mechanical/ Electrical/ Plumbing racks (vertical and horizontal), exterior skin panels, etc.
- Sub-assemblies: Corridor top out walls, panelized roof systems, pre-clad frame systems (for items like trash enclosers, equipment screens, gates, fences, etc.), temporary items (formwork, enclosers, safety items, protection, access), etc.
- Kit of parts: While some prefabricated components are delivered to the site assembled and ready for installation, another option is to break components down into a “kit of parts” that can be easily assembled onsite to increase efficiency.

The advantages of industrialized, off-site construction include:

- Shorter construction times: some form of foundation and servicing is still required on-site, but on-site construction time and labour-force requirements are reduced. This is especially important in remote areas with short construction seasons.
- Greater cost certainty: through fewer mid-project changes and weather delays, and fewer on-site injuries.
- Reduction of waste and higher quality: due to design optimization and careful planning of the production process.
- Scale and production: opportunities for scaling up and mass-producing complete modules or components, providing economies of scale, including bulk purchasing of materials and equipment.

[5] Source: Building Design and Construction, “What Makes Prefabrication Work?”, Brian Burkett, April 10, 2023

Understanding the current condition of assets on reserves is fundamental to establishing an implementation plan for CTIG. Using such information, the gap between “what is” and “what should be” can be clearly identified. Substantial work on this issue has been undertaken by ISC and included in its infrastructure needs analysis by Associated Engineering (AE), which was incorporated in the first CTIG report. Since then, AE has developed a model First Nations community of 1,000 inhabitants, outlining all the physical facilities and their costs. The full suite of facilities would require a capital investment of close to $1 billion (in 2023 dollars) and would require $80 million annually for operations and maintenance.

Specifications for such a model community need to be flexible enough to accommodate variations for size of community, and regional and cultural differences. Nonetheless, there is an opportunity to standardize entire buildings having the same function or specific modules within them and then producing these modules in industrial facilities.

Canada already has capacity in prefabricated and panelized construction, due largely to its need for temporary buildings in remote locations. Large, temporary work camps are regularly built at, for example, major dam construction sites such as Site C in British Columbia or the Keeyask Dam in Manitoba. Additional resilience can be built into these modules as required so that their life expectancy is equivalent to site-built structures. Modules are produced in Canada for a variety of building types, such as schools, student accommodation, hotels and nurses’ residences. There is also opportunity for hybrid solutions: the work crew required to assemble the modules on site may also be employed to install foundations and complete finishing and utility hook-ups.

The existing capacity of the prefabricated and panelized construction industry in Canada will need to be ramped up substantially to supply the need for delivering infrastructure works at scale for First Nations. This may require direct government investment, but a well-conceived program, with the promise of a steady stream of work over multiple years, would provide sufficient incentive for private-sector investment. Apart from the primary goal of achieving the required upgrades to the First Nations’ living conditions, the benefits of such an approach to Canada could be substantial, including:

- Establishing greater added value for Canadian wood that is in increasingly short supply;
- Placing prefabrications plants in locations needing economic stimulus; and
- Establishing Canada as a world leader in prefabricated and panelized construction.

A key variable in the economic viability of prefabrication is transportation costs, so careful planning of plant locations and road access to reserves would be required. Larger buildings would require more constituent modules due to limitations on load size. Despite transportation challenges, it is a truism of this industry that the more remote a location, the more it makes sense to use prefabricated construction as the costs associated with bringing in materials and providing for workers outstrip the diseconomies of factory construction and transportation. Given the population distribution of on-reserve First Nations, i.e. that 78% of the First Nations population is located on Zone 1 and 2 reserves, it could be argued that this strategy is economically appropriate only for Zone 2 and 3 reserves. In response, the overriding imperative is to achieve the goals of the CTIG program and a cost premium (of perhaps 10%) on southern reserves is a reasonable price to pay given the severity of the problem.

6.2 Cashflow Analysis

Following the production of the implementation schedule and cashflow, it has become apparent that with consideration of the topics discussed in this report, it is now necessary to extend the delivery schedule from 2023-2030 to 2024 -2040. This significantly impacts the total budget for the CTIG program.

The impact of this change to the implementation schedule includes additional inflation for both Capital and Operations and Maintenance costs. The following forecast escalation percentages have been used for the purpose of calculating the likely cost of construction in future years:

Escalation Forecast	2023	2024	2025	2026	2027	2028	2029	2030
Escalation Rate	7.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
	2031	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038 - 2040**
	3.0%	3.0%	5.0%	6.0%	5.0%	3.0%	3.0%	3.0%

Canada has been experiencing record increases in construction costs over the past two years, including a cumulative 25% increase in residential costs in Toronto and Vancouver. The current tightening of the cost of lending by the Bank of Canada is now influencing the economy in general and the construction industry in particular. A gradual return to the desired inflation rate of 1-3% annually is expected, but there is still sufficient demand in the economy to keep the escalation rate for 2023 in the 6-8% range. 2024 will see continuing improvement in supply chains and lower demand for labour, with the escalation rate reducing to 4-6%. For 2025 and after, the rate is expected to trend back toward the desired inflation range of 1-3%, but for construction the annual rate will remain at the top end of this range due to demand factors, particularly population growth and labour shortages. In the longer term, a cyclic bump in escalation is expected in the mid-2030s.

BTY Group is a leading and widely recognized authority on escalation trends and forecasts and has been publishing its provincial forecasts for the industry in Canada since 2004, as well as providing escalation advice to federal and provincial agencies and the private sector. These forecasts are available from BTY's Market Intelligence Report at BTY.com.

Annual expenditure

The following table shows the total annual expenditure for Capital, and Operational and Maintenance budgets between 2024 and 2040.

6.3 Cost Premium of Delaying Closing the Gap from 2030 to 2040

The Budget 2023, announced by the Government of Canada in March 2023, did not include any provisions for the CTIG mandate. As a result, the available time to close the gap is getting shorter. Considering the magnitude and complexity of this mandate, it is advisable to extend this timeframe.

However, expanding the timeframe of the CTIG mandate will result in cost increases to the program as inflation and the resulting cost escalation of the construction industry impacts the pricing of materials, labour, and overall project delivery. In addition, the cost of the program continues to rise due to the significant age of existing infrastructure, most of which requires significant capital to operate and maintain.

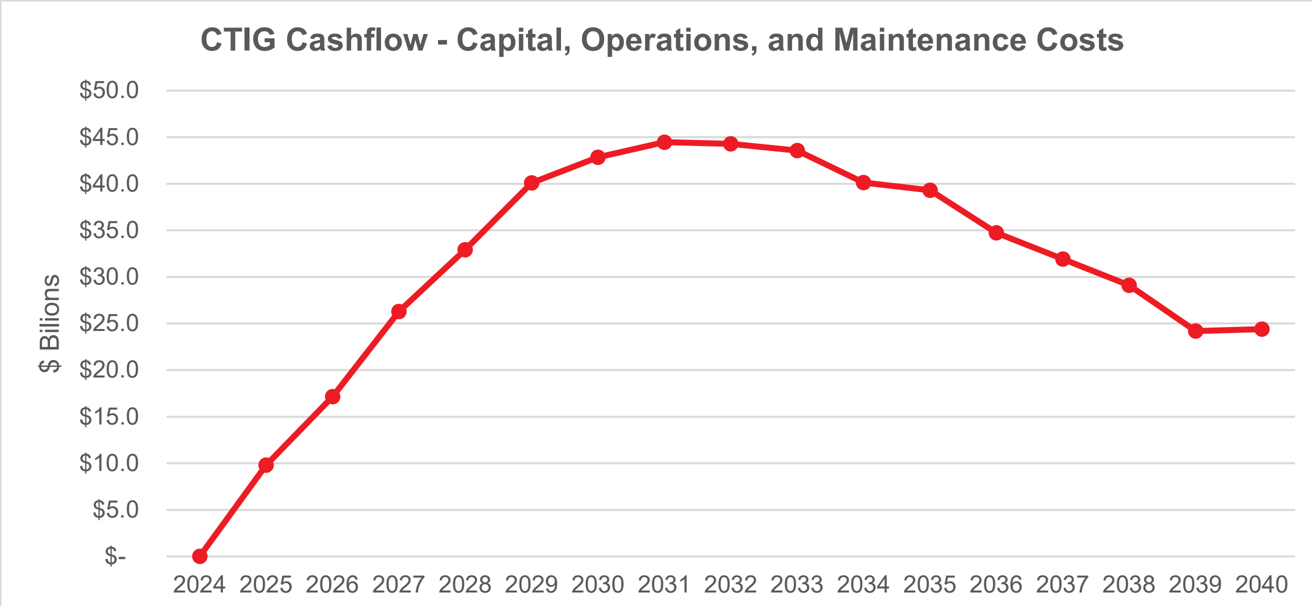
Region	CTIG to 2030	CTIG to 2040
Alberta	$49.3 billion	▲ $73.4 billion
British Columbia	$70.7 billion	▲ $113.7 billion
Manitoba	$48.0 billion	▲ $84.2 billion
Yukon/Northwest Territories	$28.4 billion	▲ $43.7 billion
Atlantic Canada	$15.0 billion	▲ $24.9 billion
Ontario	$58.9 billion	▲ $80.9 billion
Quebec	$28.1 billion	▲ $45.4 billion
Saskatchewan	$50.8 billion	▲ $61.7 billion
Total	**$349.2 billion**	**▲ $527.9 billion**

The primary reason for the cost variance between what is presented in this report and our Phase 1 study, is as follows:

- Significant changes to assumptions regarding implementation and delivery schedule.
- Changes to Implementation Schedule impacts the escalation allowances, resulting in an increase to the Capital Cost budgets for all asset classes and regions.
- O&M costs have been included up until 2040, this is an increase of 10-years to the previous forecast cashflow presented.
- Digital Connectivity scope now includes O&M, and a more informed Capital scope, following the completion of Digital Connectivity Phase 2 study. Refer to Appendix 1 for further details.

Annual expenditure

The following table shows the total annual expenditure for Capital, and Operational and Maintenance budgets between 2024 and 2040.



Region	Closing the Infrastructure Gap Cashflow Summary (2023 to 2032, $ Billions)									
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BC	-	$0.59	$1.7	$3.3	$5.0	$6.3	$8.1	$8.6	$8.6	$8.5
AB	-	$0.29	$1.2	$2.6	$4.1	$4.9	$5.8	$6.0	$6.4	$6.6
SK	-	$0.33	$1.1	$1.8	$2.7	$3.5	$4.5	$4.7	$5.0	$5.0
MB	-	$0.36	$1.5	$2.8	$4.4	$5.6	$6.5	$6.9	$7.2	$7.3
ON	-	$0.41	$1.4	$2.4	$3.8	$4.9	$5.9	$6.3	$6.6	$6.7
QC	-	$0.24	$1.0	$1.8	$2.9	$3.4	$3.7	$3.8	$3.9	$3.8
ATL	-	$0.13	$0.69	$1.1	$1.8	$2.1	$2.2	$2.4	$2.3	$2.1
YK/NWT	-	$0.25	$1.1	$1.2	$1.6	$2.2	$3.6	$4.3	$4.4	$4.3
Total	-	$2.6	$9.8	$17.2	$26.3	$32.9	$40.1	$42.9	$44.5	$44.3

Region	Closing the Infrastructure Gap Cashflow Summary (2033 to 2040, $ Billions)								
	2033	2034	2035	2036	2037	2038	2039	2040	Total
BC	$8.7	$8.6	$9.5	$9.4	$8.2	$7.4	$5.6	$5.6	$113.7
AB	$6.5	$6.5	$5.6	$4.3	$4.1	$3.2	$2.6	$2.7	$73.4
SK	$4.7	$4.5	$4.9	$4.9	$4.4	$3.6	$3.0	$3.1	$61.7
MB	$7.2	$6.9	$6.4	$5.0	$4.8	$4.6	$3.4	$3.4	$84.2
ON	$6.5	$6.0	$6.2	$5.8	$5.5	$4.8	$4.0	$3.8	$80.9
QC	$3.8	$3.5	$3.3	$1.9	$1.9	$2.1	$2.2	$2.2	$45.4
ATL	$2.1	$1.4	$1.0	$1.0	$1.0	$1.2	$1.2	$1.2	$24.9
YK/NWT	$4.2	$2.8	$2.4	$2.5	$2.1	$2.2	$2.3	$2.4	$43.7
Total	$43.6	$40.1	$39.3	$34.7	$31.9	$29.1	$24.2	$24.4	$527.9

Closing the Infrastructure Gap
The Cost of Inaction

CTIG 2030 Program **$349.2 billion**	CTIG Extended to 2040 **$527.9 billion (+51.17%)**
Housing: $135.1 billion	Increases to $201.5 billion (+49.1%)
Infrastructure: $59.5 billion	Increases to $104.8 billion (+76.1%)
Education: $12.6 billion	Increases to $23.6 billion (+87.3%)
First Nations Direct Asks: $55.4 billion	Increases to $62.6 billion (+12.9%)
Accessibility: $1.6 billion	Increases to $2.0 billion (+25%)
Connectivity: $5.2 billion	Increases to $9.9 billion (+90.4%)
Net-Zero Carbon: $12.7 billion	Increases to $15.4 billion (+21.3%)
Climate Adaptation: $30.9 billion	Increases to $51.5 billion (+66.7%)
All Season Roads: $35.5 billion	Increases to $54.1 billion (+52.4%)
Drinking Water Advisories: $0.7 billion	Increases to $2.5 billion (+357.1%)

7.0 Connectivity Study

Broadband services of at least 50 Mbps downstream and 10 Mbps upstream (50/10) and cellular service are essential to everyday life in Canada — especially for modern educational and entrepreneurial opportunities. Most Canadians today enjoy access to such digital services to improve their quality of everyday life, but for 609 First Nations across Canada with no or only one of either broadband or cellular service, this is still not the case. Large numbers of First Nations communities in each province and territory lack connection to these vital digital services, which impacts healthcare and education services, as well as business and employment opportunities.

The Government of Canada has publicly committed to the goal of connecting 98% of Canadians to highspeed internet by 2026 and of connecting 100% of Canadians by 2030. First Nations, who are over-represented in Canada's digital connectivity gap, must not be neglected as part of Canada's goal of achieving 100% digital connectivity by 2030.

7.1 Intent of Previous Study

The previous Connectivity Study uses publicly available data to identify the extent of the wired and wireless infrastructure gaps in First Nations and provides capital budgets to resolve the gaps and ensure every First Nation has:

- A fibre backbone to the Internet;
- Fibre-to-the-home (FTTH) last mile; and
- Long Term Evolution (LTE) or 5G mobility services.

This study assessed the infrastructure in place for 50 Mbps downstream and 10 Mbps upstream (50 /10) and mobility services for First Nations. The infrastructure gap was identified at $5.2 billion and of all the First Nations communities studied, only 20 communities have the three infrastructure elements of fibre backbone, FTTH last mile and LTE Mobility services in place or have funds to put in place. At this stage the Operations and Maintenance costs were excluded.

7.2 Current Study Methodology

To determine the infrastructure gaps, Planetworks compiled a database of First Nations which summarizes the available infrastructure as reported in publicly available databases. This database was shared with Innovation Sciences and Economic Development (ISED) Canada which augmented the data with additional information on service providers, cellular coverage, and the status of ISED managed projects. This data was used to identify the extent of the broadband and cellular infrastructure gaps in First Nations and to develop capital (Capex) and operational (Opex) expenditures to resolve the gaps and ensure every First Nation has the following three telecommunications infrastructures necessary to close the gaps:

- A fibre backbone to the Internet;
- Fibre-to-the-home (FTTH) last mile; and

- At least Long-Term Evolution (LTE), but for new builds, the latest cellular technology commercially available, (referred to collectively throughout as Cellular).

Further to the costing approach described in Appendix 1, BTY made the following adjustments to derive an appropriate total project budget.

- Included 20% Design Contingency and 10% Construction Contingency
- Appropriate escalation to the anticipated year of expenditure.

Please refer to Section 7.3.1 of this Report which summarises the total Capital and O&M Budgets for Digital Connectivity.

7.3 Key Findings

The key findings from this study are summarized below:

57% of Communities need Cellular Infrastructure

81 Communities require an estimated 12,280 km of fibre backbone plant to be built (Average of 151 km per community)

74% of Communities need FTTH Infrastructure

457 Communities have no broadband or FTTH projects planned
57 Communities meet 50/10 using last mile technology that will require replacement by 2030
36 Communities where less than 75% of the dwellings are served with FTTH

48% of First Nation communities lack adequate broadband or cellular services

Please note: each of the three infrastructure areas – backbone, FTTH or Cellular are built independently. It is possible for a community to be missing infrastructure in more than one infrastructure category.

Please refer to Appendix 1 for additional detailed information.

7.4 Cost Table

Capital and O&M Budget

The following table summarises the Capital funding requirement necessary for every First Nations community to have a fibre backbone, FTTH wired last mile and LTE or 5G mobility services.

Closing the Infrastructure Gap 2040 (millions)	2024	2025	2026	2027	2028	2029	2030	2031	2032
Connectivity									
Capital Cost Connectivity	$0	$562	$579	$864	$1,087	$1,120	$1,153	$1,123	$946
O&M Cost Connectivity	$31	$32	$33	$34	$35	$91	$94	$97	$100
TOTAL COST	**$31**	**$594**	**$612**	**$898**	**$1,123**	**$1,211**	**$1,247**	**$1,220**	**$1,046**
Closing the Infrastructure Gap 2040 (millions)	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**Total (millions)**
Connectivity									
Capital Cost Connectivity	$196	$0	$0	$0	$0	$0	$0	$0	$7,630
O&M Cost Connectivity	$105	$111	$233	$240	$247	$255	$262	$270	$2,271
TOTAL COST	**$301**	**$111**	**$233**	**$240**	**$247**	**$255**	**$262**	**$270**	**$9,901**

The Previous Digital Connectivity Study and the subsequent Cost Report identified a budget of $5.2 Billion Digital Connectivity Budget to close the wired and wireless infrastructure gap. The previous study excluded Operational and Maintenance Costs, and assumed all works could be completed by 2030, therefore only included escalation up too 2030.

The latest Digital Connectivity Study and this Prioritization and Implementation Plan includes revised Billion Digital Connectivity Budget to close the wired and wireless infrastructure gap, as presented above. This totals $9.9 billion. This revised Digital Connectivity Budget includes both Capital and Operational and Maintenance budgets, whilst being delivered over a longer time horizon, therefore including additional escalation compared with the previous, and includes Operational and Maintenance budgets up to 2040. This is the reason for the significant increase between our Cost Report and Prioritization and Implementation Plan.

8.0 Closing Remarks and Next Steps

While this report has identified the additional cost escalation that will accrue with delaying the implementation of CTIG to 2040, there is further work to be done to consolidate and price the physical impacts of this delay. There is data readily available for this exercise, the studies undertaken by members of AFN's consulting team have made forecasts of capital and O&M investment required to 2040. These studies capture the additional costs of asset deterioration after 2030, which should be incorporated in the financial analysis of the cost of implementation delay.

On analysis of the need, there is still work to do on clarifying the status of FN assets, beyond the data currently available from ISC. This requires a large-scale facility assessment exercise, which will better define the baseline from which CTIG has to start. This will also be an ongoing exercise that will monitor progress on CTIG and identify where progress is being made or lagging.

This report has identified criteria that will determine the financial capacity of FNs to finance the CTIG. A useful further step in enabling FNs to finance projects would be to clarify where each FN sits on the financing spectrum, from requiring 100% social transfers at one pole to being able to fully self-finance at the other. This could be done from the viewpoint of government in assessing the potential exposure of levels of government to equity financing and loan guarantees and from the viewpoint of private lenders in assessing the riskiness of proposed financing structures.

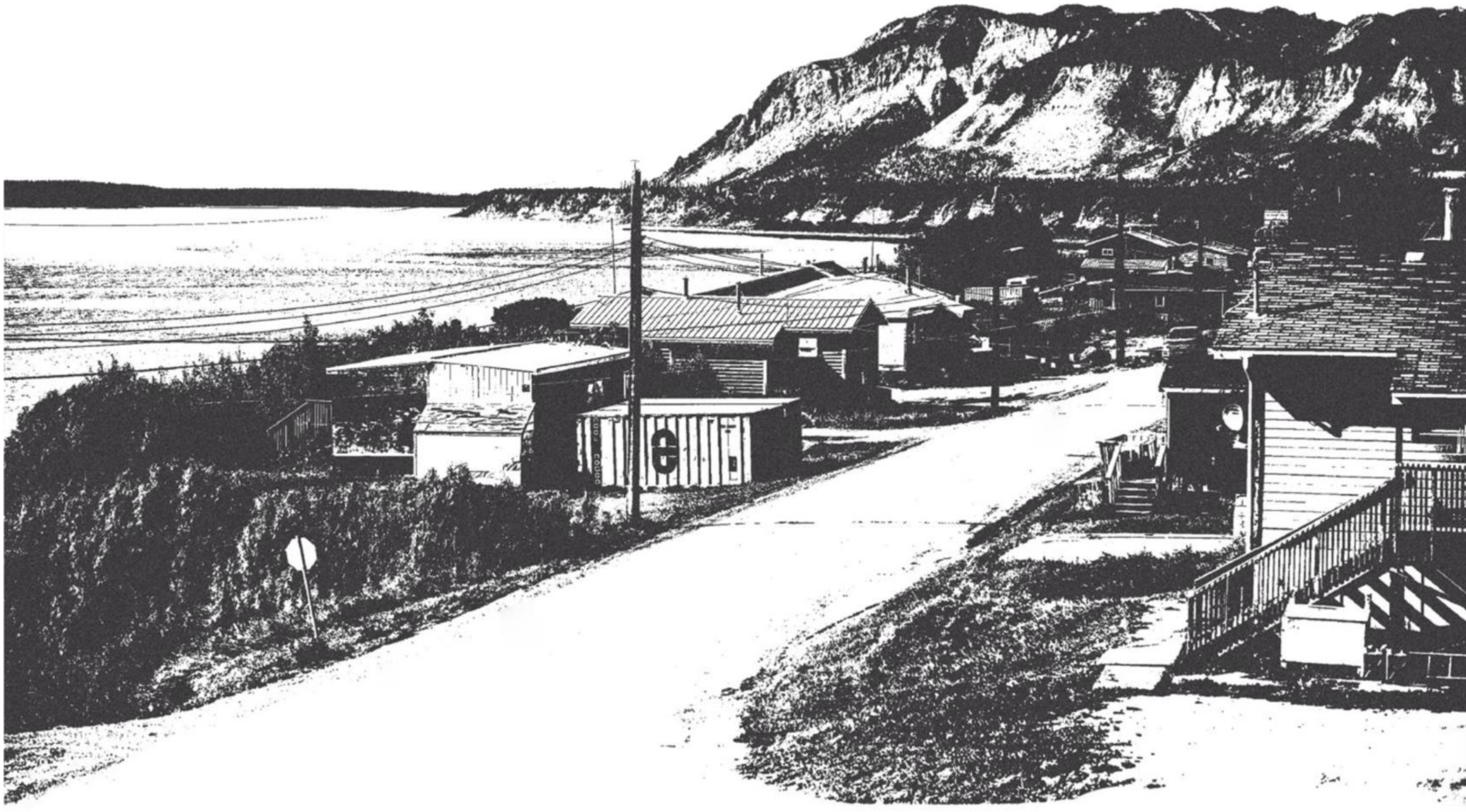
There is considerable interest among FNs and government bodies in regional needs, how they differ and how they are reflected in cash flows. While valuable information can be gleaned from ISC’s 2022 survey, much of the distribution of costs among regions has been done through pro ration by FN population. Greater refinement of these figures would allow better planning of regional programs.

This report touches on a series of issues that are key building blocks in establishing priorities and planning the implementation of CTIG, but as has been stated repeatedly, can only scratch the surface of such a large undertaking. There are many more steps to be taken before this program can be realized, many of them at government level, in showing their willingness and motivation to address this issue aggressively and close the infrastructure gap.

CLOSING THE INFRASTRUCTURE GAP BY 2030
PRIORITIZATION AND IMPLEMENTATION PLAN

Appendix 1

PLANETWORKS – TELECOM INFRASTRUCTURE ANNEX PHASE 2



Contents

1.0 Executive Summary

Broadband services of at least 50 Mbps downstream and 10 Mbps upstream (50/10) and cellular service are essential to everyday life in Canada — especially for modern educational and entrepreneurial opportunities. Most Canadians today enjoy access to such digital services to improve their quality of everyday life, but for 609 First Nations across Canada with no or only one of either broadband or cellular service, this is still not the case. Large numbers of First Nations communities in each Province or Territory lack connection to these vital digital services which affect their socioeconomic outcomes and impede the operational development of both health and commercial facilities on their lands.

The Government of Canada has publicly committed to the goal of connecting 98% of Canadians to highspeed internet by 2026 and of connecting 100% of Canadians by 2030. First Nations, who are over-represented in Canada's digital connectivity gap, must not be neglected as part of Canada's goal of achieving 100% digital connectivity by 2030.

To determine the infrastructure gaps, Planetworks complied a database of First Nation communities which summarizes the available infrastructure as reported in publicly available databases. This database was shared with Innovation Sciences and Economic Development (ISED) Canada which augmented the data with additional information on service providers, cellular coverage, and the status of ISED managed projects. This data was used to identify the extent of the broadband and cellular infrastructure gaps in First Nation communities and to develop capital (Capex) and operational (Opex) expenditures to resolve the gaps and ensure every First Nation community has the following three telecommunications infrastructures necessary to close the gaps:

- A fibre backbone to the Internet
- Fibre-to-the-home (FTTH) last mile, and
- At least Long-Term Evolution (LTE), but for new builds, the latest cellular technology commercially available, (referred to collectively throughout as Cellular).

The infrastructure gap is extensive and totals before annual escalation, $4.51 Billion. The on-going annual operational costs are estimated at $82.4 Million. The tables summarize the situation.

Infrastructure Gap at a Glance	
81 Communities require a Fibre Backbone	*11% of communities* **81** require an estimated 12,280 km of fibre backbone plant to be built or an average of 151 km per community
550 Communities require FTTH infrastructure	*74% of communities* ○ **457** have no broadband or FTTH projects planned ○ **57** meet 50/10 using a last mile technology other than FTTH that will require replacement by 2030 ○ **36** where less than 75% of the dwellings in the community are served with FTTH and additional Capex is required for all dwellings to be served
430 Communities require Cellular infrastructure	57% of communities ○ **419** require communication towers ○ **11** have 3G service today and require an electronics upgrade
Each of the three infrastructure areas – backbone, FTTH or Cellular are built independently. It is possible for a community to be missing infrastructure in more than one infrastructure category.	

Table 1 - Infrastructure Gap at a Glance

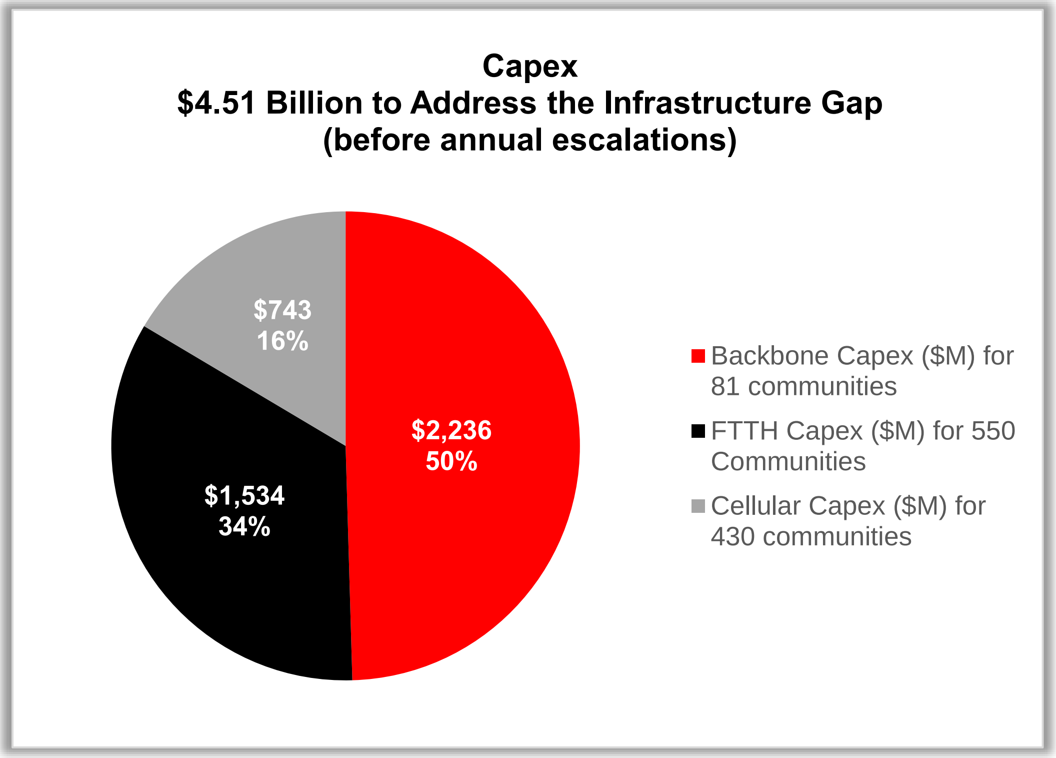


Figure 1 - Capex to Address Infrastructure Gap

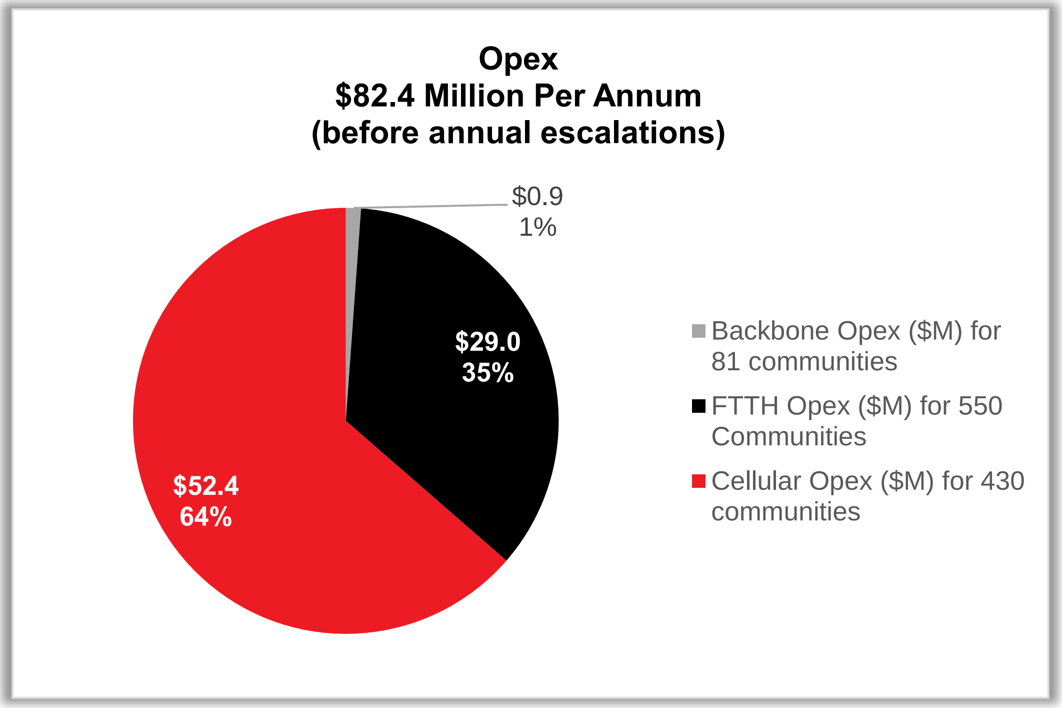


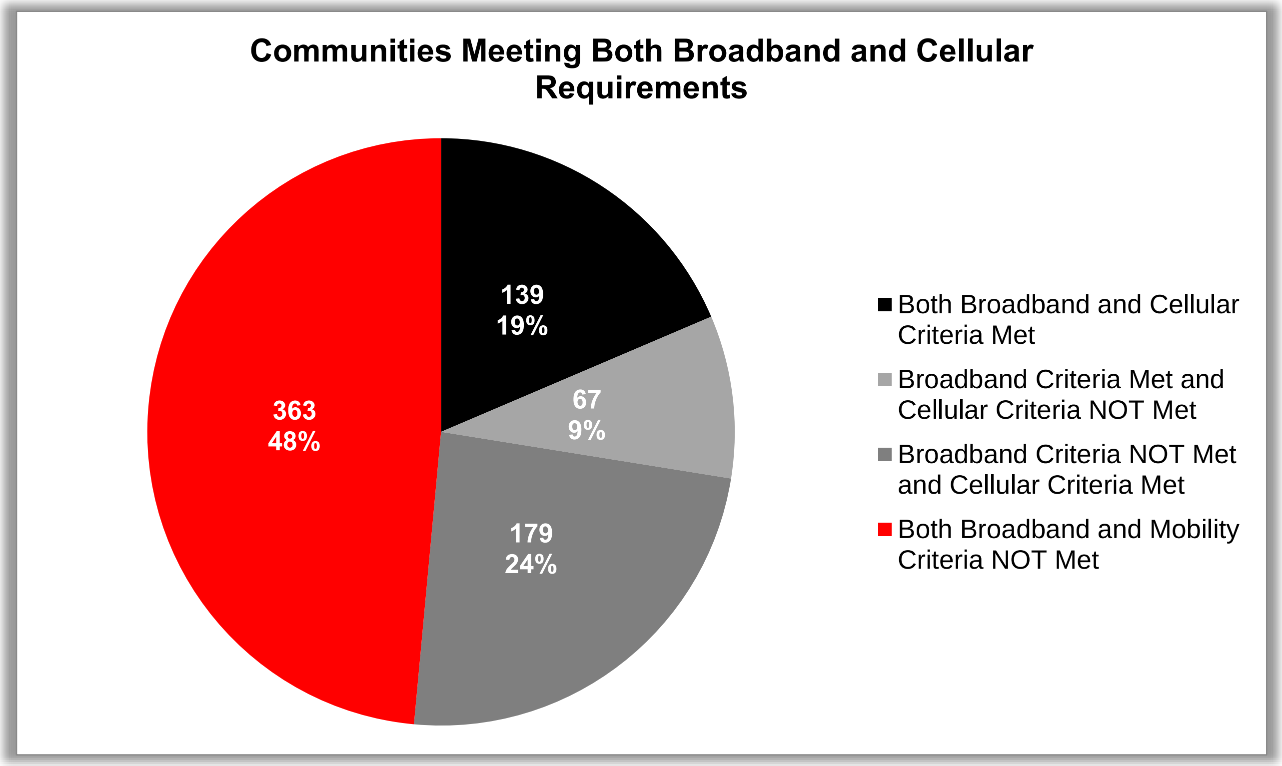
Figure 2 - Opex Per Annum to Support the New Infrastructure

The budgets presented in Figure 1 and Figure 2 represent the direct Construction Cost in 2023 only, and exclude contingencies and escalation. As such, please refer to the CTIG 2030 – Prioritization and Implementation Plan Report which considers the implementation of the scope described in this report to determine a total Digital Connectivity Budget to close the wired and wireless infrastructure gap across Canada.

Various funding programs have been in place since 2019 with only limited success at closing the connectivity infrastructure gap. Unlike other infrastructures, the fibre and cellular infrastructures are not community owned utility infrastructures but are infrastructures owned by each service provider. If multiple service providers offer service within a community, there will be multiple networks within the community, one per service provider. Furthermore, the broadband and cellular industries are highly competitive, driven by revenues, and service into new areas are set by economics associated with revenues against the total cost of ownership to build and operate the infrastructure, commonly referred to as the business case.

For First Nations communities, the majority of which are small and isolated, the business case is difficult even with Capex grants. A community is classified having broadband service if 75% of the dwellings within a community meet the 50/10 broadband criteria, and for cellular services, the cellular criteria is met when 75% of the roadway has LTE or 5G coverage. The situation is summarized in the chart below.

Figure 3 - Community Service (Broadband and Cellular)



Only 139, 19% of the 748 First Nation communities studied, meet both the criteria for 50/10 broadband and cellular services. This may be optimistic as the cellular service is based on roadway coverage and not the desired, in-building coverage.

Considering that 609 of the 748 First Nation communities, split 363 with neither broadband nor cellular services and 246 with only one of either broadband or cellular services, need infrastructure and that the current project duration for FTTH is 4-5 years, the 2030 goal to close the infrastructure gaps seems highly unlikely while timelines like 2040 may be more realistic. Changes are required to help accelerate the build-out and address the First Nations socioeconomic disparities attributed to the connectivity gaps. The following summarizes key changes and recommendations to be addressed with ISC, ISED, the CRTC, the federal government and others on behalf of underserved First Nation communities to help close the connectivity infrastructure gap closer to 2030.

1.1 Change Funding Eligibility and Include Provisions for Opex

The broadband funds follow a 90 / 10 Capex split for First Nations communities meaning that the grant addresses 90% of the Capex for a 10% match. With this funding split in place, 20% of the First Nations in the study meet the 50/10 broadband criteria with FTTH and another 14% percent either have projects in flight or meet 50/10 with a technology other than FTTH, leaving 66% or two thirds of First Nations communities with no plans for 50/10 or better. These underserved communities are located within 350km from the closest major service and have less than 200 dwellings where even with 100% Capex funding, there is no business case for service providers to provide their service. Furthermore, most of these communities do not have the funds available for the 10% match. The grants, as currently structured, do not address the service providers' Opex. ***Changes are recommended to cover the 10% match for broadband projects and address some Opex costs for a set period.***

1.2 Open Funding Streams for In-Community Cellular Coverage

There has been minimal funding to date for cellular projects and these have been focussed on highway coverage, a significant policy issue for First Nations due to the Missing and Murdered Indigenous Women, Girls and 2 Spirited People (MMIWG2S+), lost along highways stretches like BC's Highway of Tears between Prince George and Prince Rupert. The focus on funding cell coverage along highways and not within communities is problematic given the importance that First Nations place on cellular coverage. Most First Nation communities equate cellular service with citizen safety ***both*** within their community and when travelling outside their community. Cell phones and tablets are the defacto internet devices and the dominant devices used to access government-based services. Based on the ISED data which tracks roadway coverage, 56% of communities do not have cellular coverage in-community and this number may be higher when in-building coverage is addressed. There is no business case for service providers to extend cellular service; and, additionally, while cellular service is a priority, it is a more difficult business case to make than that for broadband. Furthermore, cellular services have significantly more Opex than broadband and any funding solution should address Opex for a set period, ideally pre-paid, with the Capex tranches to simplify on-going administrative and overhead costs. There may be opportunities for multiple programs to address cellular services as Planetworks knows of at least two First Nations communities that are building First Nations owned communications towers using ISC infrastructure funding. ***Changes are recommended to establish funding streams for in-community cellular coverage that addresses both Capex and pre-paid Opex costs for a set period***.

1.3 Shorten Funding Approval Timelines

Depending on the funding stream, the period between when the application in-take closes and when the parties reach an executed contribution agreement ranges from 18 months to two years. For FTTH which takes typically 3 years to complete, the approval process adds another 18-24 months to the overall deployment making the project 40% longer than if privately built and adds significant risk to project costs and project resourcing. By reducing the approval processes to 6 months, more projects can be completed with greater certainty. ***Changes are recommended to reduce the funding approval processes to no more than six months.***

1.4 Investigate Solutions for Interim Broadband Relief for Communities with No Service

Including the 18-24 months needed by the Funders to reach executed contribution agreements with the funding applicants, the typical time now to build out FTTH is 4 - 5 years. With this duration for the approval and build processes, there are clearly not enough First Nation communities with approved projects in the queue to close the broadband gap by 2030. Even if all the remaining underserved First Nations communities submit applications for funding in 2023 and get these approved by 2025 - an unlikely event - there are simply not enough skilled workers to address this additional workload alongside the workload needed for the urban centres. Consequently, interim solutions need to be investigated. It takes significantly less time to build a cell tower than to deploy FTTH.

One possible interim solution is to marry the communities' desires for in-community cellular services with 50/10 broadband and use the same infrastructure to deploy both cellular services and 50/10 fixed wireless access while the FTTH infrastructure rolls out. Other interim solutions may involve offering subsidies for Starlink, a retail Low Earth Orbit (LEO) satellite service, and for other wholesale LEO satellite services to bridge the 50/10 broadband gap to dwellings and the backbone connectivity respectively. (It should be noted that the latter funding solution is being offered service providers with the current CRTC Broadband Fund application intake closing April 2023).

A third option may be the use of cell phones on LEO satellites for short message emergency communication, currently being touted by Apple with the iPhone 14 but expected to be available with other phones soon. First Nations can use an iPhone 14 or other phones with similar capabilities for emergency communications to provide interim relief for safety along highways with no cell coverage. As the identification and costing of interim measures are outside the scope of this activity, ***we recommend that a range of interim solutions be fully developed and costed.***

1.5 Participate in the Oversight of Rogers' Benefits for Acquiring Shaw

Rogers' benefit package for acquiring Shaw is an excellent opportunity for underserved First Nations communities in Western Canada. It is expected that the acquisition of Shaw will complete in 2023 and when it does complete, ***we recommend that the Assembly of First Nations (AFN), Rogers and the CRTC be ready to define which Western Canadian First Nation communities will get both broadband and cellular services addressed under Rogers' benefits package, and to set up a stakeholder steering committee that provides oversight of and ensures Rogers' completion.*** For reference the two key promises are repeated here:

Investments to Create Jobs and Connect Communities

- *Rogers to invest $2.5 billion to build 5G network in Western Canada, driving economic growth and strengthening innovation sector*
- *New $1 billion fund dedicated to connecting rural, remote and Indigenous communities to high-speed Internet across the four Western provinces*

1.6 Leverage Government's Telecom Buying Power

Government is a significant user of telecom services generating significant revenues for telecom service providers and has great buying power that can be leveraged to aggregate the connectivity needs of many communities at once. To accelerate the roll out of broadband and cellular services to underserved First Nations, government can use their buying power combined with the many available funding streams, to get the new networks constructed. To offset Opex concerns by the service providers, government could act as the anchor revenue tenant on the new networks and move their data and cellular connectivity requirements within the area to the new network. This could be negotiated under an area-wide Request-for-Proposal. ***We recommend that Government leverage their buying power and use their data and cellular traffic as anchor revenue to advance connectivity to groups of First Nations communities.***

1.7 Develop Annual Quotas for Service Providers to Connect Unserved First Nations

Since the business cases to serve small First Nations communities are difficult, service providers who exist within a highly competitive ecosystem will always serve more lucrative, higher density areas first. Even with 100% Capex and some Opex grants available to the community or service provider, it will be difficult for First Nations communities to attract service providers without some driving incentive or obligation. This is where the CRTC or ISED may be helpful. The CRTC or ISED could place a quota requirement on service providers as part of their serving obligations, to have to demonstrate annually the number of First Nations communities, previously unserved, that they have connected within the reporting year with either cellular or FTTH. This will help motivate the service providers to actively find connectivity solutions for underserved First Nations communities. ***We recommend that the CRTC or ISED develop quotas for service providers to add unserved First Nations communities annually to their networks with cellular coverage in-community and FTTH.***

1.8 Create Incentives for Service Providers to Develop First Nations' Telecom Capacity

All the large service providers which participated in the interviews expressed interest in developing capacity within the First Nations to address the telecommunication skills necessary to support local community networks. However, except for Northwestel, none had implemented any programs to date. ***We recommend that incentives are established for all service providers to advance capacity building within First Nations and given the importance of developing local talent to the sustainability of remote networks, a fund of $500M be established to support capacity building.***

1.9 Strike a Task Team to Investigate Spectrum Ownership

Spectrum refers to blocks of airwaves. There has been considerable work among First Nations communities with ISED and others regarding ownership of the airwaves above their communities. Decisions are expected in 2023 which will have a significant impact on First Nations and will potentially give First Nations communities the first step into opportunities to extend cellular and broadband solutions to their communities. ***We recommend that if not struck already, the AFN strike a task team to track policy decisions and to review technology options that will help First Nation communities acquire, control, and use their airwaves.***

1.10 Continue Refining the Data Accuracy

The data is this report is based on a combination of publicly available data and ISED's data for LTE coverage along roadways. Most of the data is self-reported, meaning that it is only as accurate or as timely as the information provided to the authorities by the service providers. Planetworks has encountered situations within their client base where the community is recorded in the publicly available data as meeting the 50/10 criteria and clearly within the community, the service is sub 50/10. We have found other instances where the cellular service is LTE but it is so over-subscribed that the users can barely use the service. It is extremely important therefore to confirm the data within the database with actual user experience and this can only be effectively done by the communities themselves.

The next steps involve engaging First Nation communities to collect information at the community level to confirm everything from permanent dwelling counts to community boundaries, necessary for Capex planning exercises by service providers and to verify speed performance for broadband networks and for cellular networks, speed performance in-community both outdoors and indoors.

2.0 Acknowledgement of Third-Party Participation

In order to compile the information in this report, Planetworks, BTY and the AFN met with many parties, many multiple times throughout December 2022 to January 2023 to get their views and assistance including:

- ISED
- ISC
- CRTC
- BC Government Citizen Services
- TELUS
- Bell
- Bell Mobility
- Rogers
- Northwestel
- CIRA
- Arrow Technologies
- Clear Sky Communications

We are grateful to all those who participated in this study. Your participation was helpful and much appreciated.

3.0 Introduction

While most Canadians regard high-speed internet connections and data streaming as essential to daily life and prosperity, and have done so for over 15 years now, many First Nations do not have access to high-speed internet or cellular services due to lack of telecommunications infrastructure. The pandemic highlighted the need for the infrastructure to support high-speed internet as essential for all Canadians. High-speed connectivity has become synonymous with positive economic development, quality education, quality healthcare services and the preservation of indigenous culture. Many First Nations are in rural and remote parts of Canada and for them high-speed connectivity means that their children can remain within their communities via "home-schooling" and attend primary and secondary school with on-line access to the same resources as urban students without facing the hardship of moving, extra financial implications, and loss of culture. High-speed access also means that these First Nations can receive state-of-the-art healthcare from specialized practitioners in urban centres without the expense and trauma associated with travel while sick.

The Canadian Radio-Television and Telecommunications Commission (CRTC) recognized the importance of high-speed access in 2019 and mandated that by 2030, 100% of Canadians have access to at least 50Mbps (Megabits per second) down and 10Mbps up (50/10) with unlimited data plans. To meet this mandate, the CRTC launched the Broadband Fund in 2019 with an initial allocation of $750 million and Innovation, and Science and Economic Development Canada (ISED) launched the Universal Broadband Fund with a budget of an initial budget of $1.75 Billion in November 2020 increasing by $1.0 Billion to $2.75 Billion in 2021 and according to the UBF website is now $3.225 Billion. The CRTC and ISED broadband fund awards are intended to address 50/10 connectivity issues to rural and unserved communities where it is not economical to build out infrastructure unless upfront Capex is awarded through government grants. Both funds are matching programs, and, for First Nations, both allocate grants of up to 90% of the Capex needed by a First Nation, or a service provider on behalf of a First Nation, to build out the infrastructure. In addition to the CRTC and ISED funding, many of the Provincial and Territorial governments, and other federal government agencies such as Indigenous Services Canada (ISC) under the First Nations Infrastructure Fund, have grant programs to aid the development of telecommunications infrastructure for rural and remote communities. The Canada Infrastructure Bank (CIB) has also allocated funds for loans to address funding gaps for these projects. All the grant programs require that the telecommunications infrastructure be operated by an experienced service provider to ensure the on-going sustainability of the infrastructure built using government funds.

The cell phone is now considered the de facto device to access all levels of government services, First Nations, Provincial and Federal. During the pandemic it became obvious that cellular services are an essential service to which many First Nations do not have access to, meaning they could not do simple everyday tasks, for instance run the ArriveCan application, necessary for travel nor receive automated alerts on outbreaks, among other shortfalls. Furthermore, First Nations have been long calling for cellular coverage of well-used highway corridors as essential for traveller safety. The eligibility requirements for the CRTC UBF fund were subsequently modified in 2021 to include funding for telecommunications infrastructure for provisioning mobile wireless networks to communities and along major transportation roads that have positive impacts on Canada's public safety.

Regardless of the funding programs in place, significant infrastructure gaps exist for First Nations. There are many reasons for the gap including remoteness, cost-base for on-going services, and lack of experienced service providers willing to provide service.

In addition to the funding opportunities which some First Nations are already acting on, there are other infrastructure projects that should be leveraged to build out the fibre optic connections necessary for high-speed and cellular access. Examples include the building of new roads, replacement of winter roads with all-season roads, building out of power transmission lines and the upgrading of water and sewer upgrades. Fibre optic cable can be plowed in conduit along new roads, placed on power pole lines or communications conduit placed at the same time as water and sewer infrastructure. In the industry, this concept is referred to as “Touch Once” and “Dig Once” and often results in savings for the telecommunication infrastructure of up to 10-fold as most of the telecom infrastructure cost is labour.

3.1 Scope and Study Objectives

The study objectives include:

- Developing a database of connectivity status for First Nation communities to determine the extent of infrastructure gaps necessary for every First Nation community to have both fibre-to-the-home (FTTH) and at least, LTE cellular services available within their communities. This database can also be used by the AFN to track the connectivity progress made as more infrastructure is deployed.
- Developing Capital expenditures (Capex) to address these gaps inclusive of BTY recommendations for regional and zonal multipliers and for contingencies
- Developing operational and maintenance expenditures (Opex) to support the new infrastructure inclusive of BTY recommendations for regional and zonal multipliers and for contingencies
- Socializing the First Nation community connectivity status with key telecommunications service providers and collecting their thoughts on how best to accelerate the roll out of broadband and cellular infrastructure
- Identifying strategies and recommending approaches to close the infrastructure gap

3.2 Study Approach

This study assesses the infrastructure in place for 50 /10 and cellular services for First Nations on Reserve lands without Modern Day Treaties. There are a few First Nations included in the analysis with Modern Day Treaties who still participate with the Assembly of First Nations (AFN.) The study excludes Metis and Inuit communities as these are outside the AFN scope. A list of the 748 First Nation communities included in the study is included in Appendix D. As this is one of the first opportunities to create a database of First Nation communities in Canada, the list is not exhaustive and at the time of writing this report, Planetworks identified at least sixteen First Nations communities, listed in Appendix E, that were missed in the database, need to be vetted and added to future database updates.

Analysis is performed at the community level. First Nations having multiple communities comprising the Nation, were split into individual communities. First Nation communities with 0 population and 0 roads in the various public databases were excluded, leaving a study group for this report of 748 communities. Each community was then defined by a simple shape file which captured the dwellings to be served within the Reserve Land mass. Where possible, these shape files were adjusted to capture First Nation dwellings located just outside the Reserve borders, a situation often encountered for northern villages along rivers and waterways where the First Nation reserve border stops at one bank but dwellings are on both banks.

Planetworks then worked with Innovation Science and Economic Development Canada (ISED) to address the limitations in the publicly available data, where dwellings collocated within the Reserve but on public right-of-way (provincially owned highways etc.) are excluded. ISED amended the shape files to include these dwellings and updated the dwelling and broadband coverage information. A community is considered have broadband service if at least 75% of the dwellings within the community “shape” boundaries are reported within the ISED database as having 50Mbps down and 10Mbps up (50/10) service.

ISED also analyzed the cellular coverage to dwellings along the roadways within each community “shape” boundary and provided their cellular coverage information for use in the analysis. ISED receives this coverage information from the cellular service providers at minimum annually. Presented information, unless expressly stated otherwise, is derived from publicly available information for First Nation communities, some of which may be dated, optimistic, erroneous or missing.

The database uses publicly available data to create a community view of each of the 748 First Nation communities including:

- Best broadband performance
- Available broadband technologies & Internet Service Providers (ISPs)
- Availability of a fibre backbone
- Mobility performance
- Availability of FTTH
- Funded backbone or last mile projects
- Other relevant infrastructure information such as presence of all-season roads, power sources etc.

With ISED’s assistance, the above was expanded to include

- Cellular coverage within the community boundaries
- Broadband dwelling coverage within the community boundaries
- Completion dates for ISED managed projects
- Other details such as backbone service providers, POP service providers etc. that will make it easier to analyse the situation on a community basis

Until ISED offered their data regarding cellular coverage, Planetworks had resorted to defining a community as having cellular services only if a tower was located within the community shape boundary. This rudimentary approach yielded a pessimistic view with almost all First Nation communities requiring a cell tower. In reality, it is possible for communities to receive cellular signals from towers outside the community to people walking around in the community with clear-line-of-sight to the tower outside the community limits. When Planetworks analysed the ISED data and compared it against known coverage situations with Planetworks’ clients, we found the ISED coverage data to be too optimistic as almost all First Nation communities seemed to have cell coverage, a situation which we know firsthand from our client base not to be true. Consequently, after trying various distance options for tower locations from the community centre point, we landed on a compromise between the two approaches with community having cellular coverage if there is both a tower within 5km of the community centre and 75% of the roadways within the community “shape” have Cellular coverage according to the ISED data. This compromise tracks well with the outdoor coverage experienced by Planetworks’ First Nations Clients. What remains uncertain is indoor coverage. For cellular coverage indoors, the cellular radio signal must travel through walls and is greatly attenuated. It is therefore possible to have the roadways adequately covered by cellular and not have cellular coverage inside any of the dwellings.

Once the data was finalized, Planetworks ran queries against the data to determine how many communities required fibre backbones, FTTH and cellular towers. This data formed the basic infrastructure requirements to address the service gaps. Planetworks applied in-house average unit Capex costs to build fibre backbones, FTTH and cellular infrastructure.

While we understand the need to establish a baseline target for all Canadians, the 50/10 performance target will likely only just meet household bandwidth requirements for 2030. It makes no sense to build out any solution that cannot grow beyond 50 /10. The preferred future-proof last mile technology that can keep pace with the ever-increasing demands for internet bandwidth is FTTH. For communities with limited to no service now or for those meeting 50/10 service today with a technology other than FTTH such as Fixed Wireless Access (FWA) or Coaxial Cable, we have budgeted for a FTTH upgrade into the community. Similarly for cellular services, for those communities with no cellular coverage today, we have budgeted for a single full cell site per community, and for those communities with 3G service today, we have budgeted for the upgrade of the 3G electronics with some minor tower reinforcements. As technology performance is always getting better, it is expected that all new technology – be it FTTH or cellular – be the most current and up-to-date commercially versions available in the market at the time of deployment. For cellular, this is now 5G.

3.3 Underlying Data Accuracy

Data accuracy is challenging especially when the situation is evolving and ever-changing. At the time of writing, the BC Government, the Alberta Government, ISC and the CRTC all had open funding intakes which will change the outcomes of this report as more First Nation communities or service providers on behalf of First Nation communities, get funded under the various funding streams. Furthermore, some 200 projects are funded and in-progress which when completed, again will change the data. Consequently, this study is a snapshot in time based on the best information available.

3.3.1 Community Accuracy

This project seems to be one of the first where First Nation communities are defined. It is important to continue sharing and revising the shape file information with input from others to refine the data and build an accurate view of each community and its boundaries. We have already identified several communities where dwellings lie outside the Reserve boundary and modified the shape file to reflect the difference between the Reserve and community boundaries. An accurate view of each community boundary and the dwellings captured within it, is necessary for Capex and Opex budgeting but also necessary for the whole community to access the 90% funding grants available to First Nation communities. Ultimately the community connectivity information should be available on-line in a publicly available database so that all parties can use the same community boundary definitions.

This report addresses data for 748 First Nation communities, and we have since discovered another 16 communities that will need to be included in the database. There are likely others missing and as communities are discovered, they should be added to the database. ISED is currently working with the 16 communities to stitch in the road coverage. This work however couldn't be addressed within the timeframe of this report. The community list for the 748 communities in study, arranged by region, is included in Appendix D and the 16 missing communities, included in Appendix E. Also included in Appendix D are maps by Region showing the locations of the communities in the study.

It is important to note that within this report, we only consider the areas for the communities that are within the boundaries of the First Nation reserves. Historically, often the community centre itself will not be within these defined areas, but rather just outside. It is important going forward that shape files describing the communities are modified to reflect this nuance as unfortunately, for areas outside the Reserve, the funding grants do not follow the benefits for First Nations such as the 90% grant for Capex in the UBF funds.

3.3.2 Dwelling Accuracy

Like the method that Planetworks used in this report, service providers use a standard Capex metric per permanent dwelling for FTTH planning and funding applications. Once the project is funded, the service providers conduct detailed outside plant designs and if the dwelling count is not correct, could find themselves short of cash to complete the build. The information regarding permanent dwelling counts within each community, therefore, needs to be accurate and tracked. This will involve regular participation by the communities.

3.3.3 Best Information Available

Most of the broadband data in the database is from ISED's "National Broadband Internet Service Availability Map".

The data contained within the interactive map is based on ISPs to self-report performance, some of which are good at keeping their data current and others not. For instance, we know from our clients that Northwestel has received funding for FTTH for most of the First Nation communities in the Yukon and Northwest Territories, FFTH plans are in place or the infrastructure already built out. This status is good news but is not reflected in the publicly available data likely due to a backlog in Northwestel's reporting.

Furthermore, since the broadband connectivity is based on self-reporting, there could be a tendency for some ISP's to report optimistic results for 50/10 as means to lock-out a community for other competitive service providers by making the community ineligible for any additional funding. This was especially evident with Fixed Wireless Access solutions where broadband performance less than 50/10 is likely. ISED did modify the data behind the map to corroborate the FWA reporting and now FWA showing 50/10 has been technically verified as being able to deliver 50/10. Regardless the problem of over-stating performance still exists within the data.

Furthermore, while an ISP may report 50/10 or cellular being available for a community, their service may not actually deliver the purported performance. We have seen this in a few situations with our Clients, particularly regarding cellular performance. Essentially the demands from the subscribers within the First Nations community are greater than what the cellular or broadband system was initially designed for, and the overall performance and user experience is less than what was promised.

With these issues regarding the best available information or the reality of the user experiences, it is important to engage the communities to corroborate the reported performance and to collect broadband performance at the community level. This is best done through telephone surveys with the community leadership and through community members running automated, ISP independent speed tests like that offered by the Canadian Internet Registration Association (CIRA). At time of writing, the AFN received a proposal from CIRA for CIRA to collect data and aggregate speed test data from all the First Nation communities within the AFN purview for $20,000 for the first year and depending on the services required, up to $20,000 for each subsequent year. This solution would also track progress in user uptake once new FTTH infrastructures have been deployed. There are other solutions such as "Sam Knows" which could also be used.

3.3.4 Cellular Coverage

ISED has supplied the data for cellular coverage. This is based self-reporting by service providers along roads. It is unclear if the analysis tracks to in-dwelling coverage, a requirement of most of our First Nation clients. The self-reporting reflects the technology ideal performance and not actual. Therefore, for those communities with purported cellular coverage in this study, it is prudent to verify the coverage by having community members run speed tests indoors within dwellings and outdoors along the roadway.

3.4 Background, Definitions, Challenges and Technology Overview

The following section introduces key concepts, connectivity definitions and challenges.

3.4.1 Community Size

The study is by First Nations communities. A Nation may have multiple communities, and each is tracked separately. There are 748 communities analyzed in this study, the number of communities in each region is shown below.

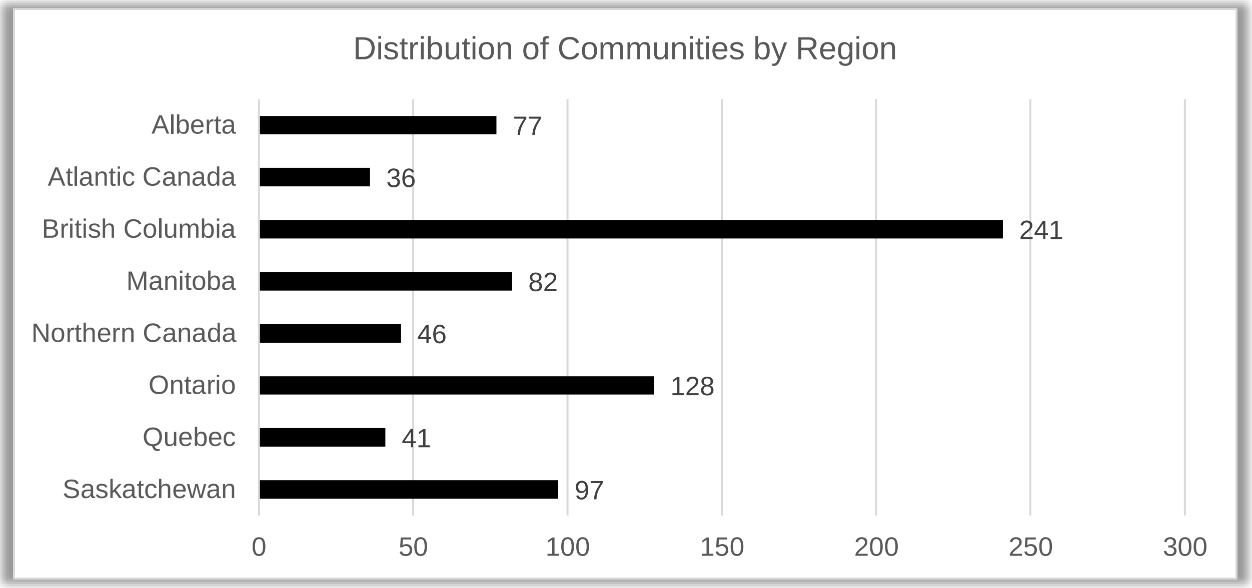


Figure 4 - Regional Community Distribution

Most First Nations communities, 73%, as shown below, are small with less than 200 dwellings and with 49% having less than 100 dwellings. This poses a challenge from a telecommunications business perspective. The cellular business is competitive nationally and broadband is competitive everywhere but, in the Yukon, and Northwest Territories where Northwestel has a monopoly. Given the competitive nature of the business, economics are better with population density and as the dwelling density decreases the business case becomes less attractive. The funding grants are meant to address the upfront Capex but as the communities get smaller with lower population and are in more remote in locations, the revenue potential does not cover the operational and maintenance costs necessary to support the service. This is especially true for cellular. The cellular business is based on population as individuals carry cell phones. From the database, for communities with less than 200 households, the average number of people per dwelling is 3.5 meaning that a community with 200 dwellings, has roughly 700 people, many of which would not subscribe to cellular services (too young, too old or not interested) or already have cell plans due to regular travel to communities with cell service. The traditional cellular model falls apart even with 100% upfront Capex due to the lack of net new revenue potential versus operational and maintenance costs, using traditional competitive business metrics.

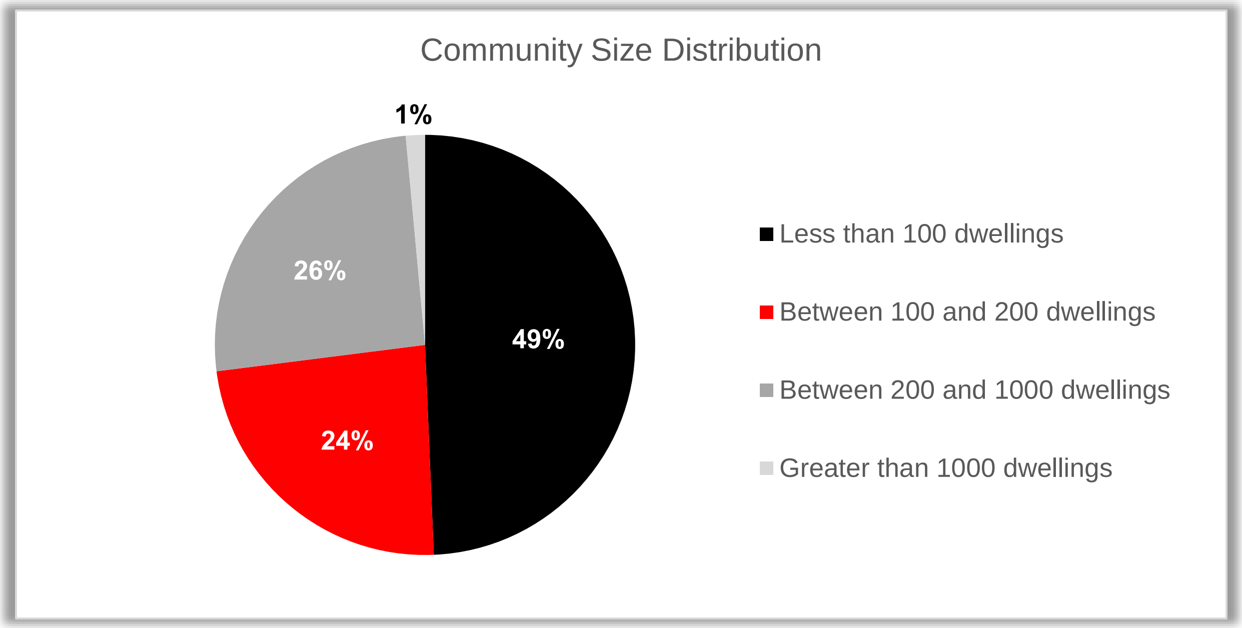


Figure 5 - Community Sizing

Given that FTTH infrastructure requires significant upfront Capex and comparatively minimal on-going operational and maintenance costs, service providers can make business case modelling work with 90% upfront Capex covered for communities of 200 dwellings or less, depending on the community distance to the next community serviced. The issue for the business case then becomes Opex. It would make sense for a local technician to be stationed in very remote communities to conduct the service calls, however at 200 dwellings there is not work for one full time equivalent. This is compounded by contractual constraints that many of the big service providers have with their labour agreements.

3.4.2 Broadband Service Definitions

Communities meeting the broadband criteria. For the purposes of the analysis, a community is considered as “meeting the broadband criteria” if 75% or more of the dwellings are reported by the ISP as having 50/10 service from any last mile technology (FTTH, FWA, Coaxial Cable, DSL). The coverage threshold was tested across a few values (70%, 80%, 90%) and there was little variation in the number of communities meeting the broadband criteria. Consequently, 75% was chosen as this also was the threshold used by ISED for cell coverage along roads. It is a realistic expectation as there will be dwellings within a community that simply cannot be served by a wired solution such as FTTH due to its location. It is expected that these dwellings will opt for satellite solutions or possibly FWA.

Communities meeting the broadband criteria with technologies other than FTTH. Communities which meet the 50/10 threshold with technologies other than FTTH are included in Capex and Opex planning as these infrastructures will at some point in the next 10 years are not able to deliver the bandwidth demanded.

Communities NOT meeting the broadband criteria. A community does not meet the broadband criteria and if used for Capex and Opex planning when:

- It has no broadband service today
- Less than 75% of the dwellings have less than 50/10 service

Communities NOT meeting the broadband criteria but have funded projects. Communities which do not meet the broadband criteria but have funded FTTH projects are excluded from the Capex and Opex planning.

3.4.3 Cellular Service Definitions

Communities meeting the cellular criteria. A community is considered as "meeting the cellular criteria" if two criteria are met:

A. 75% of more of the roadways within the First Nation community has LTE or 5G coverage. There are a few communities where there are no roads, in which case, 75% of the area has LTE or 5G coverage. As this is roadway coverage, there is no guarantee about in-dwelling coverage but represents a good starting point to determine the number of communities requiring cellular infrastructure to close the gap. See 3.3.4.
B. There is a communication tower within 5km of the community centre (calculated using the ISED geolocated placename points for each community).

Communities NOT meeting the cellular criteria. A community does not meet the cellular criteria when:

- It has no cellular service today
- Has partial LTE or 5G coverage – i.e., less than 75% of the roadways within the community have LTE or 5G
- Has 3G coverage – i.e., 75% or more of the roadways within the community have only 3G service

Communities NOT meeting the cellular criteria but have funded projects. Communities which do not meet the cellular criteria but have funded projects to build out cellular infrastructure are excluded from the Capex and Opex planning.

3.4.4 Backbone Definition

Every community requires a fibre backbone from the community Point-of Presence (POP) site to the next POP in the neighbouring community. Often referred to as the transport, the fibre backbone is a very high-capacity link that carries all the data from the community broadband and cellular networks back to the Internet. A community requires a fibre backbone as the first critical step to obtaining either FTTH or cellular services.

3.4.5 FTTH Network Definition and Overview

There are four distinct components to FTTH networks:

- Optical line termination (OLT) – the electronics in the ISP POP site
- Outside plant - the outdoor part of the network comprising fibre optic cable and passive optical components, between the ISP POP and the customer property line, usually mounted on strand on poles or buried in the ground
- The customer drop – the optical cable connecting the outside plant at the property line to the optical network unit (ONU), usually located inside the home
- Customer premises equipment – the ONU, service gateway, Wi-Fi routers and other ancillary equipment to enable the service located inside the home

For the purposes of the study, we have combined the electronics inside the POP, the outside plant, the customer drop and the customer premise equipment for all dwellings in the community into the “last mile”.

The data handling capacity of optical systems is defined by the terminal electronics in the POP and home as the fibre itself is almost limitless in data handling capacity. Terminal electronics are easily replaced, so fibre-based infrastructure will have lifespans of twenty-five years or more and will support the evolution of faster and better service by replacing electronics in the POPs and in the homes. Consequently, the end goal is to build a fibre-optic backbone to every First Nations’ POP which connects to a Fibre-to-the-Home (FTTH) network as illustrated in the following diagram.

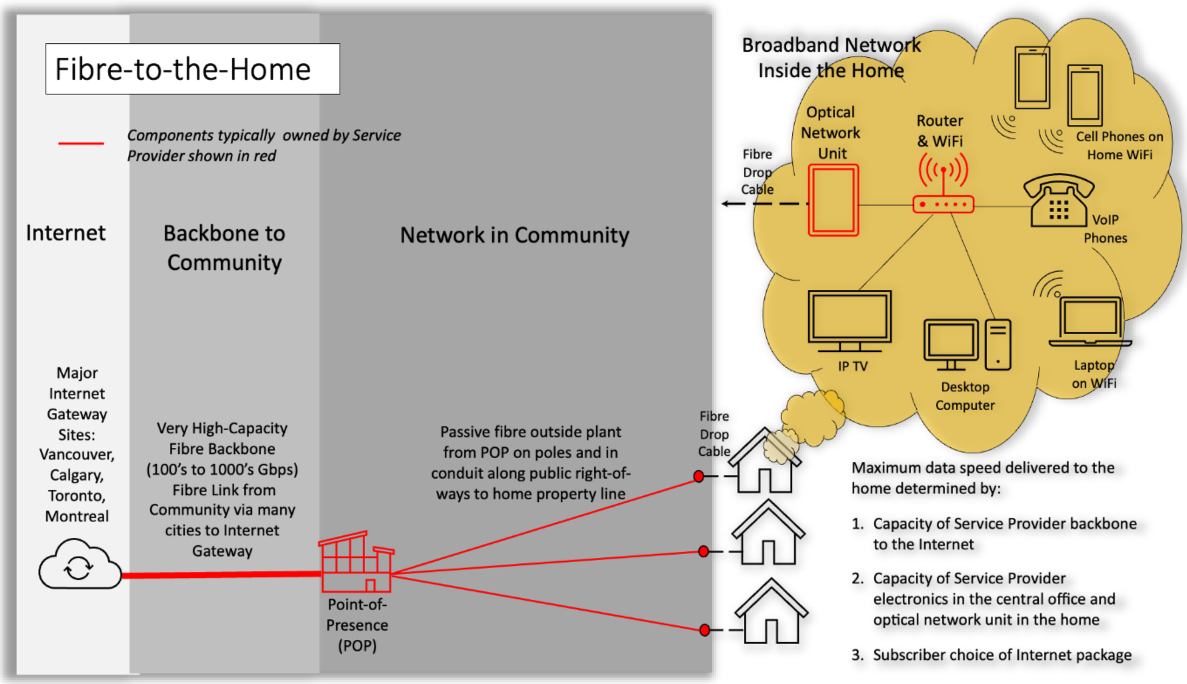


Figure 6 - Fibre-to-the-Home

While the CRTC’s universal broadband objective is currently asymmetrical (50 Mbps downstream with 10 Mbps upstream), data services should ultimately be upgradeable to higher speeds and have symmetrical speeds (same up speed as down) with unlimited data caps. The preferred technology to do this is FTTH.

Furthermore, while FTTH has high upfront Capex costs it has comparatively low on-going operational costs. Once the FTTH infrastructure is built, it takes significantly less Opex than other outside plant infrastructures such as copper twisted pair used by the Telcos or coaxial cable used by the CableCos, to keep the network running throughout its anticipated twenty-five year or more life. For some Telcos, it has been purported that the business case to change copper twisted pair out for FTTH is based solely on the operational savings to be had over the two infrastructures. A rule of thumb for FTTH Opex is 2-5% per annum of the initial Capex build.

For communities with no fibre backbones or fibre backbone projects and no 50/10 last mile networks, upgrade projects should be executed to build the backbone and the last mile at the same time. This approach facilitates high-capacity service to dwellings immediately upon project completion and avoids stranding Capex investments for significant periods while funding is put in place to upgrade whichever of either the backbone or last mile was not completed in the first round.

If an area has been built out with FTTH, the maximum data speed is set by the service provider's internet package and will be much greater than 50/10, for instance TELUS PureFibre Gigabit Internet is 940Mbps up and down; however in an area, not everyone will subscribe to full capacity of the new FTTH network or even to the FTTH at all, and the average wired up and down speeds reported will be significantly less than the network capability. This is especially true in rural and remote First Nations, where there may be reluctance to change from other technologies due to lack of awareness of the FTTH advantages, service affordability or due to presence of multi-year service contracts, a common tactic used by service providers to reduce subscriber churn and movement to competitors' networks.

3.4.6 Cellular Network Overview

Mobility cell sites, with todays' streaming capabilities in LTE and 5G phones, require high-capacity connections, typically 2,000 Mbps symmetrical or more per cell site. This backbone target was provided Planetworks by a cellular service provider planning to serve a remote, currently unserved, community of 350 dwellings in late 2022. For capacities like 2,000Mbps, communities require both a fibre backbone to the community POP site as well as a fibre connection from the POP to the cell site. LTE, sometimes referred to as 4G is the minimal acceptable cellular technology to support streaming and internet browsing. Any new infrastructure, especially if government funding is used, should be the most current technology commercially available at the time of the build which is 5G today. First Nations with 3G service today will have a tower in the community which could be re-used for 5G or more advanced technologies with the changeout of antennas, electronics and possibly some tower reinforcement activities. First Nations with no cellular services, will require a new tower and 5G electronics. The schematic outlines the Cellular network for a community.

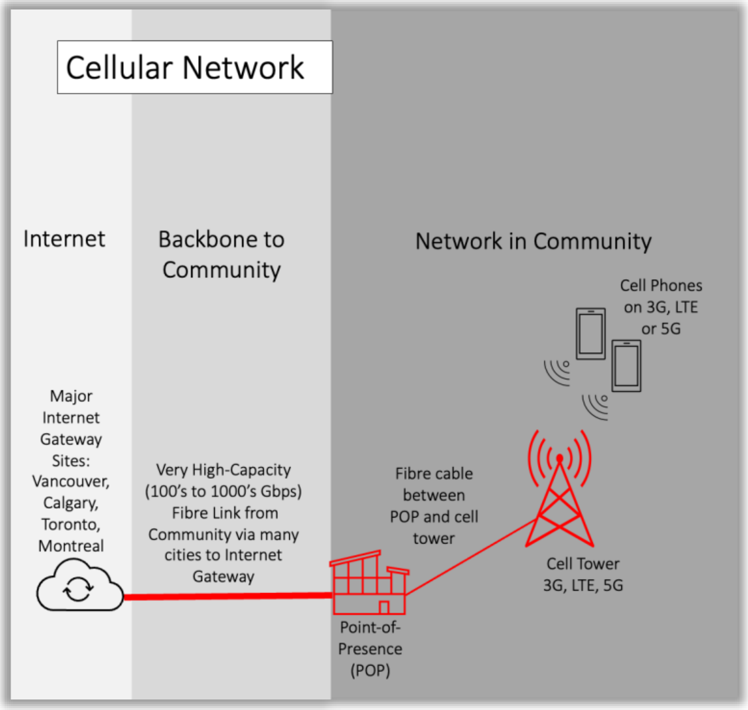


Figure 7 - Cellular Networks

In contrast to FTTH, cellular networks require comparatively less up-front capex but higher Opex to run. A rule of thumb for cellular site Opex is 8-10% of the initial capex investment.

3.4.7 Fixed Wireless Access Overview

FWA technology bypasses the FTTH infrastructure and can deliver 50/10, but 25/5 is more typical. Unlike FTTH, FWA is not as future proof as it has limited bandwidth capacity which is shared across all subscribers. At some point the aggregated subscriber demand will exhaust the available capacity especially since there is not enough licensed spectrum available today to address the capacity growth.

FWA however, should not be discounted as a 50/10 last mile solution as it does offer a significant benefit of quick and inexpensive deployment when compared to FTTH and can be used as an interim measure to bring broadband connectivity to those communities with no or limited broadband today. FWA and cellular networks can be deployed in months versus the 4 years typical for FTTH, providing immediate relief to those First Nation communities having a fibre backbone but no broadband services. FWA can be built as independent networks or as an overlay to cellular networks. If the business case issues can be resolved for cellular services to small communities, it would be possible to deliver both cellular and FWA from the same cellular tower, giving the underserved communities both services very quickly.

As shown in the following illustration, to enable FWA, the ISP installs an antenna on the subscriber's roof with line-of-sight to the cell tower. The subscriber antenna is connected by a coaxial cable to ISP's FWA modem to enable service.

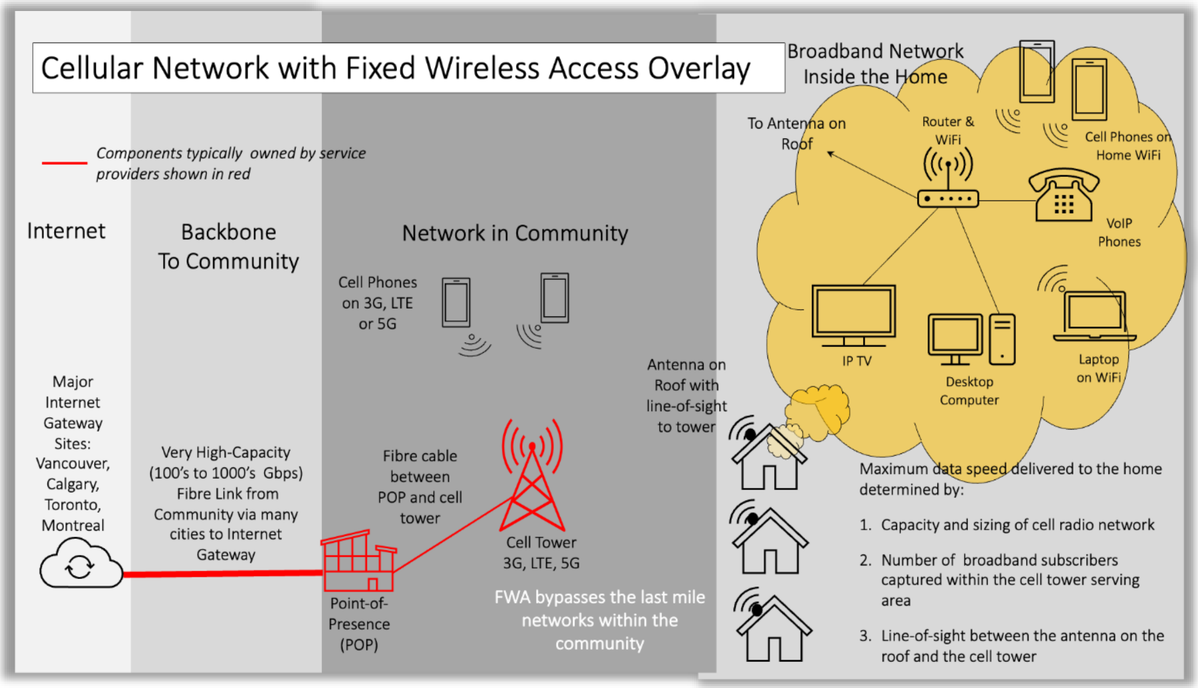


Figure 8 - Cellular with FWA Overlay

3.4.8 LEO Solution Overview

Finally, there are disruptive technologies emerging using low earth satellites (LEOs) that will provide interim backbone connectivity and residential solutions for remote First Nations. LEO solutions bypass infrastructure investment for fibre backbones and FTTH.

Starlink, a retail satellite service, owned by SpaceX and Elon Musk, uses a private constellation of some 2,300 plus low-earth-orbit (LEO) satellites to provide direct to premise (residence or business) broadband internet connectivity globally, and is emerging as a strong competitor to Canadian service providers serving remote and rural communities. It is available now in Canada represents a good interim solution for broadband connectivity while FTTH is rolled out. In fact, there are rumours of funding opportunities being developed to address the on-going subscription costs for First Nation dwellings in some parts of Canada to get more First Nations dwellings connected faster.

Each Starlink satellite delivers approximately 2Gbps to be shared by all premises illuminated by a satellite's 28km diameter, spot beam. Consequently, in populated areas where Starlink has oversold its service, like in the USA, the service throughput has degraded simply due to the number of users sharing the spot beam. In remote communities where population densities are low, subscribers can expect to receive 100Mbps data rates bursting to 300Mbps down. These speeds are higher than Starlink subscribers would experience in high population density areas in southern Canada where there are more users per spot beam but will degrade as more users within the spotbeam share the bandwidth.

Starlink speeds are also constrained by the location and capacity of ground stations that serve as gateways to connect the satellites to the internet. Ground station related traffic constrictions can adversely affect Starlink speeds. The Starlink business model is self-help and requires that residential or business consumers go on-line, purchase the terminal equipment, and sign up for the service. Starlink dispatches the terminal equipment and the consumer self-installs it. The installation process involves mounting a small satellite dish anywhere that has clear line-of-sight to a large arc of the sky.

The diagram below illustrates the Starlink model.

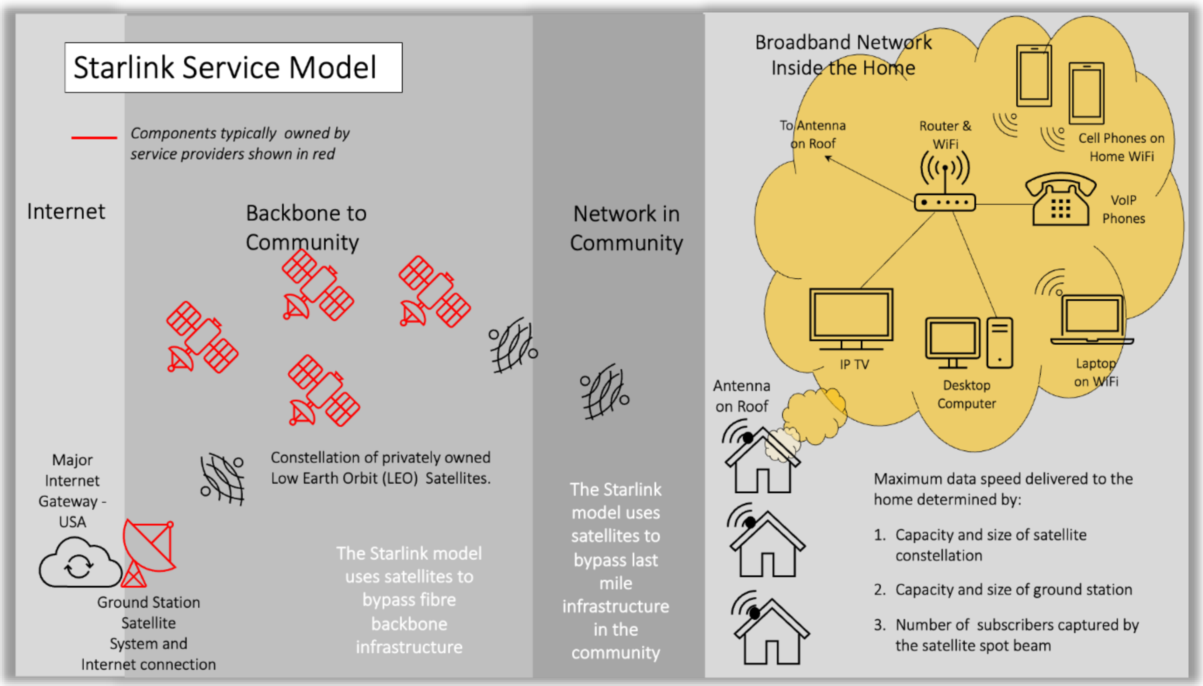


Figure 9 - Starlink

There are several LEO satellite backbone solutions in development, starting with OneWeb available now as a beta test service, Telesat Lightspeed with a plan to start service in 2026 and others, which could also be used as stop-gap measures for backbone connectivity while the fibre backbone is built out or for communities where fibre backbones may never be available. However, the on-going operational costs for backbone capacity from LEO satellites will need to be addressed at the national level as the current rates are simply too high for small communities to sustain for any length of time.

4.0 Communities Needing Backbone Infrastructure

The backbone refers to a high-capacity fibre optic link connecting a physical site, referred to as a Point-of-Presence (POP) within the First Nation community, to an existing Internet POP in the next closest serviced community. The black dots on the map indicate that, of the 748 First Nation communities, 543 (73% of the total) have a fibre backbone in place or within 2km of the community point and 124 have funded plans to build a fibre backbone. The remaining 81 do not have a fibre backbone and are split, 27 with a low-capacity satellite backbone (grey) and 54 with no backbone or a microwave backbone.

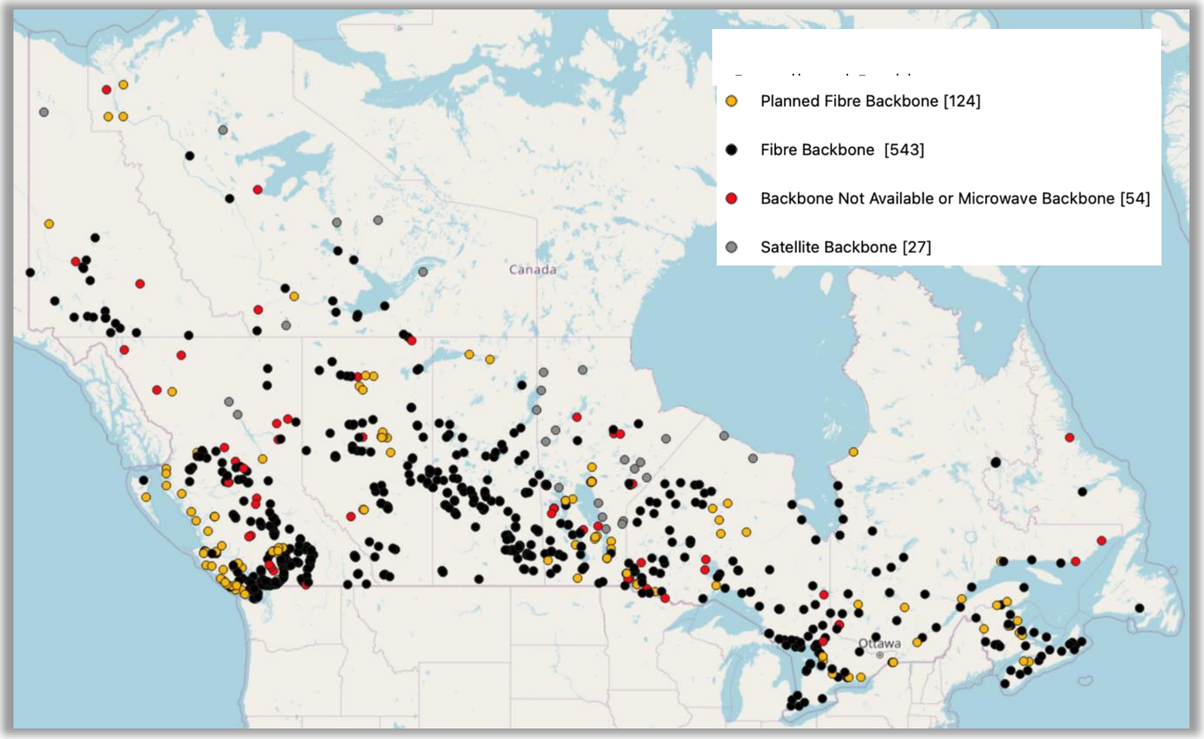


Figure 10 - Backbone Infrastructure Map

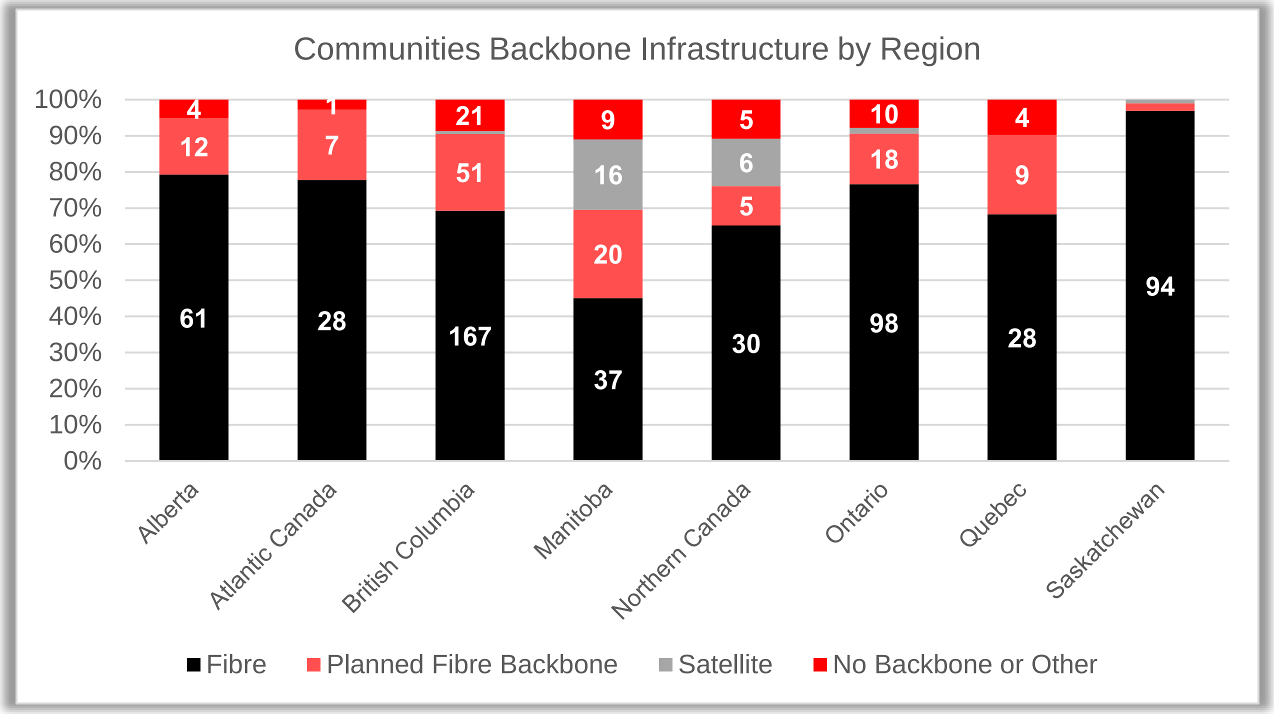


Figure 11 -Backbone Infrastructure by Region

The 27 communities currently fed by low-capacity satellite are isolated communities with no year-round road access. It is likely that these communities will remain satellite fed until the communities get an all-season road built. As each new all-season road is constructed, we recommend that a backbone fibre cable is planned as part of the road construction and that as a minimum, the road contractor be responsible to place the conduit in the new road shoulder as the road construction completes. Any fibre backbone solution to replace the existing satellite backbone will require advanced engineering and innovations such as trenching in permafrost or using submarine cable in Arctic lakes and rivers. Although we were unable to collect the data with any certainty, it would be expected that these First Nation communities are also on diesel power as many are without fibre backbones. As the transmission lines are built to these communities to replace the diesel, the fibre backbone should be extended using the power line infrastructure – either placed on transmission poles or buried in conduit in the transmission line right-of-way.

The satellite communities are typically fed today by a service provider reselling low-capacity satellite services from Telesat using Anik F2. The backbone service for the entire community is typically 10 / 3 and then distributed typically over DSL on telephone lines to community dwellings resulting in each dwelling receiving less than 1Mbps down.

Anik F2 is end-of-life, expected to fall out of orbit in summer 2023 and was to be replaced with Telesat's new low earth orbit service for large business and community backbone applications, "Lightspeed." The Federal Government invested $85 million in Lightspeed in 2019 and pledged additional funding to a maximum of $600 million over ten years for Telesat to make Lightspeed the Canadian satellite backbone solution for rural and remote communities and 50/10 available everywhere by 2030.

Unfortunately, Telesat is delayed and forecasts their LEO service to be available in 2026, three years too late for the 27 First Nation communities relying on Anik F2 for a satellite backbone. It is unclear what most service providers are doing to address satellite connections to First Nation connectivity with the Anik F2 failure but one service provider, Northwestel embarked on a program to replace their Anik F2 satellite backbone services with One Web in October 2022.

OneWeb, another large business and community backbone provider, and competitor to Lightspeed, can deliver a satellite backbone of up to 150 /30 Mbps. However even with the One Web backbone increase over Anik F2, satellite communities are significantly limited when compared to communities with fibre backbones capable of carrying 1000's of Gbps of traffic (1Gbps = 1000 Mbps). Furthermore, the cost of the OneWeb service is too high, currently in the order of $200 per month per dwelling in small communities just for the backbone service.

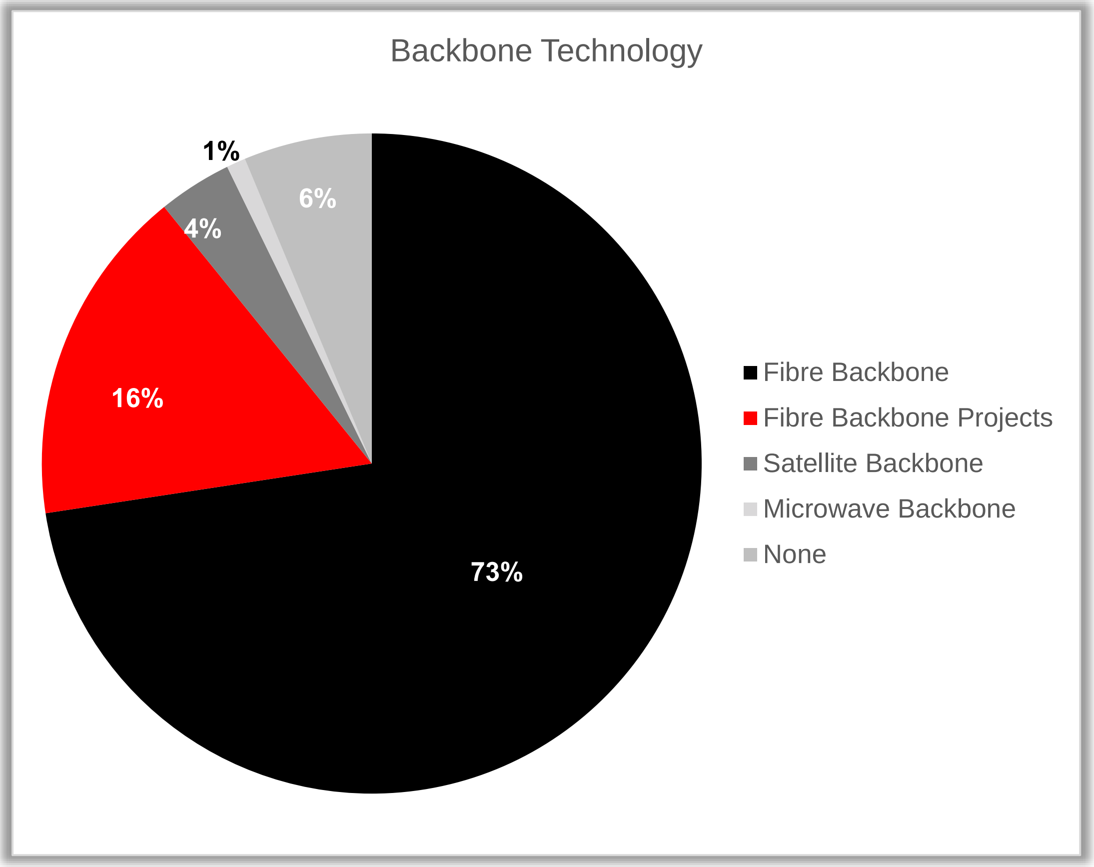


Figure 12 - Backbone Technology

The chart above breaks down the backbone technologies. The Capex and Opex planning includes costs to advance fibre backbones to communities with none and to replace existing satellite, and microwave backbones with fibre. The total route kilometers of fibre was determined by calculating in the database the distance as the crows flies from the community to the next closest community with a fibre backbone, and then using a factor of 1.3 to convert the crowflight distance to a route km estimate. In total to address the 81 communities requiring fibre backbones 12,280 route km of fibre backbone infrastructure is needed, or 151 route km on average per community.

5.0 Communities Needing FTTH Infrastructure

The map below and chart below shows the 550 communities requiring FTTH infrastructure and Capex. These include:

- 457 communities with neither broadband service today nor any FTTH projects planned. These communities need immediate attention.
- 57 which currently meet 50/10 using a last mile technology other than FTTH and will require replacement shortly after 2030
- 36 where less than 75% of the dwellings in the community are served with FTTH and additional Capex is required for all dwellings to be served

The remaining 198 communities either meet the broadband criteria with FTTH (149) or have FTTH projects in flight (49).

It should be noted that 206 communities currently meet the 50/10 broadband criteria, 149 with FTTH plus another 57 using a technology other than FTTH. The breakdown of technologies used to meet the 50/10 broadband criteria is discussed in the next section.

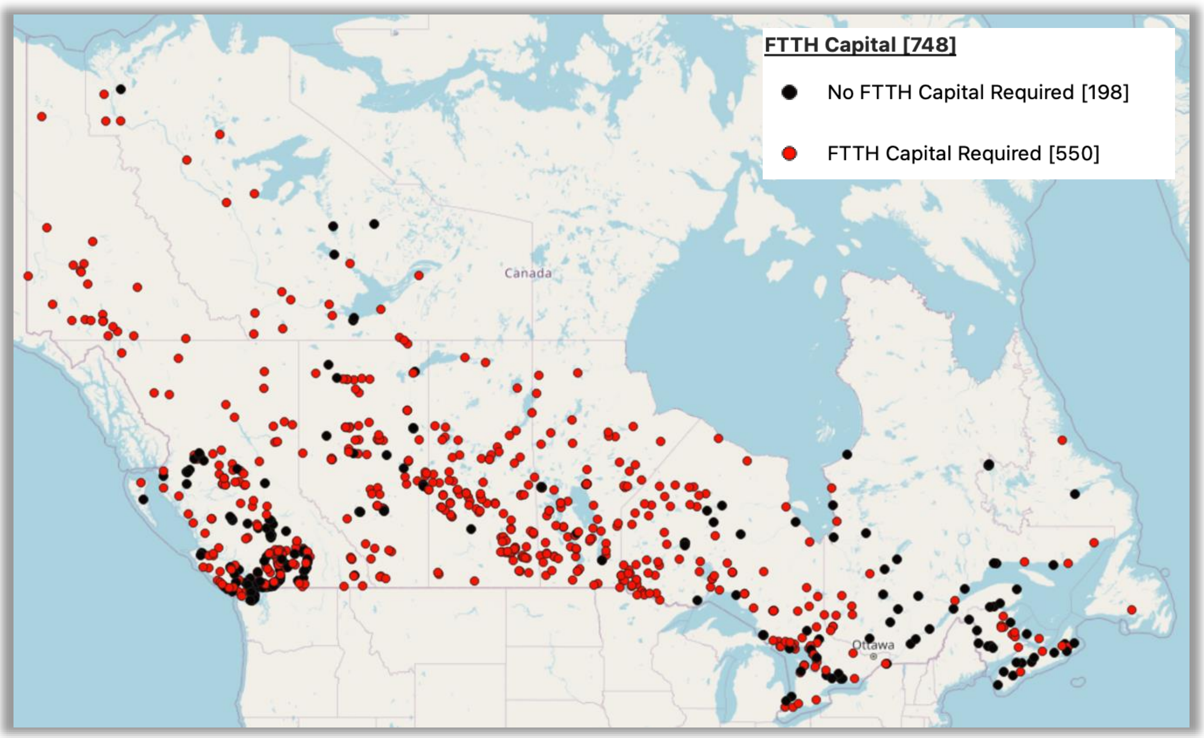


Figure 13 - FTTH Capital Needed

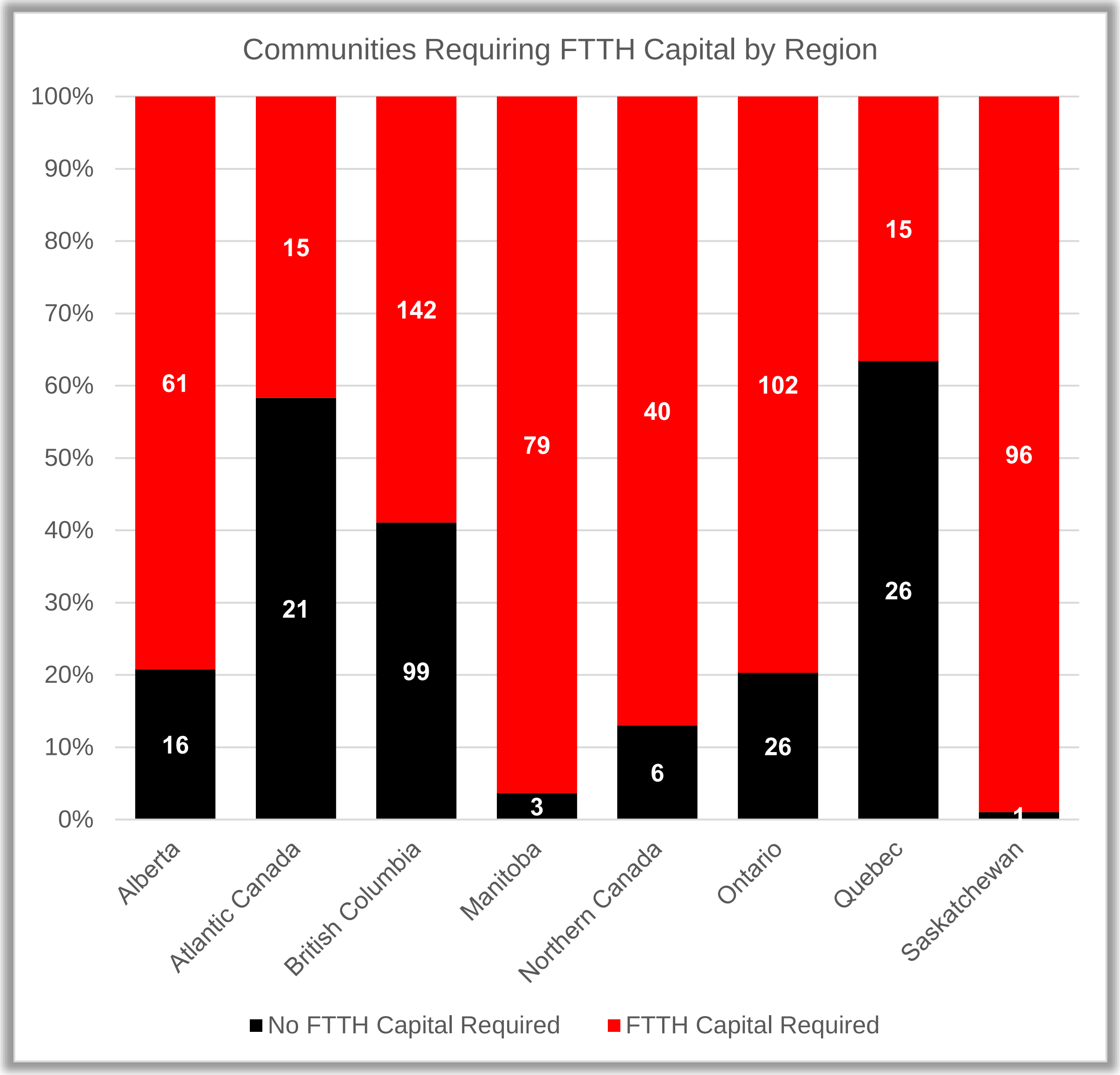


Figure 34 - FTTH Capital Required by Region

5.1 Communities Meeting the 50/10 Broadband Criteria

The chart below summarizes by region, the distribution of the 748 communities by region, 206 of which currently meet 50/10 broadband coverage criteria either with FTTH or another technology, 49 of which do not meet the broadband criteria but have FTTH projects in flight and 493 of which are underserved. This is a different view to the information present above as it reflects the communities that currently meet the 50/10 broadband criteria with any technology – FWA, DSL , coaxial cable and FTTH - while the map and table above identifies the communities that require capital for FTTH.

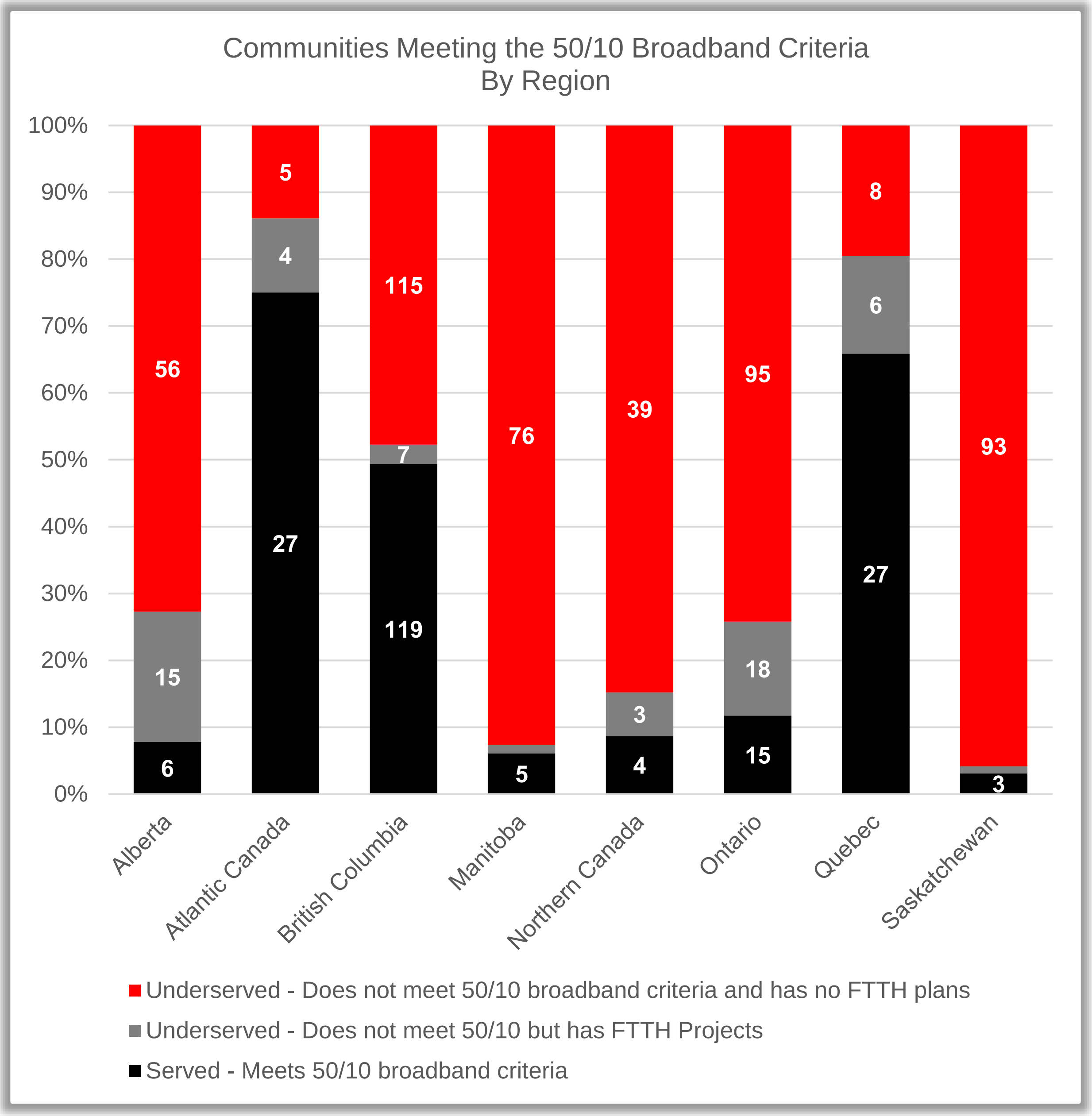


Figure 45 - Communities Meeting 50/10 by Region

The community size does have an impact on the percentage of communities meeting the broadband criteria or having FTTH projects in flight as shown in the charts below with the bigger communities having a lower overall percentage not meeting the broadband criteria. This is in keeping with competitive telecom business models where denser areas with greater revenue potential are built first.

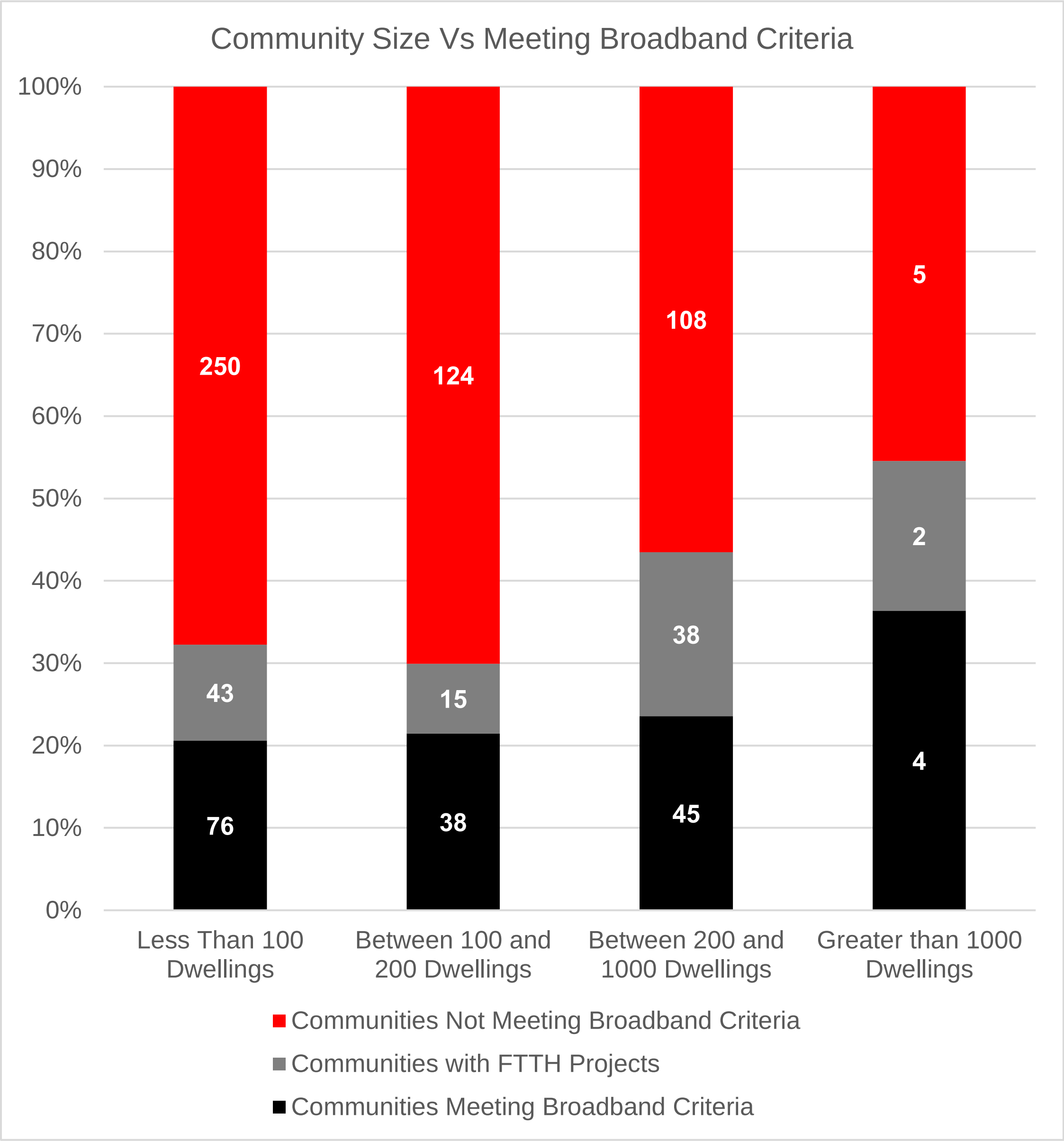


Figure 56 - Broadband Service Compared to Community Size

5.2 50/10 Broadband Technology Hierarchy

To sort through the data, Planetworks used a hierarchy based on technology bandwidth capability to sort through the communities which currently meet the 50/10 broadband criteria using FTTH or another technology. FTTH with its future-proof attributes is the best technology for broadband capacity, then coaxial cable, then FWA and DSL. All listed technologies are capable of 50/10 but FWA has capacity issues and is typically 25/5 and DSL has reach issues and is typically 15/1 or less. The chart below summarizes the breakdown of technologies used in the 206 communities currently meeting the 50/10 broadband criteria using any last mile technology.

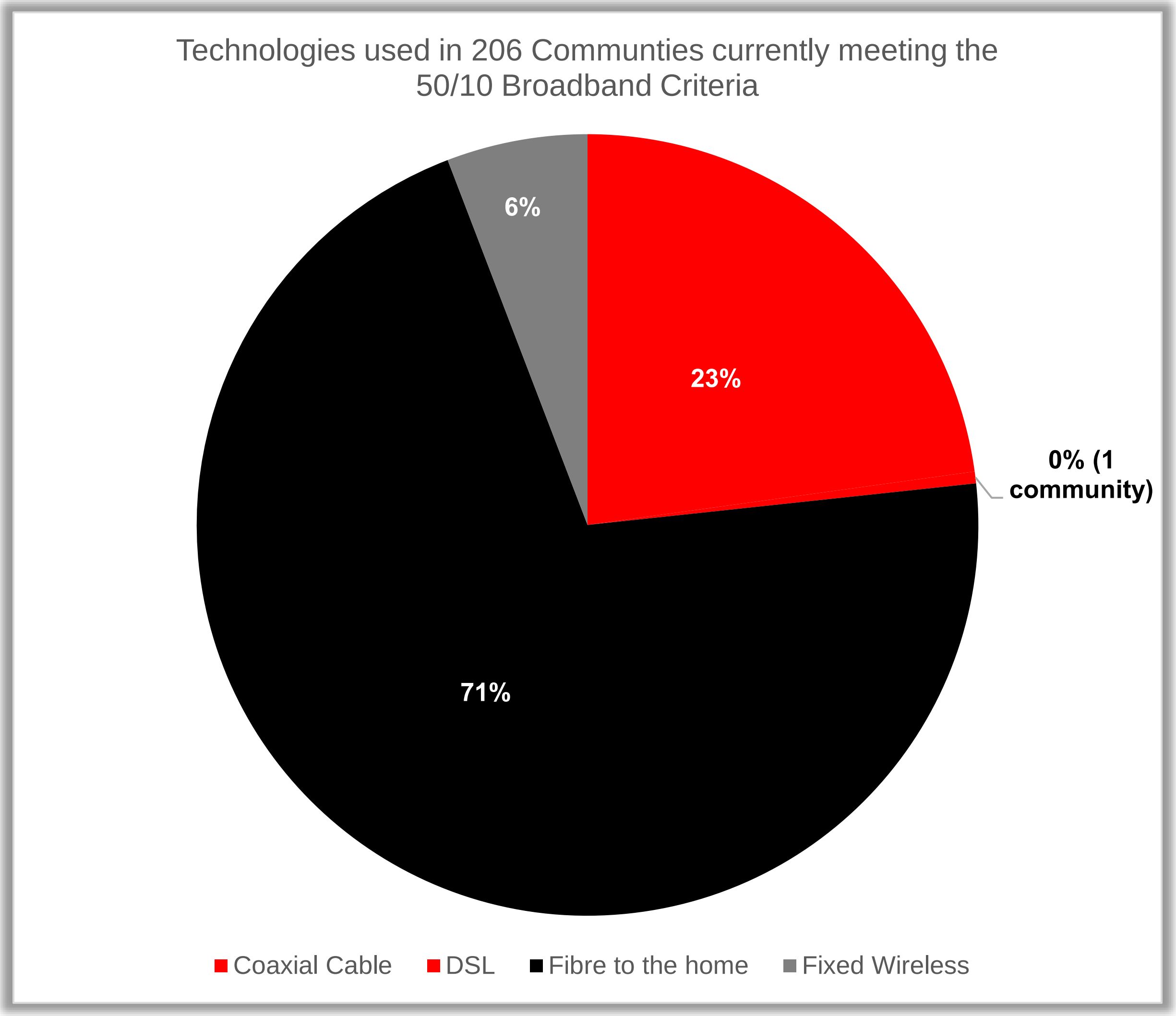


Figure 67 - Technologies Used in Communities Meeting Broadband Service Criteria

To prepare First Nations for the evolution of better, faster service, the FWA and DSL access networks that currently meet the 50/10 broadband criteria must be replaced with FTTH shortly after 2030 when 50/10 will no longer meet the average dwelling bandwidth requirements. Note that while coaxial cable access networks do meet 50/10 and scale for throughputs much greater then 50 Mbps down, they too will ultimately need to be replaced with FTTH for higher-speeds and more importantly, for symmetrical services (same speed up and down), necessary for home-schooling and work-at-home. However, those communities with coaxial cable today should be de-prioritized for FTTH and left last for upgrade after 2030. For this study, any First Nation community without an existing or planned FTTH project mile will be included in the Capex calculation.

5.3 Roles of Fixed Wireless Access and Starlink

FWA and Starlink are both shared access technologies where individual bandwidth performance reduces as more subscribers use the service and as individual subscribers each use more data. For small rural and remote communities where the maximum number of subscribers on the system will be limited, the performance will be very good and likely very much better than anything available to this point. Both technologies offer solutions for underserved communities for the interim. Starlink has the benefit of offering downstream speeds much greater than FWA but does while FWA has the benefit of being deployed with cellular infrastructure for a combined cellular broadband solution.

Of the 748 communities studied, 134 or 18% of communities have less than 25 dwellings. Of these 134 communities, 106 have fibre backbones, making FWA and cellular services a great interim option for the subset not meeting 50/10 today and would First Nations desires for both cellular coverage and broadband access.

Starlink can be used for broadband service and since the service is based on self-help, once the equipment arrives it can be immediately activated providing connectivity relief even faster than cellular services with FWA. It or another LEO retail solution in the future, will be necessary to provide connectivity to seasonal fishing and hunting villages or to single dwellings outside the community centres. Consequently, we do recommend that part of the funding solutions should include on-going subsidies for services like Starlink.

5.4 Underserved Broadband Communities

Four hundred and fifty-seven communities, 61% of communities, neither meet the 50/10 broadband criteria nor have FTTH projects in flight. For these underserved communities, the performance of wired connectivity is insufficient to support modern communications methods. Basic services such as “Zoom calls” are impossible. Most of these communities experience less than 1Mbps downstream on average and need immediate attention.

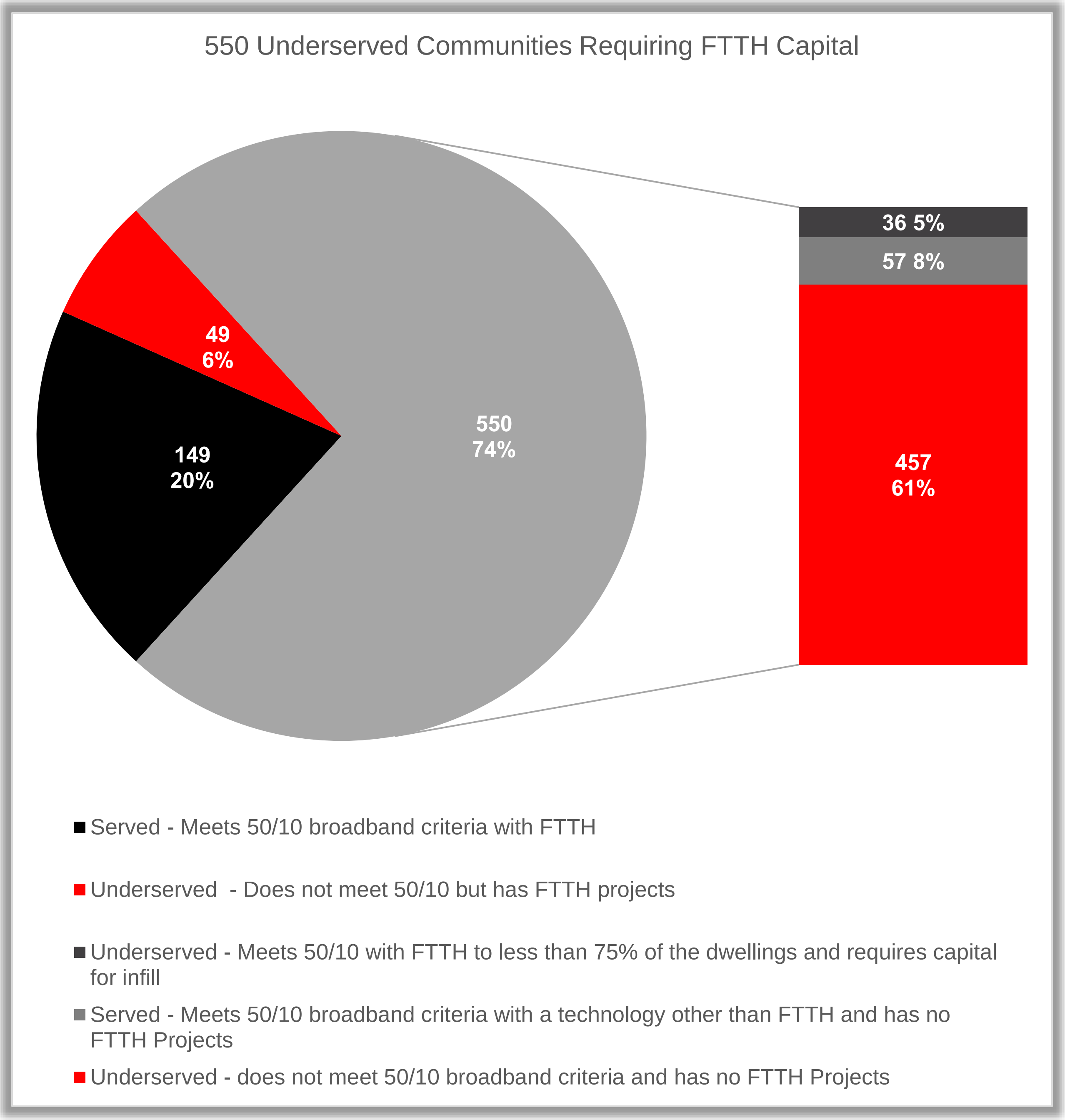


Figure 78 - Underserved Communities Requiring FTTH Capital

It is interesting to note that despite the funding opportunities having been available since 2019 for 50/10 builds, only 6% of First Nation communities have active grants to build out FTTH infrastructure and only 20% have FTTH infrastructure after grants have been actively awarded since 2019.

6.0 Communities Needing Cellular Infrastructure

To achieve good cellular internet browsing and video streaming, each First Nation needs a high-capacity backbone scalable to 10,000's Mbps to address future demands and at least one cell site within the 5km of the community centre. A fibre backbone is also required for broadband services and can easily support connection requirements with scaling capacity to address for both the broadband and cellular services that a community requires. In fact, for underserved First Nations communities with neither cellular services, nor broadband services available, the backbone synergy will lend itself to a deployment phasing since the building out of cell sites is much faster than building out FTTH. Essentially, the backbone and cellular services can be deployed first with an interim solution of Fixed Wireless Access (FWA) to give the community access to cellular services and to 50/10 with FWA while funds and planning are put in place to build out FTTH.

Long Term Evolution (LTE), often referred to as 4G, is capable of 220Mbps down and can support video streaming. The next generation technology, 5G can deliver much higher bandwidths down and is rapidly being deployed in Canada's urban centers. Any new investment in cellular services should be to the most current technology available which at present is 5G. LTE itself can be upgraded to 5G with minimal stranded investment. The generation before LTE is 3G, a narrowband technology not suitable for video streaming and very poor for internet browsing. Upgrading old 3G infrastructures to 5G, requires a complete replacement of electronics but can reuse the tower with some Capex provisions for tower reinforcement.

The Capex and Opex planning exercises to address the cellular infrastructure gap identifies a community as having cellular if 75% of the roadways within a community have LTE or 5G service based on data from ISED and as described in sections 3.3.3 and 3.3.4 due to optimistic service provider self-reporting, there is a tower within 5km of the community centre. Existing infrastructure is LTE, new infrastructure should be built to the most current technology and in 2023 should be 5G.

Of the 748 communities, 620 communities (83%) do not have cell towers within their community boundaries. A cell tower within the community pretty much guarantees in-building cellular services to most of the community but is not necessary for coverage. It is possible to serve the communities with cellular from towers outside the community. As shown in the following map using the definitions above, 318 communities have cellular service today. As the analysis is based on outdoor coverage along roadways, additional work is required within these 318 communities to verify indoor coverage. This should be done both by desktop analysis using propagation tools much in the same way that ISED correct the FWA reporting and by internet speed tests conducted from the community. The remaining 430 communities require cellular infrastructure: 419 new towers and 11 electronic upgrades from 3G to 5G.

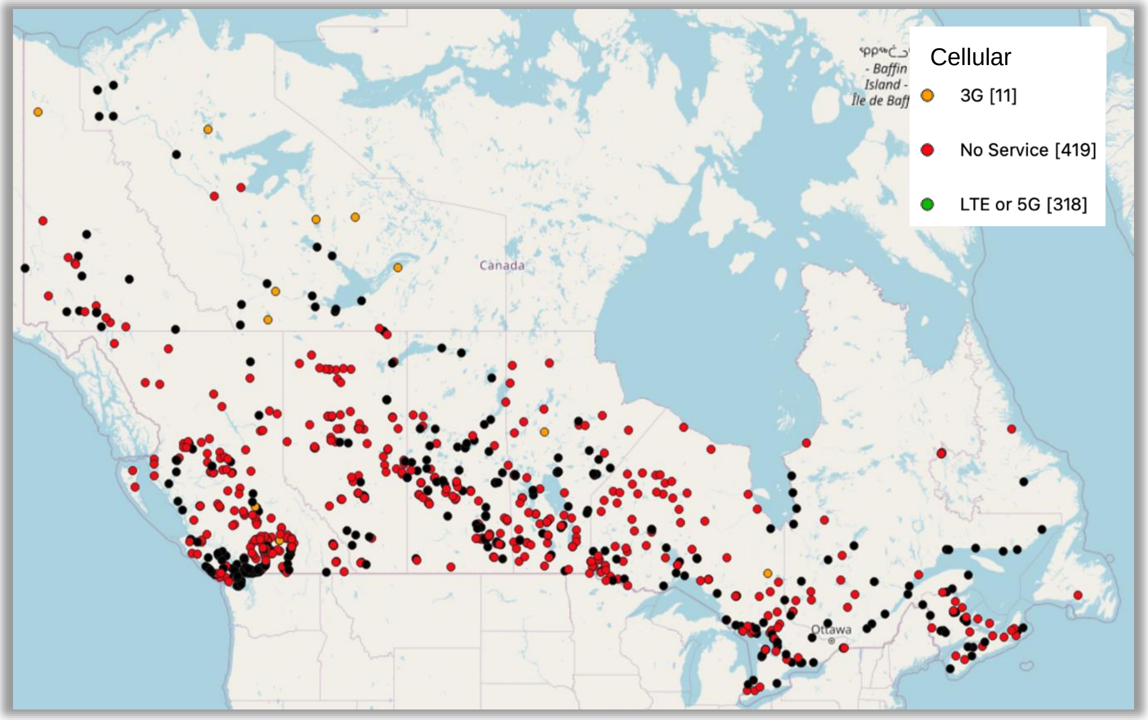


Figure 198 - Cellular Service Map

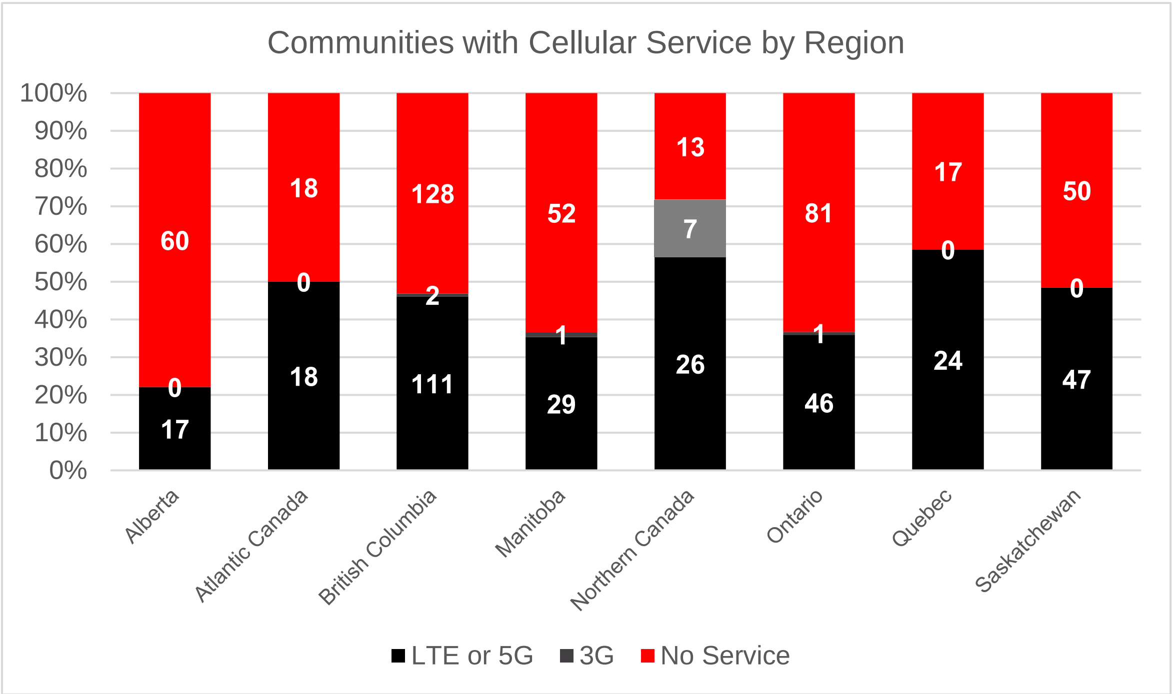


Figure 20 - Cellular Service by Region

6.1 Communities Meeting the Cellular Criteria

Forty-three percent of the communities meet the Cellular criteria for outdoor coverage along roads. This is heavily skewed by community size. All the very large First Nation communities meet the cellular coverage criteria but this falls rapidly as the community sizes get smaller in dwelling size, indicating challenges with the cellular business case for First Nations.

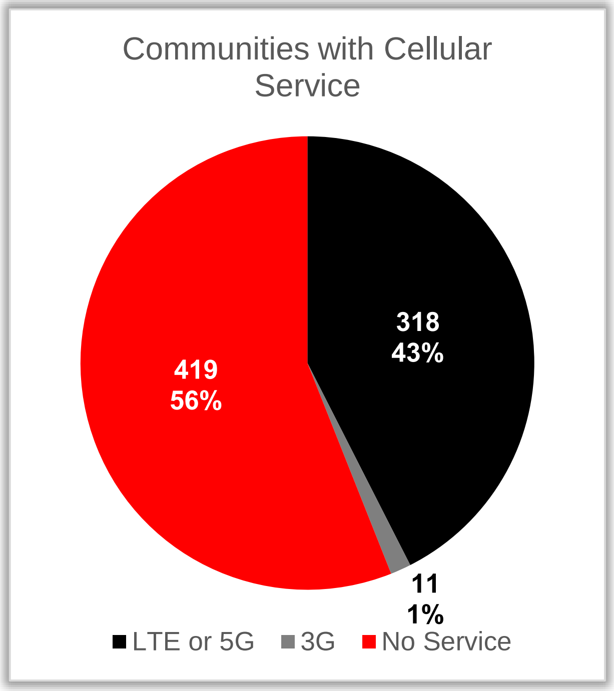


Figure 21 - Community Cellular Service

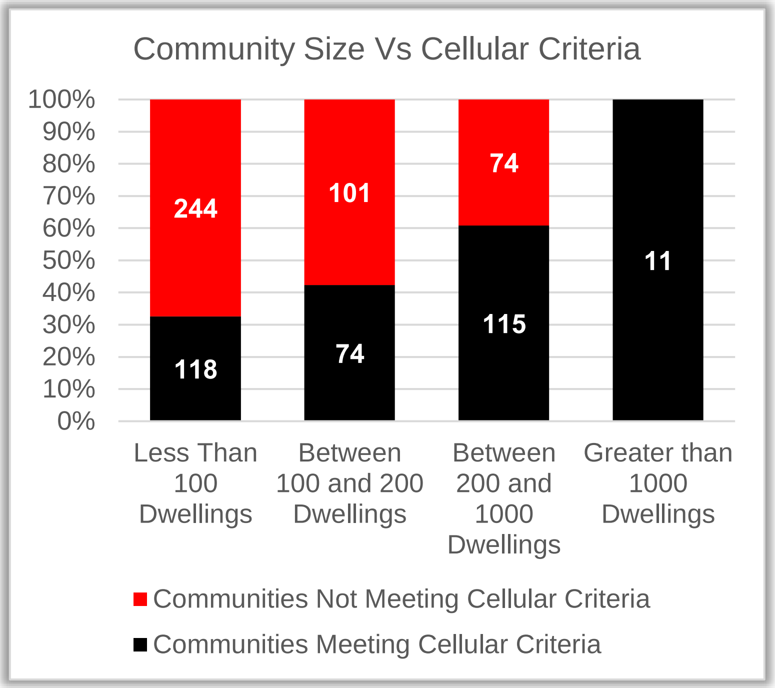


Figure 22 – Cellular Service Compared to Community Size

These results are expected as to date, none of the funding activities have addressed in-community cellular coverage. There have been some funding activities aimed at highway coverage but none really aimed at in-community coverage. The Capex and Opex planning for cellular services are based on tower sites. Regardless of the community size, service providers need at least one tower and even if this tower and the companion electronics are completely subsidized, the service providers have large Opex costs associated with the tower that is does not scalable downward to match the community size. Furthermore, the cellular market is approaching subscriber saturation with the possibility of finding net new subscribers with no cell phone to date, slim. Even in underserved First Nations communities, the band office and many of the community members will have cell phones which they use when they travel outside the community to covered areas, making a business case based on net new revenue difficult.

6.2 Cellular Coverage of Highways

Mobility coverage along unserved highway corridors has become a First Nations safety policy. The challenge with the coverage to these areas is that there are no net new revenue opportunities associated with highway cell sites, only additional Opex costs, making highway service unattractive to service providers. There have been funding opportunities available for highway coverage with the Mobility service providers like Rogers taking advantage and providing coverage to notorious corridors such as BC's Highway of Tears. While these are good initiatives, there are still many more corridors requiring cellular coverage and of course the 419 First Nations without in-community cellular service identified in the section above, making Capex for this activity extraordinarily difficult to quantify as it simply is not reasonable to have 100% coverage on all Canadian highways.

While the funding and requirements get sorted out for highway coverage, there are emerging technologies solutions using Low Earth Orbit satellites that will provide stop-gaps including the iPhone 14 with a built-in app to enable emergency short messages via LEO satellite on unserved highways purported to be available in November 2022; use of LEO satellites for cell backbones coming in 2024, and other cell phone technology using LEOs for "cell towers in space" such as Lynk and StarLink making announcements in May 2021 and August 2022 respectively for service coming in the next 2-3 years which enables a cell phone to use satellites in locations with no cellular services available.

6.3 Cellular Airwaves

Mobility services use radio waves grouped in bands. Radio waves or spectrum is an asset that is managed by ISED and coordinated by ISED with other international spectral agencies like the FCC. This coordination and management activity ensures that the spectrum can be used without harmful interference from other and allows services, like cellular, to work seamlessly across international borders.

Cellular spectrum in Canada is complex with the first spectral bands offered the cellular service providers on first-come-first-serve-basis such as the 800MHz or PCS bands and other bands opened after the initial, sold off in auctions. The licensed areas can be large and often cover underserved areas including First Nations communities. During the more recent spectral auctions, ISED has mandated that the cellular service providers use their purchased spectrum within a set period or run the risk of losing it.

We know of no situations where cellular service providers have lost spectrum. Instead, it is common for underserved areas to have the cellular spectral bands fully licensed out to cellular providers. The following tables were developed using the service provider data supplied with the roadway coverage and may not accurately reflect the true spectral licensing situation but does give a good indication of how common this problem is. Multiple cellular service providers can hold licenses for the same underserved area so in the case of The West, in the table below, where there are 240 underserved communities, there are 384 instances where cellular service providers are listed as the service providers for these unserved communities, indicating that for many underserved communities, there is at least two cellular service providers holding spectral licenses and not using them.

	Instances where a service provider is listed as cellular services provider to an unserved community			
	The West (BC,AB,SK)	The East (MB,ON,QB)	Atlantic Canada	Northern Canada
	240 unserved communities	*152 unserved communities*	*18 unserved communities*	*20 unserved communities*
Rogers	136	87	16	
TELUS / Bell	138	93	17	17
SaskTel	47	25		
Freedom Mobile	10	3		
Eastlink		1	10	
Videotron		3		
No Service Providers	**53**	**54**	**1**	**3**
Total Instances	384	266	44	20

Table 2 - Service Providers in Unserved Communities

TELUS and Bell Mobility, while fierce competitors for cellular subscribers, share their radio access network nationally and are shown as one cellular service provider in the table above. This means that where TELUS has a cell site, Bell can offer service and vice versa. TELUS is the incumbent Telco for BC and AB while Bell is the incumbent for MB, ON, QB, Atlantic Canada and Northern Canada. As a starting point for First Nations communities wanting cellular, they should make a call to either TELUS or Bell depending on their region and then to Rogers as Rogers is a national provider serving everywhere but Northern Canada. It is likely that one of TELUS/Bell or Rogers will hold spectrum licenses for the community and are in a position, should they be able to develop a workable business case, to extend service.

In the table above, there are 111 communities that are remote and have no 3G, LTE or 5G cellular service providers listed. The data provided the AFN by ISED did not include other deployments of cellular technologies which may have yielded service providers for those communities with none showing now. Regardless from the AFN data for these 111 communities, it is unclear which cellular service providers to approach.

In the situations above, where cellular service providers have spectrum but are not using it to serve the First Nations or there are no cellular service providers identified, it may make sense for the First Nation to become a service provider, a feat with many potential barriers, all of which requiring careful consideration. Regardless, it makes sense for the First Nation to acquire the spectrum assets above their territory as a first step. Indigenous ownership of spectrum is becoming a significant policy issue. At present, First Nation communities do not have the right to own spectral bands in the airspace above their communities, but this situation is rapidly changing with some key decisions coming in 2023 and 2024 following ISED's consultation process on two key topics that may change the direction for spectrum ownership. The consultations are summarized below and the decisions arising from these decisions carefully tracked.

Consultation Topic	Date	Comments
Non-competitive Local (NCL) Licensing Framework	August 2022	New proposed licensing process to make 5G spectrum available in a user- friendly way, on a very localised basis to address community needs (3900MHz and mmWave bands to start)
New Access Licensing Framework Consultation	August 2021	New supplementary licensing process (Access Licensing framework) for unused spectrum, commonly referred to as "***Use It or Lose It"*** Focussing on unused spectrum in rural and remote areas for three spectrum bands first – Cellular(800MHz), PCS(1900MHz), and 900 MHz

Table 3 - Consultation Topics

7.0 Underserved Communities

Of the 748 First Nation Communities in this study, 363 communities, or nearly half, meet neither the 50/10 broadband criteria nor the Cellular criteria and are critically underserved. These communities should be addressed as a first priority.

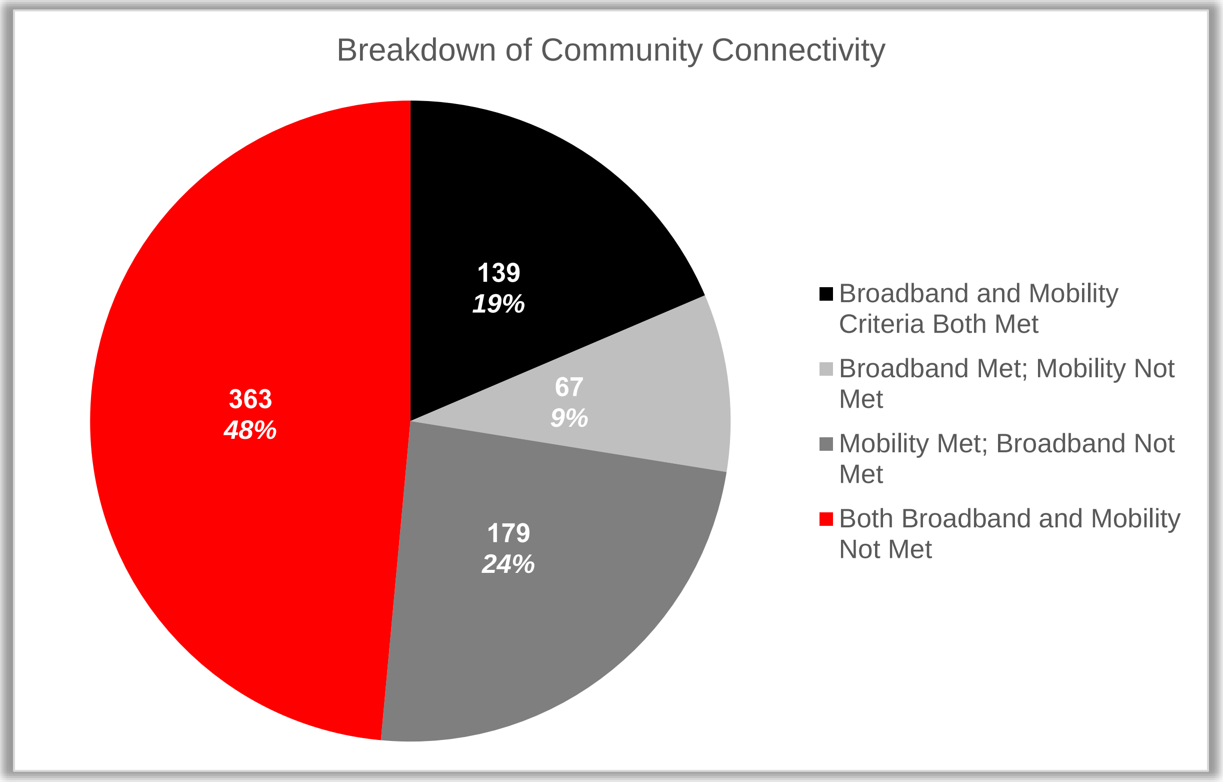


Figure 23 - Overall Community Connectivity (Broadband and Cellular)

8.0 FTTH and Cellular Service Providers

Planetworks met with service providers during December 2022 and January 2023. The purpose of the meetings were twofold:

A. Share with the incumbent service providers, the list of First Nation communities in their traditional serving territories not meeting the broadband criteria or cellular criteria. This is likely one of the first times an exercise like this has occurred and it is important that all stakeholders share a similar view of the challenge.
B. Collect from all interviewed service providers, their thoughts on the challenges extending service even with government grants of up to 90% of the Capex.

Due to time constraints, the team of Planetworks, BTY and the AFN was only able to conduct interviews with (alphabetically):

- Arrow Technology Group
- Bell
- Clear Sky Connections
- Northwestel
- Rogers
- TELUS

We met multiple times with each of the large service providers, TELUS, Bell, Rogers and Northwestel to meet their Indigenous Relations teams and to learn about different programs on many varied issues for everything from service affordability to new business models and developing telecommunications skills in remote communities. Each of TELUS, Rogers and Bell (which include Northwestel) offered letters of support for this initiative and Rogers and TELUS also offered recommendations regarding methods to accelerate connectivity to underserved First Nations. These letters are included in Appendix A.

Many of the smaller regional service providers, such as City West in BC, or K-Net in Ontario are being very innovative with First Nation connectivity and do provide options for First Nations which should be explored during future surveys by the AFN on connectivity.

8.1 Largest Incumbents and Relationships

The largest FTTH and cellular service providers are facilities-based service providers, meaning that they own the infrastructure over which they offer service, and are split between Telco Incumbents (Bell, SaskTel and TELUS) from the traditional telephone business using copper twisted pair outside plant and Cableco Incumbents (Rogers, Shaw, Videotron, Cogeco and Eastlink) from the traditional cable TV business using coaxial cable outside plant. Both the Telco and Cableco incumbents are evolving their outside plant from either copper twisted pair or coaxial cable, to FTTH.

Although the telecom industry is highly competitive, there are agreements in place at the network level among Telco incumbents and among Cableco incumbents. The following table summarizes some of the ownership and business relationships as well as indicators of size and service breadth (national or regional.)

Incumbent	Subsidiaries	National or Regional	Location of Facilities	High Speed Internet Subscribers (Million)	Mobility Subscribers (Million)	Notes
Bell Canada Enterprises	Bell Mobility, Bell Aliant, MTS Bell, Northwestel, Bell Fib TV, Telebec, NorthernTel, Bell Media, BCE Nexxia	National	MB, ON, QB, Atlantic, North, parts of Northern BC	3.86	9.2	*Bell and TELUS have a national sharing agreement for towers*
TELUS	Telus Mobility, TELUS TV, Koodo Mobile, Public Mobile, Mascon Communications, TELUS Quebec	National	AB, BC and parts of QB	Not Available	10.6	*Bell and TELUS have a national sharing agreement for towers*
SaskTel		Regional	Saskatchewan	Not Available	0.7	*Owned by the Saskatchewan Govt*
Rogers	Rogers Wireless, Fido, Rogers TV, Rogers Cable, Cityfone, Ruralwave,	National	Towers in Western Canada; outside plant and towers in eastern Canada	10.8	11.3	*Rogers is acquiring all of Shaw except Freedom Mobile*
Shaw	Shaw Mobile, Freedom Mobile, Shaw Cablesystem, various community cable TV companies in BC	Regional	AB, BC and parts of ON	7.08	2.6	
Videotron		Regional	Quebec and Ottawa	1.8	1.7	*Videotron is acquiring Freedom Mobile as part of Rogers' acquisition of Shaw*
Cogeco	Breezeline	Regional	Ontario and Quebec, parts of Atlantic Canada	1.6	No cellular	
Eastlink		Regional	Small communities throughout 9 provinces	0.5	Not Available	

Table 4 - List of Incumbents

The acquisition of Shaw by Rogers represents an excellent opportunity to strengthen First Nation connectivity in Western Canada. From the Rogers website, the acquisition brings several benefits including the following two that will help close the connectivity gap for broadband and Cellular in Western Canada for First Nations:

Investments to Create Jobs and Connect Communities

- *Rogers to invest $2.5 billion to build 5G network in Western Canada, driving economic growth and strengthening innovation sector*
- *New $1 billion fund dedicated to connecting rural, remote and Indigenous communities to high-speed Internet across the four Western provinces*

The acquisition is expected to complete mid 2023. In the past, many promises have been made in support of other Telco or Cableco consolidations and it has been difficult to quantify how these promises correlate to change. Given the magnitude of the connectivity issues for First Nations in Western Canada, it is necessary for the AFN, CRTC, and Provincial Governments to work with Rogers to develop a plan to address underserved First Nations, provide on-going oversight of the rollout and put in measures to track the progress. The AFN should work with the CRTC to strike this team immediately.

8.2 First Nations Service Providers

There are several Service Providers, some being First Nations owned, that specialize in connectivity to First Nations and rural non-First Nations communities. A partial list includes: Eeyou Communications Network, K-Net, Western James Bay Telecom Network, Clear Sky Connections and Arrow Technology Group. These Service Providers have innovative business models and methods which should be analyzed for successes as part of future strategies to ensure sustainability of the fibre infrastructure.

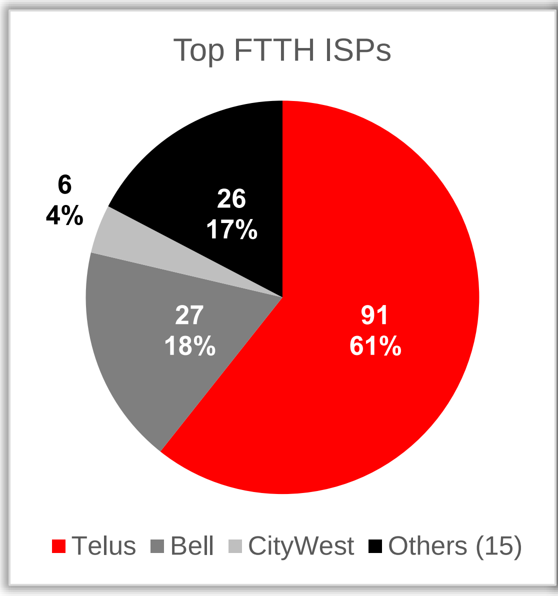
We were able to meet with two service providers in the time available, Arrow Technology Group (ATG) which provides connectivity to more than 40 rural communities in Alberta, 35 of which are First Nation communities and Clear Sky in Manitoba planning to develop an open access backbone to connect Manitoba communities. Both have experienced challenges with the funding processes.

ATG currently provides broadband connectivity services using the Alberta Supernet backbone with ATG FWA last mile. In most of their served communities, ATG's FWA service is the only broadband service available – there are no other competitors. ATG applied to the UBF to upgrade all their served communities with FTTH in 2020. In late 2022, ATG was informed that they were granted approval for FTTH in 23 communities, roughly half of those served by ATG, and were offered no explanation as to why the other half were not approved. It is interesting to note that the communities that were approved for funding were the smaller ones served by ATG where the business case is marginal at best and the ones not approved, were the larger ones where the business case was stronger and would have helped subsidize the less profitable ones. The funding application process is a competitive process. Only one service provider can be awarded grants for FTTH per community. Consequently, ATG could only assume that another service provider must have applied for and received approval over ATG, to serve these communities even although in most of the communities ATG was the only broadband service provider at time of application.

Clear Sky in Manitoba has similar funding challenges to ATG with the Connect to Innovate Fund (CTI). Clear Sky is a not-for-profit company that is focused on creating a fibre backbone to connect 63 First Nation communities. Given the challenging terrain and lack of existing infrastructure, the Capex costs to build out a backbone to serve all the First Nation communities was more than 60% of the available CTI funding during the 2018/2019 application intake process. Regardless, Clear Sky received funding approval conditional on Clear Sky partnering with an ISP. Clear Sky was unable to reach an agreement with this ISP and found themselves in a competitive situation for the funding with another service provider purporting to be able to build the backbone for much less. Consequently, this critical backbone project never moved forward and Clear Sky is now working on a smaller project with ISC funding completing in 2023 to build a backbone to two communities.

8.3 FTTH ISPs Serving First Nation Communities

According to our data, there are 150 First Nations communities with FTTH today of which 61% are served by TELUS and 18% by Bell. It is interesting to note that CityWest, a small regional Telco in BC is the third largest supplier of FTTH to First Nations communities and that 17% of the FTTH served communities, are addressed by 15 service providers, each with one or two projects.



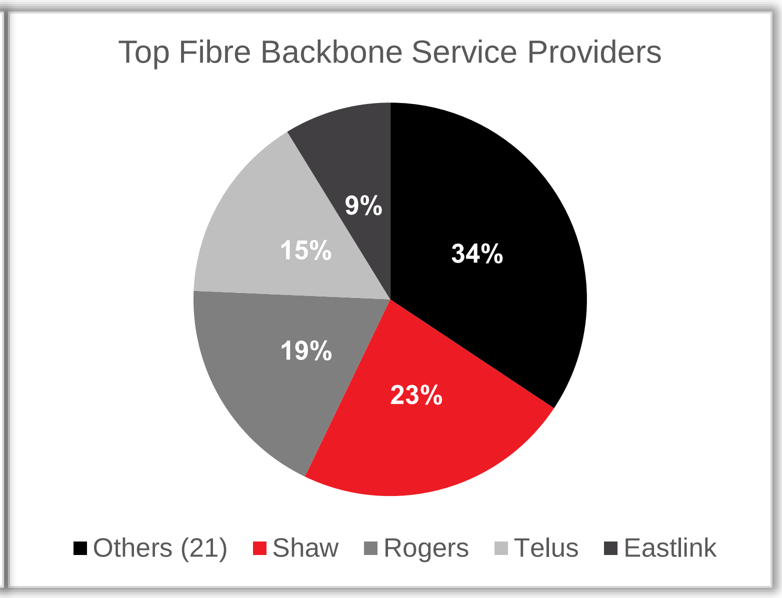


Figure 94 - ISPs Providing FTTH or Fibre Backhaul

The FTTH service provider ratio does not track to the service providers for backbones. Of the 399 instances of named backbone service providers, the two biggest backbone service providers to First Nations communities are Shaw (23%) and Rogers (19%), both Cablecos. TELUS at 15% and Eastlink, a Cableco like Shaw and Rogers, is the fourth largest provider at 9%. The remaining 34% are split across 21 service providers. In our databases, neither Shaw nor Rogers have any FTTH facilities in First Nations communities. This may be due to any number of reasons – they are providing service to the community with coaxial cable and meeting the 50/10 threshold or the backbone is for Rogers' cellular service not broadband or the backbone traverses the community without dropping service. Regardless, the high percentage of Rogers and Shaw combined is good news to extend FTTH to communities in Western Canada without FTTH or FTTH projects in flight now. Shaw's service territory comprises predominantly

BC and Alberta and their strong backbone presence to many First Nations communities is the first step for Rogers to meet their promises with their acquisition of Shaw.

8.4 Alternative Business Models for First Nation Communities

First Nations are looking for innovative business models with service providers which gives them control, or at least influence over the connectivity services offered their communities. This is a dramatic change for Canadian telecommunication and cable TV businesses which have always been facilities based, meaning that the service provider fully owns and controls the networks end-to-end over which the service is offered.

The concept of treating broadband networks as critical infrastructure to be shared by multiple service providers has been around for twenty-five years or more. Communities have tried deploying open access networks in the past where multiple ISPs offer service over the same network to their residents with limited success and at time of writing there is at least one new open access network using FTTH under construction in Alberta. There are more examples of open access backbones having been in place and operational for years including, not limited to, the Columbia Basin Broadband Corporation connecting remote communities in the Kootenays in BC, Supernet connecting communities throughout Alberta and the MacKenzie Valley Fibre Line connecting communities along the Mackenzie Valley from Inuvik NT to High Level AB.

One of the key stipulations for funding under any of the government grants is for the service provider receiving the grant to build an open access network, capable of supporting multiple service providers. This makes sense as there no business case for one service provider without the aid of government grants to build out these networks, much less multiple service providers overbuilding their privately owned networks on top of each other, the situation in urban Canada. The open access stipulation is an opportunity for First Nations communities to use the funded infrastructure to provide their own ISP services in the future but more importantly, is an opportunity for First Nation communities to own all or a few of the fibre strands within the subsidized cable. This is important as it will give the First Nation connectivity options to network their communities together in the future or use the fibres for other business aspects.

Northwestel, the Telco monopoly serving YT, NT and northern BC is by far the Telco leader in partnering with First Nations and building innovative business models to address First Nations' needs. Two models, really variants of each other, address the First Nation's desire to own the fibre infrastructure but for sustainability of the asset, are structured such that Northwestel operates and maintains the fibre cable asset for the duration of the agreement. In both cases, the First Nation is the owner of the asset and retains some of the fibre strands for their future use throughout the Agreement term. Northwestel uses some of the fibre strands in the cable for their business and provides the operational and maintenance services for the fibre asset throughout the Agreement term.

Going forward it will take many different and innovative business models to get service extended to underserved communities.

8.5 Common Challenges with Extending Service to Unserved First Nations Communities

During discussion in the interview process, there were a few common themes which are summarized here and should be considered for coming funding application intakes. These are not presented in any order.

8.5.1 Lack of information

The funding application process is set such that the detailed engineering including site surveys occurs once the funding contribution agreement is executed. For the funding application, the service providers use in-house metrics to develop their business case and summarize it in the application. For broadband, the metrics are based on dwellings counts within the community and whether the outside plant is aerial on poles or trenched underground. For cellular, metrics are more complex but are related to population within the community and net new subscribers.

Many of the service providers cited that accurate information regarding community boundaries, number of dwellings with full-time residents is difficult to obtain for many First Nation communities. Without this information, there can be a great variation between costing developed for the application process with the actual project cost. To date the larger service providers have absorbed this difference simply due to the extended length of time it takes to get an application, or in this case a contract change, approved. This trend is not expected to continue much longer.

8.5.2 Difficult business case for FTTH

Several service providers offered that under special circumstance, 100% upfront Capex may be needed to make the business case work. The business case for FTTH in smaller communities of less than 200 dwellings is difficult even with 90% upfront Capex. As the communities get smaller and more remote, the cost per dwelling to deploy FTTH gets higher while the revenue opportunities get lower. In many cases to now, the service provider has been able to make their business case work with a 10% match by them. However, as the community sizes get smaller, even with an expenditure of only 10%, the service provider cannot make their business case work and many First Nation communities do not have the 10% available to offer the service provider as incentive to extend service.

Other ways offered by the service providers to make the business case for FTTH in smaller communities work is with some on-going operational subsidies to help close the gaps between negative revenue and net neutral.

The AFN offered local support from First Nations as means to reduce some operational costs and better the business case for small communities. There are situations with some remote First Nations where a service call can take weeks or months because the service provider needs to stockpile enough orders to make a technician visit from the closest service centre economical. This is problematic for FTTH adoption. Typically, the FTTH outside plant is built and because subscription to the FTTH service is not mandatory, the subscriber drop cables, ONU installations and service activation is completed on demand subscriber-by-subscriber as each subscriber signs up the service, a process that for remote communities can be drawn out for months. If there was a technician available within the community to address some of the work orders and act as a depot for the ONUs, considerable expense could be saved especially if all optical drops are placed when the outside plant is constructed. While the service providers seemed genuinely interested in using local technical support, very few had any plans in place due to labour constraints in collective agreements. Several service providers flagged that the subscriber drop cable and CPE were not covered by one or more funding programs.

8.5.3 Difficult business case for Mobility

The business case for cellular coverage in a community is difficult because the opportunity for net new subscribers and revenue is limited as many people as possible within an underserved community tend to have cell plans already so that they can use their phones when they travel outside the community. For Bell and TELUS sharing the same radio access network, this gets more complicated as both must share subscribers in a community and neither can be guaranteed 100% of the subscribers.

While FTTH has high upfront Capex, lower on-going operational costs and high average revenue per user, cellular is the reverse scenario with considerably lower upfront Capex but higher on-going operational costs and lower average revenue per user. A community with 200 dwellings will require typically $4,000,000 in upfront Capex and 2% a year to operate while for cellular will require typically $1,500,000 upfront and 7-10% a year to operate. Consequently, when the AFN team met with the cellular providers, they all independently, had the same message. That while the upfront Capex is necessary given the small revenue potential, there is no way to extend cellular coverage to small unserved communities without provisions for on-going Opex subsidies.

One of the service providers suggested that the Opex for a set period be prepaid upfront with Capex grant. This would avoid the overhead within both the service provider's and the funder's operations associated with the annual reporting.

8.5.4 Challenges with the Funding Application Process

There were several issues associated with the funding process which became evident during discussions with the service providers. First, application intakes tend to occur together at time approaching the federal government year-ends with little warning that the intake is opening. Consequently, First Nations communities tend not to be ready. They need to find service provider partners which for some is no small feat in itself, and then work with the service provider to submit the application, all usually within a 3-month window. And there could be multiple funding sources available to the First Nation at the same time, confusing the process. The service providers recommended that the various government agencies coordinate the timing of their application intakes and ideally publish a schedule of when intakes are to occur, even tentatively, so that the First Nation communities could plan accordingly.

One of the most common themes in the discussions with the service providers was annoyance over "cherry-picking" where certain service providers applied for funding to address the community centers but left the hard-to-serve-dwellings on the community outskirts for others, making service to these dwellings on the outskirts even more costly and complex. Because the funding application is competitive, a service provider can make his application look more appealing economically to the funders by cherry-picking the community core and beat out other service providers with worse economics willing to serve all the dwellings, not just those in the community core. Almost all the service providers recommended that the funders take a holistic view of an area which captures the both easier-to-serve and the harder-to-serve.

By far the biggest challenge with the funding application process is the extended time it takes to get projects approved. For UBF based funds, the application process from application submission date to signed contribution agreement takes upwards of eighteen months while for CRTC based funds, upwards of 2 years. Once the contribution agreement is approved, a FTTH project will take two to three years from start to finish. The funding and build process will take 4-5 years and the budget submitted with the Application understated. Furthermore, if the funding approval processes remain at 18-24 months, all 542

First Nation communities must have funding Applications in within the next 24 months, a situation that is not likely, to meet the 50/10 target by 2030.

8.5.5 Service affordability

The AFN discussed service affordability with the service providers. The big service providers – TELUS, Rogers and Bell, all have subsidy programs in place to aid low-income households with access to high-speed internet services once those services become available.

8.5.6 Cellular Funding

There are no funding programs in place to extend cellular service into underserved communities. There have been a few funding opportunities to extend cellular coverage along highways but little funding to provide in-community coverage for underserved First Nation communities. Given that many of the First Nation communities are very small with less than 200 dwellings and there is no business case for cellular, specific funding programs need to be developed which addresses both the upfront Capex for a tower and the some or all the on-going Opex.

9.0 Funding Sources and Application Process

There are many funding sources available to First Nation communities for connectivity today and most follow a 90/10 Capex grant where the Funder supplies 90% of the Capex while the Applicant supplies 10%. Each program tends to target specific objectives, but many have over-lapping objectives making the process at times, complicated. The application for a community is competitive with the funding award going to the service provider with the best economics for a specific community during each application intake. For the recent intakes, the awards have been made predominantly to experienced service providers which have been in business for more than three years. However, funding awards have also been made to a few First Nations with long term operational agreements in place with experienced service providers. The funding is first-come-first-serve by community and once a service provider is funded for a community, no other service providers may be funded nor can the community tap other funds for the same work.

While the framework for infrastructure sustainability makes sense for most communities by either having experienced service providers lead the funding request or by First Nations contracting operations with experienced service providers, there are 30 communities that have neither ISPs nor cellular service providers to draw upon. It is unclear how these communities should proceed.

The Applications vary somewhat by fund but all require significant detail about the number of dwellings in the community to be served, and the elements of the business case including revenues, Opex, availability of other funding sources and verification that the Applicant can pay the 10% match. Once the Application is submitted, the funder conducts their reviews and grants the applicant a conditional letter of approval. The Applicant and the funder then start negotiations which result in an executed contribution agreement. The process from application submission to executed contribution agreement, currently takes 18-24 months depending on the funding source. Once a contribution agreement is in place, the project starts and lasts typically 3 years for FTTH, 2 years for backbones and 1 year for cellular projects. At present, there are no projects in the database extending beyond 2025. The flurry of intake activity for various funds over the last 4 months will be for projects completing 4-5 years from now if the duration of the intake process remains as is.

Once a project is associated with an executed contribution agreement, ISED uploads the information to the National Broadband Availability Map. The Applicant provides updates on the project status to the Funder per the contribution agreement and once the project is completed, sends ISED the updated the connectivity for the community.

9.1 Funding Sources

The following section describes some of the larger funding opportunities with the federal government. There are also provincial and territorial funding opportunities, many in partnership with the ISED or the CRTC, that for expediency are not described in this section.

In the database, there are 1220 approved projects, most of which are either with Indigenous Services Canada (ISC) or Connecting Canadians Projects (CCP). ISC has funded various projects relating to connectivity such as consulting services, fibre infrastructure to connect band offices, and some miscellaneous infrastructure including a couple communications towers for cellular services. The majority of CCP funded projects are for broadband technologies other than FTTH, such as FWA, coaxial cable and DSL. Most of the project data shared with the AFN does not include project end dates. None of the data includes the awarded grant amounts. In the chart below "Other" captures a range of private and provincial projects.

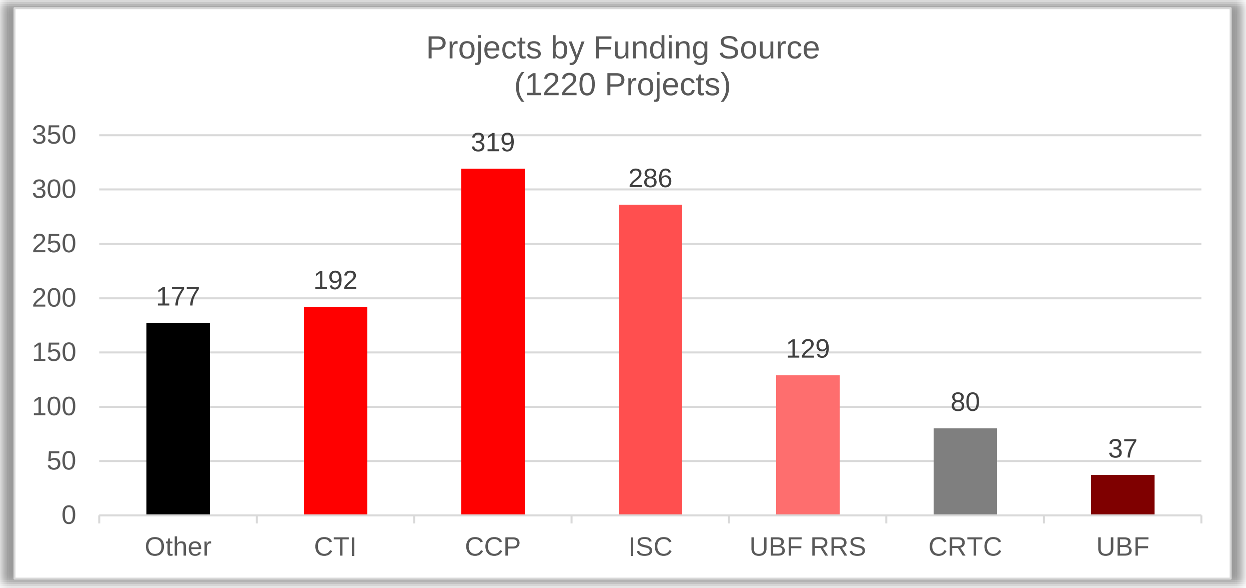


Figure 105 - Projects by Funder

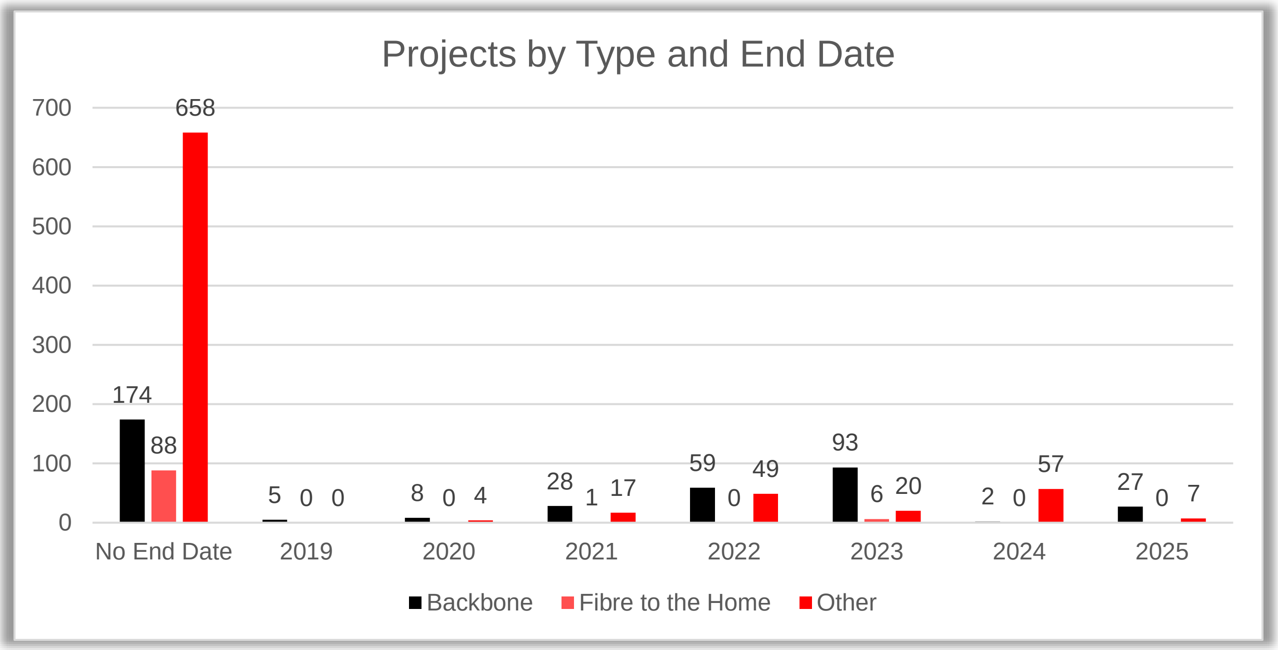


Figure 116 - Project End Dates

9.1.1 CRTC Broadband Fund

The CRTC established the Broadband Fund to help provide all Canadians with access to broadband Internet and mobile wireless services. The Fund will award up to $750 million to projects that help achieve this goal. Unlike other funding programs derived from tax dollars, the funding for the Broadband fund comes directly from contributions made by large Canadian telecommunications service providers whose total annual Canadian revenues amount to at least $10 million. The CRTC is currently accepting applications until April 2023 for backbones, highway cellular coverage and subsidies for satellite backbones.

9.1.2 Connect to Innovate (CTI)

Connect to Innovate Fund is a fund administered by ISED that committed $585 million to improve connectivity in over 975 rural and remote communities, including 190 Indigenous communities, by 2023. This program primarily supports backbone infrastructure to connect institutions like schools and hospitals within the community and to connect communities with other communities.

9.1.3 Connecting Canadians Program (CCP)

CCP is a partnership between the provincial or territorial governments and the federal government as an extension of the UBF program to provide funding to build out broadband infrastructure to underserved communities originally with a minimum service of 5Mbps down and 1Mbps up. CCP is now administered by the Provincial Governments and tends to be focussed on last mile solutions using FTTH. Some of the early funding awards under this program addressed FWA and other last mile technologies. The BC and AB Governments both have open intakes at time of writing for CCP.

9.1.4 Universal Broadband Fund (UBF)

The Universal Broadband Fund (UBF) is a $3.225 billion investment by the Government of Canada designed to help connect 100 per cent of Canadians with at least 50/10 by 2030. The UBF is administered by ISED and funds backbone and FTTH projects. The UBF currently is not accepting applications.

9.1.5 Universal Broadband Fund Rapid Response Stream (UBF RRS)

The Universal Broadband Fund Rapid Response Stream refers to a specific funding intake of the UBF program in 2021 to offer up to $5M for projects that were "shovel ready" and could be completed within twelve months. This project addressed last mile and backbone projects.

9.1.6 Indigenous Services Canada (ISC)

ISC has many funding programs available to development of First Nation connectivity infrastructure. Their funding addresses issues such as connecting schools, hospitals and band offices within an indigenous community but has also been used by several indigenous communities for cell towers.

9.1.7 Canada Infrastructure Bank (CIB)

While the CIB does not have funding programs available per se, they do offer low interest, long term loans for service providers and for First Nation communities to build out broadband infrastructure. This loan can be used for the 10% Capex match.

10.0 Capital and Operating Expenditures to address the Infrastructure Gap

For the purposes of long-term planning, the Capex identified in this section equates to the funding necessary for every First Nations community to have a fibre backbone, FTTH last mile and cellular services. The cost estimates use community data from the database, and cost metrics from in-house Planetworks' data adjustmented for aftors recommended by BTY.

The sixteen missing communities represent 602 dwellings, based on available information that has yet to be vetted by ISED or others. Information such as availability of a fibre backbone, the backbone service provider, FTTH service or cellular service is not known. The 16 communities represent 2% of the communities and 602 dwellings represents 0.4% of the dwellings. This range is captured with the error bounds for Capex and Opex costing.

10.1 Methodology

Planetworks uses in-house unit metrics for the construction and operation of telecommunications based on route km of backbone fibre, dwelling counts for FTTH and tower costs for cellular networks and tracks a range of values for each unit metric. The costing for this report was developed using average values in the range, and the upper and lower bounds of the range forming the costing accuracy. There is a significant range for each metric between the lower and upper bounds for Capex, to address Capex volatility in the telecom industry due to demand, lack of qualified contractors and worldwide supply issues. Opex costing too, is highly variable but by service provider and typically not released by the service provider due both the competitive nature of the telecommunications industry and the Opex effect on each service provider's financial performance.

The scope of the Capex for each network type is itemized in the tables in Appendix B (B1.2 for Backbone, B1.3 for FTTH and B1.4 for Cellular).

The scope of the Opex assumes an established existing operator with business processes and infrastructure already in place. This includes a 24/7 network operations center, customer call center, operational support systems (OSS) such as network monitoring, management, provisioning, trouble tracking, etc. and business support systems (BSS) such as billing, customer relations management, collections, supply chain management, etc. as well as department costs for finance, human resources and legal functions. Therefore, the Opex figures include only small incremental amounts for the support costs for the new networks and new customers. In addition to the incremental allowances for these functions, the scope of the Opex includes the following.

- Backbone. The dominant Opex cost in this category is for fibre optic break-fix with a smaller amount for electronic equipment support and maintenance.
- FTTH. Opex addresses fibre optic break-fix for the outside cable plant and, for the electronics (inside plant), with allowances for equipment licensing, support agreements, break-fix, and energy consumption.
- Cellular. Opex addresses allowances for equipment licensing, support agreements, preventive and routine maintenance (e.g., regular tower inspections) break-fix, and energy consumption.

The Capex and Opex estimates do not include allowances for capacity building nor costs to develop self-help capabilities at the community level. The following are typical unit level costs which could be used to help build up a complete estimate for capacity building and as a minimum Planetworks recommends reserves of at $500 Million be set aside for this activity:

- For technical training of personnel: allow $30-50K per person per school year for formal technical training (10 months per school year) and most courses will require 2 school years.
- On-the-job type hand-off training for a new build: allow $160-220K for a technician on site for one year.

To determine quantities, Planetworks used the database to determine quantities sorted to address BTY's recommendations for cost breakdowns. Using the database, Planetworks identified the quantity of communities needing:

- Backbones, calculated the distance as-the-crow-flies to the nearest community with a backbone and converted these crow flight km to route km
- FTTH, the distance from each community to the nearest service center and identified the number of dwellings within each underserved community
- Cellular service but already have 3G service and the distance from each community to the nearest service centre
- Cellular service and a new tower and the distance from each community to the nearest service centre

Once the quantities were determined, Planetworks applied in-house unit metrics for Capex and Opex costs for backbone, FTTH and tower construction to the quantities. These costs were then sorted into the Regions (AB, BC, SK, MB, ON, QB, Atlantic Canada, Canada North) and Zones (G1, G2, G3, G4 defined by distance to nearest service centres) as defined by BTY. Planetworks applied the BTY recommended adjustments for both regions and zones.

Finally, BTY recommended contingencies be added to the infrastructure. Current good practice for budgeting construction projects dictates that three types of contingencies be considered:

- Design Contingency: To cover risks resulting from incomplete design information and the inherent risks in cost forecasting up to tender time. As the design evolves the allowance is absorbed into the quantified work and is ultimately reduced to zero at the pre-tender stage. Given the conceptual nature of the information available, a Design Contingency of 20% has been included to cover some of the exceptional risks and challenges faced by First Nations projects.
- Construction Contingency: A post-tender contingency to cover extras caused by, for example, poorer-than-anticipated ground conditions or poorly coordinated drawings leading to change orders. This can vary between 3% and 7% for new construction and 10% is recommended for renovation projects. Given the complexity of the connectivity scope a Construction Contingency of 10% across the board has been applied to Capex projects in this review.
- Project Contingency: This is usually applied to project soft costs. The allowances for soft costs in this review are deemed to include a built-in allowance for contingencies.

The resulting Capex and Opex estimates represent all-in costs adjusted for zone, region and contingency in keeping with BTY recommendations for infrastructure builds but do not account for annual escalation factors. The assumptions behind the costing build-up are included in Appendix B.

10.2 Findings

With telecommunications outside plant being built all over the world during the past 3 years, further accelerated both by bandwidth demand due to COVID stay-at-home policies and by the availability of government grants, the current demand greatly exceeds the material supply for fibre cable and other key components, driving up Capex costs or delaying projects or both. We have seen two-year project delays due to fibre availability and 25% increases in project costs for materials. In addition, with the big telecom service providers rapidly building fibre infrastructure in Canada, there is a shortage of skilled labour available to build fibre outside plant. This will be troublesome for the small rural projects without any buying power. We have seen increases in project labour costs of 50% and more due to skilled labour availability, resulting in First Nation communities having to pay for the overages themselves or scale back their project scope.

There are means to stabilize Capex for projects in First Nations communities. The first, as the telecom industry is driven by volume, involves aggregating the requirements of many or all First Nations communities into one project to drive the cost per dwelling or route km down, and to make the project big enough to secure the labour and stabilize the Capex throughout the project. Alternatively, if the First Nations communities could be grouped by region, addressed by the large service providers, the large service providers with their annual buying volume could extend their buying power to these communities again stabilizing the Capex.

Like the situation with the FTTH last mile, the Capex planning for 5G is volatile due to worldwide demand and supply issues. Steel for towers is scarce and labour to install the towers scarcer still causing extreme variability in Capex costing especially for First Nation communities typically requiring only a single tower to be built. This is an industry that responds best to volume buying. If the tower requirements could be aggregated across many First Nation communities or across all, the tower and labour costs could be stabilized due to volume. From the analysis, 419 First Nations communities need at least one tower in town for 5G services. The Capex costing assumes that where a community needs Cellular, only one tower is required per community which may not fully cover the community.

The infrastructure gap totals $4.51 Billion and is split $2,236 million fibre backbone, $1,534 million FTTH last mile, $743 million cellular infrastructure. This planning excludes Capex for funded projects for backbone, FTTH last mile, or Cellular infrastructure and assumes that these projects will complete with no additional funding required. Given the volatility of the telecom market, this assumption may not be valid considering the current material and labour supply issues and will need to be qualified in a future iteration of data refinement when more information regarding the projects and their completion status is better understood.

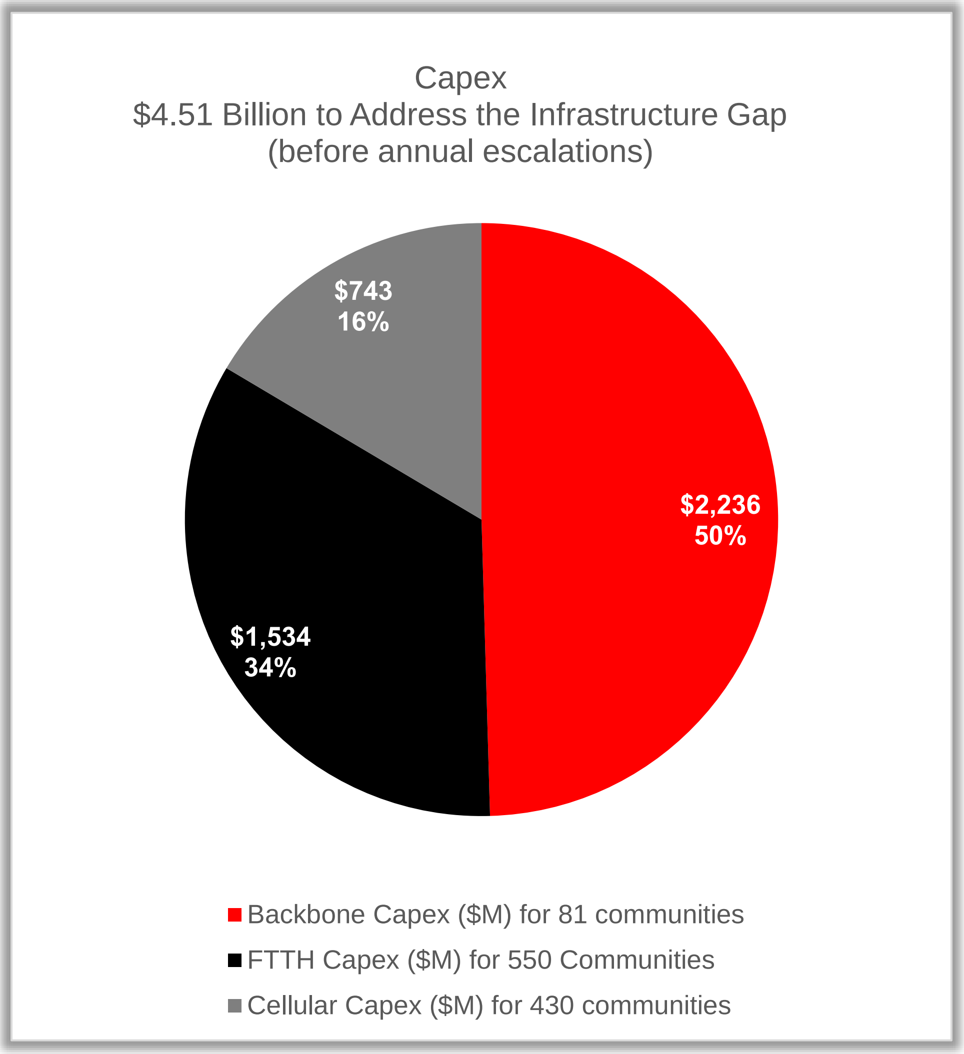


Figure 127 - Capex Needed to Address the Infrastructure Gap

The Opex to support the new infrastructure is estimated at $82.4 million per year. It is interesting to note that while the backbone represents the greatest Capex expenditure, it represents the least Opex costs and conversely, the cellular infrastructure represents the least Capex cost but the greatest annuals Opex costs of the three asset categories, lending credence to feedback from the big cellular service providers that both Capex and on-going Opex subsidies will be necessary for Cellular service to be extended into small communities.

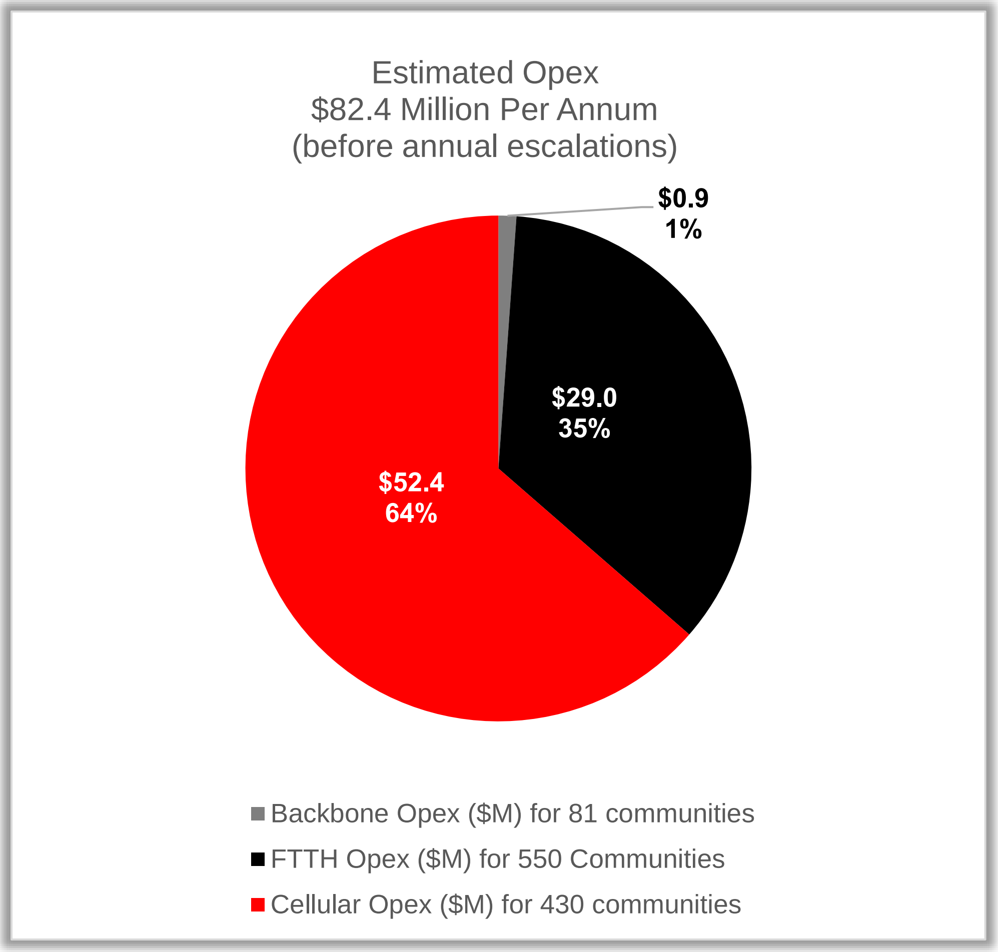
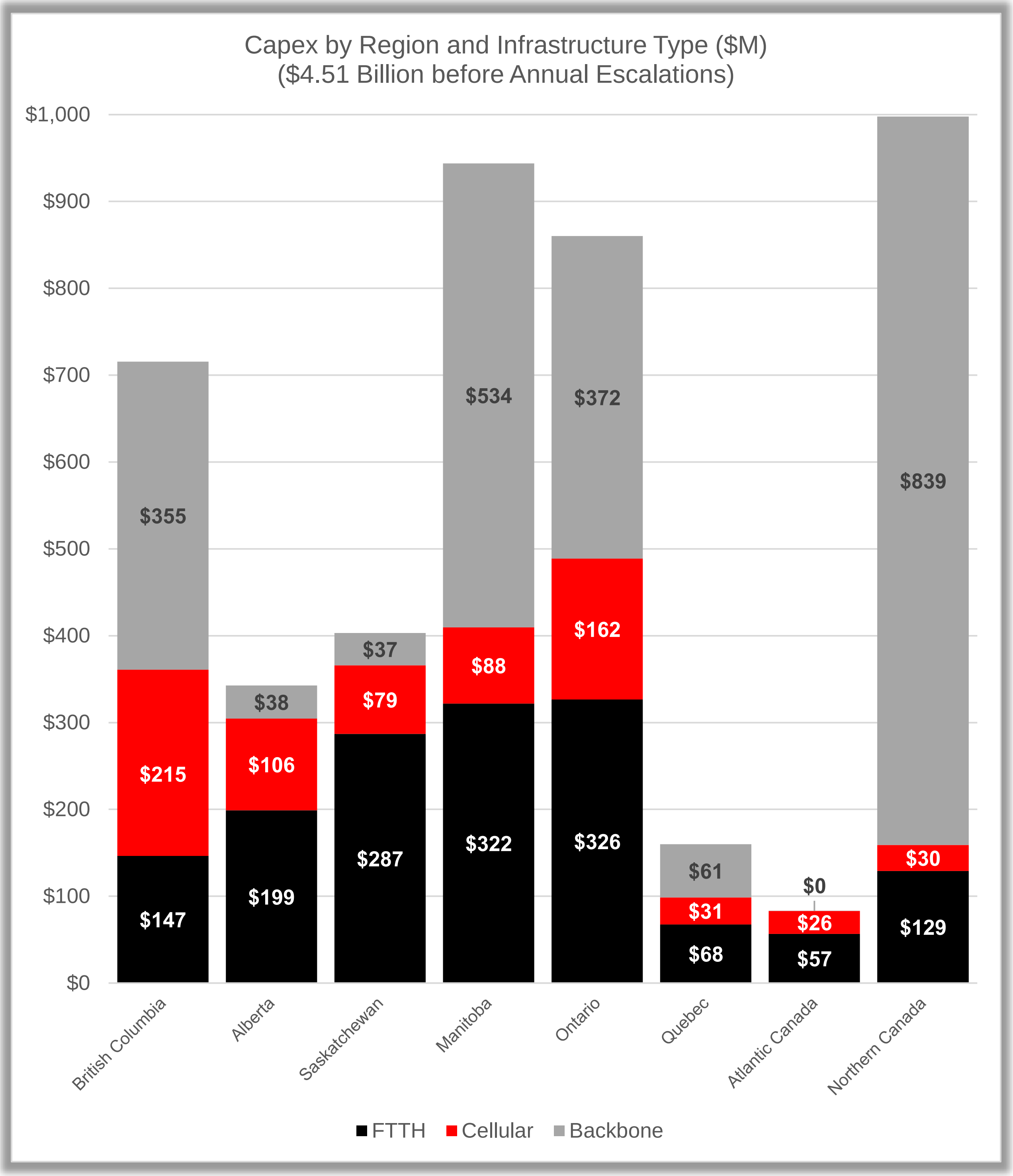


Figure 138 - Estimated Opex Per Annum

10.3 Capex and Opex by Region

The three infrastructure types of backbone, FTTH and Cellular are very different in terms of Capex and Opex. Backbone infrastructure requires significant upfront Capex but once installed, almost no Opex to support while cellular infrastructure requires less up front Capex but once installed, significantly more Opex than Backbone infrastructure. FTTH infrastructure is in the middle of the two requiring large upfront Capex and annual Opex greater than Backbone infrastructures but significantly less than cellular infrastructures.

The charts following charts summarize the Capex and Opex by region and by infrastructure type – backbone, FTTH or cellular.



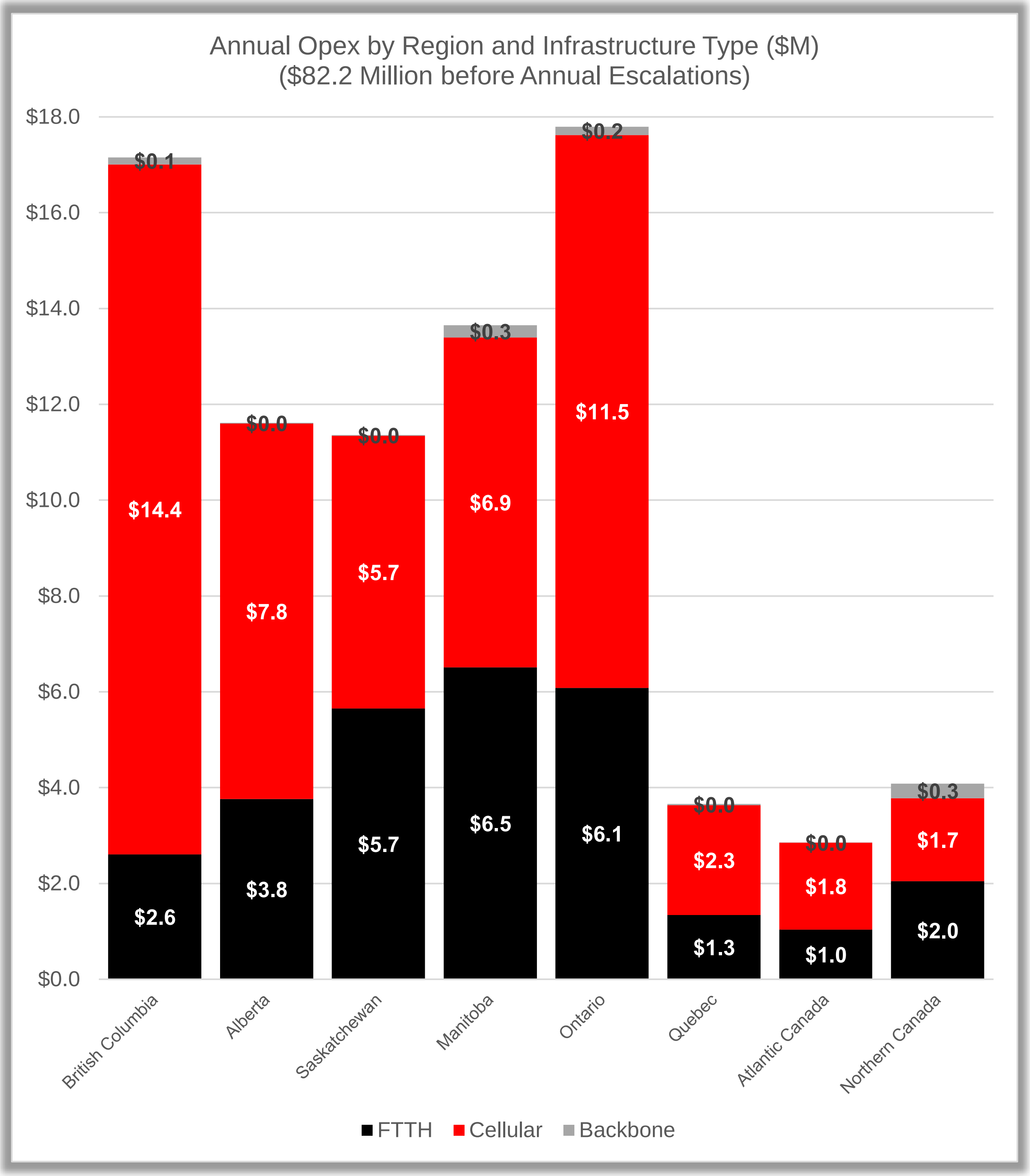


Figure 29 - Capex and Opex by Region

10.4 Capex and Opex Costing by Zone

The following tables show the regional Capex and Opex split out by Zone where the zones are defined according to:

Zone	Description / criterial	Zone
G1 – Urban	All season road < 50 km to service center	1
G2 – Rural	All season road 50-350 km to service center	2
G3 – Remote	All season road >350 km to service center	3
G4 – Special	No all-season road access	4

Table 5 – Definition of Zones

Capex breakdown by Region and Zone including contingencies					
Region	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Total ($ M)**
AB	$0.0	$174.6	$167.9	$0.0	$342.6
BC	$9.8	$388.6	$309.8	$8.3	$716.5
MB	$0.0	$292.2	$652.6	$0.0	$944.8
Northern Canada	$7.1	$37.0	$958.0	$0.4	$1,002.5
Atlantic Canada	$2.1	$73.7	$7.4	$0.0	$83.2
ON	$3.9	$279.8	$369.6	$207.6	$860.8
QC	$0.0	$37.6	$119.6	$2.5	$159.8
SK	$9.4	$195.1	$198.6	$0.0	$403.1
TOTAL	$32.2	$1,478.7	$2,783.5	$218.8	$4,513.2

Table 6 - Capex Breakdown by Region and Zone

Opex breakdown by Region and Zone including contingencies					
Region	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Total ($ M)**
AB	$0.0	$4.7	$6.9	$0.0	$11.6
BC	$0.6	$11.0	$5.0	$0.6	$17.2
MB	$0.0	$5.3	$8.3	$0.0	$13.7
Northern Canada	$0.1	$0.9	$3.2	$0.0	$4.2
Atlantic Canada	$0.1	$2.5	$0.3	$0.0	$2.9
ON	$0.1	$5.6	$8.6	$3.5	$17.8
QC	$0.0	$1.0	$2.4	$0.3	$3.7
SK	$0.3	$6.0	$5.1	$0.0	$11.4
Totals	$1.1	$36.9	$39.9	$4.4	$82.4

Table 7 - Opex Breakdown by Region and Zone

The predominant Capex costs occur in Zone 2 and Zone 3. In these situations, fibre backbone costs, representing 49% of the required Capex, are the highest. These communities do however represent a significant opportunity to reduce the backbone infrastructure costs if the backbone can be built coincidently with an all-season road or with a power transmission line. A good example of this approach is the Tlicho’s new all-season road to Whati NT where a funded fibre project was completed in late 2022 to bury a fibre backbone into the new road shoulder.

10.5 Qualifiers and Accuracy

The accuracy of the cost estimates is limited by the accuracy of the database, the accuracy of the cost metrics; and the limitations of the cost models used. The information is from a variety of sources, each with varying degrees of currency and accuracy as the data relies on collecting and recording processes that are subject to errors of omission and transcription. The cost model parameter values are averages based on a mix of conditions and assumptions that will be valid to varying degrees. In addition to specific conditions, project costs vary depending on the remoteness of the location, the scale of the project, the degree of competition for the work, as well as the cost of land-use consultations and associated environmental impact assessments, cultural heritage impact assessments, archaeological impact assessments and construction permit regulations and processes. As noted earlier and as a general statement, telecommunication infrastructure unit costs recently increased, pushed by rising demand, supply chain issues and inflation. The cost models are simplifications tailored to the available information. That said, the cost models are considered sufficiently accurate given the type and quality of the input data.

The total telecommunications infrastructure capex costs are estimated to be accurate within +70%/–30 (Class 5). It should be noted that individual community costs will be less accurate than the aggregate total as some errors will be off setting. In short, the wide error margins are the result of planning uncertainty. Additional engineering, with the necessary site and route surveys, will reduce the uncertainty and decrease the error margins. Even if the input data had better accuracy, it is recognized that the information is a snapshot in time and the data will become rapidly dated and less representative of the current situation.

11.0 Next Steps to Close the Infrastructure Gap

In this section, we explore policies and tactics to close the infrastructure gaps. The section is split into sections "Macro Policy Issues" and "Non-Exhaustive Tactical Strategy List". In the first section we will explore ten macro policies that require the AFN's attention if the gaps are going to be closed. In the second section we list fifteen tactical issues which play part in closing the infrastructure gaps.

11.1 Macro policy issues

The following are high level policy issues requiring AFN's attention. These are repeated in the Executive Summary as they represent key issues that must be addressed with ISC, ISED, the CRTC and the federal government on behalf of unserved communities.

1. <u>Change Funding Eligibility and Include Provisions for Opex</u>

The broadband funds follow a 90 / 10 Capex split for First Nations communities meaning that the grant addresses 90% of the Capex for a 10% match. With this funding split in place, 20% of the First Nations in the study meet the 50/10 broadband criteria with FTTH and another 14% percent either have projects in flight or meet 50/10 with a technology other than FTTH, leaving 66% or two thirds of First Nations communities with no plans for 50/10 or better. These underserved communities are located within 350km from the closest major service and have less than 200 dwellings where even with 100% Capex funding, there is no business case for service providers to provide their service. Furthermore, most of these communities do not have the funds available for the 10% match. The grants, as currently structured, do not address the service providers' Opex. ***Changes are recommended to cover the 10% match for broadband projects and address some Opex costs for a set period.***

2. <u>Open Funding Streams for In-Community Cellular Coverage</u>

There has been minimal funding to date for cellular projects and these have been focussed on highway coverage, a significant policy issue for First Nations due to the Missing and Murdered Indigenous Women, Girls and 2 Spirited People (MMIWG2S+), lost along highways stretches like BC's Highway of Tears between Prince George and Prince Rupert. The focus on funding cell coverage along highways and not within communities is problematic given the importance that First Nations place on cellular coverage. Most First Nation communities equate cellular service with citizen safety ***both*** within their community and when travelling outside their community. Cell phones and tablets are the defacto internet devices and the dominant devices used to access government-based services. Based on the ISED data which tracks roadway coverage, 56% of communities do not have cellular coverage in-community and this number may be higher when in-building coverage is addressed. There is no business case for service providers to extend cellular service; and, additionally, while cellular service is a priority, it is a more difficult business case to make than that for broadband. Furthermore, cellular services have significantly more Opex than broadband and any funding solution should address Opex for a set period, ideally pre-paid, with the Capex tranches to simplify on-going administrative and overhead costs. There may be opportunities for multiple programs to address cellular services as Planetworks knows of at least two First Nations communities that are building First Nations owned communications towers using ISC infrastructure funding. ***Changes are recommended to establish funding streams for in-community cellular coverage that addresses both Capex and pre-paid Opex costs for a set period***.

3. Shorten Funding Approval Timelines

Depending on the funding stream, the period between when the application in-take closes and when the parties reach an executed contribution agreement ranges from 18 months to two years. For FTTH which takes typically 3 years to complete, the approval process adds another 18-24 months to the overall deployment making the project 40% longer than if privately built and adds significant risk to project costs and project resourcing. By reducing the approval processes to 6 months, more projects can be completed with greater certainty. ***Changes are recommended to reduce the funding approval processes to no more than six months.***

4. Investigate Solutions for Interim Broadband Relief for Communities with No Service

Including the 18-24 months needed by the Funders to reach executed contribution agreements with the funding applicants, the typical time now to build out FTTH is 4 - 5 years. With this duration for the approval and build processes, there are clearly not enough First Nation communities with approved projects in the queue to close the broadband gap by 2030. Even if all the remaining underserved First Nations communities submit applications for funding in 2023 and get these approved by 2025 - an unlikely event - there are simply not enough skilled workers to address this additional workload alongside the workload needed for the urban centres. Consequently, interim solutions need to be investigated. It takes significantly less time to build a cell tower than to deploy FTTH. One possible interim solution is to marry the communities' desires for in-community cellular services with 50/10 broadband and use the same infrastructure to deploy both cellular services and 50/10 fixed wireless access while the FTTH infrastructure rolls out. Other interim solutions may involve offering subsidies for Starlink, a retail Low Earth Orbit (LEO) satellite service, and for other wholesale LEO satellite services to bridge the 50/10 broadband gap to dwellings and the backbone connectivity respectively. (It should be noted that the latter funding solution is being offered service providers with the current CRTC Broadband Fund application intake closing April 2023). A third option may be the use of cell phones on LEO satellites for short message emergency communication, currently being touted by Apple with the iPhone 14 but expected to be available with other phones soon. First Nations can use an iPhone 14 or other phones with similar capabilities for emergency communications to provide interim relief for safety along highways with no cell coverage. As the identification and costing of interim measures are outside the scope of this activity, ***we recommend that a range of interim solutions be fully developed and costed.***

5. Participate in the Oversight of Rogers' Benefits for Acquiring Shaw

Rogers' benefit package for acquiring Shaw is an excellent opportunity for underserved First Nations communities in Western Canada. It is expected that the acquisition of Shaw will complete in 2023 and when it does complete, ***we recommend that the Assembly of First Nations (AFN), Rogers and the CRTC be ready to define which Western Canadian First Nation communities will get both broadband and cellular services addressed under Rogers' benefits package, and to set up a stakeholder steering committee that provides oversight of and ensures Rogers' completion.*** For reference the two key promises are repeated here:

Investments to Create Jobs and Connect Communities

- *Rogers to invest $2.5 billion to build 5G network in Western Canada, driving economic growth and strengthening innovation sector*

- *New $1 billion fund dedicated to connecting rural, remote and Indigenous communities to high-speed Internet across the four Western provinces*

6. Leverage Government's Telecom Buying Power

Government is a significant user of telecom services generating significant revenues for telecom service providers and has great buying power that can be leveraged to aggregate the connectivity needs of many communities at once. To accelerate the roll out of broadband and cellular services to underserved First Nations, government can use their buying power combined with the many available funding streams, to get the new networks constructed. To offset Opex concerns by the service providers, government could act as the anchor revenue tenant on the new networks and move their data and cellular connectivity requirements within the area to the new network. This could be negotiated under an area-wide Request-for-Proposal. ***We recommend that Government leverage their buying power and use their data and cellular traffic as anchor revenue to advance connectivity to groups of First Nations communities.***

7. Develop Annual Quotas for Service Providers to Connect Unserved First Nations

Since the business cases to serve small First Nations communities are difficult, service providers who exist within a highly competitive ecosystem will always serve more lucrative, higher density areas first. Even with 100% Capex and some Opex grants available to the community or service provider, it will be difficult for First Nations communities to attract service providers without some driving incentive or obligation. This is where the CRTC or ISED may be helpful. The CRTC or ISED could place a quota requirement on service providers as part of their serving obligations, to have to demonstrate annually the number of First Nations communities, previously unserved, that they have connected within the reporting year with either cellular or FTTH. This will help motivate the service providers to actively find connectivity solutions for underserved First Nations communities. ***We recommend that the CRTC or ISED develop quotas for service providers to add unserved First Nations communities annually to their networks with cellular coverage in-community and FTTH.***

8. Create Incentives for Service Providers to Develop First Nations' Telecom Capacity

All the large service providers which participated in the interviews expressed interest in developing capacity within the First Nations to address the telecommunication skills necessary to support local community networks. However, except for Northwestel, none had implemented any programs to date. ***We recommend that incentives are established for all service providers to advance capacity building within First Nations and given the importance of developing local talent to the sustainability of remote networks, a fund of $500M be established to support capacity building.***

9. Strike a Task Team to Investigate Spectrum Ownership

Spectrum refers to blocks of airwaves. There has been considerable work among First Nations communities with ISED and others regarding ownership of the airwaves above their communities. Decisions are expected in 2023 which will have a significant impact on First Nations and will potentially give First Nations communities the first step into opportunities to extend cellular and broadband solutions to their communities. ***We recommend that if not struck already, the AFN strike a task team to track policy decisions and to review technology options that will help First Nation communities acquire, control, and use their airwaves.***

10. Continue Refining the Data Accuracy

The data is this report is based on a combination of publicly available data and ISED's data for LTE coverage along roadways. Most of the data is self-reported, meaning that it is only as accurate or as timely as the information provided to the authorities by the service providers. Planetworks has encountered situations within their client base where the community is recorded in the publicly available data as meeting the 50/10 criteria and clearly within the community, the service is sub 50/10. We have found other instances where the cellular service is LTE but it is so over-subscribed that the users can barely use the service. It is extremely important therefore to confirm the data within the database with actual user experience and this can only be effectively done by the communities themselves.

The next steps involve engaging First Nation communities to collect information at the community level to confirm everything from permanent dwelling counts to community boundaries, necessary for Capex planning exercises by service providers and to verify speed performance for broadband networks and for cellular networks, speed performance in-community both outdoors and indoors.

11.2 Non-Exhaustive Tactical Strategy List

There are many tactical strategies to address the unserved including, but not limited to and not presented in any order:

1) Interim Solution – Mobility and FWA. Build out the backbone and cellular infrastructure first and use the cellular infrastructure to deliver 50 /10 via FWA to unserved wired dwellings until FTTH is built out. The cellular service in each First nations community, like FTTH requires a fibre backbone making both FTTH and Cellular builds synergistic. Mobility networks are quick to build, in the order of months versus FTTH which is in the order of years. One option is to build out the fibre backbone and cellular cell site in every community and with comparatively minimal additional Capex, overlay the cellular infrastructure for fixed wireless access. The FWA would then be used to provide 50/10 to unserved dwellings for the interim until FTTH is deployed.

2) Interim Solution – Starlink. Lobby for Starlink subsidies for First Nation dwellings and encourage First Nation communities to use Starlink for the interim until FTTH arrives. Note this solution is only useful for about 25 -50 dwellings wanting broadband in a community. After this density of subscribers within a small distance, the overall Starlink capacity will degrade.

3) Dig Once. Build wired and wireless infrastructure with other First Nation infrastructure, "Dig Once". When planning for road upgrades, new all-season roads, power transmission lines, water and sewer distribution systems, piggy-back plans for fibre. This will save Capex, accelerate the deployment of fibre infrastructure, and reduce maintenance costs as placing all utilities in a single corridor has proven to reduce the incidence of dig-ups.

4) Verify First Nation community data. The publicly available databases do not agree on the status of the infrastructure. There are mismatches within the wired and wireless data that makes building statistics difficult. Engage First Nations directly to confirm their infrastructure and build status and to determine what levels of service are they receiving. For instance, one of our clients has an LTE cell site within the community but while the service says LTE, the down and up speeds rival 3G and are less than 1Mbps during peak time and not appropriate for any internet browsing.

5) Set up a centralized portal with an organization independent of the service providers such as CIRA, for First Nation communities to run speed tests and have the data collected in the back-office for analysis, trending and progress reports.

6) Ensure that all federally funded projects have a First Nation / Indigenous component for digital infrastructure. First Nation communities are not taking advantage of federal funding available to build out FTTH. One way to ensure that First Nation communities get addressed is to have a First Nation FTTH component required with every broadband award. Similarly, to advance cellular infrastructure within First Nations communities, lobby the Federal Government to address the lack of cellular service within nations with funding streams specially dedicated to cellular with interim fixed wireless access as eligible for funding.

7) Develop First Nations partnerships with Telecom Service Providers for FTTH. Individual First Nation communities will not have the clout and volume buying power that the service providers have. One means to ensure that First Nation communities get timely FTTH for a stable Capex plan is to piggy-back First Nations requirements on the service providers rollouts. By doing this, the First Nation communities will leverage the service provider's buying power for materials and labour.

8) Develop First Nations partnerships with Mobility Service Providers for 5G and interim FWA. Individual First Nation communities will not have the clout and volume buying power that the cellular service providers have for building out the tower infrastructures in-community necessary for 5G service.

9) Provide help with funding applications, project tracking, project auditing and reporting projects. The payment filing, tracking and reporting for government funded FTTH or 5G projects is daunting, difficult and time-consuming. For many of the smaller First Nation communities, the availability of skilled resources to apply for the funding and payments, report on project progress and track projects through to completion, is not available. Resources are necessary to assist.

10) Continually monitor developments in satellite backbone technologies and expect to allocate funds to refresh FN satellite backbones every 3-5 years. We are in a time of rapid change for rural communications, largely due to Starlink and other LEO satellite providers. These changes will continue for the foreseeable future and it is important that First Nation communities are kept abreast of the changes and informed of which changes to act on and why. Satellite solutions may have a short life-span depending on the market.

11) Lobby for National *affordable* satellite backbone solutions. On-going monthly Opex costs for wholesale LEO services are cost prohibitive and while Starlink represents a good solution for a few dwellings within many First Nations, a high-capacity community-based, affordable satellite backbone solution for those communities with an existing satellite backbone is necessary. This will require on-going subsidies for satellite communities like that offered in the CRTC Broadband Fund with open intake until April 2023.

12) Lobby for emerging solutions for cellular coverage on unserved highways and provide centralized service testing. Track new consumer technologies using LEO satellites such as the iPhone 14 with its embedded emergency calling to address the cellular infrastructure gap along highways. Trial solutions and keep First Nation communities abreast of the changes and informed of which changes to act on and why.

13) Lobby for access to spectrum for First Nations. Utilize a system, identified in consultation with First Nations, like the Access Licensing "Use it or Lose it" strategy, that frees up Spectrum usage for First Nations to access for free or for a low cost.

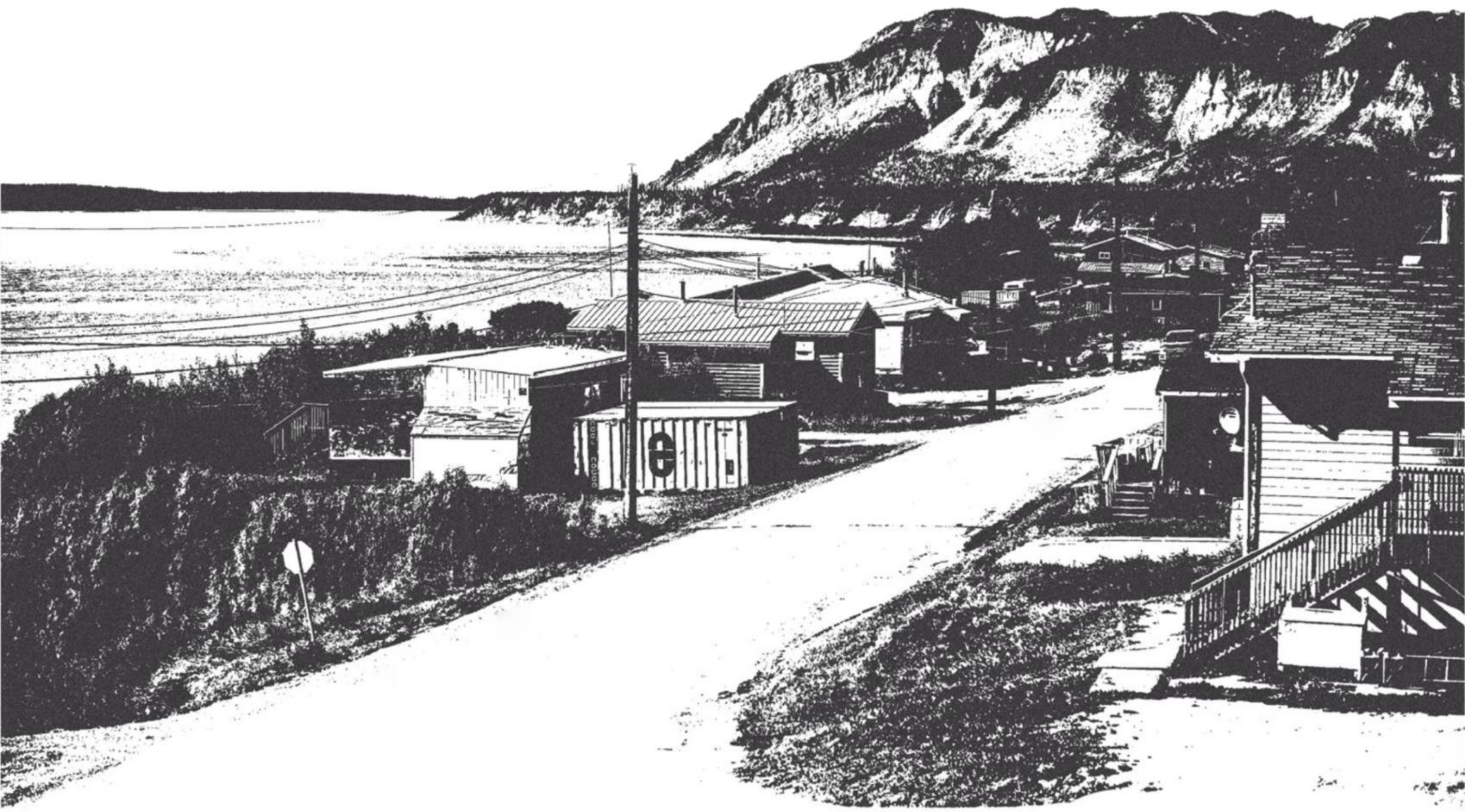
14) Work with the CRTC to establish annual targets for connectivity to First Nations for service providers.

15) With the CRTC, define with Rogers, the First Nations communities to be connected with broadband and cellular as part of the Rogers' benefit package for acquiring Shaw. Set up a Steering committee to oversee the build, track progress and ensure its completion.

CLOSING THE INFRASTRUCTURE GAP
DIGITAL CONNECTIVITY STUDY

Appendix 1

LETTERS FROM BELL, TELUS AND ROGERS



A1. Letter of Support from Bell

Bell

February 10th, 2023

Assembly of First Nations (AFN)
55 Metcalfe Street
Suite 1600
Ottawa, Ontario
K1P 6L5

Attention: Matthew George, Senior Policy Analyst, Assembly of First Nations
Susanna Reardon, Senior Consultant, Planetworks Consulting Corp

Dear Matthew & Susanna,

SUBJECT: Bell Support Letter for AFN
Closing the Infrastructure Gap for High-Speed Internet and Mobility Services in First Nation Communities

---

Bell Canada is a division of BCE Inc., Canada's largest communications company. With over 140 years of experience, BCE leads the industry in providing advanced broadband communications networks and services to consumers across the country. Today, more than 50,000 BCE employees in every province and territory are ensuring Canadians are connected, informed and entertained wherever they may be.

Bell is a huge proponent for the expansion of pure fibre Internet and Mobility services to homes and businesses across rural and remote Canada, including First Nation communities. Bell is actively deploying Fibre to the Home broadband, Fixed Wireless Internet and improved Mobility services across numerous First Nation communities across Canada.

While leveraging Federal programs such as Connect to Innovate, Universal Broadband Fund and CRTC Broadband Fund and Provincial programs such as Internet for Nova Scotia Initiative, Régions Branchées, and the Accelerated High Speed Internet Program, amongst others, Bell has been successful in connecting both the unserved and undeserved, however Bell recognizes that more must be done to connect all First Nations across Canada.

With that said, Bell fully supports the AFN goal to close the wired and wireless infrastructure gaps in First Nation communities across Canada.

Yours truly,

J. Daniels

Jonathan Daniels
Vice President, Regulatory Law

A2. Letter of Support and Recommendations from TELUS

TELUS Corporation
2930 Centre Ave NE, Floor 01
Calgary, AB T2A 4Y2
Assembly of First Nations

Assembly of First Nations
55 Metcalfe Street, Suite 1600 Ottawa, ON K1P 6L5

Feb 7, 2023

RE: Supporting Indigenous Connectivity

Dear Mr. Matthew George,

TELUS thanks the Assembly of First Nations (AFN) for inviting us to share our perspective on solutions to support bridging the connectivity gap in First Nation communities. TELUS shares the AFN's perspective that broadband connectivity is central to ensuring social and economic wellbeing, and that the path towards equitable connectivity in Indigenous communities is an ongoing process that requires intentional commitments.

TELUS is aligned with the urgent need to deliver robust broadband connectivity to Indigenous communities.

We remain deeply committed to enabling connectivity to the **240 Indigenous communities** in our serving areas across B.C., Alberta and Quebec. Given the high capital costs of enabling connectivity to remote and rural Indigenous communities, public-private partnerships across all levels of government are critical to closing this barrier. Well-informed funding programs established by the federal government (including ISED, ISC and the CRTC), and provincial governments through engagement with Indigenous governments and industry are essential to ensuring no community is left behind. Additionally, ensuring that ISED and CRTC connectivity and spectrum policies acknowledge and address the unique challenges of remote and rural Indigenous communities can go a long way towards delivering connectivity for all.

TELUS has been privileged to partner with Indigenous governments, funding organizations like the All Nations Trust Company and government funding programs like ISED's Universal Broadband Fund to co-fund broadband connectivity to address the significant costs associated with these projects across the remote regions we serve. To date TELUS has connected over **91 Indigenous communities** and **167 reserves and treaty lands** to our advanced wireline networks and through co-funding partnerships - we are forecasting an additional 130 Indigenous Lands will be enabled by 2025. In very remote areas TELUS' wireless LTE coverage (wireless high speed internet (wHSIA) is revolutionizing the use of our network, providing high-speed internet access where internet access has not historically been possible. **175 Indigenous communities** and **507 reserves and treaty lands** are able to access our wHSIA network.

With the roll-out of 5G networks, the speed and quality of connectivity in communities served by wHSIA networks will grow. TELUS continues to advocate for stronger spectrum policy to ensure that this public asset is being deployed effectively and consistently for remote, rural and Indigenous communities. Ending the practice of spectrum squatting through the adoption and enforcement of stricter "use-it-or-lose-it" policies would play a significant role in delivering meaningful connectivity improvements to remote and rural communities.

While the current co-funding partnerships and programs are making significant progress in addressing the connectivity gap in First Nation communities, there are opportunities to strengthen the programs in order to deliver stronger results. A few such considerations include:

- Government funding programs have successfully leveraged multiple funding mechanisms to rapidly deploy capital. As more connectivity gaps are bridged, a **consolidation of funding programs** would decrease the costs associated with the application process. This would make the grant process more accessible for ISPs of all sizes, and most importantly would unlock a wider array of business cases to help connect remote communities. One funding program and one ISP alone may not have enough funds to make the case viable, but when you combine multiple programs together, you improve the conditions and unlock new opportunities.
- Ensuring **coordination between funding programs** to bring connectivity to both the dense and sparsely populated areas to limit 'gaps' in connectivity. These gaps become very challenging to overcome on a case by case basis versus initially connecting the full community.
- Overly restrictive eligibility requirements often mean communities that are partially served (but not fully served) are not economical to connect. **Evolving the criteria to connect "a meaningful majority"** would unlock more opportunities to improve connectivity to communities and ensure equitable access for the full community.
- Reaching the most difficult to connect communities requires extraordinary funding. While current funding programs that offer 90% of the upfront capital to subsidize the build are a fantastic starting point for the vast majority of projects, there are cases where this is simply insufficient to make the buildout financially viable. **Removing percentage caps on projects and considering opex costs**, given the heightened maintenance and operating costs in remote areas, will increase the viability of further highway coverage and connectivity.
- Coordinating funding awards and contract negotiations to be closely aligned with the build seasons can drastically change the timing for communities to be connected. Given Canada's climate and vast geography, the build season is limited particularly in remote, northern communities meaning a few months delay in announcing new funding can mean a year delay to the build.

- Canada must continue to invest in projects with technologies that can scale to meet the needs of the future. TELUS' combination of PureFibre and 5G technology, coupled with our commitment to ongoing upgrades and maintenance, will ensure rural and Indigenous communities have services on par with urban areas and in line with our competitive national pricing strategy. TELUS acknowledges affordability can be a barrier to access; through our Connecting for Good programs we work to ensure low income families, elders, youth aging out of care, people with disabilities, and Indigenous women at risk or surviving violence have access to the technology they need.

The key to success is ensuring ongoing engagement and collaboration between First Nation governments, industry and federal and provincial governments to find solutions. TELUS is holding ourselves accountable to this as we proudly advance our formalized commitment to reconciliation through our annual Indigenous Reconciliation and Connectivity Report.

TELUS was the first technology company in Canada to develop and launch an Indigenous Reconciliation Action Plan (attached) highlighting how we are embedding Reconciliation within our business. Guided by Indigenous voices and Indigenous-led frameworks of Reconciliation including the 94 Calls to Action and the 231 Calls for Justice, our goal is to support the success of Indigenous Peoples, by understanding the intersections between Reconciliation and our business. To support us in remaining accountable we report out annually on our IRAP and have established an external Indigenous Advisory Council. We invite you to learn more about our efforts at www.TELUS.com/reconciliation

Thank you again for the invitation to engage, share our work to date and discuss how we can collaborate with AFN and Governments to further the ways in which policy could accelerate connectivity for Indigenous communities.

Sincerely,

Shazia

Shazia Zeb Sobani
Vice President
Member of the TELUS team

Attachments:

2022 Indigenous Reconciliation and Connectivity Report

A3. Letter of Support and Recommendations from Rogers

February 13, 2023

Assembly of First Nations
55 Metcalfe Street, Suite 1600
Ottawa, Ontario K1P 6L5
Attention: Matthew George

Dear Matthew,

Thank you for the invitation to meet with you and contribute to the Assembly of First Nation's (AFN) study on telecommunications infrastructure gap for First Nations communities. We understand from your work that you have identified many communities that do not have mobility and/or fibre infrastructure in their communities and we appreciate the critical importance of addressing these gaps.

Rogers supports the various levels of government and Indigenous leadership seeking to address the digital inequities of rural, remote, and Indigenous communities. The recent global pandemic has amplified the importance of access to unserved & underserved areas. Rogers is committed to influencing positive change where technologically and financially feasible and believes that solutions can be found when public/private sector and community investment couples with strategic regulatory support. Through partnerships with organizations such as the AFN, Rogers can explore, identify, and innovate to overcome significant challenges associated with network expansion across the vast landscape of Canada.

Every community presents its own unique set of opportunity and challenges. While it is helpful to advocate and formulate policy and programs at a national level, we support community specific solutions that will likely include a mix of technologies (cellular, FWA, FTTH and satellites) as well as capacity building to ensure services are fit-for-purpose and the benefits of connectivity can be maximized for all.

I am attaching a response to some of the specific questions that you and your consulting team have proposed as well as general information on Rogers Indigenous Collaboration program.

Our team would welcome continued discussion with AFN and offer our continued support of this important work.

Yours sincerely,

Jennifer Campeau
Director, Indigenous Collaboration

333 Bloor St E Toronto, ON M4W 1G9

ROGERS.

Rogers Response to Questions

Q1. Effectiveness of current funding programs to close the broadband and mobility infrastructure gaps by 2030. Do you have any recommendations to streamline the current programs?

Rogers supports all levels of government and Indigenous leadership in their efforts to work with Industry to help address gaps in high-speed broadband and cellular services. Rogers is aware of and continues to participate in many public sector funding programs including the $3.225B Universal Broadband Fund, the $750M CRTC Broadband Fund and various provincial opportunities such as Connecting BC, the Alberta Broadband Fund and Ontario's Accelerated High-Speed Internet Program.

These are large multi-year programs offered by different levels of government that, when combined with private sector investment and expertise, are making significant impacts on the closing the digital divide, particularly for underserved households to gain access to high-speed broadband. The High-Speed Internet Access Dashboard published by ISED[1] shows that 93.5% of households currently have access to high-speed broadband and that number is expected to be closer to 98.6% by 2026 as various funded projects move to completion.

We are encouraged to see some streamlining already occurring. For example, on March 8, 2022, an agreement was announced between the provincial and federal governments to provide up to $830 million to support the expansion of high-speed internet services to the remaining rural and Indigenous communities who are underserved in British Columbia.

With so much public and private funding working to address rural broadband through multi-year projects, it is a dynamic landscape and challenging to understand where the actual gaps remain. This may be improved by more frequent updates to the broadband map and improved monitoring and reporting of projects as well as through continued field validation with communities.

Most of the funding to date has gone towards addressing broadband. Gaps in cellular coverage within communities and along important transport corridors may be an area for future focus.

[1] https://ised-isde.canada.ca/site/high-speed-internet-canada/en/universal-access/broadband-dashboard

333 Bloor St E Toronto, ON M4W 1G9

Q2. Tactical methods which you recommend could be used to accelerate broadband and mobility connectivity to First Nation communities

Investment in telecommunication infrastructure in rural areas is often challenging due to lower population numbers, and therefore a lower customer-base, coupled with high-costs to deploy and maintain infrastructure.

Some of the incremental obstacles that drive costs and challenge investment includes:

- Topography and geology
- Weather resulting in unpredictable delays
- Proximity to existing network infrastructure
- Age, availability, and capacity of existing infrastructure
- Availability of people to undertake work and maintain infrastructure
- Availability and ability to deploy equipment and resources to build/maintain infrastructure
- Rapid advances in technology require continuous ongoing investment
- Increasing consumer expectations – improved services, lower costs
- Vandalism of infrastructure
- Local opposition to deployment of infrastructure
- Permitting and approvals
- Community information/data

On this last point, negotiating with First Nations for access for the deployment of telecommunications infrastructure that would benefit rural and Indigenous communities is an additional and growing challenge to the deployment of telecommunication infrastructure. Infrastructure may need to be sited on Crown lands within Traditional Territories or on reserve lands. As the proponent for the project, Rogers recognizes the existing rights of Indigenous peoples related to their land and through our engagement efforts led by an all-Indigenous collaboration team, we support the duty of the government to consult.

Negotiations take time and effort and place an additional burden on rural communities (Indigenous and non-Indigenous). Not all communities have the resources and capacity to conduct negotiations efficiently and we would welcome efforts to develop a negotiation framework and help to improve capacity in community to support negotiations.

Increasingly, we are also finding that negotiations to deploy the infrastructure necessary to connect rural and Indigenous communities are being undertaken as though we were a primary resource extraction company where precedence has been set to 'pay to play' to access land and waters. Community leadership must understand the magnitude, complexity, and differentiation of

333 Bloor St E Toronto, ON M4W 1G9

ROGERS.

telecommunication builds. In the same light, Rogers' leadership will continue to understand the importance of connectivity to the customer while balancing expectations of its stakeholders.

To assist as many Nations as possible, we must ensure builds remain efficient and cost-effective while dealing with the additional challenges of deploying more remote infrastructure. The perception that Rogers can easily entertain incremental requests for funding and support beyond the cost of a build is unrealistic with so many Nations left to serve. Rogers often finds itself in precarious positions when communities seek to barter or confer pre-and-post-build. As such, Rogers leans heavily on change management principles to ensure community fully understands we are bringing service to them vs. taking something from.

We also strive to ensure community comprehends the potential of this technology to further self-determination efforts. Connected communities are using connectivity to tell their own story vs. having it told for them. Traditional Ecological Knowledge is captured in ways which Nations want it to be recorded. Boundaries and mapping exercises are for more accurate, assisting negotiation efforts, archeological efforts, and other. Businesses are reaching customers they never have before. Members are working remotely and bringing outside dollars into their community. Teachers are speaking to students through online classes. Elders are speaking to the next generation virtually. Languages and voices are getting online before they are lost. Leadership tables are building capacity and sharing ideas with their own members and members of other Nations. Those unwell are getting help remotely; mentally and physically. Home and property are protected through Wi-Fi and other means. 5G technology is allowing Guardians to monitor resources, and even test water quality in real time. Communities now access public alerts, calls for help, and safety on roadways/waterways. And this is just the tip of the iceberg. Working together with Rogers to bring connectivity to community is much more substantial than simply connecting homes to pay a monthly bill. However, we realize this is not understood on its own.

Q3. In your opinion, is Fixed Wireless Access a reasonable interim step to FTTP?

Yes. Provided fixed wireless access is engineered with sufficient capacity in mind, it is a reasonable and sometimes the only viable way to efficiently serve more distributed communities.

Q4. Current funding programs offer 90% of the upfront capital to subsidize the build. Is this enough?

Yes, we are aware that some programs have offered up to 90% of capital costs to subsidize builds. The challenge is that even if the infrastructure were funded at 100%, in some cases the high ongoing operational costs to operate and upgrade infrastructure remain the barrier to investment.

Q5. Current funding programs, except satellite backhaul in the current CRTC intake, do not allow for opex costs. Should this be changed in future funding programs and if so, for what situations (mobility coverage on highways, FTTP for communities with less than 100 dwellings etc) are opex subsidies recommended? In what form should these opex subsidies take? (annual submissions or upfront capital)? What is a reasonable period over which the opex subsidy should run?

333 Bloor St E Toronto, ON M4W 1G9

ROGERS.

We have seen many cases where the ongoing operational costs for more remote infrastructure (cellular and wireline) far exceeds the forecast revenue from lower and more distributed population centres. In these cases, subsidizing ongoing operational costs would increase the viability of investment. This would be a significant shift in the way funding programs are currently designed and further consideration is needed. We would be happy to discuss this point further based on our examples.

Q6. Service affordability. How many First Nations dwellings do you currently serve? What is the service uptake? What programs do you have in place to address affordability? In your opinion, are these affordability programs aiding First Nations in connecting?

We do not yet have sufficient data to properly address the question of uptake. Regarding affordability, please refer to the section on our Connected for Success program in the attached information from our Indigenous Collaboration team. Note that this program is currently limited to our cable footprint in the east but through our proposed acquisition of Shaw, Rogers has committed to providing this program nationally.

Q7. Can you give us an overview of some of the initiatives being undertaken by your company for First Nations consultation, Indigenous involvement in deployments or other activities?

Please see the attached information from our Indigenous collaboration team.

Q8. Anything else that you think is pertinent to recommend to advance connectivity to underserved First Nations

Every community presents its own unique set of opportunity and challenges. While it is helpful to advocate and formulate policy and programs at a national level, we support community specific solutions that will likely include a mix of technologies (cellular, FWA, FTTH and satellites) as well as capacity building to ensure services are fit-for-purpose and the benefits of connectivity can be maximized for all.

333 Bloor St E Toronto, ON M4W 1G9

ROGERS.

Indigenous Collaboration at Rogers

With unanimous support from Executive Leadership, Rogers now proudly employs one of the industry's first all-Indigenous outreach, change management, and corporate development teams. Our growing staff of 15+ members are culturally, skillfully, and geographically diverse to serve Indigenous customers and their communities. We focus on leading-edge and resilient strategies required to connect coast to coast to coast via traditional and innovative means. Once connected, our team ensures communities fully leverage network enhancements to exceed their own mandates.

Over a span of 18 months, our Indigenous Relations Team has formed, stormed and normed to establish relationships with over 120 First Nations, organizations, and industry partners. We have also established foundational partnerships with the Indian Residential School Survivors Society, Red Dress Society, Downie Wenjack Fund, Mohawk Institute, Orange Shirt Society, Indspire, Carrier Sekani Family Services, Forward Summit, Coastal First Nations Guardianship Program, Southern Chiefs Organization, National Coalition of Chiefs, et al. Our journey toward truth and reconciliation is also guided by the Canadian Council for Aboriginal Business' (CCAB) Progressive Aboriginal Relations (PAR) program of which we are an active member and sponsor. We are also dedicated to the MMIW Calls to Justice and supporting initiatives regarding revitalization and protection of Indigenous languages.

Affordability and network expansion are evaluated hand-in-hand as we are able to offer a multitude of platforms and service to ensure the safety, security, and access to those who can benefit most. In addition to flexible Rogers, Fido and Chatr services, we also administer Rogers Connected for Success program which offers high-speed, low-cost internet to rent-geared-to-income tenants of a non-profit housing partner organization, eligible individuals receiving provincial income or disability support, and seniors receiving the Federal Guaranteed Income Supplement.

In recognition of our ongoing and collective journey towards reconciliation, the need for action, and for greater collaboration with Indigenous communities, Rogers Communications went a step further and released its Truth and Reconciliation Commitment Statement on September 15th, 2022. Written in partnership with Indigenous leaders at the company, the statement reflects the Truth and Reconciliation Commission of Canada's 94 Calls to Action and the United Nations Declarations on the Rights of Indigenous Peoples. Each employee, leader and line of business at Rogers plays a role in delivering on this commitment and joining Indigenous Peoples and allies to support and further reconciliation. Key highlights of the commitment include:

- **Connecting communities**: Building on a positive track record of partnering with Indigenous Peoples to foster improved connectivity, inclusion, and economic growth, Rogers commits to taking further action to bridge the digital divide in rural and remote communities. Through innovative partnerships with Indigenous communities, all levels of government, and its dedicated Indigenous Relations team, Rogers builds digital infrastructure which removes inequities and ensure no one is left behind due to access or geographical challenges.

333 Bloor St E Toronto, ON M4W 1G9

ROGERS.

- **Creating safe spaces and hiring top talent:** Employee resource group, Rogers Indigenous Peoples' Network will continue with leadership and allies across the company to promote safe spaces, educate colleagues, and grow the culture of inclusion. Working in partnership with post-secondary institutions and recruitment agencies, Rogers will also recruit, retain and promote Indigenous talent across the country, including through internship and co-op initiatives.
- **Investing in the next generation**: Rogers will continue to support and remove financial barriers for Indigenous youth attending post-secondary education through its Ted Rogers Scholarships program, and award community grants to organizations providing programming to Indigenous youth. Through Jays Care Foundation's Indigenous Rookie League, youth in First Nation, Metis or Inuit communities will have greater access to sports.
- **Amplifying voices**: Across Rogers Sports & Media, dedicated news coverage and online public information resources amplifies Indigenous voices and enhances awareness of the history & legacy of residential schools and the reconciliation process. The achievements and stories of Indigenous athletes will be featured on sports programming. And Indigenous business' will be given greater opportunity through Rogers Business platforms and services.

To read the full statement and learn more about how Rogers is partnering with Indigenous Peoples, please visit our Truth and Reconciliation Hub.

As reported quite heavily, Rogers Communications Inc. is also in process of acquiring Shaw Communications Inc. As part of this agreement, Rogers also commits to a new $1 billion Rogers Rural and Indigenous Connectivity Fund, with aim to connect as many rural, remote, and Indigenous communities across Western Canada as possible. This will bring *high-speed* Internet and close critical connectivity gaps much sooner for underserved areas. Rogers will also consult with Indigenous communities to create Indigenous-owned and operated Internet Service Providers, which would leverage Rogers expanded networks and capabilities to create sustainable, local connectivity solutions. As we strive to do our part, we are hopeful that other public/private entities will join this effort and bring additional resources to the table. If the ultimate desire is complete and fulsome connectivity coverage, Rogers will not achieve this alone amongst the variables at hand.

Nevertheless, Rogers has made significant strides toward truth & reconciliation and will continue to do so where corporation and community can appropriately align. We will leverage our team of Indigenous Collaboration experts to remain consistent and authentic in our approach. Partnerships with advocates such as the AFN, Internet Society, CCAB, and others, will assist to ensure that time, effort, and resources are responsibly invested. The onus of all parties is a realistic and collaborative approach to connectivity during arguably 'a once in a lifetime opportunity' for many. In the meantime, Rogers will continue to build upon a positive track record and investment toward Indigenous people; community; partnerships; innovation; and reconciliation.

333 Bloor St E Toronto, ON M4W 1G9

QUOTES:

"It has been a privilege to work in partnership with Indigenous communities internally and externally, to listen and learn, and work together to bring greater connectivity, access to education, and economic growth. By investing in our networks to bridge the gap between rural and remote Indigenous communities, awarding scholarships, and aligning our business practices with community sustainability in mind, we are proud to do our part on the road to reconciliation."

- **Tony Staffieri, President and CEO, Rogers Communications**

"The digital divide has long hindered coastal communities from taking full advantage of new opportunities to improve our well-being—culturally, socially or environmentally. We are thrilled to work with Rogers Communications in bridging that divide through hi-speed Internet. Improving connectivity throughout the North and Central Coast and Haida Gwaii is an example of reconciliation in action; it will bring transformational change to our communities, and a range of new educational, employment and economic opportunities."

- **Christine Smith-Martin, CEO, Coastal First Nations**

"Carrier Sekani Carrier Family Services (CSFS) would like to express our gratitude for support from the Ted Rogers Community Fund. Monetary grants and equipment donations from Rogers Inc. have been so important in supporting the educational work, upgrading, digital literacy, and digital accessibility needs of the Indigenous youths and families we serve. CSFS would like to recognize that the Ted Rogers Community Grants help Indigenous Youth in northern BC discover their highest potential. We are so pleased to see Rogers 'walk the talk' of reconciliation – Rogers has a fulsome Indigenous strategy based on UNDRIP, TRC and Reconciliation. Furthermore, the company funds Indigenous-focused initiatives across Canada. The campaign, #dosomething, is positively impacting communities across this country – thank you."

- **Mary Teegee, CSFS Executive Director of Child and Family Services**

"Our partnership with Rogers Communications stands as a testament to the impact that financial support can have on Indigenous learners – and their communities. Rogers's commitment continues to have transformative repercussions for First Nations, Inuit, and Métis students across the country, and we are pleased to be able to share this significant journey with them."

- **Mike DeGagné, President and CEO, Indspire**

"Reconciliation must be achieved by a genuine understanding of the exceptional circumstances faced by the First Nation you work with – and then coming to the table as a true partner in achieving mutual goals. In our experience, Taykwa Tagamou Nation's partnership with Rogers achieved just that. Our enhanced connectivity provides us with everything from improved safety when hunting and harvesting in our vast Traditional Territory to a providing a competitive edge in the modern economy, and

333 Bloor St E Toronto, ON M4W 1G9

ROGERS.

everything in between. Our partnership with Rogers is as unique as we are and fulfills our community's many growing needs.

- **Chief Bruce Archibald, Taykwa Tagamou First Nation**

"Our community is absolutely thrilled by our partnership with Rogers. First Nations can only be truly in the driver's seat of their economic and educational destinies if they are connected to the right partners and hubs of excellence. Because of our partnership with Rogers, Taykwa Tagamou Nation is economically and competitively ready for the opportunities of today; while ensuring our youth are educationally connected for the opportunities of tomorrow."

- **Deputy Chief Derek Archibald, Taykwa Tagamou First Nation**

About Rogers Communications Inc.

Rogers is a leading Canadian technology and media company that provides communications services and entertainment to consumers and businesses. Rogers shares are publicly traded on the Toronto Stock Exchange (TSX: RCI.A and RCI.B) and on the New York Stock Exchange (NYSE: RCI). For more information, please visit: www.rogers.com or http://investors.rogers.com.

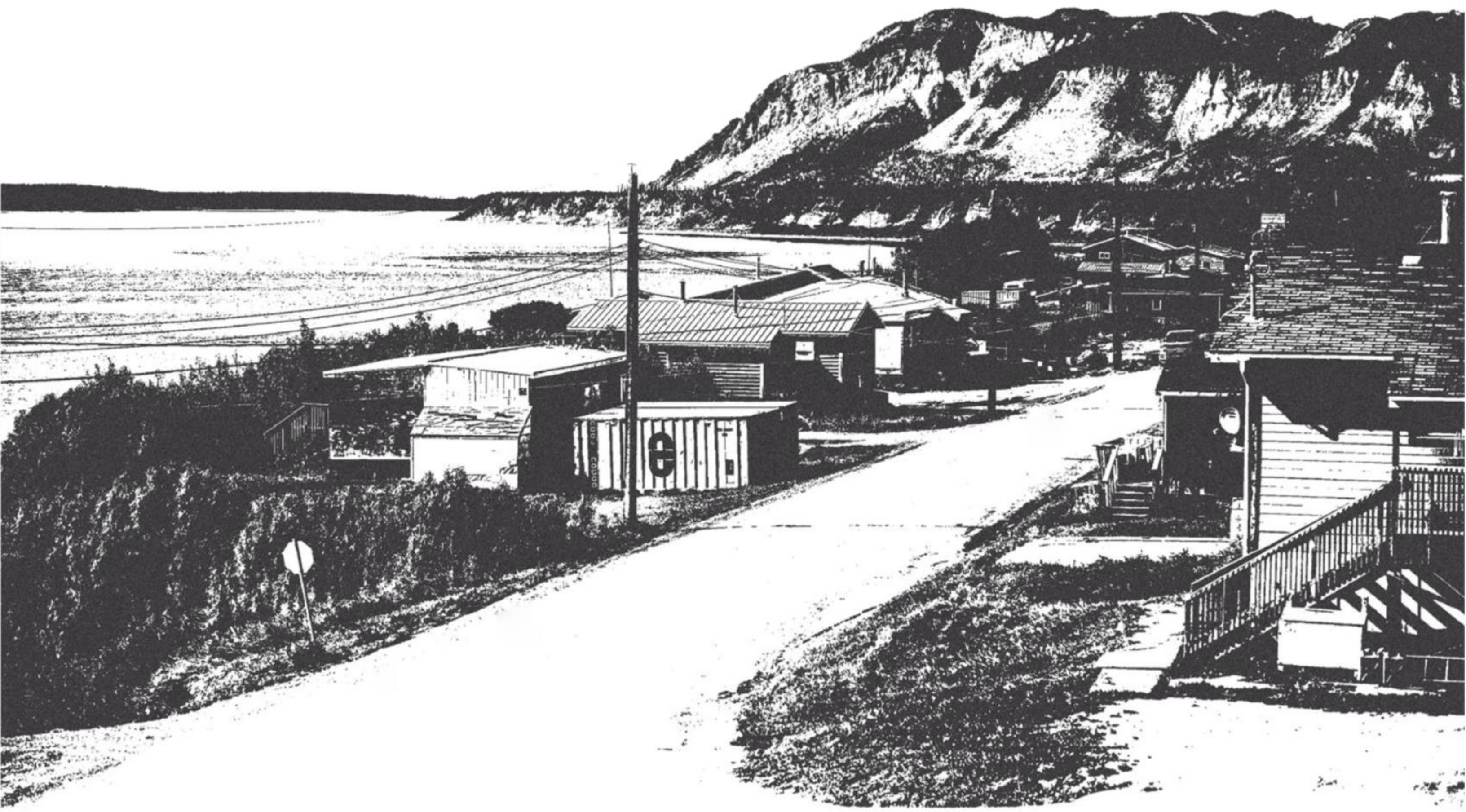
333 Bloor St E Toronto, ON M4W 1G9

ROGERS

CLOSING THE INFRASTRUCTURE GAP
DIGITAL CONNECTIVITY STUDY

Appendix 2

COSTING ASSUMPTIONS



Closing the Infrastructure Gap
Prepared by: Planetworks Consulting Corporation

Appendix B – Costing Assumptions

B1. Assumptions and Quantities before Adjustment Factors

This section summarizes the unit costing, quantities and other assumptions prior to including any adjustments.

B1.1. Average Capex and Opex Per Unit Before Adjustments

The following tables summarize the average unit costs developed by Planetworks. These costs exclude adjustments for community zone & region or contingencies.

Average Capex before adjustments	
Fibre backbone: no adjustment factor ($/km)	$87,000
FTTH: no adjustment factor ($/dwelling passed)	$12,000
Cellular new tower: no adjustment factor ($/tower site)	$1,000,000
Cellular electronic upgrade for existing cell sites: no zonal adjustment factor ($/upgrade site)	$300,000

Table 8 - Capex Median Costs Before Adjustments

Average Opex before adjustments	($/year)
Average Opex per km per year of transport fiber	$65
Average Opex per dwelling passed per year	$312
Average Opex per new cell site per year	$97,500
Average Opex per cell site upgrade per year	$11,700

Table 9 - Opex Median Costs Before Adjustments

B1.2. Quantities and Work split percentages - Backbone

The following tables summarizes from the study group, the number of communities which a fibre backbone, the total kilometers of backbone as the crow flies and the estimated route km of fibre, converted from the crow-flight data by 1.3. The following table shows the percentage breakdown of the capex by labour and materials.

Quantity Fibre Backbone	Communities	Total route km as-the-crow-flies	Estimated route km
Communities requiring a fibre backbone	82	9,446	12,280

Fibre Backbone – Capex components and percentage of total			
#	Category	Scope	%
1	Soft labour	Plan, engineer, procure, permit, administer contracts, training and manage the project.	5.0%
2	Hard labour	Construct, install, test, accept and commission.	67.0%
3	Civil works	Supply, as applicable: conduit, vaults, poles, pole attachment hardware, grounding material, floor space for inside plant, etc.	6.0%
4	Outside plant cabling	Supply, as applicable: transport cable, splice closures and kits, fiber termination hardware, spare fiber and accessories.	12.0%
5	Inside plant electronics	Supply, as applicable: optical line terminal, wave division multiplex, add-drop multiplex, optical amplifiers, transport routers, back up power, element management software, spares.	10.0%

Table 10 - Capex Fibre Backhaul Component Cost Percentage Breakdown

B1.3. Quantities and Work split percentages - FTTH

The following tables summarizes from the study group, the number of communities which require FTTH infrastructure and the percentage breakdown of the capex by labour and materials.

Quantity FTTH Infrastructure	Communities	Dwellings
Communities meeting the 50/10 broadband criteria with technology other than FTTH and requiring an upgrade shortly after 2030	57	7,284
Communities not meeting the broadband criteria and have no FTTH plans	457	66,358
Total Communities requiring FTTH	514	73,642

Fibre-to-the-Home – Capex components and percentage of total			
Item	Category	Scope	%
1	Direct labour, soft costs	Plan, engineer, procure, permit, administer contracts, training and manage the project.	8.0%
2	Direct labour, hard costs	Construct, install, test, accept and commission.	50.0%
3	Equipment & material for civil works	Supply, as applicable: conduit, vaults, poles, pole repairs-replacement, pole attachment hardware, grounding material, floor space for inside plant equipment, etc.	10.0%
4	Equipment outside plant cabling	Supply, as applicable: feeder and distribution cable, splice closures and kits, fiber termination hardware, cabinets, splitters, fiber access terminals, spare fiber and accessories.	19.0%
5	Equipment inside plant electronics	Supply, as applicable: access router, optical line terminal, back up power, element management software, spares.	5.0%
6	Equipment, customer drop cable	Supply, as applicable: connectorized outside drop cable, network interface device (demarc), inside drop cable and wall port.	5.0%
7	Equipment, customer drop electronics	Supply: optical network terminal.	3.0%

Table 11 - Capex FTTH Component Cost Percentage Breakdown

B1.4. Quantities and Work split percentages - Cellular

The following tables summarizes from the study group, the number of communities which either require a new cell tower or electronics upgrade and the percentage breakdown of the capex by labour and materials.

Quantity Cellular Infrastructure	
Communities requiring new cell tower	419
Communities requiring electronics upgrade	11
Total communities requiring Cellular infrastructure	430

New tower – Capex components and percentage of total			
Item	Category	Scope	%
1	Soft labour	Plan, engineer, procure, permit, administer contracts, training and manage the project.	3.0%
2	Hard labour	Construct, install, test, accept and commission.	58.0%
3	Tower and site	Supply, as applicable: tower, equipment shelter, and materials related to site preparation.	21.0%
4	Power	Supply, as applicable: standby generator, back up battery.	3.0%
5	Inside plant electronics	Supply, as applicable: backhaul radio or optical line terminal, site router/switch, baseband unit, remote radio units, sector antennas, element management software, and spares.	15.0%

Table 12 - New Cellular Tower Capex Component Cost Breakdown

Electronic upgrade at existing sites – Capex components and percentage of total			
Item	Category	Scope	%
1	Soft labour	Plan, engineer, procure, permit, administer contracts, training and manage the project.	18.0%
2	Hard labour	Construct, install, test, accept and commission.	22.0%
3	Tower and site	Supply, as applicable: tower, equipment shelter, and materials related to site preparation.	18.0%
4	Power	Supply, as applicable: standby generator, back up battery.	8.0%
5	Inside plant electronics	Supply, as applicable: backhaul radio or optical line terminal, site router/switch, baseband unit, remote radio units, sector antennas, element management software, and spares.	34.0%

Table 13 - Cellular Electronic Upgrade to Exisitng Site Capex Component Cost Breakdown

B2. Zonal Adjustment Factors (Adjustment for distance from service centres)

BTY recommended zonal adjustment factors to both the Capex and Opex costs to account for the distance that a community is from a major service centre. Planetworks identified the service centres for the study, see map and tables below, and for each community calculated the distance as the crow flies (ACF) to the closest service centre. Using the look-up table and definitions below for G1-G4, Planetworks then assigned a zone to each community.

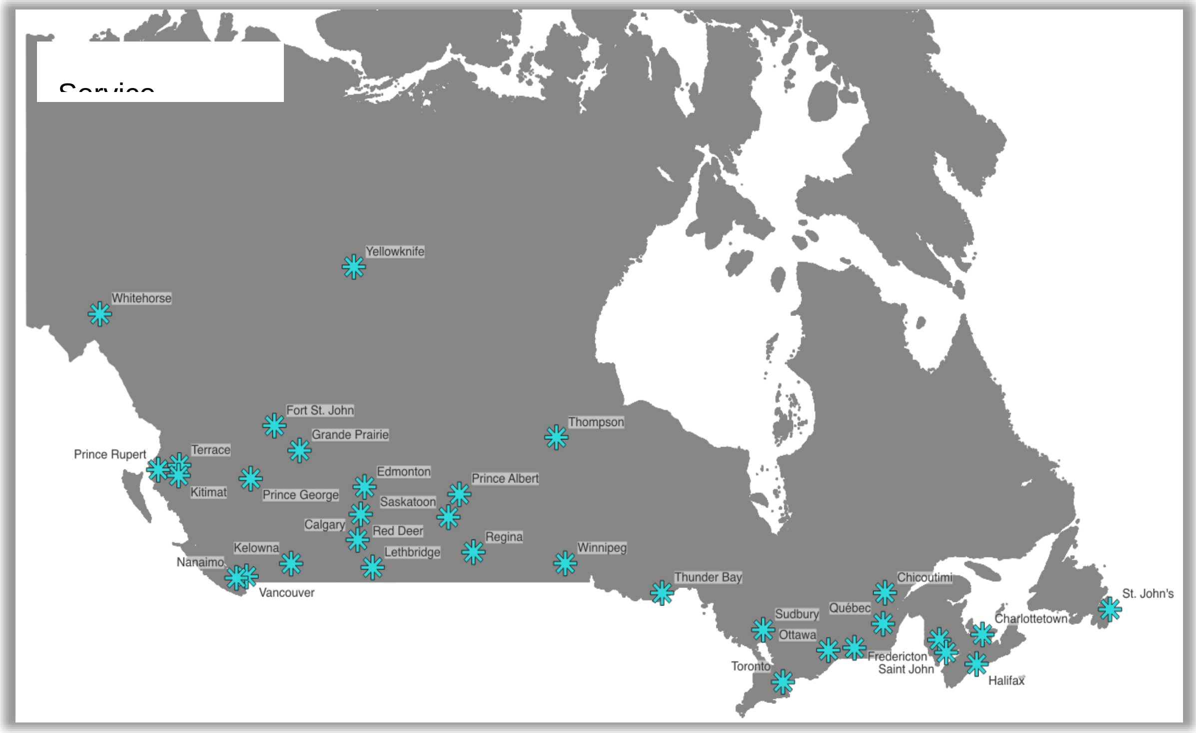


Figure 14 - Service Centres

Service Centres							
Calgary	AB	Nanaimo	BC	Saint John	NB	Charlottetown	PE
Edmonton	AB	Prince George	BC	St. John's	NL	Chicoutimi	QC
Grande Prairie	AB	Prince Rupert	BC	Halifax	NS	Montréal	QC
Lethbridge	AB	Terrace	BC	Yellowknife	NT	Québec	QC
Red Deer	AB	Vancouver	BC	Ottawa	ON	Prince Albert	SK
Fort St. John	BC	Thompson	MB	Sudbury	ON	Regina	SK
Kelowna	BC	Winnipeg	MB	Thunder Bay	ON	Saskatoon	SK
Kitimat	BC	Fredericton	NB	Toronto	ON	Whitehorse	YT

Table 14 - List of Service Centres

Zone	Description / criterial	Capex Adjustment Factor	Opex Adjustment Factor
G1 - Urban	All season road < 50 km to service center	1	1
G2 - Rural	All season road 50-350 km to service center	1.2	1
G3 - Remote	All season road > 350 km to service center	1.6	1.6
G4 - Special	No all season road access	2	2.75

Table 15 - G Zone Definition

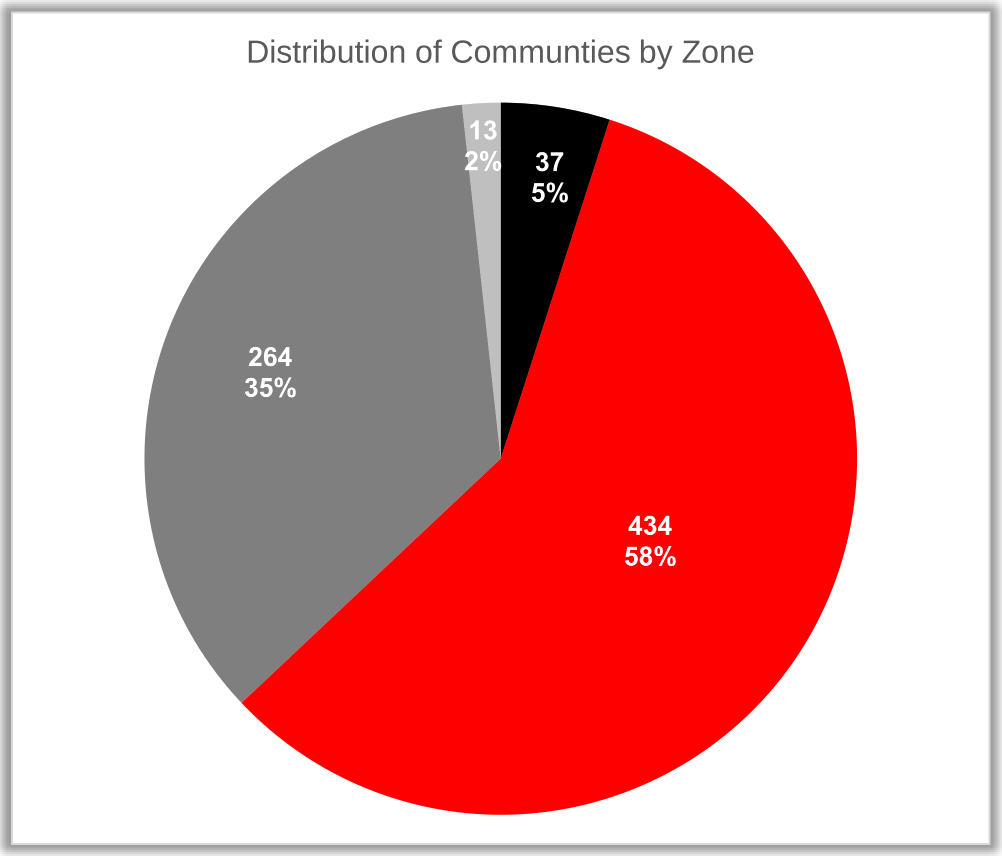


Figure 15 - National Distribution of Communities in Zones

B3. Regional Adjustment Factors

The following tables outline the adjustment factor attributed to Capex and Opex costing by region as recommended by BTY.

Region	Abbreviation	Regional Adjustment Factor
British Columbia	BC	1
Alberta	AB	0.95
Saskatchewan	SK	0.93
Manitoba	MB	0.9
Ontario	ON	1.05
Quebec	QC	0.98
Atlantic Canada: PE, NB, NS, NL	AC	0.93
The North: YK, NT	TN	1.22

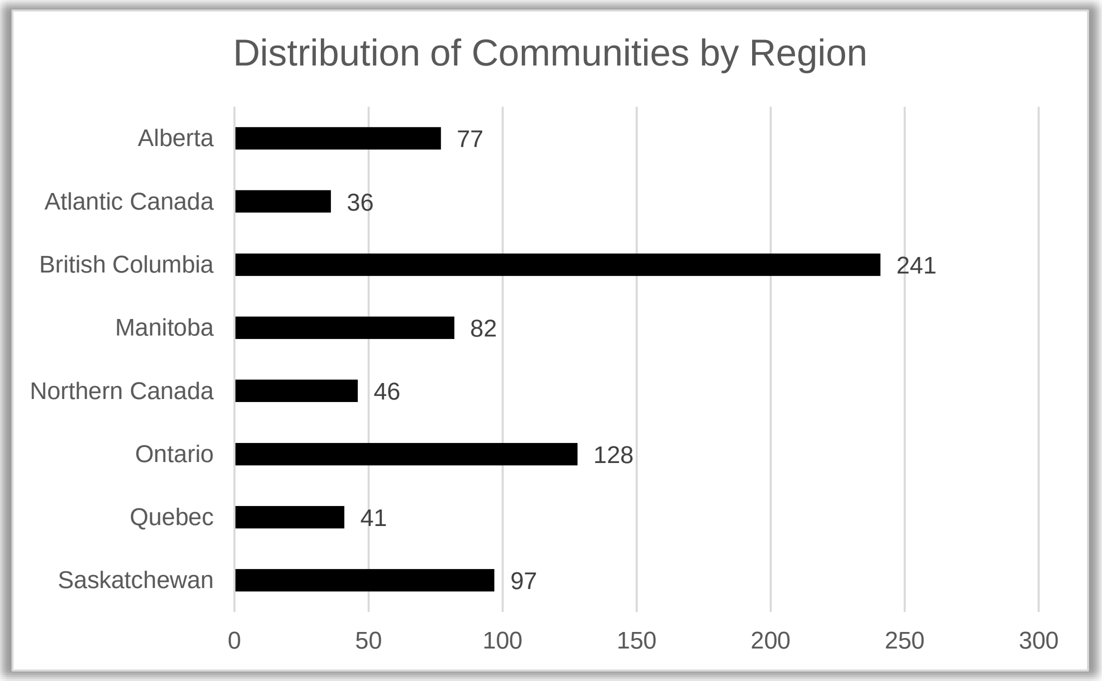


Figure 16 - Regional Distribution of Communities

B4. Average Capex and Opex Unit Costs after Zonal, Regional and Contingency Adjustments

The following tables outline the average Capex and Opex costs across all communities after applying BTY recommendations or zonal, regional and contingency adjustments.

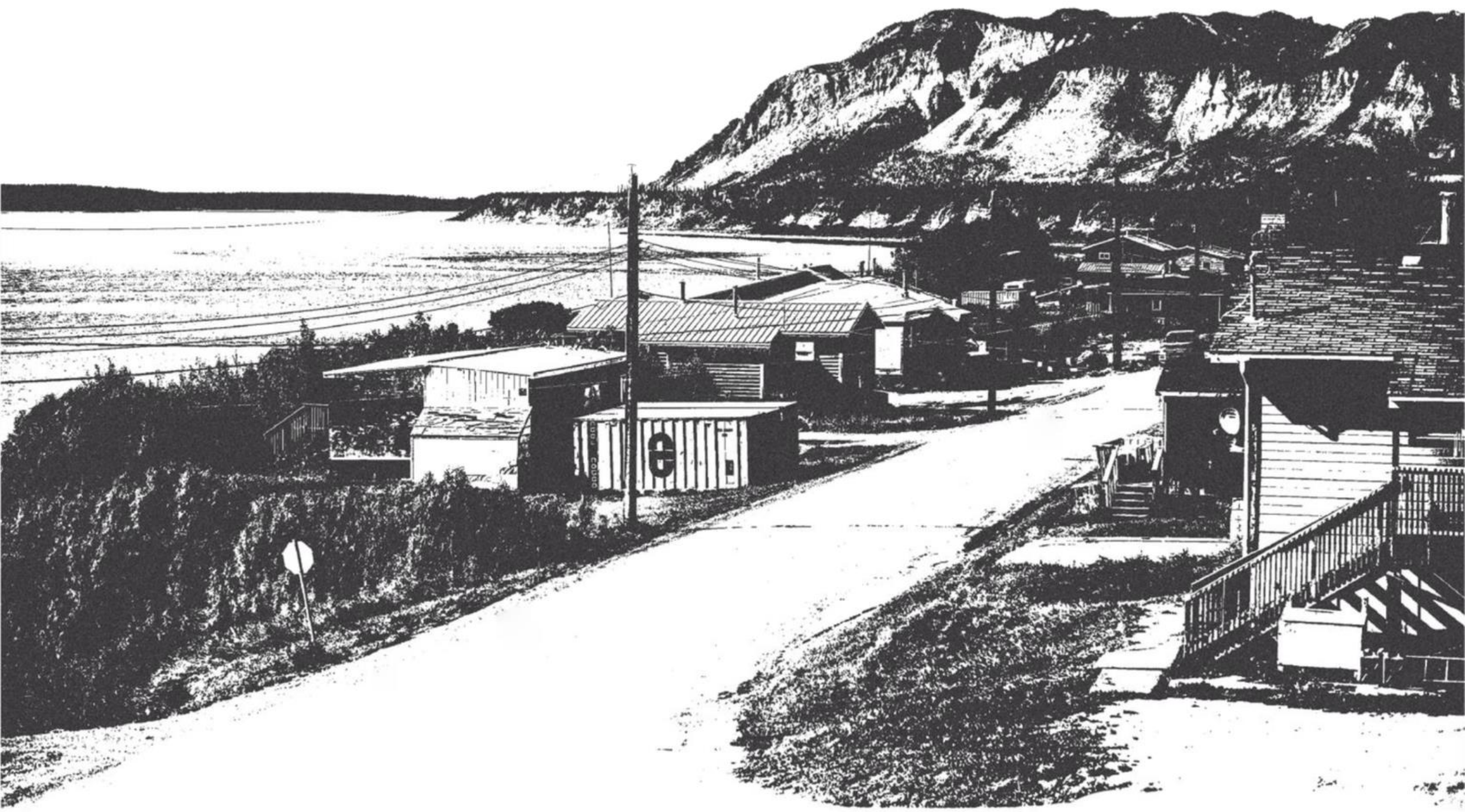
Average Capital cost metrics after zonal, regional and contingency adjustment factors	
Average Capex per km of transport fiber	$236,706
Average Capex per dwelling passed	$20,832
Average Capex per new cell site	$1,757,091
Average Capex per cell site upgrade	$636,480

Average Annual Operating cost metrics after zonal, regional and contingency factors	**Per Year**
Average Opex per km per year of transport fiber	$99
Average Opex per dwelling passed per year	$394
Average Opex per new cell site per year	$124,586
Average Opex per cell site upgrade per year	$16,167

CLOSING THE INFRASTRUCTURE GAP
DIGITAL CONNECTIVITY STUDY

Appendix 3

STUDIED FIRST NATION COMMUNITIES ARRANGED BY REGION



C1. Alberta

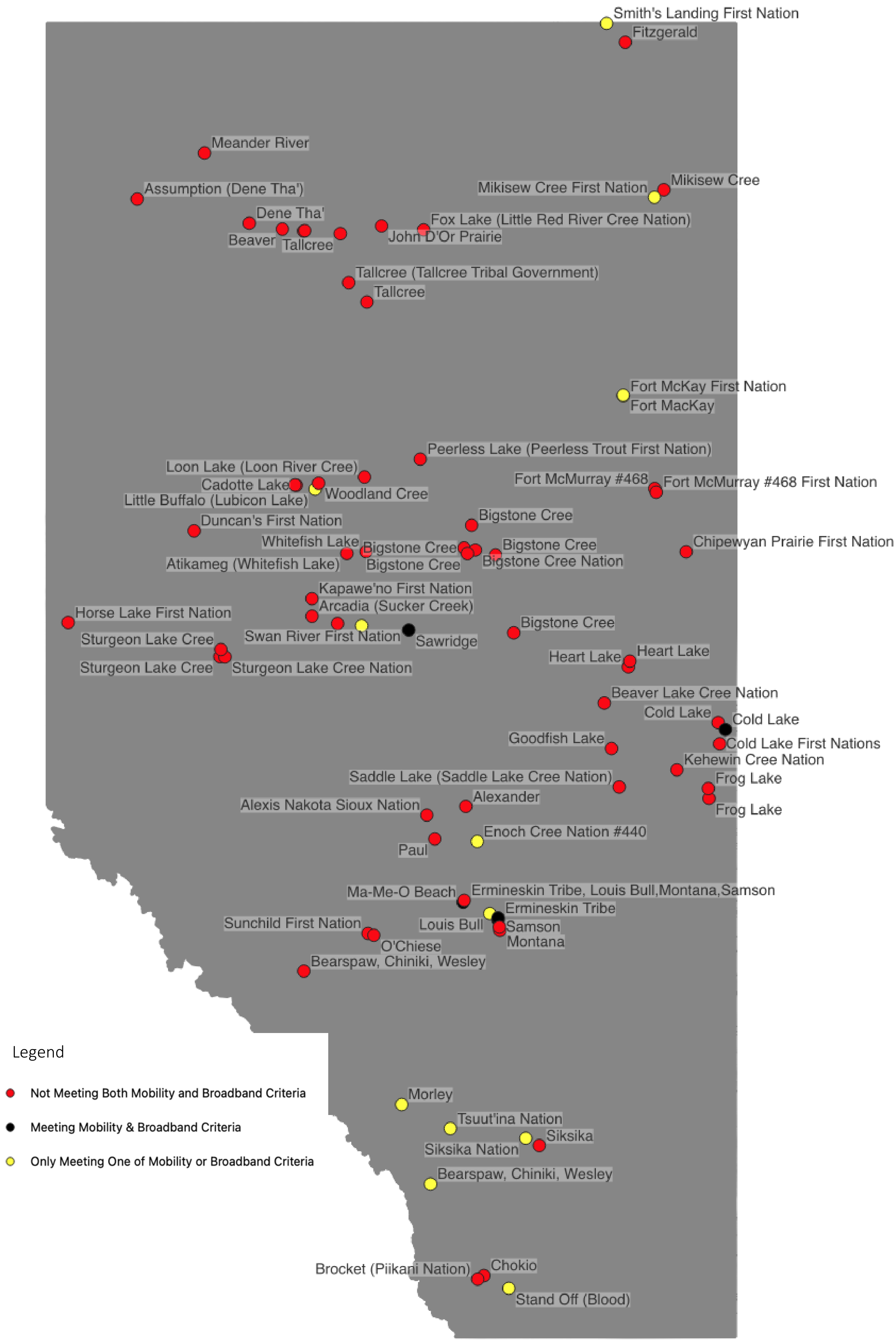


Figure 34 - Alberta Communities

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3152	7038	Chokio	AB	Alberta	49.581944/-113.659723	No	No	Fibre		TELUS	
3153	7093	Siksika	AB	Alberta	50.792404/-112.854679	No	No	Fibre		TELUS	
3154	7139	Bearspaw, Chiniki, Wesley	AB	Alberta	50.436468/-114.433168	No	Yes	Fibre		TELUS	
3155	7259	Morley	AB	Alberta	51.167156/-114.852035	No	Yes	Fibre		TELUS	
3156	7264	Bearspaw, Chiniki, Wesley	AB	Alberta	52.366514/-116.271926	No	No	None	88	TELUS	
3157	7323	Samson	AB	Alberta	52.756667/-113.433332	No	No	Fibre		TELUS	
3158	7374	O'Chiese	AB	Alberta	52.683941/-115.256086	No	No	Fibre		TELUS	
3159	7386	Ma-Me-O Beach	AB	Alberta	52.97347/-113.960161	Yes	Yes	Fibre		TELUS	
3160	7392	Ermineskin Tribe, Louis Bull,Montana,Samson	AB	Alberta	52.989876/-113.944811	No	No	Fibre		TELUS	
3161	7539	Frog Lake	AB	Alberta	53.872095/-110.390698	No	No	Fibre		TELUS	
3162	7547	Cold Lake	AB	Alberta	54.5167/-110.257201	No	No	Fibre		TELUS	
3163	7548	Goodfish Lake	AB	Alberta	54.297504/-111.805785	No	No	Fibre		TELUS	
3164	7557	Cold Lake	AB	Alberta	54.458055/-110.153334	Yes	Yes	Fibre		TELUS	
3165	7568	Heart Lake	AB	Alberta	54.983167/-111.560442	No	No	Fibre		TELUS	
3166	7607	Bigstone Cree	AB	Alberta	55.267066/-113.225661	No	No	Fibre		TELUS	
3167	7626	Sawridge	AB	Alberta	55.29006/-114.74979	Yes	Yes	Fibre		TELUS	
3168	7641	Sturgeon Lake Cree	AB	Alberta	55.12858/-117.476136	No	No	Fibre		TELUS	
3169	7642	Sturgeon Lake Cree	AB	Alberta	55.069452/-117.489395	No	No	Fibre		TELUS	
3170	7659	Whitefish Lake	AB	Alberta	55.933055/-115.368612	No	No	None	31	TELUS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3171	7665	Bigstone Cree	AB	Alberta	56.147222/-113.837223	No	No	Fibre		TELUS	
3172	7666	Bigstone Cree	AB	Alberta	55.963333/-113.946668	No	No	Fibre		TELUS	
3173	7667	Bigstone Cree	AB	Alberta	55.917626/-113.897509	No	No	Fibre		TELUS	
3174	7669	Bigstone Cree	AB	Alberta	55.905368/-113.489649	No	No	Fibre		TELUS	
3175	7679	Fort McMurray #468	AB	Alberta	56.443611/-111.17861	No	No	Fibre		TELUS	
3176	7685	Fort MacKay	AB	Alberta	57.186852/-111.635737	No	Yes	Fibre		TELUS	
3177	7688	Mikisew Cree	AB	Alberta	58.767804/-111.046475	No	No	Fibre		TELUS	
3178	7689	Fitzgerald	AB	Alberta	59.861667/-111.605557	No	No	None	43	TELUS	
3179	7692	John D'Or Prairie	AB	Alberta	58.493799/-115.143893	No	No	Fibre		TELUS	
3180	7693	Tallcree	AB	Alberta	58.435833/-115.742501	No	No	None	30	TELUS	
3181	7698	Tallcree	AB	Alberta	57.911945/-115.356111	No	No	Fibre		TELUS	
3182	7699	Rocky Lane	AB	Alberta	58.458753/-116.259085	No	No	Fibre		TELUS	
3183	7700	Beaver	AB	Alberta	58.470834/-116.584446	No	No	Fibre		TELUS	
3184	7702	Dene Tha'	AB	Alberta	58.514876/-117.064521	No	No	Fibre		TELUS	
3185	7710	Meander River	AB	Alberta	59.043377/-117.714415	No	No	Fibre		TELUS	
3186	7716	Cadotte Lake	AB	Alberta	56.470502/-116.382204	No	No	Fibre		TELUS	
3187	7718	Woodland Cree	AB	Alberta	56.486314/-116.058057	No	No	Fibre		TELUS	
3589	50430	Siksika Nation	AB	Alberta	50.859133413/-113.050832492	No	Yes	Fibre		TELUS	
3590	50432	Tsuut'ina Nation	AB	Alberta	50.94835079/-114.145948148	No	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3591	50434	Sunchild First Nation	AB	Alberta	52.699762902/-115.339955245	No	No	Fibre		TELUS	
3592	50435	Stand Off (Blood)	AB	Alberta	49.461774136/-113.296657558	No	Yes	Fibre		TELUS	Shaw
3593	50436	Brocket (Piikani Nation)	AB	Alberta	49.548738624/-113.748952543	No	No	Fibre		TELUS	
3594	50437	Alexis Nakota Sioux Nation	AB	Alberta	53.728860024/-114.487037294	No	No	Fibre		TELUS	
3595	50438	Alexander	AB	Alberta	53.803858915/-113.92055457	No	No	Fibre		TELUS	
3596	50439	Louis Bull	AB	Alberta	52.874721516/-113.572145625	Yes	No	Fibre		TELUS	
3597	50440	Enoch Cree Nation #440	AB	Alberta	53.501954999/-113.755541841	No	Yes	Fibre		TELUS	
3598	50441	Paul	AB	Alberta	53.523795927/-114.370706986	No	No	Fibre		TELUS	
3599	50442	Montana	AB	Alberta	52.72617603/-113.425473045	No	No	Fibre		TELUS	
3600	50443	Ermineskin Tribe	AB	Alberta	52.835851489/-113.452475333	Yes	Yes	Fibre		TELUS	
3601	50444	Samson	AB	Alberta	52.820386078/-113.455046318	Yes	Yes	Fibre		TELUS	
3602	50445	Beaver First Nation	AB	Alberta	58.455790128/-116.274777973	No	No	Fibre		TELUS	
3603	50446	Tallcree (Tallcree Tribal Government)	AB	Alberta	58.061100988/-115.621570082	No	No	Fibre		TELUS	
3604	50447	Fox Lake (Little Red River Cree Nation)	AB	Alberta	58.464919869/-114.533463449	No	No	Fibre		TELUS	
3605	50448	Assumption (Dene Tha')	AB	Alberta	58.698151479/-118.691266621	No	No	Fibre		TELUS	
3606	50449	Horse Lake First Nation	AB	Alberta	55.351716274/-119.693693974	No	No	Fibre		TELUS	
3607	50450	Driftpile Cree Nation	AB	Alberta	55.343233101/-115.782493738	No	No	Fibre		TELUS	
3608	50451	Duncan's First Nation	AB	Alberta	56.102080538/-117.865029012	No	No	Fibre		TELUS	
3609	50452	Kapawe'no First Nation	AB	Alberta	55.548633946/-116.154862748	No	No	Fibre		TELUS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3610	50453	Little Buffalo (Lubicon Lake)	AB	Alberta	56.438653356/-116.108051722	No	Yes	Fibre		TELUS	
3611	50455	Sturgeon Lake Cree Nation	AB	Alberta	55.067594631/-117.418096202	No	No	Fibre		TELUS	
3612	50456	Arcadia (Sucker Creek)	AB	Alberta	55.404200961/-116.154259455	No	No	Fibre		TELUS	
3613	50457	Swan River First Nation	AB	Alberta	55.325862744/-115.433419221	No	Yes	Fibre		TELUS	
3614	50458	Bigstone Cree Nation	AB	Alberta	55.94642528/-113.782960037	No	No	Fibre		TELUS	
3615	50459	Atikameg (Whitefish Lake)	AB	Alberta	55.918895784/-115.648071708	No	No	Fibre		TELUS	
3616	50460	Beaver Lake Cree Nation	AB	Alberta	54.681381396/-111.911099025	No	No	Fibre		TELUS	
3617	50461	Mikisew Cree First Nation	AB	Alberta	58.71129957/-111.183327263	No	Yes	Fibre		TELUS	
3618	50462	Saddle Lake (Saddle Lake Cree Nation)	AB	Alberta	53.970277177/-111.693468054	No	No	Fibre		TELUS	
3619	50464	Cold Lake First Nations	AB	Alberta	54.337050706/-110.236182461	No	No	Fibre		TELUS	
3620	50465	Frog Lake	AB	Alberta	53.957501968/-110.400805303	No	No	Fibre		TELUS	
3621	50466	Kehewin Cree Nation	AB	Alberta	54.116088446/-110.85709438	No	No	Fibre		TELUS	
3622	50467	Fort McKay First Nation	AB	Alberta	57.179506461/-111.634912714	No	Yes	Fibre		TELUS	
3623	50468	Fort McMurray #468 First Nation	AB	Alberta	56.413527317/-111.157463748	No	No	Fibre		TELUS	
3624	50469	Heart Lake	AB	Alberta	55.031288096/-111.54004954	No	No	Fibre		TELUS	
3625	50470	Chipewyan Prairie First Nation	AB	Alberta	55.931793505/-110.721774982	No	No	Fibre		TELUS	
3626	50474	Woodland Cree First Nation	AB	Alberta	56.472367886/-116.401824765	No	No	Fibre		TELUS	
3627	50476	Loon Lake (Loon River Cree)	AB	Alberta	56.535499093/-115.39269853	No	No	Fibre		TELUS	
3628	50477	Smith's Landing First Nation	AB	Alberta	59.999002364/-111.878066019	No	Yes	Fibre		TELUS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3629	50478	Peerless Lake (Peerless Trout First Nation)	AB	Alberta	56.678375065/-114.581941221	No	No	Fibre		TELUS	

C2. British Columbia

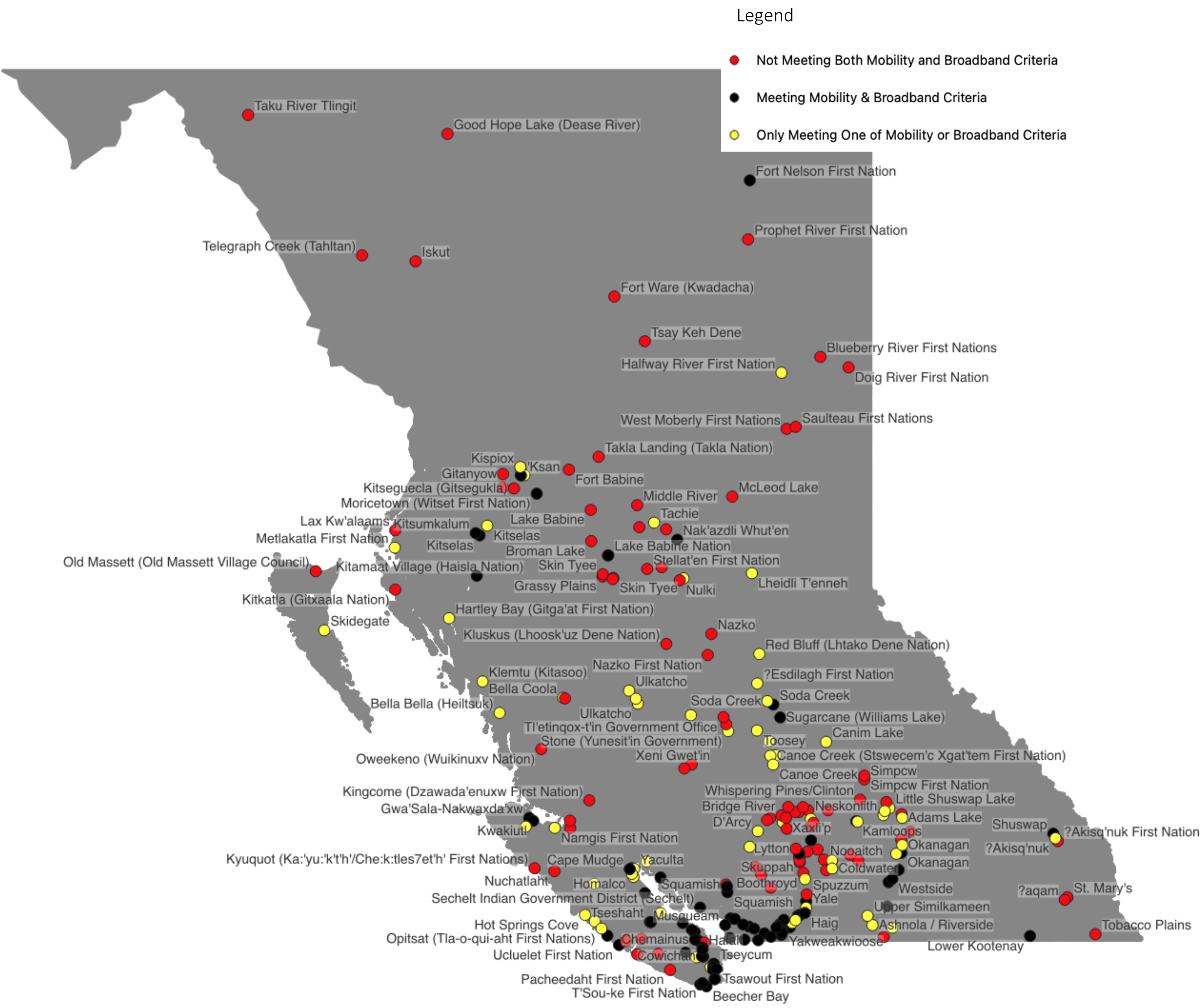


Figure 35 - British Columbia Communities

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3198	8007	St. Mary's	BC	British Columbia	49.62032/-115.696089	No	No	Fibre		TELUS	
3199	8013	?Akisq'nuk	BC	British Columbia	50.451202/-115.959718	Yes	No	Fibre		TELUS	Shaw
3200	8049	Haig	BC	British Columbia	49.396721/-121.45304	Yes	Yes	Fibre		TELUS	Shaw
3201	8076	Matsqui	BC	British Columbia	49.005994/-122.476246	Yes	Yes	Fibre		TELUS	Shaw
3202	8096	Leq' a: mel	BC	British Columbia	49.209032/-122.023377	Yes	Yes	Fibre		TELUS	Shaw
3203	8135	Westside	BC	British Columbia	49.88223/-119.535235	Yes	Yes	Fibre		TELUS	Shaw
3204	8144	Okanagan	BC	British Columbia	50.007636/-119.396944	Yes	Yes	Fibre		TELUS	Shaw
3205	8157	Squamish	BC	British Columbia	49.690967/-123.150287	Yes	Yes	Fibre		TELUS	Shaw
3206	8158	Squamish	BC	British Columbia	49.771237/-123.162035	Yes	Yes	Fibre		TELUS	Shaw
3207	8161	Squamish	BC	British Columbia	49.8/-123.183301	No	No	Fibre		TELUS	
3208	8169	D'Arcy	BC	British Columbia	50.55/-122.4833	Yes	No	Fibre		TELUS	
3209	8220	Samahquam	BC	British Columbia	50.051308/-122.539473	No	No	None	14	No Service Provider	
3210	8228	Yale	BC	British Columbia	49.471157/-121.425282	No	Yes	Fibre		TELUS	
3211	8236	Lytton	BC	British Columbia	50.200935/-121.57214	No	No	Fibre		TELUS	
3212	8244	Lytton	BC	British Columbia	50.304382/-121.649164	No	No	Fibre		TELUS	
3213	8253	Seton Lake	BC	British Columbia	50.704731/-122.281307	No	No	Fibre		No Service Provider	
3214	8254	Ts'kw'aylaxw	BC	British Columbia	50.8167/-121.666701	No	No	Fibre		TELUS	
3215	8255	Upper Hat Creek 1 (Bonaparte)	BC	British Columbia	50.8167/-121.5833	No	No	Fibre		No Service Provider	
3216	8256	Lower Hat Creek 2 (Bonaparte)	BC	British Columbia	50.88402222/-121.493	No	No	Fibre		No Service Provider	
3217	8260	T'it'q'et	BC	British Columbia	50.5833/-121.85	No	No	Fibre		No Service Provider	
3218	8270	Oregon Jack Creek	BC	British Columbia	50.666701/-121.266699	No	No	Fibre		TELUS	
3219	8277	Coldwater	BC	British Columbia	50.002411/-120.98532	No	No	Fibre		TELUS	
3220	8281	Upper Nicola	BC	British Columbia	50.21971/-120.462118	No	No	Fibre		TELUS	
3221	8284	Okanagan	BC	British Columbia	50.247252/-119.337691	Yes	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3222	8293	Okanagan	BC	British Columbia	50.234306/-119.448288	No	Yes	Fibre		TELUS	Shaw
3223	8296	Okanagan	BC	British Columbia	50.430341/-119.341435	No	No	Fibre		TELUS	
3224	8314	Tappen	BC	British Columbia	50.783988/-119.330606	No	No	Fibre		TELUS	
3225	8315	Adams Lake	BC	British Columbia	50.736567/-119.320557	Yes	No	Fibre		TELUS	Shaw
3226	8378	Kamloops	BC	British Columbia	50.689234/-120.325803	Yes	Yes	Fibre		TELUS	Shaw
3227	8382	Hustalen 1 (Adams Lake)	BC	British Columbia	50.95325/-119.66673611	No	No	Fibre		TELUS	
3228	8394	Simpcw	BC	British Columbia	51.265369/-120.151162	No	No	Fibre		TELUS	
3229	8454	Soda Creek	BC	British Columbia	52.327502/-122.274759	Yes	Needs Upgrade - 3G Only	Fibre		TELUS	
3230	8502	Canoe Creek	BC	British Columbia	51.595617/-122.092169	Yes	No	Fibre		TELUS	
3231	8504	Canoe Creek	BC	British Columbia	51.469131/-122.148759	Yes	No	Fibre		TELUS	
3232	8510	Tl'etinqox-t'in Government Office	BC	British Columbia	52.112626/-123.235654	No	No	Fibre		No Service Provider	
3233	8518	Ulkatcho	BC	British Columbia	52.293673/-125.114376	Yes	No	Fibre		TELUS	
3234	8519	Ulkatcho	BC	British Columbia	52.359753/-125.157296	Yes	No	Fibre		TELUS	
3235	8524	Bella Coola	BC	British Columbia	52.370575/-126.751771	No	Yes	Fibre		TELUS	
3236	8527	Nazko	BC	British Columbia	53.217921/-123.501972	No	No	None	107	No Service Provider	
3237	8590	Hot Springs Cove	BC	British Columbia	49.3683298/-126.2723705	No	Yes	Fibre		TELUS	
3238	8596	Tla-o-qui-aht	BC	British Columbia	49.071259/-125.781959	Yes	Yes	Fibre		TELUS	
3239	8602	Toquaht	BC	British Columbia	48.995918/-125.379408	No	No	Fibre		No Service Provider	
3240	8614	Cowichan	BC	British Columbia	48.75955/-123.828869	Yes	No	Fibre		TELUS	Shaw
3241	8618	Chemainus	BC	British Columbia	48.901357/-123.696519	Yes	Yes	Fibre		TELUS	Shaw
3242	8637	T'Sou-ke	BC	British Columbia	48.363364/-123.74757	Yes	Yes	Fibre		TELUS	Shaw
3243	8678	Cowichan	BC	British Columbia	48.768781/-123.67978	Yes	Yes	Fibre		TELUS	Shaw
3244	8694	Chemainus	BC	British Columbia	49.016099/-123.85959	Yes	Yes	Fibre		TELUS	Shaw
3245	8698	Snuneymuxw	BC	British Columbia	49.122957/-123.869598	Yes	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3246	8756	Yaculta	BC	British Columbia	50.021696/-125.194987	No	Yes	Fibre		TELUS	
3247	8774	Xeni Gwet'in	BC	British Columbia	51.468738/-123.936047	No	No	None	110	No Service Provider	
3248	8789	Broman Lake	BC	British Columbia	54.42032/-126.134615	No	No	Fibre		TELUS	
3249	8795	Lake Babine	BC	British Columbia	54.817021/-126.146656	No	No	Fibre		TELUS	
3250	8799	Fort Babine	BC	British Columbia	55.322294/-126.626221	No	No	Fibre		TELUS	
3251	8805	Pinchi	BC	British Columbia	54.570593/-124.493298	No	No	None	30	TELUS	
3252	8808	Tachie	BC	British Columbia	54.654818/-124.757885	Yes	No	Fibre		TELUS	
3253	8812	Grassy Plains	BC	British Columbia	53.966992/-125.888129	No	No	None	5	TELUS	
3254	8817	Skin Tyee	BC	British Columbia	53.948561/-125.651762	No	No	None	22	TELUS	
3255	8829	Nulki	BC	British Columbia	53.918487/-124.196575	No	No	Fibre		TELUS	
3256	8840	Middle River	BC	British Columbia	54.876138/-125.129788	No	No	None	54	No Service Provider	
3257	8853	'Ksan	BC	British Columbia	55.249714/-127.678414	Yes	Yes	Fibre		TELUS	
3258	8863	Kitselas	BC	British Columbia	54.616699/-128.4167	Yes	No	Fibre		TELUS	
3639	50501	Taku River Tlingit	BC	British Columbia	59.505817395/-133.658689059	No	No	None	162	No Service Provider	
3642	50504	Good Hope Lake (Dease River)	BC	British Columbia	59.294676499/-129.288208096	No	No	None	25	Northwestel	
3646	50530	Moricetown (Witset First Nation)	BC	British Columbia	55.021566266/-127.33091458	Yes	Yes	Fibre		TELUS	
3647	50531	Hazelton (Gitanmaax)	BC	British Columbia	55.255671125/-127.675038195	No	Yes	Fibre		TELUS	
3648	50532	Kispiox	BC	British Columbia	55.355299273/-127.691096164	Yes	No	Fibre		TELUS	
3649	50533	Glen Vowell	BC	British Columbia	55.309967275/-127.674359142	Yes	No	Fibre		TELUS	
3650	50534	Hagwilget (Hagwilget Village)	BC	British Columbia	55.253538461/-127.600300568	No	Yes	Fibre		CityWest	
3651	50535	Kitseguecla (Gitsegukla)	BC	British Columbia	55.087686089/-127.829590143	No	No	Fibre		TELUS	
3652	50536	Kitwanga (Gitwangak)	BC	British Columbia	55.099255217/-128.06793311	No	No	Fibre		TELUS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3653	50537	Gitanyow	BC	British Columbia	55.26763522/-128.070618182	No	No	Fibre		TELUS	
3654	50538	Bella Bella (Heiltsuk)	BC	British Columbia	52.169770157/-128.144901014	No	Yes	Fibre		TELUS	
3655	50539	Nuxalk Nation	BC	British Columbia	52.363600918/-126.710542817	No	No	Fibre		TELUS	
3656	50540	Klemtu (Kitasoo)	BC	British Columbia	52.590618481/-128.51967353	No	Yes	Fibre		No Service Provider	
3657	50541	Oweekeno (Wuikinuxv Nation)	BC	British Columbia	51.680112586/-127.23206379	No	No	Fibre		TELUS	
3658	50542	Saulteau First Nations	BC	British Columbia	55.852219195/-121.653003729	No	No	Fibre		TELUS	
3659	50543	Fort Nelson First Nation	BC	British Columbia	58.770105036/-122.659725939	Yes	Yes	Fibre		Northwestel	
3660	50544	Prophet River First Nation	BC	British Columbia	58.092540436/-122.697530337	No	No	Fibre		Northwestel	
3661	50545	West Moberly First Nations	BC	British Columbia	55.82791187/-121.852487973	No	No	None	35	TELUS	
3662	50546	Halfway River First Nation	BC	British Columbia	56.513367/-121.964969	No	Yes	None	43	Northwestel	
3663	50547	Blueberry River First Nations	BC	British Columbia	56.704040799/-121.112413197	No	No	None	60	No Service Provider	
3664	50548	Doig River First Nation	BC	British Columbia	56.577853627/-120.495585061	No	No	Fibre	75	No Service Provider	
3665	50549	Burrard (Tsleil-Waututh Nation)	BC	British Columbia	49.310978091/-122.989135369	Yes	Yes	Fibre		TELUS	Shaw
3666	50550	Musqueam	BC	British Columbia	49.22494/-123.1992	Yes	Yes	Fibre		TELUS	Shaw
3667	50551	Sechelt Indian Government District (Sechelt)	BC	British Columbia	49.473899608/-123.749955536	Yes	Yes	Fibre		TELUS	Eastlink
3668	50552	Homalco	BC	British Columbia	49.951639738/-125.243608422	No	Yes	Fibre		No Service Provider	
3669	50553	Klahoose First Nation	BC	British Columbia	50.125831272/-124.921269027	No	Yes	Fibre		TELUS	
3670	50554	Sliammon (Tla'amin Nation)	BC	British Columbia	49.90059/-124.617391	Yes	Yes	Fibre		TELUS	Shaw
3671	50555	Squamish	BC	British Columbia	49.318261453/-123.083572229	Yes	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3672	50557	Mount Currie (Lil'wat Nation)	BC	British Columbia	50.33212805/-122.662688197	Yes	No	Fibre		TELUS	
3673	50558	Aitchelitz	BC	British Columbia	49.150417311/-121.986896773	Yes	Yes	Fibre		TELUS	Shaw
3674	50559	Chehalis (Sts'ailes)	BC	British Columbia	49.298510556/-121.914171648	Yes	Yes	Fibre		TELUS	Shaw
3675	50560	Kwikwetlem First Nation	BC	British Columbia	49.230160912/-122.805957041	Yes	Yes	Fibre		TELUS	Shaw
3676	50561	Douglas	BC	British Columbia	49.75599262/-122.201085099	No	No	None	6	No Service Provider	
3677	50562	Skookumchuck (Skatin Nations)	BC	British Columbia	49.938295825/-122.410397335	No	No	None	10	No Service Provider	
3678	50563	Katzie	BC	British Columbia	49.201425396/-122.676930484	Yes	Yes	Fibre		TELUS	Shaw
3679	50564	Kwantlen First Nation	BC	British Columbia	49.171443898/-122.56549429	Yes	Yes	Fibre		TELUS	Shaw
3680	50565	Matsqui	BC	British Columbia	49.104450849/-122.338804672	Yes	Yes	Fibre		TELUS	Shaw
3681	50568	Scowlitz (Sq'éwlets)	BC	British Columbia	49.2359419/-122.00245605	Yes	Yes	Fibre		TELUS	Shaw
3682	50569	Semiahmoo	BC	British Columbia	49.014531999/-122.77774078	Yes	Yes	Fibre		TELUS	Shaw
3683	50570	Shxwhá:y Village	BC	British Columbia	49.168969803/-121.988923606	Yes	Yes	Fibre		TELUS	Shaw
3684	50571	Skowkale	BC	British Columbia	49.141712689/-121.940579261	Yes	Yes	Fibre		TELUS	Shaw
3685	50572	Soowahlie	BC	British Columbia	49.081020085/-121.968958886	Yes	Yes	Fibre		TELUS	Shaw
3686	50573	Skwah	BC	British Columbia	49.177749134/-121.971968117	Yes	Yes	Fibre		TELUS	Shaw
3687	50574	Squiala First Nation	BC	British Columbia	49.158014/-121.979421	Yes	Yes	Fibre		TELUS	Shaw
3688	50575	Tzeachten	BC	British Columbia	49.111856/-121.953976	Yes	Yes	Fibre		TELUS	Shaw
3689	50576	Yakweakwioose	BC	British Columbia	49.132615302/-121.938564952	Yes	Yes	Fibre		TELUS	Shaw
3690	50577	Tsawwassen First Nation	BC	British Columbia	49.037882663/-123.097696314	Yes	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3691	50578	Sumas First Nation	BC	British Columbia	49.055516307/-122.195016475	Yes	Yes	Fibre		TELUS	Shaw
3692	50579	Deroche (Leq' a: mel First Nation)	BC	British Columbia	49.187501866/-122.074570002	Yes	Yes	Fibre		TELUS	Shaw
3693	50580	Kwaw-kwaw-Apilt	BC	British Columbia	49.166849682/-121.975245699	Yes	Yes	Fibre		TELUS	Shaw
3694	50581	Seabird Island	BC	British Columbia	49.255121717/-121.730396716	No	Yes	Fibre		TELUS	
3695	50582	Skawahlook First Nation	BC	British Columbia	49.356845609/-121.606183637	Yes	Yes	Fibre		TELUS	
3696	50583	Chawathil	BC	British Columbia	49.369822294/-121.552604417	Yes	Yes	Fibre		TELUS	Shaw
3697	50584	Cheam	BC	British Columbia	49.189786987/-121.783488476	Yes	Yes	Fibre		TELUS	Shaw
3698	50586	Peters First Nation	BC	British Columbia	49.293865117/-121.657945525	Yes	No	Fibre		TELUS	
3699	50587	Shxw'ow'hamel First Nation	BC	British Columbia	49.343025919/-121.606664649	Yes	Yes	Fibre		TELUS	
3700	50589	Yale (Yale First Nation)	BC	British Columbia	49.562177161/-121.42601193	Yes	Yes	Fibre		TELUS	
3701	50590	Bridge River	BC	British Columbia	50.769540807/-121.96409765	No	No	Fibre		TELUS	
3702	50591	Cayoose Creek	BC	British Columbia	50.674303825/-121.934060123	No	Yes	Fibre		TELUS	
3703	50592	Xaxli'p	BC	British Columbia	50.734625224/-121.864423819	No	No	Fibre		TELUS	
3704	50593	T'it'q'et	BC	British Columbia	50.678208235/-121.942150103	No	Yes	Fibre		TELUS	Shaw
3705	50594	Pavilion (Ts'kw'aylaxw First Nation)	BC	British Columbia	50.885892747/-121.818992986	No	No	Fibre		TELUS	
3706	50595	Shalalth (Tsal'alh)	BC	British Columbia	50.72916019/-122.214439072	No	No	Fibre		No Service Provider	
3707	50596	Osoyoos	BC	British Columbia	49.184677743/-119.536597194	No	Yes	Fibre		TELUS	
3708	50597	Penticton	BC	British Columbia	49.49136808/-119.644762842	Yes	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3709	50598	Lower Similkameen	BC	British Columbia	49.051432157/-119.723798038	No	No	None	22	TELUS	
3710	50599	Upper Similkameen	BC	British Columbia	49.355863031/-120.078733533	Yes	No	Fibre		TELUS	
3711	50600	Spallumcheen (Splatsin)	BC	British Columbia	50.542514197/-119.138698037	No	No	Fibre		TELUS	Shaw
3712	50601	Westbank First Nation	BC	British Columbia	49.834470504/-119.615793433	Yes	Yes	Fibre		TELUS	Shaw
3713	50602	?aqam	BC	British Columbia	49.583492611/-115.754511788	No	No	Fibre		TELUS	
3714	50603	Tobacco Plains	BC	British Columbia	49.093333908/-115.081905417	No	No	Fibre		TELUS	
3715	50604	?Akisq'nuk First Nation	BC	British Columbia	50.411307768/-115.908159529	No	No	Fibre		TELUS	
3716	50605	Shuswap	BC	British Columbia	50.51585948/-116.007264788	Yes	Yes	Fibre		TELUS	Shaw
3717	50606	Lower Kootenay	BC	British Columbia	49.066742628/-116.516265401	Yes	Yes	Fibre		TELUS	Shaw
3718	50607	Lake Babine Nation	BC	British Columbia	54.238616625/-125.762517416	Yes	Yes	Fibre		TELUS	
3719	50608	Takla Landing (Takla Nation)	BC	British Columbia	55.482356/-125.975336	No	No	None	53	No Service Provider	
3720	50609	Tsay Keh Dene	BC	British Columbia	56.892647/-124.962364	No	No	Satellite	252	No Service Provider	
3721	50610	Fort Ware (Kwadacha)	BC	British Columbia	57.42367325/-125.630282177	No	No	Satellite	284	Northwestel	
3722	50611	Lheidli T'enneh	BC	British Columbia	54.008833527/-122.614301486	Yes	No	Fibre		TELUS	
3723	50612	Nadleh Whuten	BC	British Columbia	54.086247902/-124.590887052	No	No	Fibre		TELUS	
3724	50613	Stellat'en First Nation	BC	British Columbia	54.063796504/-124.911113623	No	No	Fibre		TELUS	
3725	50614	Nak'azdli Whut'en	BC	British Columbia	54.438457861/-124.250154361	Yes	Yes	Fibre		TELUS	
3726	50615	Saik'uz First Nation	BC	British Columbia	53.943390537/-124.114033181	No	Yes	Fibre		TELUS	
3727	50616	Okanagan	BC	British Columbia	50.356222024/-119.318103845	Yes	No	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3728	50618	McLeod Lake	BC	British Columbia	54.984563978/-123.045835417	No	No	Fibre		TELUS	
3729	50619	Burns Lake	BC	British Columbia	54.236657095/-125.771112955	Yes	Yes	Fibre		TELUS	
3730	50622	Campbell River No.11	BC	British Columbia	50.031657403/-125.247919353	Yes	Yes	Fibre		TELUS	Shaw
3731	50623	Cape Mudge	BC	British Columbia	50.018405453/-125.290922893	Yes	Yes	Fibre		TELUS	Shaw
3732	50624	Comox (K'ómoks First Nation)	BC	British Columbia	49.6787687/-124.958903812	Yes	Yes	Fibre		TELUS	Shaw
3733	50625	Health Bay (Kwikwasut'inuxw Haxwa'mis)	BC	British Columbia	50.696396786/-126.600633263	No	No	Fibre		No Service Provider	
3734	50626	Kwakiutl	BC	British Columbia	50.694496009/-127.408677014	Yes	Yes	Fibre		TELUS	Shaw
3735	50630	Mowachaht/Muchalaht	BC	British Columbia	49.811040011/-126.07186484	No	Yes	Fibre		TELUS	
3736	50631	Namgis First Nation	BC	British Columbia	50.596006166/-126.935274432	No	Yes	Fibre		TELUS	Shaw
3737	50633	Quatsino First Nation	BC	British Columbia	50.614095/-127.57128	Yes	No	Fibre		TELUS	
3738	50636	Kingcome (Dzawada'enuxw First Nation)	BC	British Columbia	50.977275534/-126.180201254	No	No	Fibre		TELUS	
3739	50638	Kyuquot (Ka:'yu:'k't'h'/Che:k:tles7et'h' First Nations)	BC	British Columbia	50.030573782/-127.37823364	No	No	Fibre		No Service Provider	
3740	50639	Nuchatlaht	BC	British Columbia	49.990261631/-126.942083034	No	No	Fibre		TELUS	
3741	50640	Beecher Bay	BC	British Columbia	48.337563767/-123.608301999	Yes	Yes	Fibre		TELUS	
3742	50641	Chemainus (Stz'uminus First Nation)	BC	British Columbia	48.993023934/-123.772111335	Yes	Yes	Fibre		TELUS	Shaw
3743	50642	Cowichan	BC	British Columbia	48.776217696/-123.709288442	Yes	Yes	Fibre		TELUS	Shaw
3744	50643	Lake Cowichan First Nation	BC	British Columbia	48.82604956/-124.069746544	Yes	Yes	Fibre		TELUS	Shaw
3745	50644	Esquimalt	BC	British Columbia	48.444930034/-123.430415926	Yes	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3746	50645	Halalt	BC	British Columbia	48.873995042/-123.696124543	Yes	Yes	Fibre		TELUS	Shaw
3747	50647	Malahat Nation	BC	British Columbia	48.613672616/-123.520412907	Yes	No	Fibre		TELUS	Shaw
3748	50648	Snuneymuxw First Nation	BC	British Columbia	49.15166709/-123.930277307	Yes	Yes	Fibre		TELUS	
3749	50649	Nanoose First Nation	BC	British Columbia	49.252999981/-124.130031842	Yes	Yes	Fibre		TELUS	Shaw
3750	50650	Penelakut (Penelakut Tribe)	BC	British Columbia	48.97149163/-123.658393775	No	No	Fibre		TELUS	
3751	50651	Qualicum First Nation	BC	British Columbia	49.394389896/-124.61630108	Yes	No	Fibre		TELUS	Shaw
3752	50652	Pauquachin	BC	British Columbia	48.627153456/-123.458456922	Yes	Yes	Fibre		TELUS	Shaw
3753	50653	Tsartlip	BC	British Columbia	48.581272331/-123.467466399	Yes	Yes	Fibre		TELUS	Shaw
3754	50654	Tsawout First Nation	BC	British Columbia	48.591983/-123.39068	Yes	Yes	Fibre		TELUS	Shaw
3755	50655	Tseycum	BC	British Columbia	48.666039486/-123.451344362	Yes	Yes	Fibre		TELUS	Shaw
3756	50656	Songhees Nation (Songhees First Nation)	BC	British Columbia	48.44143/-123.428152	Yes	Yes	Fibre		TELUS	Shaw
3757	50657	T'Sou-ke First Nation	BC	British Columbia	48.384648022/-123.697181191	Yes	Yes	Fibre		TELUS	Shaw
3758	50658	Pacheedaht First Nation	BC	British Columbia	48.576773609/-124.407701127	No	No	Fibre		TELUS	
3759	50659	Ahousaht	BC	British Columbia	49.275433361/-126.057568756	No	Yes	Fibre		No Service Provider	
3760	50660	Opitsat (Tla-o-qui-aht First Nations)	BC	British Columbia	49.173348235/-125.912071784	No	Yes	Fibre		No Service Provider	
3761	50662	Ditidaht	BC	British Columbia	48.809278517/-124.669701742	No	No	Fibre		TELUS	
3762	50663	Huu-ay-aht First Nations	BC	British Columbia	48.80207854/-125.127155567	No	No	Fibre		TELUS	
3763	50664	Hupacasath First Nation	BC	British Columbia	49.26579844/-124.825090475	Yes	Yes	Fibre		TELUS	Shaw
3764	50665	Tseshaht	BC	British Columbia	49.267225/-124.848919	Yes	Yes	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3765	50667	Uchucklesaht	BC	British Columbia	49.024/-125.04	No	No	Fibre		No Service Provider	
3766	50668	Ucluelet First Nation	BC	British Columbia	48.936417171/-125.52596562	Yes	Yes	Fibre		TELUS	Shaw
3767	50669	Old Massett (Old Massett Village Council)	BC	British Columbia	54.034414102/-132.175030324	No	No	Fibre		TELUS	
3768	50670	Skidegate	BC	British Columbia	53.266887/-131.989501	Yes	No	Fibre		TELUS	
3769	50672	Kitkatla (Gitxaala Nation)	BC	British Columbia	53.796382118/-130.433075895	No	No	Fibre		No Service Provider	
3770	50673	Metlakatla First Nation	BC	British Columbia	54.336949561/-130.444229115	Yes	No	Fibre		TELUS	
3771	50674	Lax Kw'alaams	BC	British Columbia	54.558568174/-130.433140512	No	No	Fibre		TELUS	
3772	50675	Hartley Bay (Gitga'at First Nation)	BC	British Columbia	53.424005194/-129.253277582	No	Yes	Fibre		No Service Provider	
3773	50676	Kitamaat Village (Haisla Nation)	BC	British Columbia	53.975475403/-128.645930028	Yes	Yes	Fibre		TELUS	
3774	50680	Kitselas	BC	British Columbia	54.493313704/-128.583467649	Yes	Yes	Fibre		TELUS	
3775	50681	Kitsumkalum	BC	British Columbia	54.522887/-128.667329	Yes	Yes	Fibre		TELUS	
3776	50682	Telegraph Creek (Tahltan)	BC	British Columbia	57.906884789/-131.160409854	No	No	None	124	Northwestel	
3777	50683	Iskut	BC	British Columbia	57.837182435/-129.989173096	No	No	Fibre		No Service Provider	
3778	50684	Adams Lake	BC	British Columbia	50.828685489/-119.701465439	Yes	No	Fibre		TELUS	
3779	50685	Ashcroft	BC	British Columbia	50.720386885/-121.322474811	No	Yes	Fibre		TELUS	
3780	50686	Bonaparte	BC	British Columbia	50.842151949/-121.385288531	No	No	Fibre		TELUS	
3781	50687	Skeetchestn	BC	British Columbia	50.840870956/-120.945864717	No	No	Fibre		TELUS	
3782	50688	Tk'emlúps te Secwépemc	BC	British Columbia	50.682038305/-120.296506554	Yes	Needs Upgrade - Minimal LTE/5G	Fibre		TELUS	Shaw

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3783	50689	Little Shuswap Lake	BC	British Columbia	50.870243535/-119.599653325	Yes	No	Fibre		TELUS	
3784	50690	Neskonlith	BC	British Columbia	50.773332534/-119.730580052	Yes	No	Fibre		TELUS	
3785	50691	Simpcw First Nation	BC	British Columbia	51.31689545/-120.149026395	No	No	Fibre		TELUS	
3786	50692	Cook's Ferry (Oregon Jack Creek)	BC	British Columbia	50.619421522/-121.319117044	No	No	Fibre		TELUS	
3787	50693	Coldwater	BC	British Columbia	50.027103635/-120.855204051	Yes	No	Fibre		TELUS	
3788	50694	Cook's Ferry	BC	British Columbia	50.42409072/-121.317911128	Yes	Yes	Fibre		TELUS	
3789	50695	Shulus (Lower Nicola)	BC	British Columbia	50.138327736/-120.857681537	No	Yes	Fibre		TELUS	Shaw
3790	50696	Nicomen	BC	British Columbia	50.264437138/-121.39824636	No	No	Fibre		TELUS	
3791	50697	Upper Nicola	BC	British Columbia	50.141989451/-120.28242517	No	No	Fibre		TELUS	
3792	50698	Shackan	BC	British Columbia	50.29338822/-121.175373007	No	No	None	28	TELUS	
3793	50699	Nooaitch	BC	British Columbia	50.153435773/-121.035106361	No	No	Fibre		TELUS	
3794	50700	Boothroyd	BC	British Columbia	49.963070753/-121.484964595	No	No	Fibre		TELUS	
3795	50701	Boston Bar First Nation	BC	British Columbia	49.87717051/-121.450370376	Yes	No	Fibre		TELUS	
3796	50702	Whispering Pines/Clinton	BC	British Columbia	50.986696924/-120.240793348	No	No	Fibre		TELUS	
3797	50704	Kanaka Bar	BC	British Columbia	50.112176966/-121.5620351	No	No	Fibre		TELUS	
3798	50705	Lytton	BC	British Columbia	50.237487/-121.577555	Yes	Yes	Fibre		TELUS	
3799	50706	Siska	BC	British Columbia	50.136346185/-121.571554917	No	No	Fibre		TELUS	
3800	50707	Skuppah	BC	British Columbia	50.187592161/-121.573860869	No	No	Fibre		TELUS	
3801	50708	Spuzzum	BC	British Columbia	49.661023326/-121.411473898	No	No	Fibre		TELUS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3802	50709	?Esdilagh First Nation	BC	British Columbia	52.562844921/-122.496775954	No	Yes	Fibre		TELUS	
3803	50710	Alexis Creek	BC	British Columbia	52.138577579/-123.952087706	Yes	No	Fibre		TELUS	
3804	50711	Alkali Lake (Esk'etemc)	BC	British Columbia	51.788658832/-122.236447751	Yes	No	Fibre		TELUS	
3805	50712	Tl'etinqox Government	BC	British Columbia	52.016983647/-123.176378748	No	No	Fibre		TELUS	
3806	50713	Canim Lake	BC	British Columbia	51.777598471/-120.986436023	Yes	No	Fibre		TELUS	
3807	50714	Xeni Gwet'in First Nations Government	BC	British Columbia	51.415370332/-124.09563063	No	No	None	127	TELUS	
3808	50715	Red Bluff (Lhtako Dene Nation)	BC	British Columbia	52.954894358/-122.451089423	No	Yes	Fibre		TELUS, Shaw	Shaw
3809	50716	Soda Creek	BC	British Columbia	52.280448919/-122.144782114	Yes	Yes	Fibre		TELUS	
3810	50717	Stone (Yunesit'in Government)	BC	British Columbia	51.92319217/-123.135168595	Yes	No	Fibre		TELUS	
3811	50718	Toosey	BC	British Columbia	51.93181594/-122.502324215	Yes	No	Fibre		TELUS	
3812	50719	Sugarcane (Williams Lake)	BC	British Columbia	52.108297741/-121.993912319	Yes	Yes	Fibre		TELUS	Shaw
3813	50720	Nazko First Nation	BC	British Columbia	52.941256207/-123.580661728	No	No	None	105	TELUS	
3814	50721	Kluskus (Lhoosk'uz Dene Nation)	BC	British Columbia	53.087346002/-124.490161267	No	No	Fibre		No Service Provider	
3815	50722	Ulkatcho	BC	British Columbia	52.467285947/-125.306675676	Yes	No	Fibre		TELUS	
3816	50723	Canoe Creek (Stswecem'c Xgat'tem First Nation)	BC	British Columbia	51.588840213/-122.20895149	Yes	No	Fibre		TELUS	
3817	50724	Gwa'Sala-Nakwaxda'xw	BC	British Columbia	50.734170408/-127.49641098	Yes	Yes	Fibre		TELUS	Shaw
3818	50726	Nee-Tahi-Buhn	BC	British Columbia	53.932956956/-125.66736571	No	No	None	24	TELUS	
3819	50728	Yekooche First Nation	BC	British Columbia	54.597878/-125.082199	No	No	Fibre		TELUS	
3820	50729	Skin Tyee	BC	British Columbia	53.995206307/-125.882243431	No	No	Fibre		TELUS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3846	51635	Tsatsisnukwomi (Da'naxda'xw First Nation)	BC	British Columbia	50.59666944/-126.59771111	No	No	Fibre		TELUS	
3847	51637	Nenagwas (Tlowitsis Nation)	BC	British Columbia	49.908593/-125.208974	No	Yes	Fibre		TELUS	
3848	100152	Ashnola / Riverside	BC	British Columbia	49.22308/-119.970223	No	Yes	Fibre		TELUS	

C3. Saskatchewan

Figure 36 - Saskatchewan

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3259	9146	Nekaneet	SK	Saskatchewan	49.765672/-109.276885	No	Yes	Fibre		Sasktel	
3260	9214	Ocean Man	SK	Saskatchewan	49.851011/-103.020734	No	No	Fibre		Sasktel	
3261	9294	Melville Beach	SK	Saskatchewan	50.616699/-102.733299	No	Yes	Fibre		Sasktel	
3262	9312	Taylor Beach	SK	Saskatchewan	50.690709/-103.654457	No	Yes	Fibre		Sasktel	
3263	9316	Star Blanket	SK	Saskatchewan	50.76196/-103.711642	No	Yes	Fibre		Sasktel	
3264	9445	Sakimay	SK	Saskatchewan	51.028408/-102.453238	No	No	Fibre		Sasktel	
3265	9458	Okanese	SK	Saskatchewan	50.925/-103.383888	No	No	Fibre		Sasktel	
3266	9483	Gordon	SK	Saskatchewan	51.27352/-104.302729	No	Yes	Fibre		Sasktel	
3267	9569	Kylemore	SK	Saskatchewan	51.907058/-103.641262	No	Yes	Fibre		Sasktel	
3268	9676	Ibstone	SK	Saskatchewan	52.5667/-108.300001	No	No	Fibre		Sasktel	
3269	9714	One Arrow	SK	Saskatchewan	52.670833/-106.108333	No	No	Fibre		Sasktel	
3270	9780	James Smith	SK	Saskatchewan	53.063889/-104.841668	No	No	Fibre		Sasktel	
3271	9800	Red Earth	SK	Saskatchewan	53.452778/-102.869445	No	Yes	Fibre		Sasktel	
3272	9805	Pemmican Portage	SK	Saskatchewan	53.933299/-102.283301	No	Yes	Fibre		Sasktel	
3273	9807	Onion Lake	SK	Saskatchewan	53.715572/-109.99889	No	Yes	Fibre		Sasktel	
3274	9819	Thunderchild	SK	Saskatchewan	53.457591/-108.86965	No	No	Fibre		Sasktel	
3275	9871	Big River	SK	Saskatchewan	53.554817/-107.086751	No	Yes	Fibre		Sasktel	
3276	9879	Pelican Lake	SK	Saskatchewan	53.725131/-107.738763	No	No	Fibre		Sasktel	
3277	9891	Montreal Lake	SK	Saskatchewan	53.531361/-105.990324	No	No	Fibre		Sasktel	
3278	9922	Canoe Lake Cree	SK	Saskatchewan	54.101784/-108.085259	No	No	Fibre		Sasktel	
3279	9938	English River	SK	Saskatchewan	55.269578/-107.601371	No	No	Fibre		Sasktel	
3280	9942	Clearwater River Dene	SK	Saskatchewan	56.048621/-108.723549	No	No	Fibre		Sasktel	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3281	9951	Lac La Ronge	SK	Saskatchewan	55.111691/-105.918746	No	Yes	Fibre		Sasktel	
3282	9955	Lac La Ronge	SK	Saskatchewan	55.07021667/-105.29592222	No	Yes	Fibre		Sasktel	
3283	9956	Sucker River	SK	Saskatchewan	55.28162778/-105.16766667	No	Yes	Fibre		Sasktel	
3284	9957	Lac La Ronge	SK	Saskatchewan	55.409167/-104.565656	No	Yes	Fibre		Sasktel	
3285	9958	Grandmother's Bay	SK	Saskatchewan	55.62060278/-104.692075	No	No	Fibre		Sasktel	
3286	9973	Wollaston Lake	SK	Saskatchewan	58.102318/-103.149369	No	Yes	Fibre		Sasktel	
3287	9975	Southend Reindeer	SK	Saskatchewan	56.326589/-103.238509	No	Yes	Fibre		Sasktel	
3288	9976	Brabant	SK	Saskatchewan	56.116699/-103.749999	No	Yes	Fibre		Sasktel	
3289	9979	Deschambault Lake	SK	Saskatchewan	54.91067/-103.374021	No	Yes	Fibre		Sasktel	
3290	9982	Sturgeon Landing	SK	Saskatchewan	54.28019722/-101.81938889	No	No	Fibre		Sasktel	
3525	50340	Little Pine	SK	Saskatchewan	52.916559636/-109.058313222	Yes	No	Fibre		Sasktel	
3526	50342	Moosomin	SK	Saskatchewan	53.082727755/-108.316508589	No	Yes	Fibre		Sasktel	
3527	50343	Mosquito, Grizzly Bear's Head, Lean Man First Nations	SK	Saskatchewan	52.490424721/-108.248435107	No	No	Fibre		Sasktel	
3528	50344	Onion Lake Cree Nation	SK	Saskatchewan	53.712645656/-109.96397755	No	Yes	Fibre		Sasktel	
3529	50345	Poundmaker	SK	Saskatchewan	52.896113982/-108.974313831	No	No	Fibre		Sasktel	
3530	50346	Red Pheasant	SK	Saskatchewan	52.457893475/-108.179618519	No	No	Fibre		Sasktel	
3531	50347	Saulteaux	SK	Saskatchewan	53.125555614/-108.329455587	No	No	Fibre		Sasktel	
3532	50348	Sweetgrass	SK	Saskatchewan	52.76546337/-108.715925322	No	No	Fibre		Sasktel	
3533	50349	Thunderchild First Nation	SK	Saskatchewan	53.480050244/-108.87464588	No	No	Fibre		Sasktel	
3534	50351	Fond du Lac	SK	Saskatchewan	59.327485668/-107.188921826	No	Yes	Fibre		Sasktel	
3535	50353	Lac La Ronge	SK	Saskatchewan	55.098885458/-105.303810469	No	Yes	Fibre		Sasktel	
3536	50354	Montreal Lake	SK	Saskatchewan	54.051736596/-105.786613604	No	Yes	Fibre		Sasktel	
3537	50355	Pelican Narrows (Peter Ballantyne Cree Nation)	SK	Saskatchewan	55.172545/-102.931514	No	No	Fibre		Sasktel	
3538	50356	Red Earth	SK	Saskatchewan	53.490952353/-102.861137353	No	Yes	Fibre		Sasktel	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3539	50357	Pakwaw Lake (Shoal Lake Cree Nation)	SK	Saskatchewan	53.483102252/-102.627554147	No	Yes	Fibre		Sasktel	
3540	50358	Wahpeton Dakota Nation	SK	Saskatchewan	53.27662607/-105.897007024	No	No	Fibre		Sasktel	
3541	50359	Black Lake	SK	Saskatchewan	59.130252/-105.602644	No	Yes	Fibre		Sasktel	
3542	50360	Sturgeon Lake First Nation	SK	Saskatchewan	53.420788367/-105.987452962	No	Yes	Fibre		Sasktel	
3543	50361	Cowessess	SK	Saskatchewan	50.516357226/-102.660126196	No	Yes	Fibre		Sasktel	
3544	50362	Kahkewistahaw	SK	Saskatchewan	50.491236/-102.531437	No	No	Fibre		Sasktel	
3545	50363	Ochapowace	SK	Saskatchewan	50.469984989/-102.394404917	No	Yes	Fibre		Sasktel	
3546	50364	Sakimay First Nations	SK	Saskatchewan	50.528615572/-102.792149654	No	No	Fibre		Sasktel	
3547	50365	Carlyle Lake Resort (White Bear)	SK	Saskatchewan	49.751758166/-102.270370937	No	Yes	Fibre		Sasktel	
3548	50366	Badgerville (Cote First Nation 366)	SK	Saskatchewan	51.643882338/-101.902688835	No	No	Fibre		Sasktel	
3549	50367	Springside (Keeseekoose)	SK	Saskatchewan	51.718979878/-101.909193966	No	No	Fibre		Sasktel	
3550	50368	The Key First Nation	SK	Saskatchewan	51.782874224/-102.129017017	No	No	Fibre		Sasktel	
3551	50369	Beardy's and Okemasis	SK	Saskatchewan	52.837420787/-106.311007815	No	No	Fibre		Sasktel	
3552	50370	James Smith	SK	Saskatchewan	53.105706001/-104.877574883	No	Yes	Fibre		Sasktel	
3553	50371	Muskoday First Nation	SK	Saskatchewan	53.088398036/-105.49059694	No	Yes	Fibre		Sasktel	
3554	50372	Whitecap (Whitecap Dakota First Nation)	SK	Saskatchewan	51.876652625/-106.71202523	No	Yes	Fibre		Sasktel	
3555	50373	One Arrow First Nation	SK	Saskatchewan	52.740485774/-106.029209914	No	No	Fibre		Sasktel	
3556	50374	Mistawasis (Mistawasis Nêhiyawak)	SK	Saskatchewan	53.174938684/-106.806615342	No	No	Fibre		Sasktel	
3557	50375	Muskeg Lake (Muskeg Lake Cree Nation #102)	SK	Saskatchewan	53.002947872/-106.874118213	No	No	Fibre		Sasktel	
3558	50376	Yellow Quill	SK	Saskatchewan	52.303235517/-103.625081172	No	Yes	Fibre		Sasktel	
3559	50377	Kinistin Saulteaux Nation	SK	Saskatchewan	52.609673249/-104.219113014	No	No	Fibre		Sasktel	
3560	50378	Carry The Kettle	SK	Saskatchewan	50.354946069/-103.467476414	Yes	Yes	Fibre		Sasktel	
3561	50379	Little Black Bear	SK	Saskatchewan	51.004640793/-103.316346079	No	No	Fibre		Sasktel	
3562	50380	Nekaneet	SK	Saskatchewan	49.675163715/-109.198160739	No	No	Fibre		No Service Provider	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3563	50381	Muscowpetung	SK	Saskatchewan	50.775983866/-104.283879894	No	No	Fibre		Sasktel	
3564	50383	Pasqua First Nation #79	SK	Saskatchewan	50.738827668/-103.990832399	No	No	Fibre		Sasktel	
3565	50384	Peepeekisis Cree Nation No.81	SK	Saskatchewan	50.865192647/-103.339242588	No	No	Fibre		Sasktel	
3566	50385	Piapot	SK	Saskatchewan	50.777051429/-104.427101688	No	No	Fibre		Sasktel	
3567	50386	Standing Buffalo	SK	Saskatchewan	50.801696783/-103.89485278	No	No	Fibre		Sasktel	
3568	50387	Star Blanket Cree Nation	SK	Saskatchewan	50.962442863/-103.304190879	No	No	Fibre		Sasktel	
3569	50388	Wood Mountain	SK	Saskatchewan	49.335381133/-106.449307443	No	No	Fibre		Sasktel	
3570	50389	Day Star	SK	Saskatchewan	51.506490998/-104.22243957	No	No	Fibre		Sasktel	
3571	50390	Fishing Lake First Nation	SK	Saskatchewan	51.856531588/-103.632372831	No	Yes	Fibre		Sasktel	
3572	50392	Muskowekwan	SK	Saskatchewan	51.327074812/-104.004442653	No	Yes	Fibre		Sasktel	
3573	50393	Kawacatoose	SK	Saskatchewan	51.481785733/-104.404392084	No	Yes	Fibre		Sasktel	
3574	50394	Canoe Narrows (Canoe Lake Cree First Nation)	SK	Saskatchewan	55.163594434/-108.157353649	No	Yes	Fibre		Sasktel	
3575	50395	Flying Dust First Nation	SK	Saskatchewan	54.135418042/-108.404323601	Yes	Yes	Fibre		Sasktel	
3576	50396	Makwa Sahgaiehcan First Nation	SK	Saskatchewan	54.027430223/-109.165292534	No	Yes	Fibre		Sasktel	
3577	50397	Island Lake (Ministikwan Lake Cree Nation)	SK	Saskatchewan	54.047993328/-109.669482613	No	No	Fibre		Sasktel	
3578	50398	Dillon (Buffalo River Dene Nation)	SK	Saskatchewan	55.927748716/-108.939963521	No	Yes	Fibre		Sasktel	
3579	50399	Big Island Lake Cree Nation	SK	Saskatchewan	54.411205254/-109.620916092	No	Yes	Fibre		Sasktel	
3580	50400	English River First Nation	SK	Saskatchewan	55.915336745/-107.717282551	No	Yes	Fibre		Sasktel	
3581	50401	Clearwater River Dene	SK	Saskatchewan	56.528199686/-109.499813897	No	No	Fibre		Sasktel	
3582	50402	Waterhen Lake	SK	Saskatchewan	54.521977932/-108.409422236	No	Yes	Fibre		Sasktel	
3583	50403	Birch Narrows First Nation	SK	Saskatchewan	56.47238978/-108.689850661	No	No	Fibre		Sasktel	
3584	50404	Big River	SK	Saskatchewan	53.574794597/-107.110766111	No	No	Fibre		Sasktel	
3585	50405	Pelican Lake	SK	Saskatchewan	53.684409062/-107.785199068	No	No	Fibre		Sasktel	
3586	50406	Starblanket (Ahtahkakoop)	SK	Saskatchewan	53.372914259/-106.930931393	No	Yes	Fibre		Sasktel	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3587	50407	Witchekan Lake	SK	Saskatchewan	53.512449928/-107.604985691	No	Yes	Fibre		Sasktel	
3588	50408	Ocean Man	SK	Saskatchewan	49.824416969/-102.934109594	No	No	Fibre		Sasktel	
3845	51355	Kinoosao (Peter Ballantyne Cree Nation)	SK	Saskatchewan	57.0834553/-102.0170078	No	No	Satellite	170	Sasktel	

C4. Manitoba

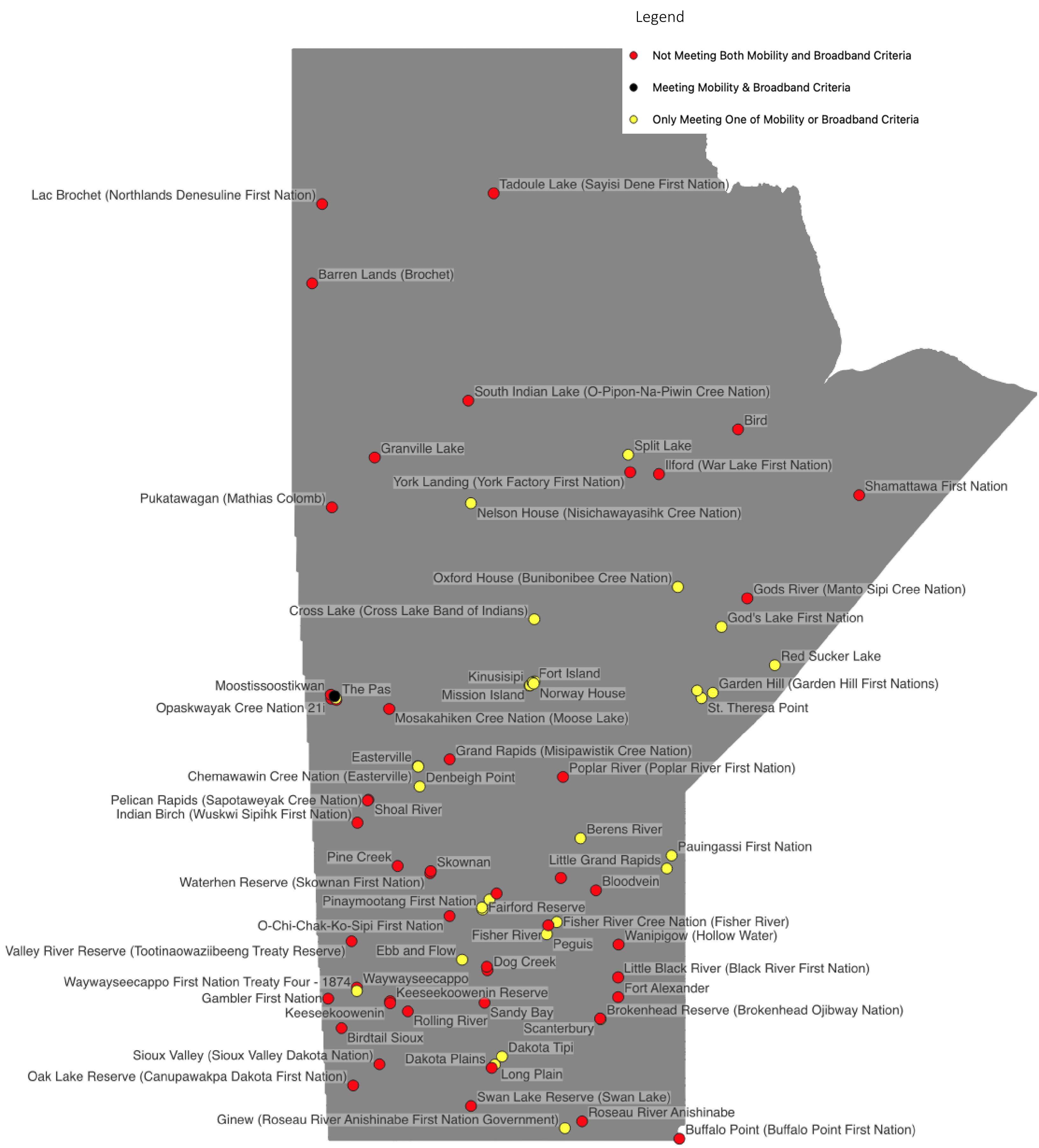


Figure 37 - Manitoba

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3135	6387	Roseau River Anishinabe	MB	Manitoba	49.210799/-96.939701	No	No	Fibre		Bell-MTS	
3136	6767	Fisher River	MB	Manitoba	51.4022/-97.5314	No	No	Fibre		Bell-MTS	
3137	6783	Fairford Reserve	MB	Manitoba	51.59578/-98.691906	Yes	No	Fibre		Bell-MTS	
3138	6787	Dog Creek	MB	Manitoba	50.9083/-98.5972	No	No	Fibre		No Service Provider	
3139	6844	Keeseekoowenin	MB	Manitoba	50.5444/-100.298601	No	No	Fibre		Bell-MTS	
3140	6874	Easterville	MB	Manitoba	53.1075/-99.812778	No	Yes	Fibre		Bell-MTS	
3141	6875	Denbeigh Point	MB	Manitoba	52.893099/-99.781901	No	Yes	Fibre		Bell-MTS	
3142	6878	Shoal River	MB	Manitoba	52.753163/-100.679453	No	No	Microwave	50	Bell-MTS	
3143	6923	Waywayseecappo	MB	Manitoba	50.7181/-100.8811	No	No	Fibre		Bell-MTS	
3144	6934	Opaskwayak Cree Nation 21a	MB	Manitoba	53.7969/-101.2397	No	No	Fibre		Bell-MTS	
3145	6935	The Pas	MB	Manitoba	53.815137/-101.245091	No	Yes	Fibre		Bell-MTS	
3146	6938	Opaskwayak Cree Nation 21i	MB	Manitoba	53.811699/-101.326422	No	No	Fibre		Bell-MTS	
3147	6939	Moostissoostikwan	MB	Manitoba	53.85221/-101.335106	No	No	Fibre		Bell-MTS	
3148	6960	Granville Lake	MB	Manitoba	56.231099/-100.568599	No	No	Satellite	115	No Service Provider	
3149	6971	Kinusisipi	MB	Manitoba	53.945474/-97.859597	No	Yes	Fibre		Bell-MTS	
3150	6983	Split Lake	MB	Manitoba	56.257627/-96.134274	No	Yes	Fibre		Bell-MTS	
3151	6985	Bird	MB	Manitoba	56.503599/-94.210601	No	No	Fibre		Bell-MTS	
3291	9996	Norway House	MB	Manitoba	53.96761/-97.787682	No	Yes	Fibre		Bell-MTS	
3466	50260	Little Black River (Black River First Nation)	MB	Manitoba	50.83036/-96.30991	No	No	Fibre		Bell-MTS	
3467	50261	Brokenhead Reserve (Brokenhead Ojibway Nation)	MB	Manitoba	50.36686/-96.61636	Yes	No	Fibre		Bell-MTS	
3468	50262	Fort Alexander	MB	Manitoba	50.611287522/-96.309519462	No	No	Fibre		Bell-MTS	
3469	50263	Wanipigow (Hollow Water)	MB	Manitoba	51.19238468/-96.302289764	No	No	Fibre		Bell-MTS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3470	50264	Fisher River Cree Nation (Fisher River)	MB	Manitoba	51.43847/-97.38331	No	Yes	Fibre		Bell-MTS	
3471	50265	Buffalo Point (Buffalo Point First Nation)	MB	Manitoba	49.0123/-95.23788	No	No	Fibre		Bell-MTS	
3472	50266	Berens River	MB	Manitoba	52.343128624/-96.967482808	No	Yes	Satellite	88	Bell-MTS	
3473	50267	Bloodvein	MB	Manitoba	51.783416345/-96.69692728	No	No	Satellite	24	Bell-MTS	
3474	50268	Jackhead (Kinonjeoshtegon First Nation)	MB	Manitoba	51.917094983/-97.3109533	No	No	Microwave	49	No Service Provider	
3475	50269	Peguis	MB	Manitoba	51.30548/-97.55859	No	Yes	Fibre		Bell-MTS	
3476	50270	Little Grand Rapids	MB	Manitoba	52.018028338/-95.455584981	No	Yes	Satellite	3	Bell-MTS	
3477	50271	Lake Manitoba	MB	Manitoba	50.947175142/-98.607003571	No	No	Fibre		Bell-MTS	
3478	50272	Pinaymootang First Nation	MB	Manitoba	51.573787419/-98.683691373	Yes	No	Fibre		Bell-MTS	
3479	50273	Ginew (Roseau River Anishinabe First Nation Government)	MB	Manitoba	49.13322927/-97.239785507	No	Yes	Fibre		Bell-MTS	
3480	50274	Little Saskatchewan	MB	Manitoba	51.683319806/-98.560381226	Yes	No	Fibre		Bell-MTS	
3481	50275	Lake St. Martin	MB	Manitoba	51.74853046/-98.435156342	No	No	None	18	No Service Provider	
3482	50276	Cross Lake (Cross Lake Band of Indians)	MB	Manitoba	54.623935/-97.776672	No	Yes	Fibre		Bell-MTS	
3483	50277	Poplar River (Poplar River First Nation)	MB	Manitoba	52.994580377/-97.274198894	No	No	Satellite	189	Bell-MTS	
3484	50278	Rossville (Norway House Cree Nation)	MB	Manitoba	53.989949746/-97.772893709	No	Yes	Fibre		Bell-MTS	
3485	50279	O-Chi-Chak-Ko-Sipi First Nation	MB	Manitoba	51.503493166/-99.257757699	No	No	Fibre		Bell-MTS	
3486	50280	Ebb and Flow	MB	Manitoba	51.025774/-99.0395	No	Yes	Fibre		Bell-MTS	
3487	50281	Waterhen Reserve (Skownan First Nation)	MB	Manitoba	51.968621377/-99.598294946	No	No	Fibre		Bell-MTS	
3488	50282	Pine Creek	MB	Manitoba	52.045479103/-100.166877462	No	No	Fibre		Bell-MTS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3489	50283	Sandy Bay	MB	Manitoba	50.549323312/-98.647344379	No	No	Fibre		Bell-MTS	
3490	50284	Birdtail Sioux	MB	Manitoba	50.266218757/-101.149246813	No	No	Fibre		No Service Provider	
3491	50285	Waywayseecappo First Nation Treaty Four - 1874	MB	Manitoba	50.679711321/-100.880476928	No	Yes	Fibre		Bell-MTS	
3492	50287	Long Plain	MB	Manitoba	49.856613704/-98.465166061	No	Yes	Fibre		Bell-MTS	
3493	50288	Dakota Plains	MB	Manitoba	49.818762257/-98.52072747	No	No	Fibre		Bell-MTS	
3494	50289	Oak Lake Reserve (Canupawakpa Dakota First Nation)	MB	Manitoba	49.620452949/-100.94536446	No	No	Fibre		Bell-MTS	
3495	50290	Sioux Valley (Sioux Valley Dakota Nation)	MB	Manitoba	49.85911/-100.48475	No	No	Fibre		Bell-MTS	
3496	50291	Rolling River	MB	Manitoba	50.452862385/-99.988346186	No	No	Fibre		Bell-MTS	
3497	50292	Valley River Reserve (Tootinaowaziibeeng Treaty Reserve)	MB	Manitoba	51.227851947/-100.972736006	No	No	Fibre		Bell-MTS	
3498	50293	Swan Lake Reserve (Swan Lake)	MB	Manitoba	49.385585113/-98.884644951	No	No	Fibre		Bell-MTS	
3499	50294	Gambler First Nation	MB	Manitoba	50.594673122/-101.382375992	No	No	Fibre		Bell-MTS	
3500	50295	Dakota Tipi	MB	Manitoba	49.948118486/-98.340568593	No	Yes	Fibre		Bell-MTS	
3501	50296	God's Lake First Nation	MB	Manitoba	54.5473761/-94.501829829	No	Yes	Satellite	45	Bell-MTS	
3502	50297	Garden Hill (Garden Hill First Nations)	MB	Manitoba	53.872779265/-94.653547614	No	Yes	Microwave	162	Bell-MTS	
3503	50298	St. Theresa Point	MB	Manitoba	53.817285996/-94.851235753	No	Yes	Fibre		Bell-MTS	
3504	50299	Wasagamack (Wasagamack First Nation)	MB	Manitoba	53.895409408/-94.927278266	No	Yes	Fibre		Bell-MTS	
3505	50300	Red Sucker Lake	MB	Manitoba	54.156167542/-93.568889484	No	Yes	Satellite	117	Bell-MTS	
3506	50301	Oxford House (Bunibonibee Cree Nation)	MB	Manitoba	54.949823501/-95.264758905	No	Yes	Satellite	135	Bell-MTS	
3507	50302	Gods River (Manto Sipi Cree Nation)	MB	Manitoba	54.835459387/-94.049960247	No	No	Satellite	34	Bell-MTS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3508	50303	Tadoule Lake (Sayisi Dene First Nation)	MB	Manitoba	58.716123576/-98.486485431	No	No	Satellite	463	Bell-MTS	
3509	50304	York Landing (York Factory First Nation)	MB	Manitoba	56.087452098/-96.098987783	No	No	Microwave	31	Bell-MTS	
3510	50307	Shamattawa First Nation	MB	Manitoba	55.862031302/-92.09302096	No	No	Satellite	259	Bell-MTS	
3511	50308	Barren Lands (Brochet)	MB	Manitoba	57.887370574/-101.663867916	No	No	Satellite	171	Bell-MTS	
3512	50309	Chemawawin Cree Nation (Easterville)	MB	Manitoba	53.103010869/-99.807560128	No	Yes	Fibre		Bell-MTS	
3513	50310	Grand Rapids (Misipawistik Cree Nation)	MB	Manitoba	53.179247551/-99.256899675	No	No	Fibre		Bell-MTS	
3514	50311	Pukatawagan (Mathias Colomb)	MB	Manitoba	55.742055/-101.316897	No	No	Satellite	118	Bell-MTS	
3515	50312	Mosakahiken Cree Nation (Moose Lake)	MB	Manitoba	53.70558589/-100.314820118	No	No	Satellite	29	Bell-MTS	
3516	50313	Nelson House (Nisichawayasihk Cree Nation)	MB	Manitoba	55.783001615/-98.885751911	No	Needs Upgrade - 3G Only	Fibre		Bell-MTS	
3517	50314	Pelican Rapids (Sapotaweyak Cree Nation)	MB	Manitoba	52.74473335/-100.69229905	No	No	Microwave	48	Bell-MTS	
3518	50315	Opaskwayak Cree Nation (The Pas)	MB	Manitoba	53.837703306/-101.271359446	Yes	Yes	Fibre		Bell-MTS	
3519	50317	Lac Brochet (Northlands Denesuline First Nation)	MB	Manitoba	58.618458742/-101.488009409	No	No	Satellite	215	Bell-MTS	
3520	50318	South Indian Lake (O-Pipon-Na-Piwin Cree Nation)	MB	Manitoba	56.779983878/-98.931194916	No	No	Microwave	184	Bell-MTS	
3521	50323	Ilford (War Lake First Nation)	MB	Manitoba	56.068429554/-95.596507194	No	No	Microwave	66	Bell-MTS	
3522	50324	Indian Birch (Wuskwi Sipihk First Nation)	MB	Manitoba	52.509069283/-100.87051545	No	No	None	26	Bell-MTS	
3524	50327	Pauingassi First Nation	MB	Manitoba	52.157606215/-95.374125799	No	Yes	Satellite	24	Bell-MTS	
3849	100195	Fort Island	MB	Manitoba	53.978629/-97.8067383	No	Yes	Fibre		Bell-MTS	
3850	100211	Jack River	MB	Manitoba	53.98329/-97.800308	No	Yes	Fibre		Bell-MTS	
3851	100213	Keeseekoowenin Reserve	MB	Manitoba	50.5669854/-100.2982916	No	No	Fibre		Bell-MTS	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3852	100238	Mission Island	MB	Manitoba	53.950646854582/-97.84941232013	No	Yes	Fibre		Bell-MTS	
3853	100267	Scanterbury	MB	Manitoba	50.372281824055/-96.62523754125	No	No	Fibre		Bell-MTS	
3854	100274	Skownan	MB	Manitoba	51.989722/-99.587778	No	No	Fibre		Bell-MTS	

C5. Ontario

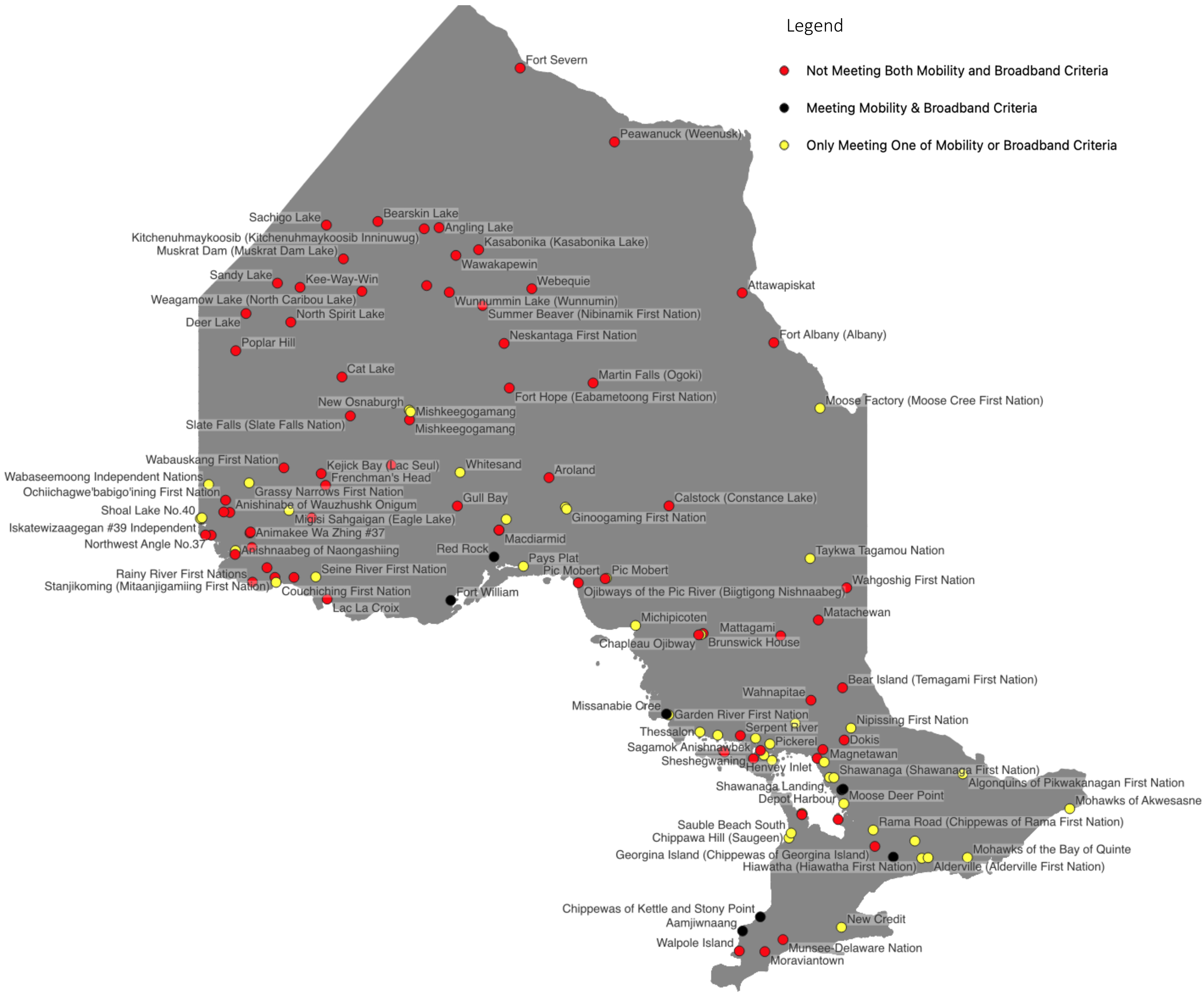


Figure 38 - Ontario

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3116	5430	New Credit	ON	Ontario	42.999722/-80.097223	No	Yes	Fibre		Bell	
3117	5513	Moraviantown	ON	Ontario	42.580834/-81.89361	No	No	Fibre		Bell	
3118	5789	Halfway Point	ON	Ontario	44.907517/-81.022687	No	Yes	Fibre		Bell	
3119	5790	Cape Croker	ON	Ontario	44.922777/-81.019999	No	Yes	Fibre		Bell	
3120	5796	Sauble Beach South	ON	Ontario	44.595444/-81.276528	No	Yes	Fibre		Bell	Eastlink
3121	5834	Pickerel	ON	Ontario	45.975/-80.533056	No	No	Fibre		Bell	
3122	5884	Henvey Inlet	ON	Ontario	45.831258/-80.665992	No	No	Fibre		Bell	
3123	5897	Shawanaga Landing	ON	Ontario	45.517441/-80.375855	No	Yes	Fibre		Bell	
3124	5898	Depot Harbour	ON	Ontario	45.31177/-80.091387	Yes	Yes	Fibre		Bell	
3125	5908	Moose Deer Point	ON	Ontario	45.085165/-80.040944	No	Yes	Fibre		Bell	
3126	6118	Matachewan	ON	Ontario	48.046999/-80.638729	No	No	Fibre		No Service Provider	
3127	6142	Pic Mobert	ON	Ontario	48.691143/-85.639915	No	No	Fibre		Bell	
3128	6196	Macdiarmid	ON	Ontario	49.439641/-88.129854	No	No	Fibre		Bell	
3129	6287	Northwest Angle No.37	ON	Ontario	49.360048/-94.882123	No	No	None	50	No Service Provider	
3130	6290	Iskatewizaagegan #39 Independent	ON	Ontario	49.607256/-95.117271	Yes	No	Fibre		Bell	
3131	6318	Frenchman's Head	ON	Ontario	50.11642/-92.198162	No	No	Fibre		Bell	
3132	6335	Angling Lake	ON	Ontario	53.838915/-89.536359	No	No	Fibre		Bell	
3133	6350	New Osnaburgh	ON	Ontario	51.234743/-90.234481	No	Yes	Fibre		Bell	
3134	6351	Mishkeegogamang	ON	Ontario	51.209965/-90.203745	No	Yes	Fibre		Bell	
3188	7780	Mohawks of Akwesasne	ON	Ontario	45.001516/-74.741496	No	Yes	Fibre		Bell	
3359	50122	Chippewas of Nawash First Nation	ON	Ontario	44.903031722/-81.026822874	No	No	Fibre		Bell	
3360	50123	Chippawa Hill (Saugeen)	ON	Ontario	44.513032641/-81.328698933	No	Yes	Fibre		Bell	Eastlink

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3361	50124	Big Grassy (Big Grassy)	ON	Ontario	49.065832497/-94.321862571	No	No	Fibre		Bell	
3362	50125	Anishnaabeg of Naongashiing	ON	Ontario	49.124703481/-94.311785084	No	Yes	Fibre		Bell	
3363	50126	Couchiching First Nation	ON	Ontario	48.634268516/-93.359769208	No	Yes	Fibre		Bell	
3364	50127	Lac La Croix	ON	Ontario	48.374216571/-92.161164803	No	No	None	64	Bell	
3365	50128	Northwest Bay (Naicatchewenin)	ON	Ontario	48.861382877/-93.573223547	No	No	None	21	Bell	
3366	50129	Nigigoonsiminikaaning First Nation	ON	Ontario	48.710957497/-92.940531666	No	No	Fibre		Bell	
3367	50130	Rainy River First Nations	ON	Ontario	48.637248177/-93.912642108	No	No	Fibre		Bell	
3368	50131	Crow Lake (Ojibways of Onigaming First Nation)	ON	Ontario	49.172669956/-93.926459093	No	No	Fibre		Bell	
3369	50132	Seine River First Nation	ON	Ontario	48.718897486/-92.428063497	No	Yes	Fibre		Bell	
3370	50133	Stanjikoming (Mitaanjigamiing First Nation)	ON	Ontario	48.711037/-93.386182643	No	No	Fibre		Bell	
3371	50136	Parry Island (Wasauksing First Nation)	ON	Ontario	45.326074329/-80.05698523	Yes	Yes	Fibre		Bell	
3372	50137	Shawanaga (Shawanaga First Nation)	ON	Ontario	45.513984273/-80.273452219	Yes	No	Fibre		Bell	
3373	50138	Georgina Island (Chippewas of Georgina Island)	ON	Ontario	44.372844095/-79.312873097	No	No	Fibre		Bell	
3374	50139	Rama Road (Chippewas of Rama First Nation)	ON	Ontario	44.64665803/-79.351270002	No	Yes	Fibre		Bell	Rogers
3375	50140	Mississaugas of Scugog Island First Nation	ON	Ontario	44.193973086/-78.880605095	Yes	Yes	Fibre		Bell	
3376	50141	Christian Island (Beausoleil)	ON	Ontario	44.821230404/-80.175101818	No	No	Fibre		Bell	
3377	50142	Fort Albany (Albany)	ON	Ontario	52.215309/-81.683575	No	No	Fibre		Bell	
3378	50143	Attawapiskat	ON	Ontario	52.925467824/-82.425159479	No	No	Fibre		Bell	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3379	50144	Moose Factory (Moose Cree First Nation)	ON	Ontario	51.262632716/-80.60051648	No	Yes	Fibre		Bell	
3380	50145	Taykwa Tagamou Nation	ON	Ontario	49.002912994/-80.832978661	No	Needs Upgrade - Minimal LTE/5G	Fibre		Bell	
3381	50146	Peawanuck (Weenusk)	ON	Ontario	55.008780876/-85.421013841	No	No	Satellite	440	Bell	
3382	50147	Ochiichagwe'babigo'ining First Nation	ON	Ontario	49.89244761/-94.543440075	No	No	Fibre		Bell	
3383	50148	Migisi Sahgaigan (Eagle Lake)	ON	Ontario	49.738164408/-93.057141246	No	Yes	Fibre		Bell	
3384	50149	Grassy Narrows First Nation	ON	Ontario	50.153775612/-93.992006208	No	Yes	None	54	Bell	
3385	50150	Wabaseemoong Independent Nations	ON	Ontario	50.129916644/-94.943154281	No	Yes	Fibre		Bell	
3386	50151	Northwest Angle No.33	ON	Ontario	49.363146029/-95.015853676	No	No	None	43	No Service Provider	
3387	50152	Animakee Wa Zhing #37	ON	Ontario	49.394713852/-93.972961194	No	No	Fibre		Bell	
3388	50153	Anishinabe of Wauzhushk Onigum	ON	Ontario	49.707720638/-94.446428132	No	No	Fibre		Bell	
3389	50154	Kejick (Iskatewizaagegan #39 Independent First Nation)	ON	Ontario	49.625647132/-95.099310254	Yes	No	Fibre		Bell	
3390	50155	Shoal Lake No.40	ON	Ontario	49.613993379/-95.135744747	Yes	No	Fibre		Bell	
3391	50156	Wabauskang First Nation	ON	Ontario	50.379514336/-93.17646179	No	No	Fibre		Bell	
3392	50157	Wabigoon Lake Ojibway Nation	ON	Ontario	49.625475618/-92.521515568	No	No	Fibre		Bell	
3393	50158	Whitefish Bay (Naotkamegwanning)	ON	Ontario	49.408979377/-93.958793749	No	No	Fibre		Bell	
3394	50160	Alderville (Alderville First Nation)	ON	Ontario	44.182799999/-78.063280424	No	Yes	Fibre		Bell	
3395	50161	Curve Lake	ON	Ontario	44.462531619/-78.375306861	Yes	No	Fibre		Bell	Eastlink
3396	50162	Hiawatha (Hiawatha First Nation)	ON	Ontario	44.173137334/-78.212158346	No	Yes	Fibre		Bell	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3397	50163	Algonquins of Pikwakanagan First Nation	ON	Ontario	45.575494461/-77.250083093	No	Yes	Fibre		Bell	
3398	50164	Mohawks of the Bay of Quinte	ON	Ontario	44.185730174/-77.141405257	No	Yes	Fibre		Bell	
3399	50168	Munsee-Delaware Nation	ON	Ontario	42.787992333/-81.468300821	No	No	Fibre		Bell	
3400	50170	Walpole Island	ON	Ontario	42.59193425/-82.493359124	No	No	Fibre		Bell	
3401	50171	Chippewas of Kettle and Stony Point	ON	Ontario	43.178391809/-81.998814987	Yes	Yes	Fibre		Bell	
3402	50172	Aamjiwnaang	ON	Ontario	42.93599504/-82.416055698	Yes	Yes	Fibre		Bell	Cogeco
3403	50173	Zhiibaahaasing First Nation	ON	Ontario	45.949984451/-82.869482887	No	No	None	4	Bell	
3404	50174	Magnetawan	ON	Ontario	45.769407892/-80.500756789	No	Yes	Fibre		Bell	
3405	50175	Wikwemikong	ON	Ontario	45.797541725/-81.728089623	No	Yes	Fibre		Bell	
3406	50176	Sheguiandah	ON	Ontario	45.8833198/-81.91557368	No	Yes	Fibre		Bell	
3407	50178	Sheshegwaning	ON	Ontario	45.933477/-82.836851	No	No	Fibre		Bell	
3408	50179	Sagamok Anishnawbek	ON	Ontario	46.157512045/-82.110214073	No	Yes	Fibre		Bell	
3409	50180	Aundeck-Omni-Kaning	ON	Ontario	45.959951292/-81.995696331	No	No	Fibre		Bell	Eastlink
3410	50181	West Bay (M'Chigeeng First Nation)	ON	Ontario	45.825471818/-82.161817332	No	No	Fibre		Bell	
3411	50182	Calstock (Constance Lake)	ON	Ontario	49.806332/-84.143492	No	No	Fibre		Bell	
3412	50183	Fort Hope (Eabametoong First Nation)	ON	Ontario	51.558898182/-87.888062562	No	No	Fibre		Bell	
3413	50184	Long Lake No.58 First Nation	ON	Ontario	49.786845437/-86.573114972	No	Yes	Fibre		Bell	
3414	50185	Ginoogaming First Nation	ON	Ontario	49.757920149/-86.54424226	No	Yes	Fibre		Bell	
3415	50186	Martin Falls (Ogoki)	ON	Ontario	51.632062207/-85.923506974	No	No	Fibre		Bell	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3416	50187	Fort William	ON	Ontario	48.354335705/-89.262676043	Yes	Yes	Fibre		Bell	Shaw
3417	50188	Gull Bay	ON	Ontario	49.804457619/-89.106557995	No	No	None	126	Bell	
3418	50190	Whitesand	ON	Ontario	50.30992583/-89.043248879	No	Yes	None	172	Bell	
3419	50191	Pays Plat	ON	Ontario	48.883166962/-87.557237452	No	Yes	Fibre		Bell	
3420	50192	Ojibways of the Pic River (Biigtigong Nishnaabeg)	ON	Ontario	48.626054497/-86.269007852	No	No	Fibre		Bell	
3421	50193	Red Rock	ON	Ontario	49.028907936/-88.245322694	Yes	Yes	Fibre		Bell	Shaw
3422	50194	Beardmore (Animbiigoo Zaagi'igan Anishinaabek)	ON	Ontario	49.602615035/-87.959058492	No	Yes	Fibre		Bell	
3423	50195	Pic Mobert	ON	Ontario	48.697990708/-85.608740461	No	Yes	Fibre		Bell	
3424	50197	Biinjitiwaabik Zaaging Anishinaabek	ON	Ontario	49.436126221/-88.129886677	No	No	Fibre		Bell	
3425	50199	Garden River First Nation	ON	Ontario	46.536849334/-84.150200023	Yes	No	Fibre		Bell	
3426	50200	Mississauga	ON	Ontario	46.208346618/-82.998628358	No	Yes	Fibre		Bell	Eastlink
3427	50201	Serpent River	ON	Ontario	46.202065989/-82.468128199	No	No	Fibre		Bell	
3428	50202	Thessalon	ON	Ontario	46.259572523/-83.415723491	No	Yes	Fibre		Bell	
3429	50203	Mishkeegogamang	ON	Ontario	51.091833907/-90.229747449	No	No	Fibre		Bell	
3430	50204	Weagamow Lake (North Caribou Lake)	ON	Ontario	52.948254387/-91.347018944	No	No	Fibre		Bell	
3431	50205	Kejick Bay (Lac Seul)	ON	Ontario	50.292598002/-92.300262382	No	No	Fibre		Bell	
3432	50207	Bearskin Lake	ON	Ontario	53.924038578/-90.972147072	No	No	Fibre		Bell	
3433	50209	Kitchenuhmaykoosib (Kitchenuhmaykoosib Inninuwug)	ON	Ontario	53.823251/-89.884895	No	No	Fibre		Bell	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3434	50210	Kasabonika (Kasabonika Lake)	ON	Ontario	53.532258476/-88.608447636	No	No	Fibre		Bell	
3435	50211	Sandy Lake	ON	Ontario	53.063088047/-93.327657085	No	No	Fibre		Bell	
3436	50212	Kingfisher Lake (Kingfisher)	ON	Ontario	53.02911729/-89.826470689	No	No	Fibre		Bell	
3437	50213	Muskrat Dam (Muskrat Dam Lake)	ON	Ontario	53.404019213/-91.779947663	No	No	Fibre		Bell	
3438	50214	Sachigo Lake	ON	Ontario	53.874268231/-92.179370904	No	No	Fibre		Bell	
3439	50215	Fort Severn	ON	Ontario	55.990661817/-87.634738858	No	No	Satellite	467	Bell	
3440	50216	Cat Lake	ON	Ontario	51.719067018/-91.81381131	No	No	Fibre		Bell	
3441	50217	Wunnummin Lake (Wunnumin)	ON	Ontario	52.934100025/-89.296349455	No	No	Fibre		Bell	
3442	50218	Dokis	ON	Ontario	46.129549206/-80.032380716	No	No	None	32	Bell	
3443	50220	Nipissing First Nation	ON	Ontario	46.323415895/-79.873861161	Yes	No	Fibre		Bell	Eastlink
3444	50221	Chapleau Cree First Nation	ON	Ontario	47.81370358/-83.446051337	No	No	Fibre		Bell	
3445	50222	Bear Island (Temagami First Nation)	ON	Ontario	46.973195435/-80.072115764	No	No	Fibre		Bell	
3446	50223	Missanabie Cree	ON	Ontario	46.551792003/-84.201793814	Yes	Yes	Fibre		Bell	Shaw
3447	50224	Atikameksheng Anishnawbek	ON	Ontario	46.397979021/-81.17876023	No	Yes	Fibre		Bell	Eastlink
3448	50225	Michipicoten	ON	Ontario	47.961157995/-84.927164477	No	Yes	Fibre		Bell	
3449	50226	Mattagami	ON	Ontario	47.79888/-81.52232	No	No	Fibre		Bell	
3450	50228	Brunswick House	ON	Ontario	47.835798453/-83.343050269	No	No	Fibre		No Service Provider	
3451	50229	Chapleau Ojibway	ON	Ontario	47.816008438/-83.393917343	No	Yes	Fibre		No Service Provider	
3452	50230	Birch Island (Whitefish River)	ON	Ontario	46.066163876/-81.776026233	No	Yes	Fibre		Bell	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3453	50232	Wahnapitae	ON	Ontario	46.772960542/-80.811236516	No	No	Fibre		Bell	
3454	50233	Wahgoshig First Nation	ON	Ontario	48.550095971/-79.974363195	No	No	None	37	Bell	
3455	50234	Wawakapewin	ON	Ontario	53.452378426/-89.141681799	No	No	Fibre		Bell	
3456	50235	Obashkaandagaang	ON	Ontario	49.714509199/-94.587144421	No	No	Fibre		Bell	
3457	50236	Poplar Hill	ON	Ontario	52.099893385/-94.3057413	No	No	Fibre		Bell	
3458	50237	Deer Lake	ON	Ontario	52.63264/-94.06543	No	No	Fibre		Bell	
3459	50238	North Spirit Lake	ON	Ontario	52.509418135/-93.014591948	No	No	Fibre		Bell	
3460	50239	Neskantaga First Nation	ON	Ontario	52.204584083/-88.011441879	No	No	Fibre		Bell	
3461	50240	Webequie	ON	Ontario	52.984051558/-87.360303421	No	No	Fibre		Bell	
3462	50241	Summer Beaver (Nibinamik First Nation)	ON	Ontario	52.745514926/-88.516125474	No	No	Fibre		No Service Provider	
3463	50242	Aroland	ON	Ontario	50.232191185/-86.957508471	No	No	Fibre		Bell	
3464	50258	Ojibway Nation of Saugeen	ON	Ontario	50.421152377/-90.658375141	No	No	Fibre		No Service Provider	
3465	50259	Slate Falls (Slate Falls Nation)	ON	Ontario	51.149375966/-91.618237135	No	No	Fibre		Bell	
3523	50325	Kee-Way-Win	ON	Ontario	53.004019085/-92.797322902	No	No	Fibre		Bell	

C6. Quebec

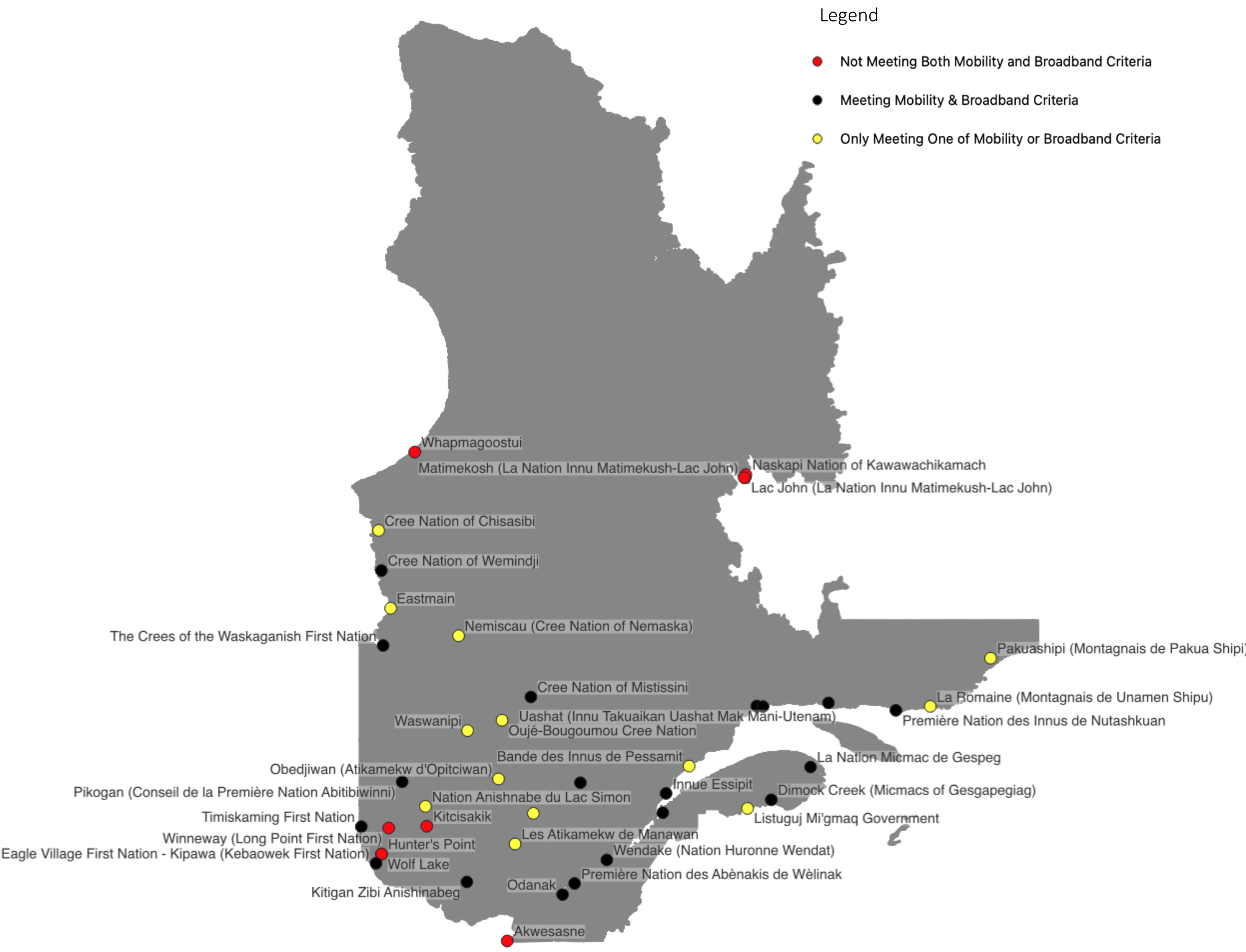


Figure 39 - Quebec

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3111	2954	Maliotenam	QC	Quebec	50.212744/-66.1947	Yes	Yes	Fibre		TELUS	
3112	4213	Akwesasne	QC	Quebec	45.001537/-74.648326	No	No	Fibre		Bell	
3113	4467	Hunter's Point	QC	Quebec	46.993953/-78.806742	No	No	None	39	No Service Provider	
3114	4596	Whapmagoostui	QC	Quebec	55.29039/-77.705979	No	No	Fibre		Bell	
3115	4597	Kitcisakik	QC	Quebec	47.617602/-77.306808	No	No	Fibre		No Service Provider	
3324	50050	Wendake (Nation Huronne Wendat)	QC	Quebec	46.862623737/-71.357194877	Yes	Yes	Fibre		Bell	Videotron
3325	50051	Listuguj Mi'gmaq Government	QC	Quebec	48.012944481/-66.705116841	Yes	No	Fibre		Bell	Cogeco
3326	50052	Dimock Creek (Micmacs of Gesgapegiag)	QC	Quebec	48.202097557/-65.921206245	Yes	Yes	Fibre		TELUS	Rogers
3327	50053	La Nation Micmac de Gespeg	QC	Quebec	48.918045976/-64.623316652	Yes	Yes	Fibre		Bell	Cogeco
3328	50054	Première Nation Malecite de Viger	QC	Quebec	47.918029926/-69.507638729	Yes	Yes	Fibre		Bell	Videotron
3329	50055	Pikogan (Conseil de la Première Nation Abitibiwinni)	QC	Quebec	48.59726819/-78.120719686	Yes	Yes	Fibre		Bell	Videotron
3330	50056	Waswanipi	QC	Quebec	49.702264/-75.959101	No	Yes	Fibre		Bell	
3331	50057	Eastmain	QC	Quebec	52.244253854/-78.502582389	No	Yes	Fibre		Bell	
3332	50058	Cree Nation of Chisasibi	QC	Quebec	53.791544/-78.900478	No	Yes	Fibre		Bell	
3333	50059	Nemiscau (Cree Nation of Nemaska)	QC	Quebec	51.685262/-76.255146	Yes	No	Fibre		Bell	
3334	50060	Cree Nation of Wemindji	QC	Quebec	53.000233303/-78.80771226	Yes	Yes	Fibre		Bell	
3335	50061	The Crees of the Waskaganish First Nation	QC	Quebec	51.485935/-78.751757	Yes	Yes	Fibre		Bell	
3336	50063	Nation Anishnabe du Lac Simon	QC	Quebec	48.058072395/-77.352564146	Yes	No	Fibre		Bell	
3337	50064	Timiskaming First Nation	QC	Quebec	47.60723722/-79.469732238	Yes	Yes	Fibre		Bell	
3338	50065	Eagle Village First Nation - Kipawa (Kebaowek First Nation)	QC	Quebec	46.785497589/-78.983807101	Yes	Yes	Fibre		Bell	
3339	50067	Winneway (Long Point First Nation)	QC	Quebec	47.577547558/-78.564836266	No	No	Fibre		Bell	
3340	50068	Wolf Lake	QC	Quebec	46.997265641/-78.799802396	No	No	None	40	No Service Provider	
3341	50071	Première Nation des Abènakis de Wèlinak	QC	Quebec	46.328638482/-72.421621543	Yes	Yes	Fibre		Bell	Cogeco
3342	50072	Odanak	QC	Quebec	46.073237922/-72.819969174	Yes	Yes	Fibre		Bell	Cogeco

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3343	50073	Kitigan Zibi Anishinabeg	QC	Quebec	46.363132244/-75.982774415	Yes	Yes	Fibre		Bell	Videotron
3344	50075	Cree Nation of Mistissini	QC	Quebec	50.415382/-73.865802	Yes	Yes	Fibre		Bell	
3345	50076	Mashteuiatsh (Première Nation des Pekuakamiulnuatsh)	QC	Quebec	48.576462813/-72.229002072	Yes	Yes	Fibre		Bell	Cogeco
3346	50077	Conseil des Atikamekw de Wemotaci	QC	Quebec	47.903154686/-73.785634522	Yes	No	Fibre		Bell	
3347	50078	Les Atikamekw de Manawan	QC	Quebec	47.220437403/-74.389030884	Yes	No	Fibre		Bell	
3348	50079	Obedjiwan (Atikamekw d'Opitciwan)	QC	Quebec	48.659340611/-74.937960203	Yes	No	Fibre		Bell	
3349	50080	Uashat (Innu Takuaikan Uashat Mak Mani-Utenam)	QC	Quebec	50.226104982/-66.399576756	Yes	Yes	Fibre		TELUS	Cogeco
3350	50081	Naskapi Nation of Kawawachikamach	QC	Quebec	54.863633124/-66.762016571	No	No	Fibre		No Service Provider	
3351	50082	Mingan (Les Innus de Ekuanitshit)	QC	Quebec	50.29146227/-64.030041544	Yes	Yes	Fibre		TELUS	
3352	50083	Première Nation des Innus de Nutashkuan	QC	Quebec	50.133657625/-61.802421544	Yes	Yes	Fibre		TELUS	
3353	50084	La Romaine (Montagnais de Unamen Shipu)	QC	Quebec	50.217116278/-60.665350428	No	Yes	None	68	TELUS	
3354	50085	Bande des Innus de Pessamit	QC	Quebec	48.938311634/-68.63816469	Yes	No	Fibre		TELUS	
3355	50086	Innue Essipit	QC	Quebec	48.34323576/-69.398630235	Yes	Yes	Fibre		Bell	Videotron
3356	50087	Matimekosh (La Nation Innu Matimekush-Lac John)	QC	Quebec	54.804513765/-66.813999752	No	No	Fibre		No Service Provider	
3357	50088	Pakuashipi (Montagnais de Pakua Shipi)	QC	Quebec	51.224305239/-58.671373169	No	Yes	None	138	Bell	
3358	50089	Oujé-Bougoumou Cree Nation	QC	Quebec	49.923534698/-74.819796049	Yes	No	Fibre		Bell	
3844	51087	Lac John (La Nation Innu Matimekush-Lac John)	QC	Quebec	54.81278889/-66.78307778	No	No	Fibre		No Service Provider	

C7. Atlantic Canada

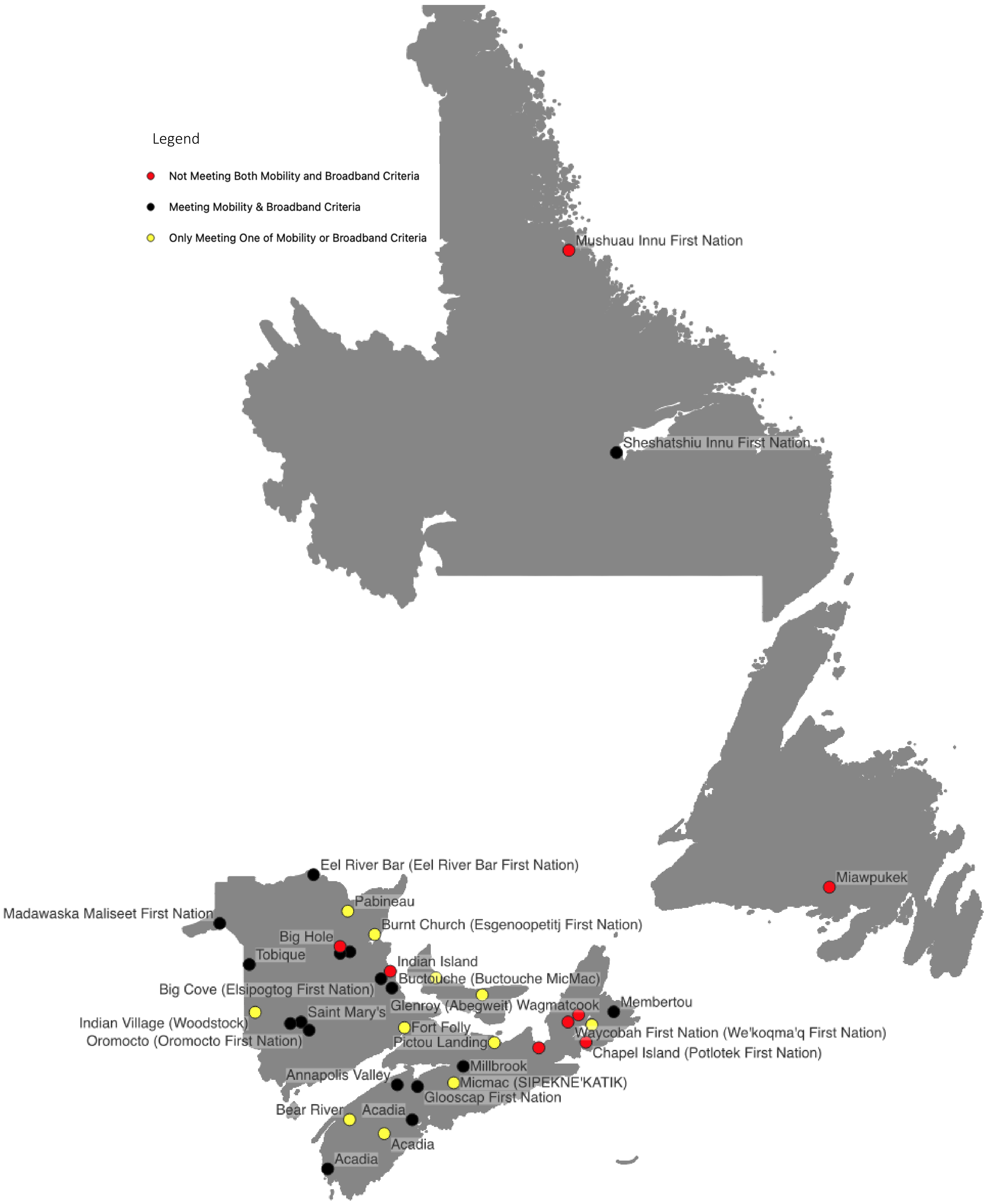


Figure 40 - Atlantic Canada

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3107	723	Acadia	NS	Atlantic Canada	44.557214/-64.342689	Yes	Yes	Fibre		Bell Aliant	Eastlink
3108	773	Acadia	NS	Atlantic Canada	44.354184/-64.920122	Yes	No	Fibre		Bell Aliant	Eastlink
3109	1492	Big Hole	NB	Atlantic Canada	47.039842/-65.828521	No	No	Fibre		Bell Aliant	
3110	1584	Pabineau	NB	Atlantic Canada	47.532625/-65.670555	Yes	No	Fibre		Bell Aliant	Rogers
3292	50001	Glenroy (Abegweit)	PE	Atlantic Canada	46.357927527/-62.902618675	Yes	No	Fibre		Bell Aliant	Eastlink
3293	50002	Lennox Island	PE	Atlantic Canada	46.599671226/-63.855963415	Yes	No	Fibre		Bell Aliant	
3294	50003	Big Cove (Elsipogtog First Nation)	NB	Atlantic Canada	46.586149044/-64.985644944	Yes	Yes	Fibre		Bell Aliant	Rogers
3295	50004	Buctouche (Buctouche MicMac)	NB	Atlantic Canada	46.45458611/-64.761534141	Yes	Yes	Fibre		Bell Aliant	Rogers
3296	50005	Burnt Church (Esgenoopetitj First Nation)	NB	Atlantic Canada	47.207830332/-65.116696553	Yes	No	Fibre		Bell Aliant	Rogers
3297	50006	Madawaska Maliseet First Nation	NB	Atlantic Canada	47.362216929/-68.305743004	Yes	Yes	Fibre		Bell Aliant	Rogers
3298	50007	Eel Ground	NB	Atlantic Canada	46.964584562/-65.628388692	Yes	Yes	Fibre		Bell Aliant	Rogers
3299	50008	Eel River Bar (Eel River Bar First Nation)	NB	Atlantic Canada	48.035380361/-66.374178766	Yes	Yes	Fibre		Bell Aliant	Rogers
3300	50009	Fort Folly	NB	Atlantic Canada	45.89063253/-64.502802588	Yes	No	Fibre		Bell Aliant	Rogers
3301	50010	Indian Island	NB	Atlantic Canada	46.691010257/-64.794538072	No	No	Fibre		Bell Aliant	
3302	50011	French Village (Kingsclear)	NB	Atlantic Canada	45.949785383/-66.850894067	Yes	Yes	Fibre		Bell Aliant	
3303	50012	Oromocto (Oromocto First Nation)	NB	Atlantic Canada	45.853917872/-66.465885656	Yes	Yes	Fibre		Bell Aliant	Rogers
3304	50014	Metepenagiag Mi'kmaq Nation	NB	Atlantic Canada	46.942644366/-65.826205368	Yes	Yes	Fibre		Bell Aliant	Rogers
3305	50015	Saint Mary's	NB	Atlantic Canada	45.971419989/-66.631261213	Yes	Yes	Fibre		Bell Aliant	Rogers
3306	50016	Tobique	NB	Atlantic Canada	46.787247608/-67.696988848	Yes	Yes	Fibre		Bell Aliant	Rogers
3307	50017	Indian Village (Woodstock)	NB	Atlantic Canada	46.109279224/-67.577302599	Yes	No	Fibre		Bell Aliant	Rogers
3308	50018	Acadia	NS	Atlantic Canada	43.83312382/-66.083507718	Yes	Yes	Fibre		Bell Aliant	Eastlink
3309	50019	Paqtnkek Mi'kmaw Nation	NS	Atlantic Canada	45.601579934/-61.738297515	No	No	Fibre		Bell Aliant	
3310	50020	Annapolis Valley	NS	Atlantic Canada	45.066607559/-64.651665661	Yes	Yes	Fibre		Bell Aliant	Eastlink
3311	50021	Bear River	NS	Atlantic Canada	44.559626707/-65.633665916	Yes	No	Fibre		Bell Aliant	Eastlink

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3312	50022	Chapel Island (Potlotek First Nation)	NS	Atlantic Canada	45.683154223/-60.767642931	No	No	Fibre		Bell Aliant	Rogers
3313	50023	Eskasoni	NS	Atlantic Canada	45.930521836/-60.645549018	No	Yes	Fibre		Bell Aliant	
3314	50024	Pictou Landing	NS	Atlantic Canada	45.675874181/-62.652563978	Yes	No	Fibre		Bell Aliant	Eastlink
3315	50025	Micmac (SIPEKNE'KATIK)	NS	Atlantic Canada	45.095174721/-63.488914817	Yes	No	Fibre		Bell Aliant	Eastlink
3316	50026	Membertou	NS	Atlantic Canada	46.116818245/-60.195072165	Yes	Yes	Fibre		Bell Aliant	Eastlink
3317	50027	Millbrook	NS	Atlantic Canada	45.333781019/-63.292748868	Yes	Yes	Fibre		Bell Aliant	Eastlink
3318	50028	Wagmatcook	NS	Atlantic Canada	46.073833331/-60.918203811	No	No	Fibre		Bell Aliant	
3319	50029	Waycobah First Nation (We'koqma'q First Nation)	NS	Atlantic Canada	45.971415266/-61.137723554	No	No	Fibre		Bell Aliant	
3320	50030	Glooscap First Nation	NS	Atlantic Canada	45.041774493/-64.235019626	Yes	Yes	Fibre		Bell Aliant	Eastlink
3321	50032	Mushuau Innu First Nation	NL	Atlantic Canada	55.91395/-61.11923	No	No	None	1	Bell Aliant	
3322	50033	Sheshatshiu Innu First Nation	NL	Atlantic Canada	53.513847/-60.139927	Yes	Yes	Fibre		Bell Aliant	
3323	50047	Miawpukek	NL	Atlantic Canada	47.863827974/-55.755687395	No	No	Fibre		Bell Aliant	

C8. Northern Canada

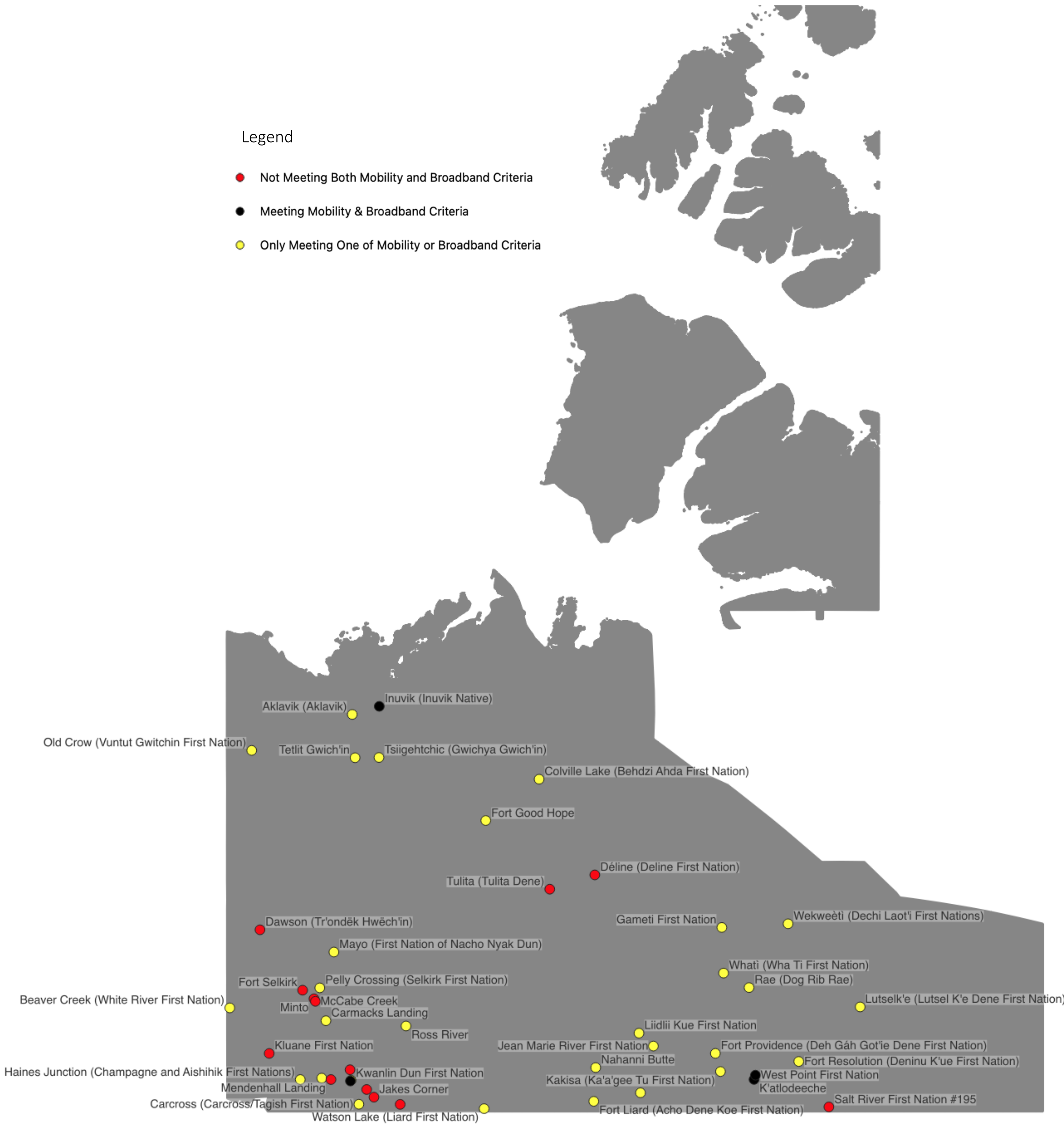


Figure 41 - Northern Canada

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3189	7787	Carmacks Landing	YT	Northern Canada	62.097544/-136.280262	No	Yes	Fibre		Northwestel (Bell)	
3190	7803	Mendenhall Landing	YT	Northern Canada	60.7528/-136.0389	No	No	Fibre		Northwestel (Bell)	
3191	7808	Ta'an Kwach'an (Lake Laberge No.1)	YT	Northern Canada	60.980851/-135.127009	No	No	Fibre		Northwestel (Bell)	
3192	7824	Jakes Corner	YT	Northern Canada	60.338597/-133.983667	No	No	Fibre		Northwestel (Bell)	
3193	7841	Marsh Lake	YT	Northern Canada	60.519296/-134.332236	No	No	Fibre		Northwestel (Bell)	
3194	7844	Minto	YT	Northern Canada	62.584797/-136.850846	No	No	Fibre		No Service Provider	
3195	7845	McCabe Creek	YT	Northern Canada	62.528441/-136.7838	No	No	Fibre		No Service Provider	
3196	7847	Fort Selkirk	YT	Northern Canada	62.772267/-137.393704	No	No	None	92	No Service Povider	
3197	7882	K'atlodeeche	NT	Northern Canada	60.755225/-115.812153	Yes	Yes	Fibre		Northwestel (Bell)	
3630	50491	Carcross (Carcross/Tagish First Nation)	YT	Northern Canada	60.170443259/-134.703755596	No	Yes	Fibre		Northwestel (Bell)	Northwestel
3631	50493	Champagne	YT	Northern Canada	60.786127925/-136.481364172	No	Yes	Fibre		Northwestel (Bell)	
3632	50494	Dawson (Tr'ondëk Hwëch'in)	YT	Northern Canada	64.064928333/-139.431202964	No	No	Fibre		Northwestel (Bell)	
3633	50495	Mayo (First Nation of Nacho Nyak Dun)	YT	Northern Canada	63.594804437/-135.897294542	No	Yes	Fibre		Northwestel (Bell)	
3634	50496	Old Crow (Vuntut Gwitchin First Nation)	YT	Northern Canada	67.570390114/-139.827821648	No	Needs Upgrade - 3G Only	Satellite	486	Northwestel (Bell)	
3635	50497	Ross River	YT	Northern Canada	61.979497634/-132.450960085	No	Yes	None	358	Northwestel (Bell)	
3636	50498	Pelly Crossing (Selkirk First Nation)	YT	Northern Canada	62.823865855/-136.572935664	No	Yes	Fibre		Northwestel (Bell)	
3637	50499	Teslin (Teslin Tlingit Council)	YT	Northern Canada	60.16781053/-132.729859353	No	No	Fibre		Northwestel (Bell)	
3638	50500	Kwanlin Dun First Nation	YT	Northern Canada	60.719059016/-135.108154978	Yes	Yes	Fibre		Northwestel (Bell)	Northwestel
3640	50502	Watson Lake (Liard First Nation)	YT	Northern Canada	60.06601545/-128.716546743	No	Yes	Fibre		Northwestel (Bell)	
3641	50503	Kluane First Nation	YT	Northern Canada	61.356458628/-138.990165013	No	No	Fibre		Northwestel (Bell)	
3643	50506	Beaver Creek (White River First Nation)	YT	Northern Canada	62.383756157/-140.875326681	No	Yes	Fibre		Northwestel (Bell)	
3644	50507	Haines Junction (Champagne and Aishihik First Nations)	YT	Northern Canada	60.752622762/-137.506441246	No	Yes	Fibre		Northwestel (Bell)	

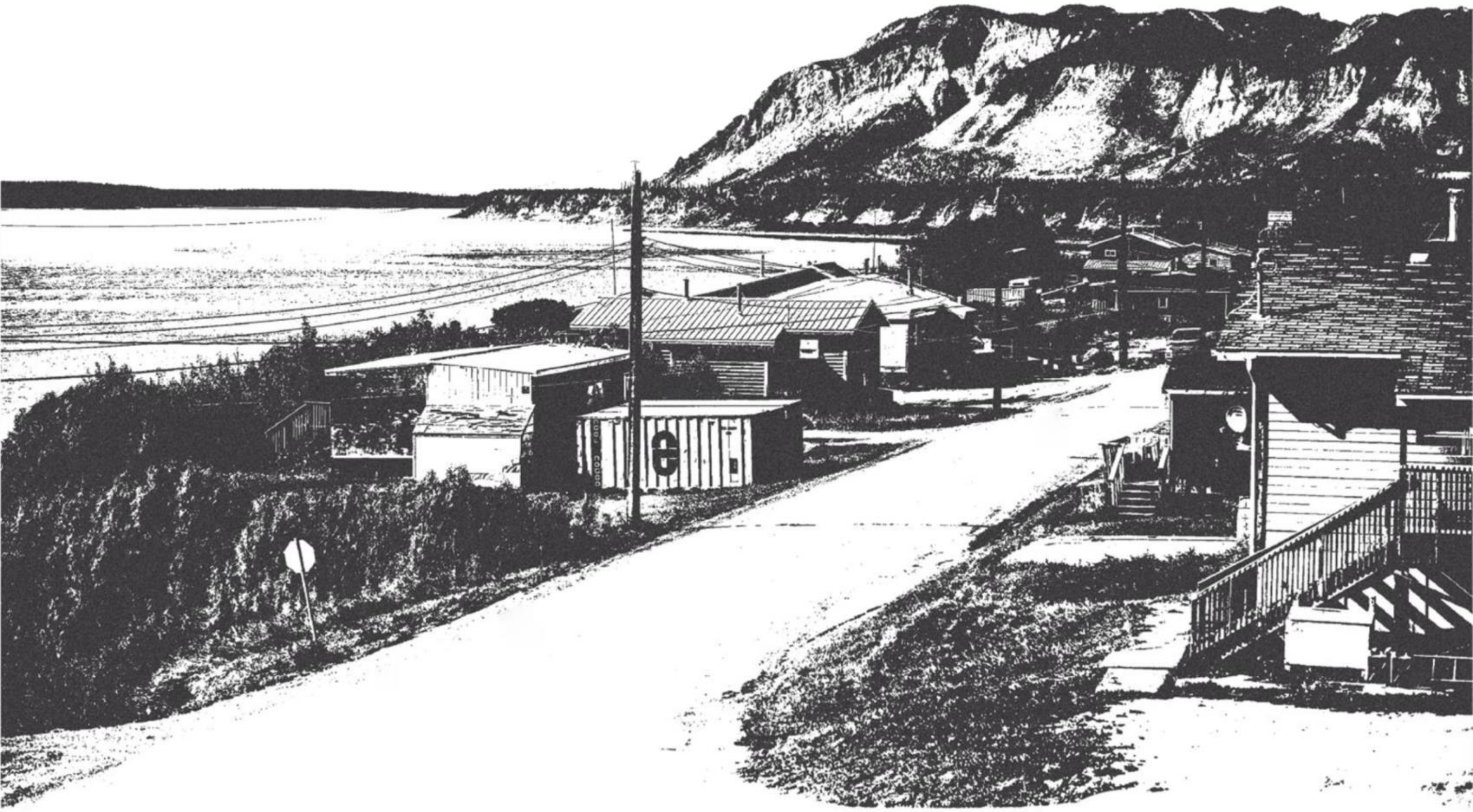
ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3645	50508	Ta'an Kwach'an	YT	Northern Canada	60.73589476/-135.076810445	No	Yes	Fibre		Northwestel (Bell)	Northwestel
3821	50750	Tulita (Tulita Dene)	NT	Northern Canada	64.900536963/-125.577923337	No	No	Fibre		Northwestel (Bell)	
3822	50751	Tetlit Gwich'in	NT	Northern Canada	67.437451734/-134.88604394	No	Yes	Fibre		Northwestel (Bell)	
3823	50752	Fort Good Hope	NT	Northern Canada	66.257147336/-128.637541635	No	Yes	Fibre		Northwestel (Bell)	
3824	50753	Tsiigehtchic (Gwichya Gwich'in)	NT	Northern Canada	67.441850878/-133.743505647	No	Yes	Fibre		Northwestel (Bell)	
3825	50754	Déline (Deline First Nation)	NT	Northern Canada	65.188556853/-123.425491956	No	No	None	251	Northwestel (Bell)	
3826	50755	Aklavik (Aklavik)	NT	Northern Canada	68.218002656/-135.020055536	No	Yes	None	150	Northwestel (Bell)	
3827	50757	Liidlii Kue First Nation	NT	Northern Canada	61.817775277/-121.31365948	No	Yes	Fibre		Northwestel (Bell)	
3828	50758	Fort Liard (Acho Dene Koe First Nation)	NT	Northern Canada	60.240307065/-123.474077516	No	Yes	Fibre		Northwestel (Bell)	
3829	50759	Salt River First Nation #195	NT	Northern Canada	60.10696096/-112.234876021	No	No	Fibre		Northwestel (Bell)	
3830	50760	Fort Providence (Deh Gáh Got'ie Dene First Nation)	NT	Northern Canada	61.357630804/-117.660680352	No	Yes	Fibre		Northwestel (Bell)	
3831	50762	Fort Resolution (Deninu K'ue First Nation)	NT	Northern Canada	61.172410358/-113.673771235	No	Yes	Fibre		Northwestel (Bell)	
3832	50764	Lutselk'e (Lutsel K'e Dene First Nation)	NT	Northern Canada	62.404721438/-110.738708026	No	Needs Upgrade - 3G Only	Satellite	190	Northwestel (Bell)	
3833	50765	Rae (Dog Rib Rae)	NT	Northern Canada	62.830024155/-116.050007707	No	Yes	Fibre		Northwestel (Bell)	
3834	50766	Nahanni Butte	NT	Northern Canada	61.031235285/-123.382623476	No	Yes	None	180	Northwestel (Bell)	
3835	50767	Trout Lake (Sambaa K'e First Nation)	NT	Northern Canada	60.44181228/-121.241394717	No	Needs Upgrade - 3G Only	Satellite	253	Northwestel (Bell)	
3836	50768	Kakisa (Ka'a'gee Tu First Nation)	NT	Northern Canada	60.940002441/-117.416687012	No	Yes	Fibre		Northwestel (Bell)	
3837	50769	Whatì (Wha Ti First Nation)	NT	Northern Canada	63.144479864/-117.268792135	No	Yes	Fibre	156	Northwestel (Bell)	
3838	50770	Jean Marie River First Nation	NT	Northern Canada	61.525364536/-120.625134537	No	Needs Upgrade - 3G Only	Fibre		Northwestel (Bell)	
3839	50771	Colville Lake (Behdzi Ahda First Nation)	NT	Northern Canada	67.039411657/-126.087111275	No	Needs Upgrade - 3G Only	Satellite	359	Northwestel (Bell)	

ID	CommunityID	Name	Province	Region	Coordinates	Broadband Criteria Met	Mobility Criteria Met	Backhaul Technology	Distance to Closest Fibre Backhaul (ACF) (Km)	INCUMBENT TELCO	INCUMBENT Cableco
3840	50772	West Point First Nation	NT	Northern Canada	60.854717088/-115.744969314	Yes	Yes	Fibre		Northwestel (Bell)	
3841	50773	Gameti First Nation	NT	Northern Canada	64.112873526/-117.352388627	No	Needs Upgrade - 3G Only	Satellite	351	Northwestel (Bell)	
3842	50774	Wekweètì (Dechi Laot'i First Nations)	NT	Northern Canada	64.189867359/-114.18502039	No	Needs Upgrade - 3G Only	Satellite	253	Northwestel (Bell)	
3843	50780	Inuvik (Inuvik Native)	NT	Northern Canada	68.361004164/-133.72981293	Yes	Yes	Fibre		Northwestel (Bell)	

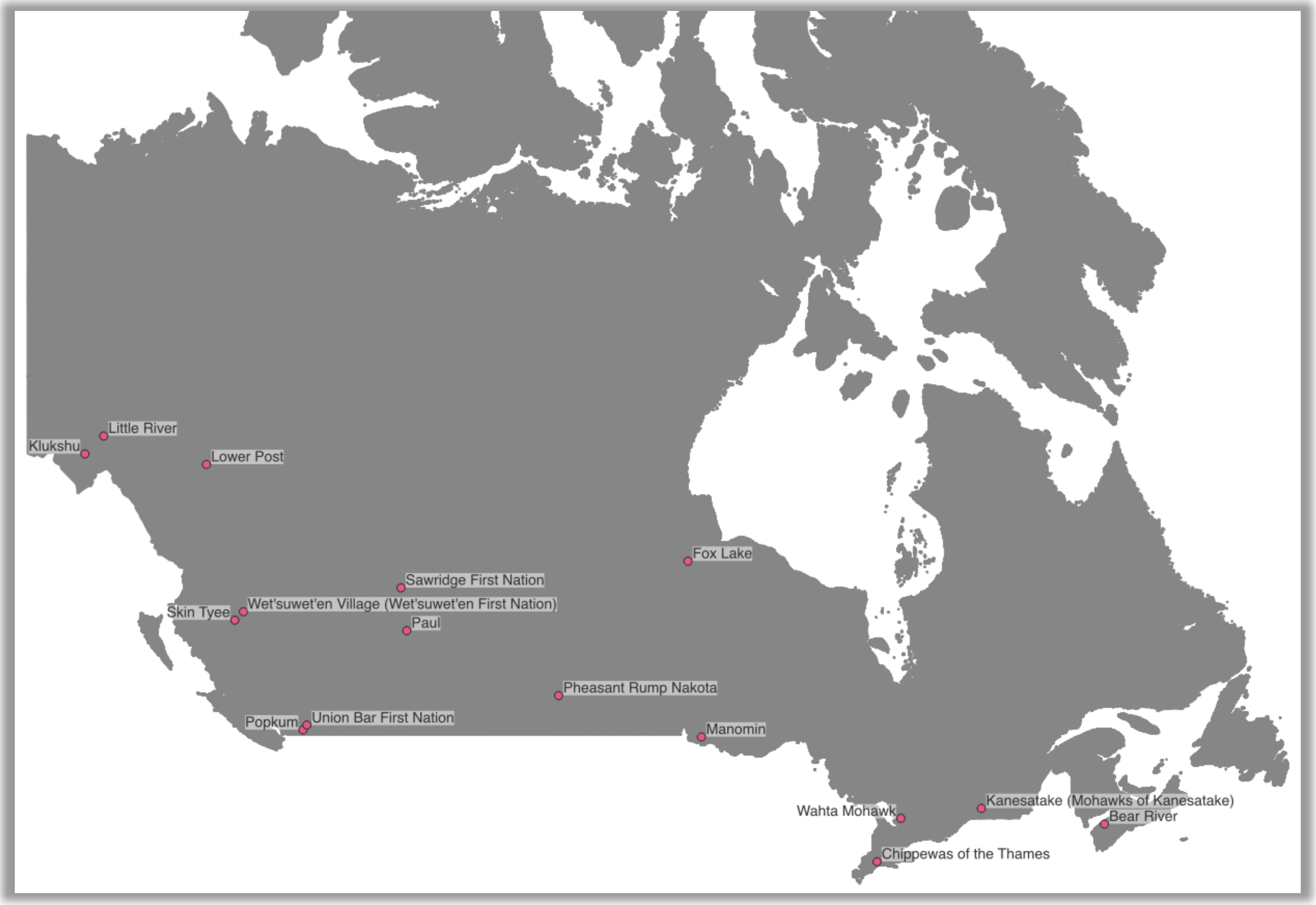
CLOSING THE INFRASTRUCTURE GAP
DIGITAL CONNECTIVITY STUDY

Appendix 4

COMMUNITIES MISSED IN THE STUDY



Map of Communities Not Included in Study

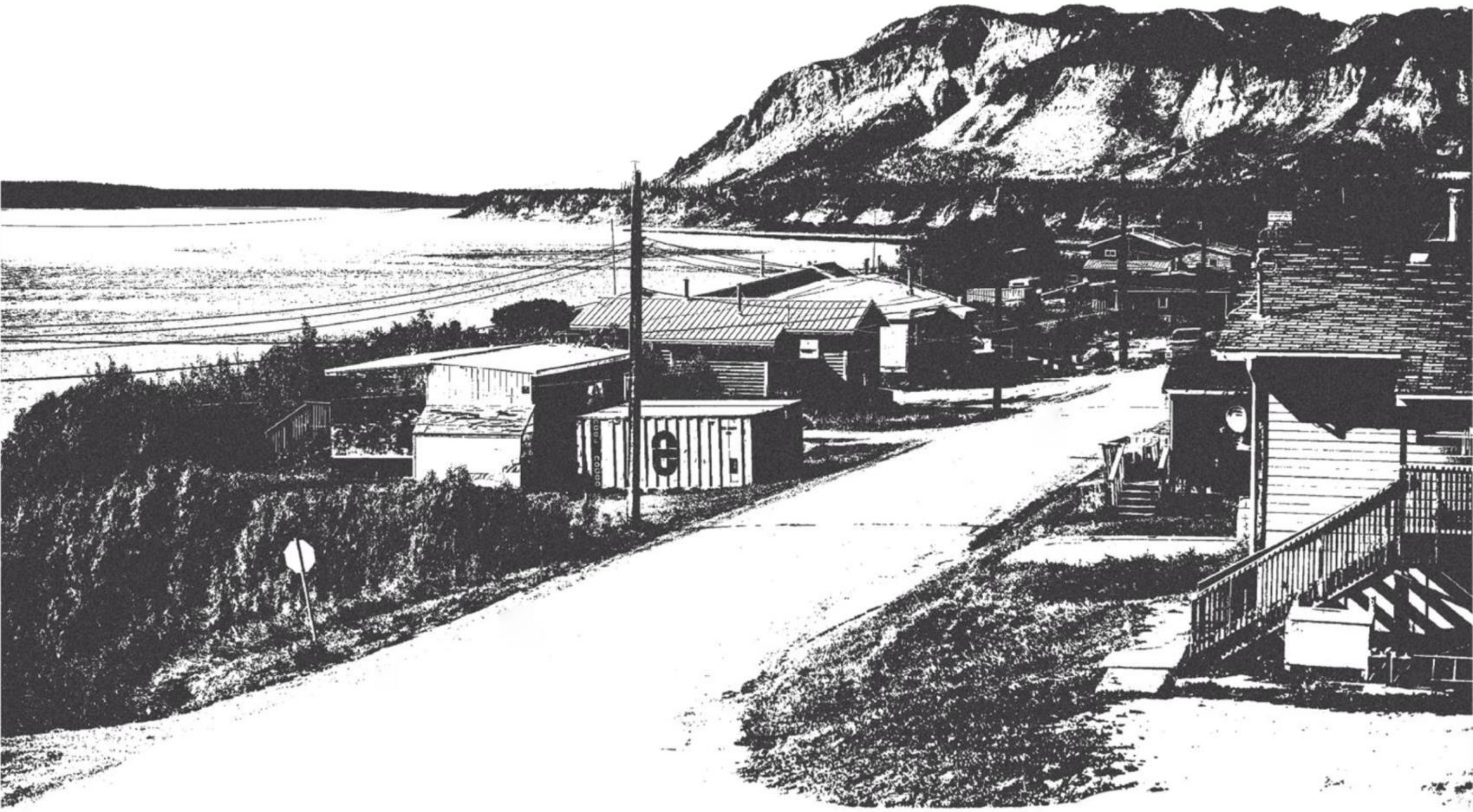


Community ID	Name	Dwellings	Province	Region	Area Name	Incumbent Telco	Incumbent Cableco
7529	Paul	5	AB	Alberta	WABAMUN 133B	No Service Provider	
50454	Sawridge First Nation	1	AB	Alberta	SAWRIDGE 150H	TELUS	Shaw
50725	Wet'suwet'en First Nation	22	BC	British Columbia	PALLING 1	TELUS	
8992	Lower Post	29	BC	British Columbia	LIARD RIVER 3	No Service Provider	
50588	Union Bar First Nation	2	BC	British Columbia	PUCKATHOLETC HIN 11	No Service Provider	
8828	Skin Tyee	1	BC	British Columbia	TATLA'T EAST 2	TELUS	
50585	Popkum	1	BC	British Columbia	POPKUM 1	TELUS	Shaw
50305	Fox Lake	2	MB	Manitoba	A KWIS KI MAHKA INDIAN RESERVE	No Service Provider	
927	Bear River	3	NS	Atlantic Canada	BEAR RIVER INDIAN RESERVE NO. 6B	Bell Aliant	Eastlink
6248	Manomin	2	ON	Ontario	RAINY LAKE INDIAN RESERVE NO. 17B	No Service Provider	
50134	Wahta Mohawk	2	ON	Ontario	WAHTA MOHAWK TERRITORY	No Service Provider	
5470	Chippewas of the Thames	2	ON	Ontario	CHIPPEWA OF THE THAMES FIRST NATION INDIAN RESERVE NO. 42	Bell	
50069	Kanesatake (Mohawks of Kanesatake)	21	QC	Quebec	KANESATAKE LANDS	Bell	Videotron
50409	Pheasant Rump Nakota	18	SK	Sasktel	TREATY FOUR RESERVE GROUNDS I.R. NO. 77	Sasktel	
7806	Little River	271	YT	Northern Canada	TA'AN KWACH'AN COUNCIL	No Service Provider	
7790	Klukshu	220	YT	Northern Canada	CHAMPAGNE AND AISHIHIK FIRST NATIONS	No Service Provider	

CLOSING THE INFRASTRUCTURE GAP
DIGITAL CONNECTIVITY STUDY

Appendix 5

GLOSSARY OF TERMS



Term	Definition
3G	3G is the third generation of wireless mobile telecommunications technology for voice communications. It is the upgrade over 2G, 2.5G, GPRS and 2.75G EDGE networks, offering some data transfer, and better voice quality This network was superseded by 4G and by 5G, both technologies having significantly better data transfer capabilities than 3G
5G	5th generation mobile network. 5G enables a new kind of cellular network that is designed to connect virtually everyone and everything together including computers, machines, objects, and devices. This technology has very high data handling capability with 100-300 Mbps average data rates and 1,000Mbps or greater peak downstream. Upstream data speeds of 25Mbps is common with peaks of 100Mbps. 5G has more capacity than 4G and can support 100X increase in data traffic.
ACF	As-the-Crow-Flies. The straight-shot distance between two points, regardless of topography between.
Asymmetrical Data Service	The downstream data speed to your network is higher than the upstream data speed. Asymmetrical service is common in Digital Subscriber Line, coaxial cable and satellite last mile technologies.
Backbone	An optical long-distance cable connecting a community POP site to the next community with a POP site and from that community to the next, and so on, until an Internet Gateway site. The major Internet Gateway sites for Canada are in Vancouver, Calgary, Toronto and Montreal.
Cableco	A term to describe broadband service providers that grew in to the broadband business from providing cable TV service over coaxial cable outside plant. Most Cablecos are both broadband and cellular service providers
CCP	Connecting Communities Program. A partnership between the provincial or territorial governments and the federal government as an extension of the UBF program to provide funding to build out broadband infrastructure to underserved communities. CCP is now administered by the Provincial Governments and tends to be focussed on last mile solutions using FTTH.
CIB	Canada Infrastructure Bank is a federal Crown Corporation of Canada tasked with financially supporting revenue-generating infrastructure projects that are "in the public interest" through public-private partnerships. CIB offers long term loans to Indigenous communities for connectivity projects,
CIRA	Canadian Internet Registration Authority is a not-for-profit organization, independent of any service provider, that manages the *.ca extension. In addition to this, CIRA also tracks broadband performance with an on-line test tool
Coaxial Cable	Coaxial cable refers to a specific transmission medium for broadband services used by Cabelcos. By nature of the data transmission over the coaxial cable, it supports inherently an asymmetrical service with significantly higher data downstream than upstream. Most coaxial plants meet the 50/10 bandwidth criteria but will need to be replaced
CRTC	Canadian Radio and Television Commission. Administrative tribunal that operates at arm's length from the federal government and provides policy and regulation for the telecommunications and broadcasting industries
CRTC Broadband Fund	The CRTC has established the Broadband Fund to help provide all Canadians with access to broadband Internet and mobile wireless services. The Fund will award up to $750 million to projects that help achieve this goal. Unlike other funding programs driven from tax dollars, the

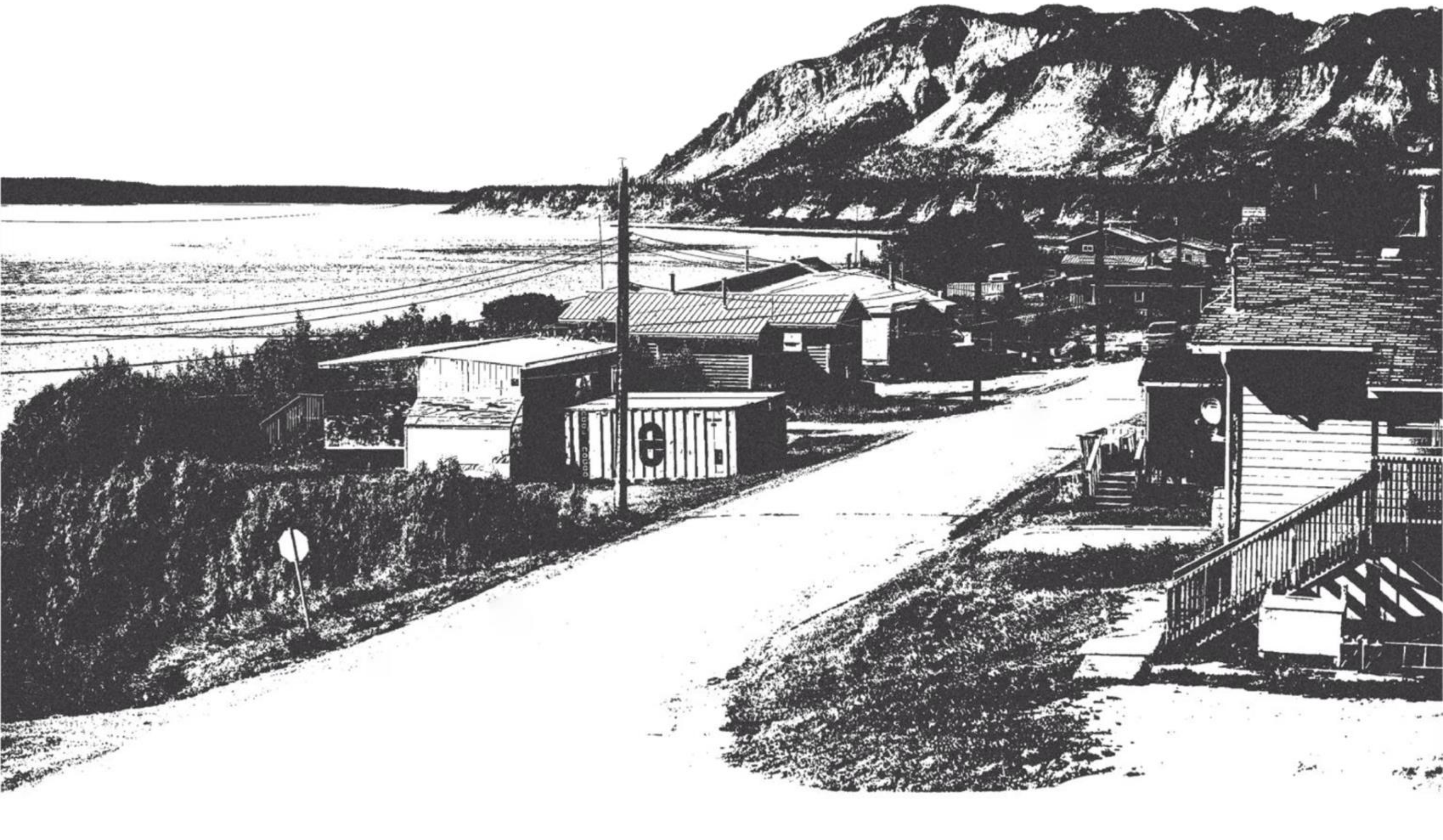
	funding for the Broadband fund comes directly from contributions made by large Canadian telecommunications service providers whose total annual Canadian revenues amount to at least $10 million.
CTI	Connect to Innovate Fund is a fund administered by ISED that committed $585 million to improve connectivity in over 975 rural and remote communities, including 190 Indigenous communities, by 2023. This program primarily supports new backbone infrastructure to connect institutions like schools and hospitals within the community and to connect communities with other communities
CTP	Copper Twisted Pair. The ordinary copper wire that connects home and business computers to the telephone company.
DSL	Digital Subscriber Line. A technology for high-speed network or Internet access over voice on the copper twisted pair lines. This technology was widely used by the Telcos and cannot support 50/10
FTTH	Fibre-to-the-Home. Also referred to as Fibre-to-the-Premise. Future-proof last mile technology using fibre optic technology between the service provider POP and the home with electronics terminating the fibre in the service provider POP site, called the Optical Line Termination (OLT) and inside the home, called the Optical Network Unit (ONU). The fibre itself is almost limitless and bandwidth. The data rates delivered to the subscriber are determined by the OLT and ONU electronics. This technology can easily deliver far greater than 50/10 with 1,000Mbps or 1Gpbs being typical today in urban centres. It is also capable of delivering symmetrical services - i.e. same data rates downstream as upstream.
FWA	Fixed wireless access refers to a technology where broadband services are delivered via air waves from a tower within a community to antennas on subscribers rooves. The technology is capable of 50/10 with careful design but is typically 25/5. FWA can be offered by independent service providers or by the cellular service providers. If the cellular service providers offer FWA, they do so from the same tower that they use to deliver their cellular services.
ISC	Indigenous Service Canada. ISC has many programs which help in the development of connectivity for indigenous communities. Their funding addresses issues such as connecting schools, hospitals and band offices within an indigenous community but has also been used by several indigenous communities for cell towers.
ISED	Innovation Science and Economic Development Canada. A department of the Government of Canada responsible for a number of the federal government's functions in regulating industry and commerce, spectrum promoting science and innovation, and supporting economic development.
ISP	Internet Service Provider
LEO	Low-earth-orbit satellite. New satellite technology capable of delivering 50/10 or better using a constellation of satellite in an orbit around Earth with a period of 128 minutes or less (making at least 11.25 orbits per day).
LTE	Long Term Evolution, LTE, also referred as 4G is the fourth generation of wireless mobile telecommunications technology for voice communications. It is has significantly better data transfer and better voice quality than 3G and is almost unilaterally deployed throughout Canada. LTE offers up to 170Mbps downstream capability from a cell site. This network was superseded by 5G.
Cellular	Cellular is used by Planetworks to describe networks that are LTE or 5G.

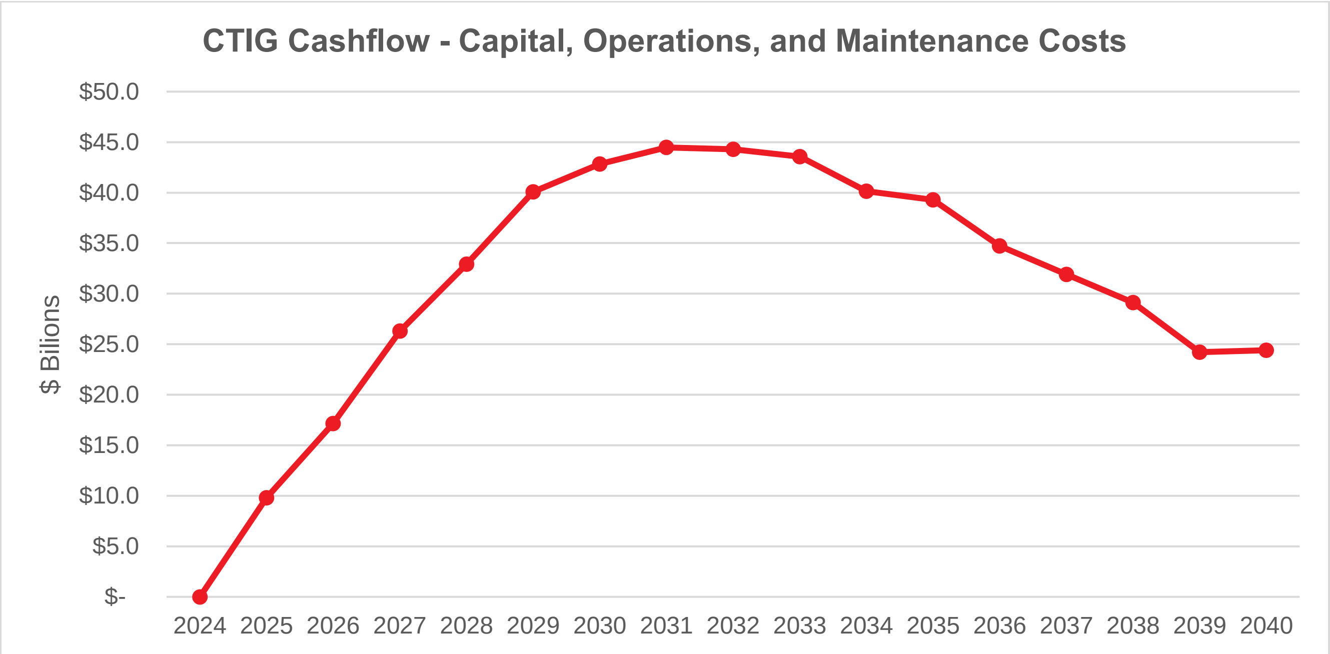
Mbps	Megabits per Second. Bits are tiny units of data, with a megabit representing a million of them, the higher the number of Mbps (megabits per second), the speedier the online activity should be.
MHz	Mega Hertz. 1000 cycles per second. This is a measure of airwave frequency.
National Broadband Internet Service Availability Map	The federal government track the deployment of 50/10 infrastructure and has developed an on-line application tool. This interactive map outlines active funding projects within the area, the level or wired and fixed wireless service available and is used by communities when applying for funding. This map is managed by ISED and is based on self-reporting by the ISPs. The federal government track the deployment of 50/10 infrastructure and has developed an on-line application tool. This interactive map outlines active funding projects within the area, the level of wired and fixed wireless service available and is used by communities when applying for funding. This map is managed by ISED and is based on self-reporting by the ISPs.
OLT	Optical line termination - the FTTH electronics located within the POP
ONU	Optical Network Unit - the FTTH electronics located within the home
PCS	Personal Communications Services. A Broad range of voice and data telecommunications services that enable people to communicate via cell phones based exclusively on digital technologies such as CDMA and GSM. Also refers to a piece of cellular spectrum at 1900MHz which in addition to cellular spectrum at 800MHz was deployed without an auction process
POP	Point-of-Presence . A demarcation point or network interface point between communicating entities where their service meet. This is often a panel inside a Telco central office.
Symmetrical Data Service	The data speed is the same downstream and upstream
Opex	Operational expenditures. Refers to operations and maintenance costs to support a Capex asset.
Capex	Capital expenditure. Refers to the Capex necessary to build an asset.
Telco	A term to describe regional broadband service providers that grew into the broadband business from providing telephone service over copper twisted pair outside plant. Most Telcos are both broadband and cellular service providers
UBF	Universal Broadband Fund. The Universal Broadband Fund (UBF) is a $3.225 billion investment by the Government of Canada designed to help connect 100 per cent of Canadians with at least 50/10 by 2030/. The UBF is administered by ISED.
UBF RRS	The Universal Broadband Fund Rapid Response Stream refers to a specific funding intake of the UBF program in 2021 to offer up to $5M for projects that were "shovel ready" and could be completed within twelve months. This project addressed last mile and backbone projects.
WiFi	Wireless Fidelity. A system using the unlicensed air waves to connect computers and other electronic equipment to the internet without using wires
50/10	50/10 refers to an internet service with 50 Mbps downstream and 10 Mbps upstream and has been identified by the CRTC as the minimum data connectivity that all Canadians should enjoy by 2030.

CLOSING THE INFRASTRUCTURE GAP BY 2030
PRIORITIZATION AND IMPLEMENTATION PLAN

Appendix 2

CASHFLOW FORECAST – BY REGION AND ASSET CLASS





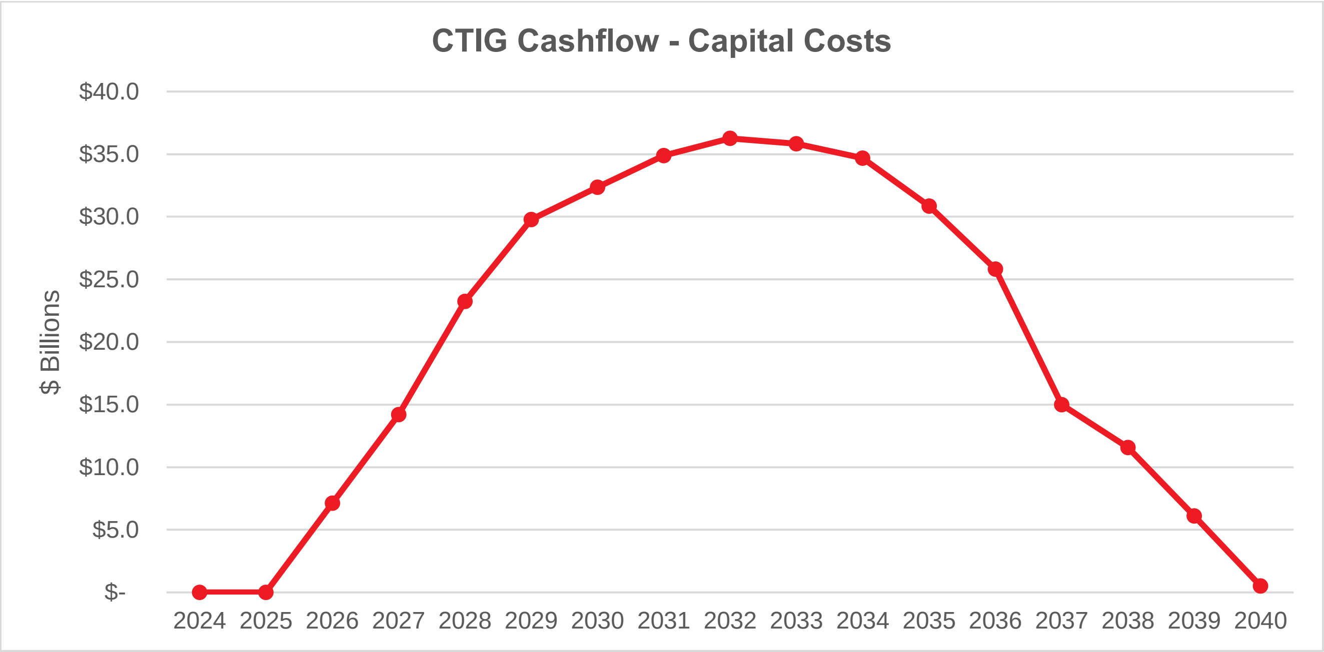
Region	Closing the Infrastructure Gap Cashflow Summary (2023 to 2032, $ Billions)									
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BC	-	$0.59	$1.7	$3.3	$5.0	$6.3	$8.1	$8.6	$8.6	$8.5
AB	-	$0.29	$1.2	$2.6	$4.1	$4.9	$5.8	$6.0	$6.4	$6.6
SK	-	$0.33	$1.1	$1.8	$2.7	$3.5	$4.5	$4.7	$5.0	$5.0
MB	-	$0.36	$1.5	$2.8	$4.4	$5.6	$6.5	$6.9	$7.2	$7.3
ON	-	$0.41	$1.4	$2.4	$3.8	$4.9	$5.9	$6.3	$6.6	$6.7
QC	-	$0.24	$1.0	$1.8	$2.9	$3.4	$3.7	$3.8	$3.9	$3.8
ATL	-	$0.13	$0.69	$1.1	$1.8	$2.1	$2.2	$2.4	$2.3	$2.1
YK/NWT	-	$0.25	$1.1	$1.2	$1.6	$2.2	$3.6	$4.3	$4.4	$4.3
Total	-	$2.6	$9.8	$17.2	$26.3	$32.9	$40.1	$42.9	$44.5	$44.3

Region	Closing the Infrastructure Gap Cashflow Summary (2033 to 2040, $ Billions)								
	2033	2034	2035	2036	2037	2038	2039	2040	Total
BC	$8.7	$8.6	$9.5	$9.4	$8.2	$7.4	$5.6	$5.6	$113.7
AB	$6.5	$6.5	$5.6	$4.3	$4.1	$3.2	$2.6	$2.7	$73.4
SK	$4.7	$4.5	$4.9	$4.9	$4.4	$3.6	$3.0	$3.1	$61.7
MB	$7.2	$6.9	$6.4	$5.0	$4.8	$4.6	$3.4	$3.4	$84.2
ON	$6.5	$6.0	$6.2	$5.8	$5.5	$4.8	$4.0	$3.8	$80.9
QC	$3.8	$3.5	$3.3	$1.9	$1.9	$2.1	$2.2	$2.2	$45.3
ATL	$2.1	$1.4	$1.0	$1.0	$1.0	$1.2	$1.2	$1.2	$25.0
YK/NWT	$4.2	$2.8	$2.4	$2.5	$2.1	$2.2	$2.3	$2.4	$43.7
Total	$43.6	$40.1	$39.3	$34.7	$31.9	$29.1	$24.2	$24.4	$527.8

Capital, Operations, and Maintenance Cashflow by Asset Category

Asset Category	Closing the Infrastructure Gap Cashflow by Asset Category (2023 to 2032, $ Billions)									
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Drinking Water	-	$0.02	$0.05	$0.09	$0.15	$0.05	$0.05	$0.05	$0.06	$0.06
Electronic Connectivity	-	$0.03	$0.59	$0.61	$0.90	$1.12	$1.21	$1.25	$1.22	$1.05
Housing	-	$0.92	$3.68	$7.24	$11.36	$11.59	$13.86	$14.56	$15.00	$15.45
Health	-	$0.01	$0.05	$0.08	$0.18	$0.13	$0.03	$0.03	$0.03	$0.03
Community Assets	-	$0.10	$0.47	$0.49	$0.78	$0.95	$1.15	$1.19	$0.93	$0.46
Water, Wastewater and Utilities	-	$0.32	$1.09	$1.47	$1.56	$1.92	$2.87	$2.95	$3.04	$3.00
Education and Training	-	$0.21	$0.83	$0.86	$1.05	$1.37	$1.78	$1.83	$1.81	$1.74
Transportation Infrastructure	-	$0.20	$0.53	$0.83	$1.00	$1.38	$1.83	$1.89	$1.92	$1.92
Emergency Services	-	$0.04	$0.04	$0.04	$0.04	$0.05	$0.12	$0.14	$0.24	$0.33
Solid Waste and Recycling	-	$0.00	$0.03	$0.06	$0.10	$0.02	$0.01	$0.01	$0.01	$0.01
Recreation and Cultural Assets	-	$0.17	$0.76	$0.79	$1.05	$1.34	$1.68	$1.73	$1.78	$1.57
Social Programs	-	$0.01	$0.01	$0.02	$0.02	$0.02	$0.04	$0.05	$0.09	$0.12
Community Accessibility Assets	-	$0.25	$0.26	$1.17	$1.21	$4.25	$4.81	$4.96	$5.11	$5.26
Climate Adaptation	-	$0.29	$0.30	$0.31	$0.53	$1.53	$2.87	$4.03	$4.33	$4.10
Net Zero Carbon	-	-	-	-	$0.23	$0.89	$1.24	$1.42	$1.85	$1.85
Accessibility	-	-	-	-	-	$0.01	$0.04	$0.07	$0.16	$0.25
ISC Direct Ask	-	-	$1.09	$3.12	$6.13	$6.32	$6.50	$6.70	$6.90	$7.11
Total	-	$2.59	$9.79	$17.17	$26.29	$32.93	$40.09	$42.85	$44.47	$44.29

Asset Category	Closing the Infrastructure Gap Cashflow Summary (2033 to 2040, $ Billions)								
	2033	2034	2035	2036	2037	2038	2039	2040	Total
Drinking Water	$0.06	$0.06	$0.09	$0.14	$0.14	$0.16	$0.17	$0.17	$1.58
Electronic Connectivity	$0.30	$0.11	$0.16	$0.24	$0.25	$0.28	$0.29	$0.30	$9.91
Housing	$16.22	$15.42	$15.82	$15.68	$15.80	$12.00	$8.45	$8.71	$201.75
Health	$0.03	$0.03	$0.05	$0.07	$0.07	$0.08	$0.08	$0.08	$1.04
Community Assets	$0.38	$0.36	$0.53	$0.78	$0.81	$0.91	$0.94	$0.97	$12.20
Water, Wastewater and Utilities	$2.91	$1.95	$2.01	$2.53	$2.53	$2.86	$2.95	$3.04	$38.99
Education and Training	$1.10	$0.97	$1.24	$1.58	$1.63	$1.85	$1.90	$1.96	$23.71
Transportation Infrastructure	$1.63	$0.97	$1.32	$1.81	$1.67	$1.79	$1.84	$1.90	$24.42
Emergency Services	$0.54	$0.61	$0.70	$0.63	$0.53	$0.49	$0.42	$0.39	$5.34
Solid Waste and Recycling	$0.01	$0.01	$0.02	$0.03	$0.03	$0.04	$0.04	$0.04	$0.49
Recreation and Cultural Assets	$0.95	$0.61	$0.90	$1.32	$1.36	$1.54	$1.59	$1.63	$20.76
Social Programs	$0.26	$0.27	$0.18	$0.18	$0.17	$0.13	$0.13	$0.14	$1.83
Community Accessibility Assets	$5.45	$4.77	$5.16	$2.74	$1.98	$2.24	$2.31	$2.37	$54.31
Climate Adaptation	$3.90	$4.13	$4.77	$5.00	$4.83	$4.75	$3.11	$2.72	$51.48
Net Zero Carbon	$1.94	$2.01	$2.02	$1.86	$0.08	-	-	-	$15.39
Accessibility	$0.44	$0.47	$0.37	$0.14	$0.05	-	-	-	$2.01
ISC Direct Ask	$7.46	$7.37	$3.96	-	-	-	-	-	$62.66
Total	$43.57	$40.13	$39.29	$34.75	$31.91	$29.12	$24.21	$24.41	$527.85



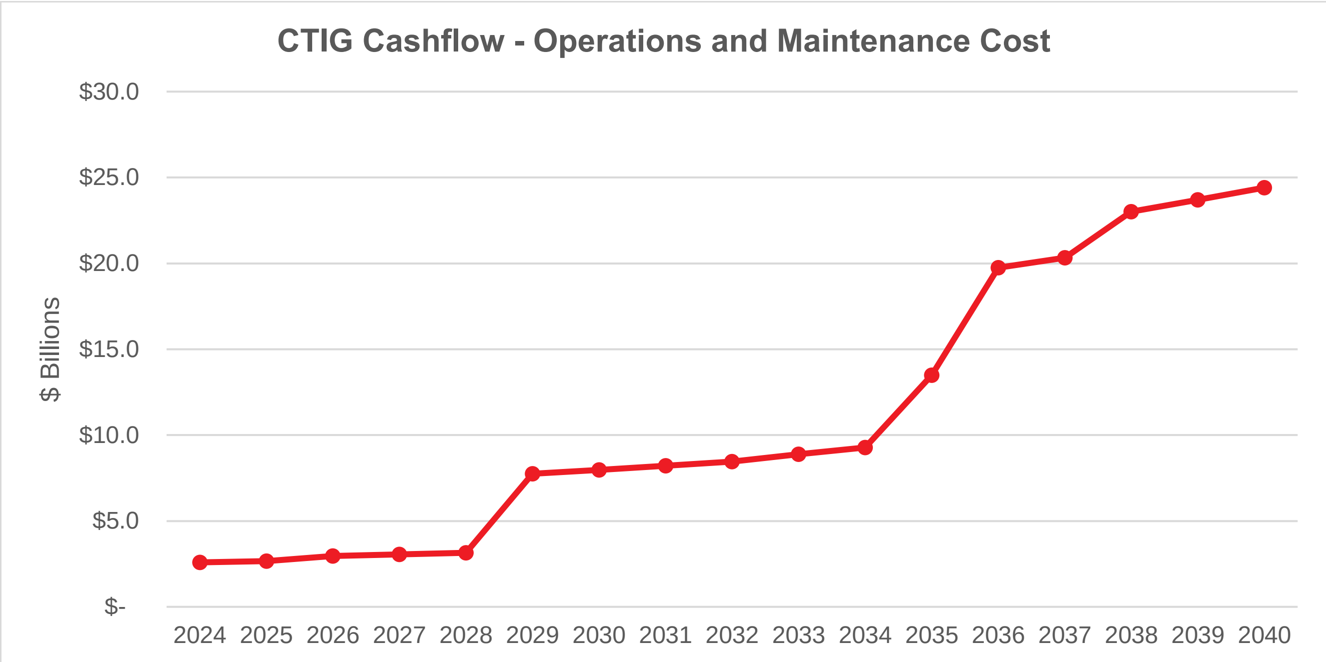
Region	Closing the Infrastructure Gap Capital Cost Cashflow Summary (2023 to 2032, $ Billions)									
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BC	-	-	-	$1.1	$2.7	$4.4	$5.7	$6.3	$6.8	$6.8
AB	-	-	-	$1.0	$2.1	$3.6	$4.3	$4.7	$4.9	$5.3
SK	-	-	-	$0.7	$1.5	$2.3	$3.2	$3.6	$3.8	$4.0
MB	-	-	-	$1.1	$2.5	$4.0	$5.2	$5.4	$5.8	$6.1
ON	-	-	-	$1.0	$2.0	$3.3	$4.4	$4.7	$5.1	$5.4
QC	-	-	-	$0.8	$1.5	$2.6	$3.2	$3.0	$3.1	$3.2
ATL	-	-	-	$0.6	$1.0	$1.7	$1.9	$1.8	$2.0	$1.9
YK/NWT	-	-	-	$0.8	$1.0	$1.3	$1.9	$2.8	$3.5	$3.6
Total	-	-	-	$7.1	$14.2	$23.2	$29.8	$32.3	$34.9	$36.3

Region	Closing the Infrastructure Gap Capital Cost Cashflow Summary (2033 to 2040, $ Billions)								
	2033	2034	2035	2036	2037	2038	2039	2040	Total
BC	$6.7	$6.7	$6.5	$6.4	$4.9	$3.5	$2.1	$0.1	$70.7
AB	$5.4	$5.2	$5.4	$4.1	$2.1	$1.9	$0.7	-	$50.7
SK	$4.0	$3.6	$3.3	$3.2	$2.4	$1.8	$0.7	-	$37.9
MB	$6.1	$6.0	$5.6	$4.5	$2.3	$1.9	$1.5	$0.2	$58.2
ON	$5.4	$5.1	$4.5	$4.1	$2.7	$2.3	$1.2	$0.2	$51.4
QC	$3.0	$3.0	$2.7	$2.1	$0.1	-	-	-	$28.2
ATL	$1.7	$1.7	$1.0	$0.4	-	-	-	-	$15.5
YK/NWT	$3.5	$3.4	$1.9	$1.0	$0.6	$0.1	-	-	$25.6
Total	$35.8	$34.7	$30.9	$25.8	$15.0	$11.6	$6.1	$0.5	$338.2

Capital Cost Cashflow by Asset Category

Asset Category	Closing the Infrastructure Gap Cashflow by Asset Category (2023 to 2032, $ Billions)									
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Drinking Water	-	-	$0.03	$0.07	$0.13	$0.03	-	-	-	-
Electronic Connectivity	-	-	$0.56	$0.58	$0.86	$1.09	$1.12	$1.15	$1.12	$0.95
Housing	-	-	$2.73	$6.27	$10.35	$10.56	$11.19	$11.81	$12.16	$12.53
Health	-	-	$0.04	$0.07	$0.17	$0.12	-	-	-	-
Community Assets	-	-	$0.36	$0.38	$0.67	$0.83	$0.86	$0.88	$0.62	$0.14
Water, Wastewater and Utilities	-	-	$0.76	$1.12	$1.21	$1.56	$1.93	$1.99	$2.05	$1.98
Education and Training	-	-	$0.62	$0.64	$0.82	$1.14	$1.17	$1.21	$1.17	$1.08
Transportation Infrastructure	-	-	$0.33	$0.61	$0.78	$1.16	$1.25	$1.29	$1.30	$1.28
Emergency Services	-	-	-	-	-	-	-	$0.02	$0.11	$0.20
Solid Waste and Recycling	-	-	$0.02	$0.05	$0.09	$0.01	-	-	-	-
Recreation and Cultural Assets	-	-	$0.59	$0.60	$0.86	$1.14	$1.18	$1.21	$1.25	$1.02
Social Programs	-	-	-	-	-	-	-	$0.00	$0.04	$0.08
Community Accessibility Assets	-	-	-	$0.69	$0.71	$3.74	$3.85	$3.96	$4.08	$4.20
Climate Adaptation	-	-	-	-	$0.21	$1.20	$2.02	$3.16	$3.43	$3.18
Net Zero Carbon	-	-	-	-	$0.23	$0.89	$1.24	$1.42	$1.85	$1.85
Accessibility	-	-	-	-	-	$0.01	$0.04	$0.07	$0.16	$0.25
ISC Direct Ask	-	-	$1.09	$3.12	$6.13	$6.32	$6.50	$6.70	$6.90	$7.11
Total	-	-	$7.12	$14.20	$23.24	$29.78	$32.35	$34.88	$36.26	$35.83

Asset Category	Closing the Infrastructure Gap Cashflow by Asset Category (2033 to 2040, $ Billions)								
	2033	2034	2035	2036	2037	2038	2039	2040	Total
Drinking Water	-	-	-	-	-	-	-	-	$0.27
Electronic Connectivity	$0.20	-	-	-	-	-	-	-	$7.63
Housing	$13.15	$12.17	$11.04	$8.64	$8.56	$3.80	-	-	$134.94
Health	-	-	-	-	-	-	-	-	$0.39
Community Assets	$0.04	-	-	-	-	-	-	-	$4.78
Water, Wastewater and Utilities	$1.84	$0.81	$0.34	$0.08	-	-	-	-	$15.68
Education and Training	$0.41	$0.24	$0.17	-	-	-	-	-	$8.67
Transportation Infrastructure	$0.96	$0.26	$0.27	$0.28	$0.09	-	-	-	$9.85
Emergency Services	$0.40	$0.47	$0.49	$0.32	$0.21	$0.12	$0.04	-	$2.37
Solid Waste and Recycling	-	-	-	-	-	-	-	-	$0.18
Recreation and Cultural Assets	$0.37	-	-	-	-	-	-	-	$8.22
Social Programs	$0.21	$0.22	$0.10	$0.07	$0.06	$0.01	-	-	$0.79
Community Accessibility Assets	$4.34	$3.74	$3.80	$0.82	-	-	-	-	$33.94
Climate Adaptation	$2.93	$3.10	$3.26	$2.78	$2.54	$2.19	$0.47	-	$30.46
Net Zero Carbon	$1.94	$2.01	$2.02	$1.86	$0.08	-	-	-	$15.39
Accessibility	$0.44	$0.47	$0.37	$0.14	$0.05	-	-	-	$2.01
ISC Direct Ask	$7.46	$7.37	$3.96	-	-	-	-	-	$62.66
Total	$34.69	$30.86	$25.81	$15.00	$11.57	$6.11	$0.51	-	$338.21



Region	Closing the Infrastructure Gap O&M Cashflow Summary (2023 to 2032, $ Billions)									
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
BC	-	$0.59	$0.6	$0.6	$0.6	$0.7	$1.7	$1.8	$1.8	$1.9
AB	-	$0.29	$0.3	$0.5	$0.5	$0.6	$1.1	$1.1	$1.1	$1.2
SK	-	$0.33	$0.3	$0.3	$0.4	$0.4	$0.9	$1.0	$1.0	$1.0
MB	-	$0.36	$0.4	$0.4	$0.4	$0.4	$1.0	$1.1	$1.1	$1.1
ON	-	$0.41	$0.4	$0.4	$0.4	$0.5	$1.2	$1.2	$1.3	$1.3
QC	-	$0.24	$0.2	$0.3	$0.3	$0.3	$0.7	$0.7	$0.7	$0.7
ATL	-	$0.13	$0.14	$0.1	$0.1	$0.1	$0.4	$0.4	$0.4	$0.4
YK/NWT	-	$0.25	$0.3	$0.3	$0.3	$0.3	$0.7	$0.7	$0.8	$0.8
Total	-	$2.6	$2.7	$3.0	$3.1	$3.1	$7.7	$8.0	$8.2	$8.5

Region	Closing the Infrastructure Gap O&M Cashflow Summary (2033 to 2040, $ Billions)								
	2033	2034	2035	2036	2037	2038	2039	2040	Total
BC	$2.0	$2.1	$3.1	$4.5	$4.7	$5.3	$5.4	$5.6	$43.0
AB	$1.2	$1.2	$1.5	$2.2	$2.2	$2.5	$2.6	$2.7	$22.7
SK	$1.1	$1.2	$1.7	$2.5	$2.6	$2.9	$3.0	$3.1	$23.7
MB	$1.2	$1.3	$1.9	$2.7	$2.8	$3.2	$3.3	$3.4	$25.9
ON	$1.4	$1.4	$2.1	$3.1	$3.2	$3.6	$3.7	$3.8	$29.5
QC	$0.8	$0.8	$1.2	$1.8	$1.9	$2.1	$2.2	$2.2	$17.1
ATL	$0.4	$0.5	$0.7	$1.0	$1.0	$1.2	$1.2	$1.2	$9.5
YK/NWT	$0.8	$0.9	$1.4	$1.9	$2.0	$2.2	$2.3	$2.4	$18.1
Total	$8.9	$9.3	$13.5	$19.7	$20.3	$23.0	$23.7	$24.4	$189.6

Operations and Maintenance Cost Cashflow by Asset Category

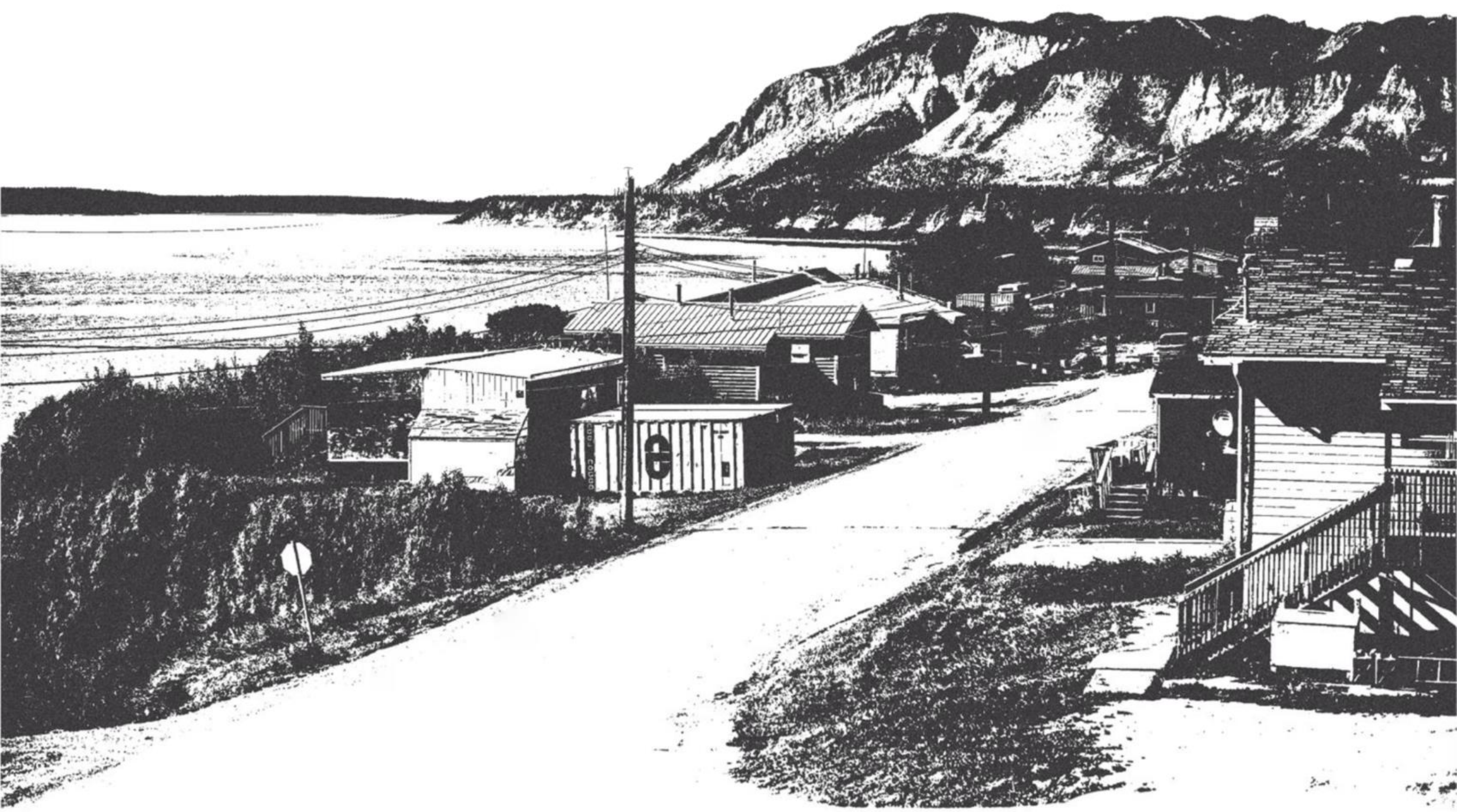
Asset Category	Closing the Infrastructure Gap Cashflow by Asset Category (2023 to 2032, $ Billions)									
	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Drinking Water	-	$0.02	$0.02	$0.02	$0.02	$0.02	$0.05	$0.05	$0.06	$0.06
Electronic Connectivity	-	$0.03	$0.03	$0.03	$0.03	$0.04	$0.09	$0.09	$0.10	$0.10
Housing	-	$0.92	$0.95	$0.98	$1.01	$1.04	$2.67	$2.75	$2.84	$2.92
Health	-	$0.01	$0.01	$0.01	$0.01	$0.01	$0.03	$0.03	$0.03	$0.03
Community Assets	-	$0.10	$0.11	$0.11	$0.11	$0.12	$0.30	$0.31	$0.32	$0.32
Water, Wastewater and Utilities	-	$0.32	$0.33	$0.34	$0.35	$0.36	$0.93	$0.96	$0.99	$1.02
Education and Training	-	$0.21	$0.21	$0.22	$0.23	$0.23	$0.60	$0.62	$0.64	$0.66
Transportation Infrastructure	-	$0.20	$0.21	$0.21	$0.22	$0.23	$0.58	$0.60	$0.62	$0.64
Emergency Services	-	$0.04	$0.04	$0.04	$0.04	$0.05	$0.12	$0.12	$0.13	$0.13
Solid Waste and Recycling	-	$0.00	$0.00	$0.00	$0.00	$0.00	$0.01	$0.01	$0.01	$0.01
Recreation and Cultural Assets	-	$0.17	$0.18	$0.18	$0.19	$0.19	$0.50	$0.52	$0.53	$0.55
Social Programs	-	$0.01	$0.01	$0.02	$0.02	$0.02	$0.04	$0.04	$0.04	$0.05
Community Accessibility Assets	-	$0.25	$0.26	$0.48	$0.50	$0.51	$0.97	$1.00	$1.03	$1.06
Climate Adaptation	-	$0.29	$0.30	$0.31	$0.32	$0.33	$0.85	$0.87	$0.90	$0.92
Net Zero Carbon	-	-	-	-	-	-	-	-	-	-
Accessibility	-	-	-	-	-	-	-	-	-	-
ISC Direct Ask	-	-	-	-	-	-	-	-	-	-
Total	-	$2.59	$2.67	$2.96	$3.05	$3.15	$7.74	$7.97	$8.21	$8.46

Asset Category	Closing the Infrastructure Gap Cashflow by Asset Category (2033 to 2040, $ Billions)								
	2033	2034	2035	2036	2037	2038	2039	2040	Total
Drinking Water	$0.06	$0.06	$0.09	$0.14	$0.14	$0.16	$0.17	$0.17	$1.31
Electronic Connectivity	$0.10	$0.11	$0.16	$0.24	$0.25	$0.28	$0.29	$0.30	$2.28
Housing	$3.07	$3.25	$4.78	$7.03	$7.24	$8.21	$8.45	$8.71	$66.81
Health	$0.03	$0.03	$0.05	$0.07	$0.07	$0.08	$0.08	$0.08	$0.64
Community Assets	$0.34	$0.36	$0.53	$0.78	$0.81	$0.91	$0.94	$0.97	$7.43
Water, Wastewater and Utilities	$1.07	$1.13	$1.67	$2.45	$2.53	$2.86	$2.95	$3.04	$23.31
Education and Training	$0.69	$0.73	$1.08	$1.58	$1.63	$1.85	$1.90	$1.96	$15.05
Transportation Infrastructure	$0.67	$0.71	$1.04	$1.53	$1.58	$1.79	$1.84	$1.90	$14.57
Emergency Services	$0.14	$0.14	$0.21	$0.31	$0.32	$0.36	$0.38	$0.39	$2.96
Solid Waste and Recycling	$0.01	$0.01	$0.02	$0.03	$0.03	$0.04	$0.04	$0.04	$0.30
Recreation and Cultural Assets	$0.58	$0.61	$0.90	$1.32	$1.36	$1.54	$1.59	$1.63	$12.54
Social Programs	$0.05	$0.05	$0.08	$0.11	$0.11	$0.13	$0.13	$0.14	$1.05
Community Accessibility Assets	$1.11	$1.03	$1.36	$1.92	$1.98	$2.24	$2.31	$2.37	$20.37
Climate Adaptation	$0.97	$1.03	$1.51	$2.22	$2.29	$2.56	$2.64	$2.72	$21.03
Net Zero Carbon	-	-	-	-	-	-	-	-	-
Accessibility	-	-	-	-	-	-	-	-	-
ISC Direct Ask	-	-	-	-	-	-	-	-	-
Total	$8.88	$9.27	$13.48	$19.74	$20.33	$23.01	$23.70	$24.41	$189.63

CLOSING THE INFRASTRUCTURE GAP BY 2030
PRIORITIZATION AND IMPLEMENTATION PLAN

Appendix 3

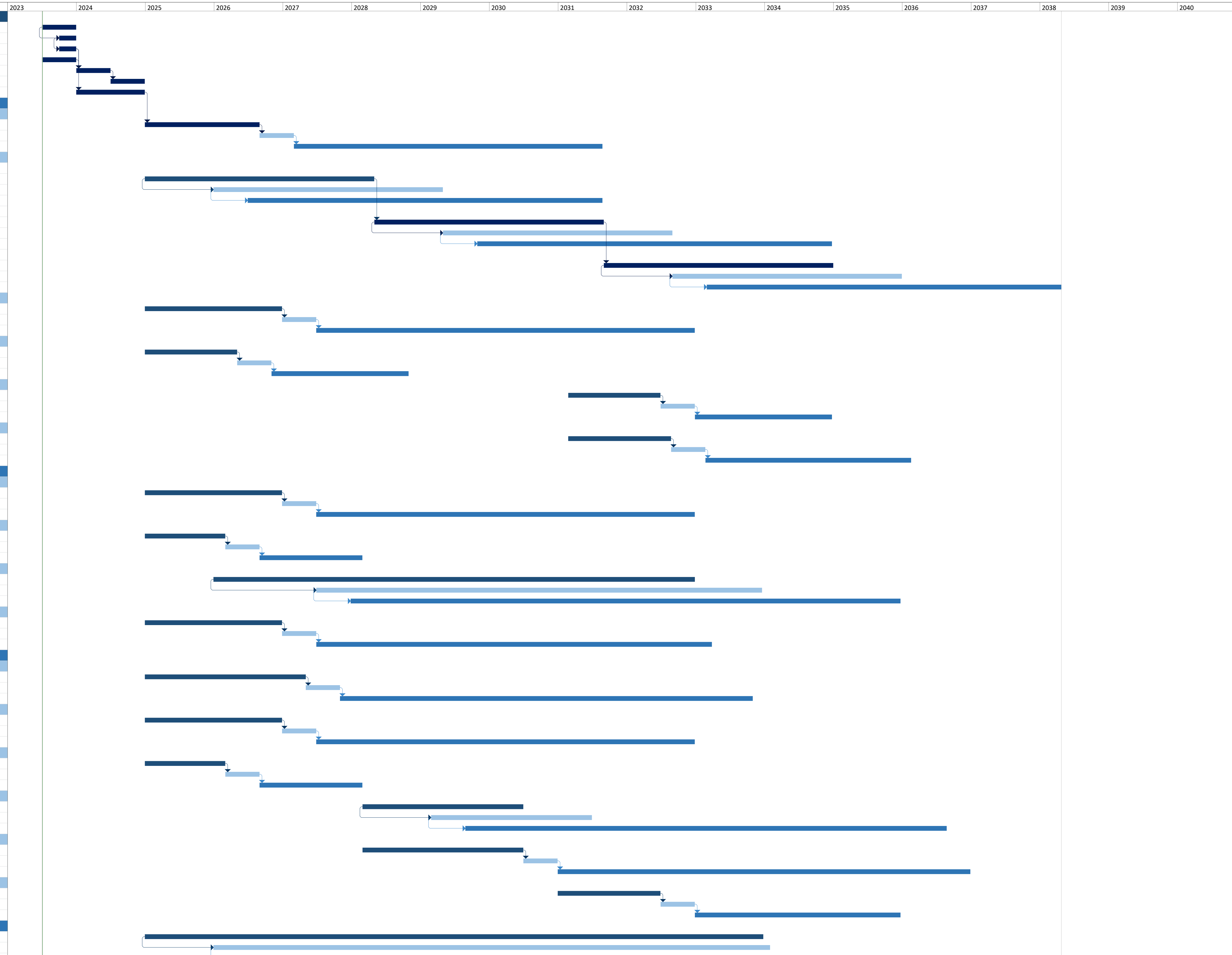
IMPLEMENTATION SCHEDULES – BY REGION



AFN SCHEDULE STRATEGY (ALBERTA)

KEY PROJECT MILESTONES

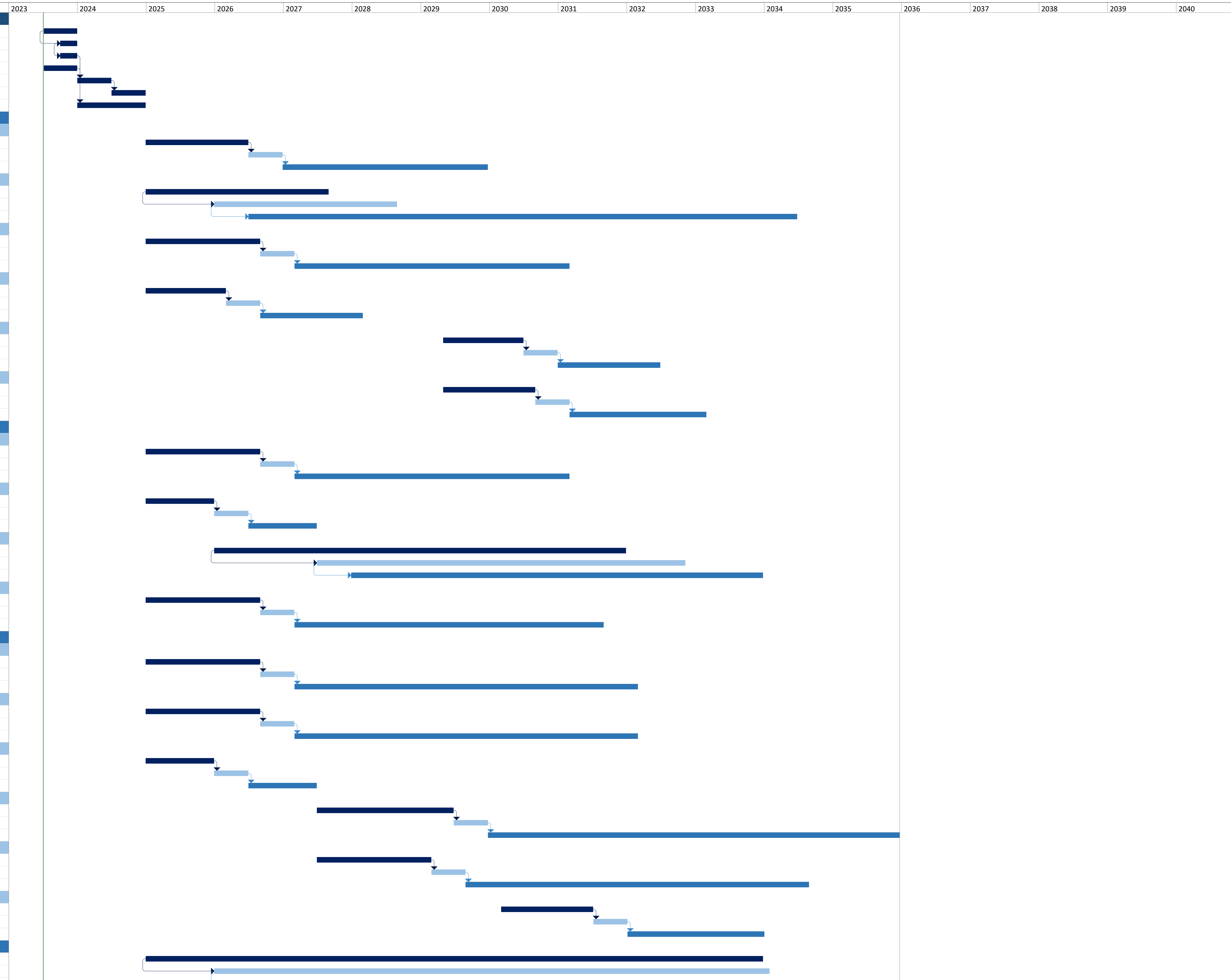
ID	Task Name	Duration	Start	Finish
1	AFN High-Level Schedule Strategy	773 wks	Mon 23-07-03	Fri 38-04-23
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	Prefabricated Construction	695 wks	Mon 24-12-30	Fri 38-04-23
10	Package #1A - Community Assets (Priority 1)	347 wks	Mon 24-12-30	Fri 31-08-22
11	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
12	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
13	Construction	234 wks	Mon 27-03-01	Fri 31-08-22
14	Package #1B - Housing (Priority 3)	695 wks	Mon 24-12-30	Fri 38-04-23
15	Package #1.1B	347 wks	Mon 24-12-30	Fri 31-08-22
16	Planning, Design & Approvals	174 wks	Mon 24-12-30	Fri 28-04-28
17	Procurement	174 wks	Mon 25-12-29	Fri 29-04-27
18	Construction	269 wks	Mon 26-06-29	Fri 31-08-22
19	Package #1.2B	347 wks	Mon 28-05-01	Fri 34-12-22
20	Planning, Design & Approvals	174 wks	Mon 28-05-01	Fri 31-08-29
21	Procurement	174 wks	Mon 29-04-30	Fri 32-08-27
22	Construction	269 wks	Mon 29-10-29	Fri 34-12-22
23	Package #1.3B	347 wks	Mon 31-09-01	Fri 38-04-23
24	Planning, Design & Approvals	174 wks	Mon 31-09-01	Fri 34-12-29
25	Procurement	174 wks	Mon 32-08-30	Fri 35-12-28
26	Construction	269 wks	Mon 33-02-28	Fri 38-04-23
27	Package #1C - Education and Training (Priority 7)	417 wks	Mon 24-12-30	Fri 32-12-24
28	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
29	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
30	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
31	Package #1D - Health (Priority 8)	200 wks	Mon 24-12-30	Fri 28-10-27
32	Planning, Design & Approvals	70 wks	Mon 24-12-30	Fri 26-05-01
33	Procurement	26 wks	Mon 26-05-04	Fri 26-10-30
34	Construction	104 wks	Mon 26-11-02	Fri 28-10-27
35	Package #3A - Social Programs (Priority 10)	200 wks	Mon 31-02-24	Fri 34-12-22
36	Planning, Design & Approvals	70 wks	Mon 31-02-24	Fri 32-06-25
37	Procurement	26 wks	Mon 32-06-28	Fri 32-12-24
38	Construction	104 wks	Mon 32-12-27	Fri 34-12-22
39	Package #3B - Emergency Services (Priority 12)	260 wks	Mon 31-02-24	Fri 36-02-15
40	Planning, Design & Approvals	78 wks	Mon 31-02-24	Fri 32-08-20
41	Procurement	26 wks	Mon 32-08-23	Fri 33-02-18
42	Construction	156 wks	Mon 33-02-21	Fri 36-02-15
43	Linear Construction	573 wks	Mon 24-12-30	Fri 35-12-21
44	Package #2A - Electronic Connectivity (Priority 2)	417 wks	Mon 24-12-30	Fri 32-12-24
45	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
46	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
47	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
48	Package #2B - Drinking Water Advisories (Priority 4)	165 wks	Mon 24-12-30	Fri 28-02-25
49	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
50	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
51	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
52	Package #2C - Community Accessibility Assets (Priority 5)	521 wks	Mon 25-12-29	Fri 35-12-21
53	Planning, Design & Approvals	365 wks	Mon 25-12-29	Fri 32-12-24
54	Procurement	338 wks	Mon 27-06-28	Fri 33-12-16
55	Construction	417 wks	Mon 27-12-27	Fri 35-12-21
56	Package #2D - Transportation Infrastructure (Priority 9)	430 wks	Mon 24-12-30	Fri 33-03-25
57	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
58	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
59	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
60	Infrastructure & Renovation Construction	626 wks	Mon 24-12-30	Fri 36-12-26
61	Package #4A - Waste, Wastewater & Utilities (Priority 6)	461 wks	Mon 24-12-30	Fri 33-10-28
62	Planning, Design & Approvals	122 wks	Mon 24-12-30	Fri 27-04-30
63	Procurement	26 wks	Mon 27-05-03	Fri 27-10-29
64	Construction	313 wks	Mon 27-11-01	Fri 33-10-28
65	Package #4B - Recreation Assets & Cultural Assets (Priority 1	417 wks	Mon 24-12-30	Fri 32-12-24
66	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
67	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
68	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
69	Package #4C - Solid Waste & Recycling (Priority 13)	165 wks	Mon 24-12-30	Fri 28-02-25
70	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
71	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
72	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
73	Package #5A - Climate Adaptation (Priority 14)	443 wks	Mon 28-02-28	Fri 36-08-22
74	Planning, Design & Approvals	122 wks	Mon 28-02-28	Fri 30-06-28
75	Procurement	122 wks	Mon 29-02-26	Fri 31-06-27
76	Construction	365 wks	Mon 29-08-27	Fri 36-08-22
77	Package #5B - Net Zero Carbon (Priority 15)	461 wks	Mon 28-02-28	Fri 36-12-26
78	Planning, Design & Approvals	122 wks	Mon 28-02-28	Fri 30-06-28
79	Procurement	26 wks	Mon 30-07-01	Fri 30-12-27
80	Construction	313 wks	Mon 30-12-30	Fri 36-12-26
81	Package #5C - Accessibility (Priority 16)	260 wks	Mon 30-12-30	Fri 35-12-21
82	Planning, Design & Approvals	78 wks	Mon 30-12-30	Fri 32-06-25
83	Procurement	26 wks	Mon 32-06-28	Fri 32-12-24
84	Construction	156 wks	Mon 32-12-27	Fri 35-12-21
85	ISC Direct Asks	547 wks	Mon 24-12-30	Fri 35-06-22
86	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
87	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
88	Construction	469 wks	Mon 26-06-29	Fri 35-06-22



AFN SCHEDULE STRATEGY (ATLANTIC REGION)

KEY PROJECT MILESTONES

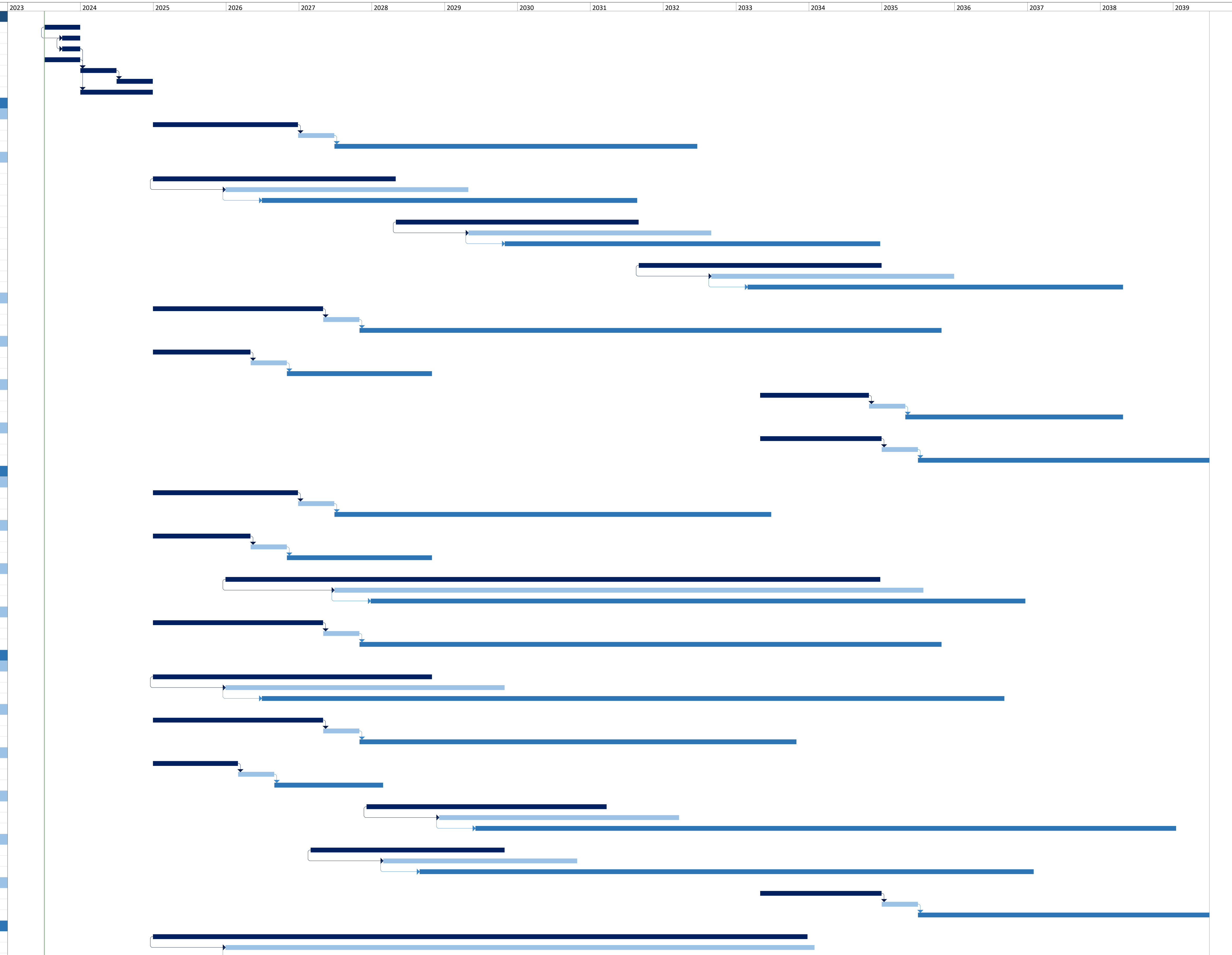
ID	Task Name	Duration	Start	Finish
1	**AFN High-Level Schedule Strategy**	**651 wks**	**Mon 23-07-03**	**Fri 35-12-21**
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	**Prefabricated Construction**	**495 wks**	**Mon 24-12-30**	**Fri 34-06-23**
10	**Package #1A - Community Assets (Priority 1)**	**260 wks**	**Mon 24-12-30**	**Fri 29-12-21**
11	Planning, Design & Approvals	78 wks	Mon 24-12-30	Fri 26-06-26
12	Procurement	26 wks	Mon 26-06-29	Fri 26-12-25
13	Construction	156 wks	Mon 26-12-28	Fri 29-12-21
14	**Package #1B - Housing (Priority 3)**	**495 wks**	**Mon 24-12-30**	**Fri 34-06-23**
15	Planning, Design & Approvals	139 wks	Mon 24-12-30	Fri 27-08-27
16	Procurement	139 wks	Mon 25-12-29	Fri 28-08-25
17	Construction	417 wks	Mon 26-06-29	Fri 34-06-23
18	**Package #1C - Education and Training (Priority 7)**	**322 wks**	**Mon 24-12-30**	**Fri 31-02-28**
19	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
20	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
21	Construction	209 wks	Mon 27-03-01	Fri 31-02-28
22	**Package #1D - Health (Priority 8)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
23	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
24	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
25	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
26	**Package #3A - Social Programs (Priority 10)**	**165 wks**	**Mon 29-04-30**	**Fri 32-06-25**
27	Planning, Design & Approvals	61 wks	Mon 29-04-30	Fri 30-06-28
28	Procurement	26 wks	Mon 30-07-01	Fri 30-12-27
29	Construction	78 wks	Mon 30-12-30	Fri 32-06-25
30	**Package #3B - Emergency Services (Priority 12)**	**200 wks**	**Mon 29-04-30**	**Fri 33-02-25**
31	Planning, Design & Approvals	70 wks	Mon 29-04-30	Fri 30-08-30
32	Procurement	26 wks	Mon 30-09-02	Fri 31-02-28
33	Construction	104 wks	Mon 31-03-03	Fri 33-02-25
34	**Linear Construction**	**469 wks**	**Mon 24-12-30**	**Fri 33-12-23**
35	**Package #2A - Electronic Connectivity (Priority 2)**	**322 wks**	**Mon 24-12-30**	**Fri 31-02-28**
36	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
37	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
38	Construction	209 wks	Mon 27-03-01	Fri 31-02-28
39	**Package #2B - Drinking Water Advisories (Priority 4)**	**130 wks**	**Mon 24-12-30**	**Fri 27-06-25**
40	Planning, Design & Approvals	52 wks	Mon 24-12-30	Fri 25-12-26
41	Procurement	26 wks	Mon 25-12-29	Fri 26-06-26
42	Construction	52 wks	Mon 26-06-29	Fri 27-06-25
43	**Package #2C - Community Accessibility Assets (Priority 5)**	**417 wks**	**Mon 25-12-29**	**Fri 33-12-23**
44	Planning, Design & Approvals	313 wks	Mon 25-12-29	Fri 31-12-26
45	Procurement	280 wks	Mon 27-06-28	Fri 32-11-05
46	Construction	313 wks	Mon 27-12-27	Fri 33-12-23
47	**Package #2D - Transportation Infrastructure (Priority 9)**	**348 wks**	**Mon 24-12-30**	**Fri 31-08-29**
48	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
49	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
50	Construction	235 wks	Mon 27-03-01	Fri 31-08-29
51	**Infrastructure & Renovation Construction**	**573 wks**	**Mon 24-12-30**	**Fri 35-12-21**
52	**Package #4A - Waste, Wastewater & Utilities (Priority 6)**	**374 wks**	**Mon 24-12-30**	**Fri 32-02-27**
53	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
54	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
55	Construction	261 wks	Mon 27-03-01	Fri 32-02-27
56	**Package #4B - Recreation Assets & Cultural Assets (Priority 1**	**374 wks**	**Mon 24-12-30**	**Fri 32-02-27**
57	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
58	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
59	Construction	261 wks	Mon 27-03-01	Fri 32-02-27
60	**Package #4C - Solid Waste & Recycling (Priority 13)**	**130 wks**	**Mon 24-12-30**	**Fri 27-06-25**
61	Planning, Design & Approvals	52 wks	Mon 24-12-30	Fri 25-12-26
62	Procurement	26 wks	Mon 25-12-29	Fri 26-06-26
63	Construction	52 wks	Mon 26-06-29	Fri 27-06-25
64	**Package #5A - Climate Adaptation (Priority 14)**	**443 wks**	**Mon 27-06-28**	**Fri 35-12-21**
65	Planning, Design & Approvals	104 wks	Mon 27-06-28	Fri 29-06-22
66	Procurement	26 wks	Mon 29-06-25	Fri 29-12-21
67	Construction	313 wks	Mon 29-12-24	Fri 35-12-21
68	**Package #5B - Net Zero Carbon (Priority 15)**	**374 wks**	**Mon 27-06-28**	**Fri 34-08-25**
69	Planning, Design & Approvals	87 wks	Mon 27-06-28	Fri 29-02-23
70	Procurement	26 wks	Mon 29-02-26	Fri 29-08-24
71	Construction	261 wks	Mon 29-08-27	Fri 34-08-25
72	**Package #5C - Accessibility (Priority 16)**	**200 wks**	**Mon 30-03-04**	**Fri 33-12-30**
73	Planning, Design & Approvals	70 wks	Mon 30-03-04	Fri 31-07-04
74	Procurement	26 wks	Mon 31-07-07	Fri 32-01-02
75	Construction	104 wks	Mon 32-01-05	Fri 33-12-30
76	**ISC Direct Asks**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
77	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
78	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
79	Construction	469 wks	Mon 26-06-29	Fri 35-06-22



AFN SCHEDULE STRATEGY (BRITISH COLUMBIA)

KEY PROJECT MILESTONES

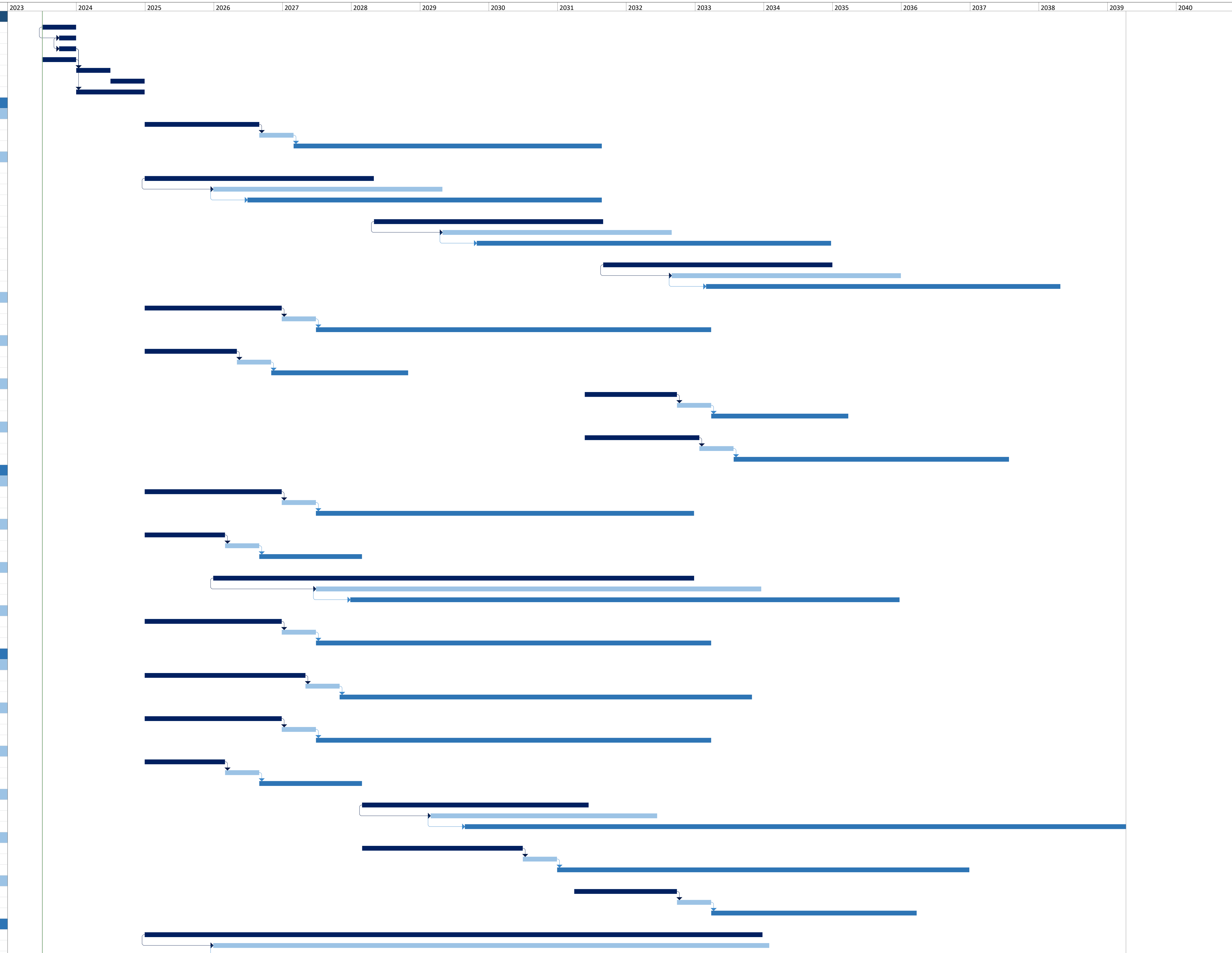
ID	Task Name	Duration	Start	Finish
1	**AFN High-Level Schedule Strategy**	**835 wks**	**Mon 23-07-03**	**Fri 39-07-01**
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	**Prefabricated Construction**	**757 wks**	**Mon 24-12-30**	**Fri 39-07-01**
10	**Package #1A - Community Assets (Priority 1)**	**390 wks**	**Mon 24-12-30**	**Fri 32-06-18**
11	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
12	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
13	Construction	260 wks	Mon 27-06-28	Fri 32-06-18
14	**Package #1B - Housing (Priority 3)**	**695 wks**	**Mon 24-12-30**	**Fri 38-04-23**
15	Package #1.1B	347 wks	Mon 24-12-30	Fri 31-08-22
16	Planning, Design & Approvals	174 wks	Mon 24-12-30	Fri 28-04-28
17	Procurement	174 wks	Mon 25-12-29	Fri 29-04-27
18	Construction	269 wks	Mon 26-06-29	Fri 31-08-22
19	Package #1.2B	347 wks	Mon 28-05-01	Fri 34-12-22
20	Planning, Design & Approvals	174 wks	Mon 28-05-01	Fri 31-08-29
21	Procurement	174 wks	Mon 29-04-30	Fri 32-08-27
22	Construction	269 wks	Mon 29-10-29	Fri 34-12-22
23	Package #1.3B	347 wks	Mon 31-09-01	Fri 38-04-23
24	Planning, Design & Approvals	174 wks	Mon 31-09-01	Fri 34-12-29
25	Procurement	174 wks	Mon 32-08-30	Fri 35-12-28
26	Construction	269 wks	Mon 33-02-28	Fri 38-04-23
27	**Package #1C - Education and Training (Priority 7)**	**565 wks**	**Mon 24-12-30**	**Fri 35-10-26**
28	Planning, Design & Approvals	122 wks	Mon 24-12-30	Fri 27-04-30
29	Procurement	26 wks	Mon 27-05-03	Fri 27-10-29
30	Construction	417 wks	Mon 27-11-01	Fri 35-10-26
31	**Package #1D - Health (Priority 8)**	**200 wks**	**Mon 24-12-30**	**Fri 28-10-27**
32	Planning, Design & Approvals	70 wks	Mon 24-12-30	Fri 26-05-01
33	Procurement	26 wks	Mon 26-05-04	Fri 26-10-30
34	Construction	104 wks	Mon 26-11-02	Fri 28-10-27
35	**Package #3A - Social Programs (Priority 10)**	**260 wks**	**Mon 33-05-02**	**Fri 38-04-23**
36	Planning, Design & Approvals	78 wks	Mon 33-05-02	Fri 34-10-27
37	Procurement	26 wks	Mon 34-10-30	Fri 35-04-27
38	Construction	156 wks	Mon 35-04-30	Fri 38-04-23
39	**Package #3B - Emergency Services (Priority 12)**	**322 wks**	**Mon 33-05-02**	**Fri 39-07-01**
40	Planning, Design & Approvals	87 wks	Mon 33-05-02	Fri 34-12-29
41	Procurement	26 wks	Mon 35-01-01	Fri 35-06-29
42	Construction	209 wks	Mon 35-07-02	Fri 39-07-01
43	**Linear Construction**	**625 wks**	**Mon 24-12-30**	**Fri 36-12-19**
44	**Package #2A - Electronic Connectivity (Priority 2)**	**443 wks**	**Mon 24-12-30**	**Fri 33-06-24**
45	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
46	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
47	Construction	313 wks	Mon 27-06-28	Fri 33-06-24
48	**Package #2B - Drinking Water Advisories (Priority 4)**	**200 wks**	**Mon 24-12-30**	**Fri 28-10-27**
49	Planning, Design & Approvals	70 wks	Mon 24-12-30	Fri 26-05-01
50	Procurement	26 wks	Mon 26-05-04	Fri 26-10-30
51	Construction	104 wks	Mon 26-11-02	Fri 28-10-27
52	**Package #2C - Community Accessibility Assets (Priority 5)**	**573 wks**	**Mon 25-12-29**	**Fri 36-12-19**
53	Planning, Design & Approvals	469 wks	Mon 25-12-29	Fri 34-12-22
54	Procurement	422 wks	Mon 27-06-28	Fri 35-07-27
55	Construction	469 wks	Mon 27-12-27	Fri 36-12-19
56	**Package #2D - Transportation Infrastructure (Priority 9)**	**565 wks**	**Mon 24-12-30**	**Fri 35-10-26**
57	Planning, Design & Approvals	122 wks	Mon 24-12-30	Fri 27-04-30
58	Procurement	26 wks	Mon 27-05-03	Fri 27-10-29
59	Construction	417 wks	Mon 27-11-01	Fri 35-10-26
60	**Infrastructure & Renovation Construction**	**757 wks**	**Mon 24-12-30**	**Fri 39-07-01**
61	**Package #4A - Waste, Wastewater & Utilities (Priority 6)**	**610 wks**	**Mon 24-12-30**	**Fri 36-09-05**
62	Planning, Design & Approvals	200 wks	Mon 24-12-30	Fri 28-10-27
63	Procurement	200 wks	Mon 25-12-29	Fri 29-10-26
64	Construction	532 wks	Mon 26-06-29	Fri 36-09-05
65	**Package #4B - Recreation Assets & Cultural Assets (Priority 1**	**461 wks**	**Mon 24-12-30**	**Fri 33-10-28**
66	Planning, Design & Approvals	122 wks	Mon 24-12-30	Fri 27-04-30
67	Procurement	26 wks	Mon 27-05-03	Fri 27-10-29
68	Construction	313 wks	Mon 27-11-01	Fri 33-10-28
69	**Package #4C - Solid Waste & Recycling (Priority 13)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
70	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
71	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
72	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
73	**Package #5A - Climate Adaptation (Priority 14)**	**580 wks**	**Mon 27-12-06**	**Fri 39-01-14**
74	Planning, Design & Approvals	172 wks	Mon 27-12-06	Fri 31-03-21
75	Procurement	172 wks	Mon 28-12-04	Fri 32-03-19
76	Construction	502 wks	Mon 29-06-04	Fri 39-01-14
77	**Package #5B - Net Zero Carbon (Priority 15)**	**518 wks**	**Mon 27-03-01**	**Fri 37-01-30**
78	Planning, Design & Approvals	139 wks	Mon 27-03-01	Fri 29-10-26
79	Procurement	139 wks	Mon 28-02-28	Fri 30-10-25
80	Construction	440 wks	Mon 28-08-28	Fri 37-01-30
81	**Package #5C - Accessibility (Priority 16)**	**322 wks**	**Mon 33-05-02**	**Fri 39-07-01**
82	Planning, Design & Approvals	87 wks	Mon 33-05-02	Fri 34-12-29
83	Procurement	26 wks	Mon 35-01-01	Fri 35-06-29
84	Construction	209 wks	Mon 35-07-02	Fri 39-07-01
85	**ISC Direct Asks**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
86	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
87	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
88	Construction	469 wks	Mon 26-06-29	Fri 35-06-22



AFN SCHEDULE STRATEGY (MANITOBA)

KEY PROJECT MILESTONES

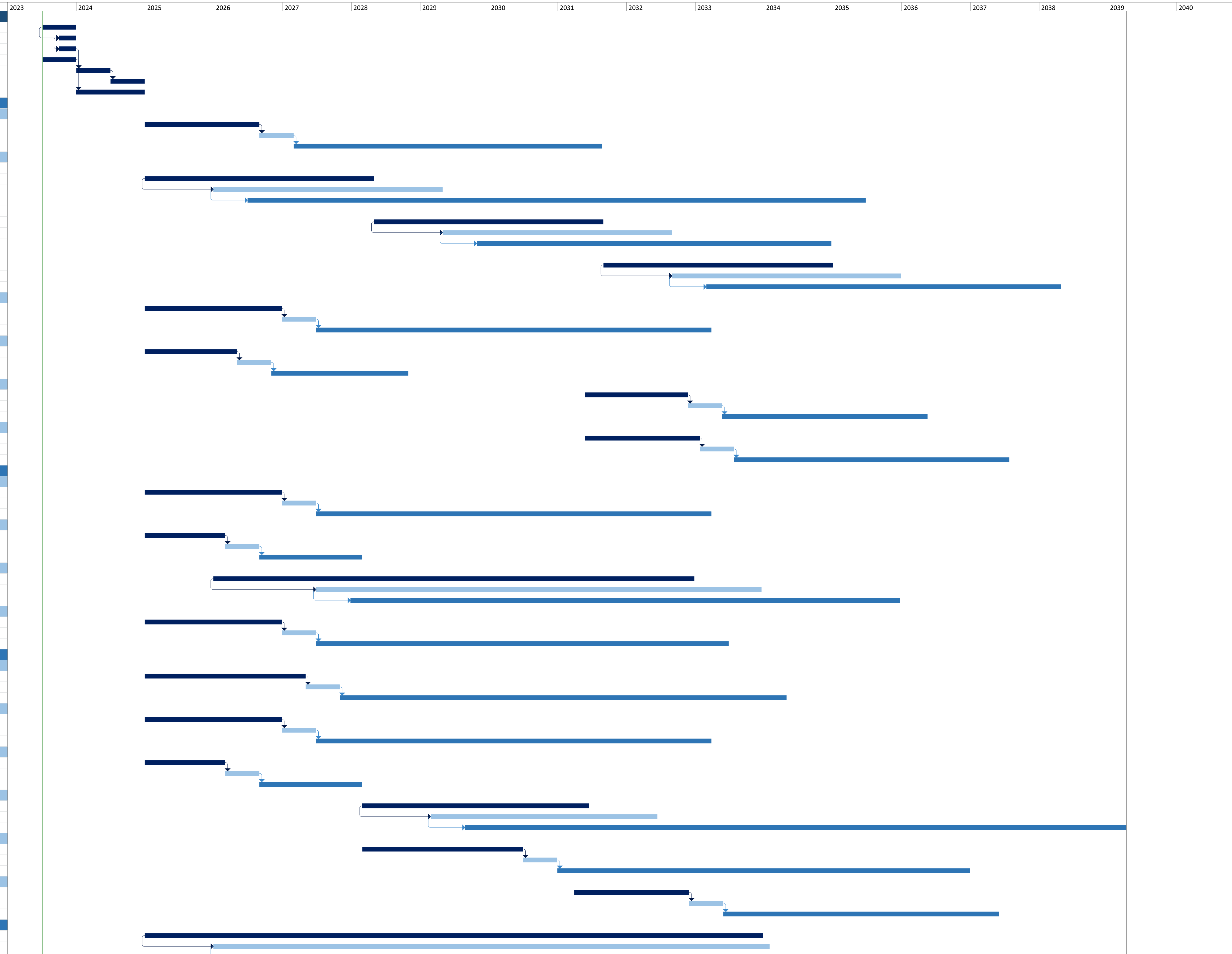
ID	Task Name	Duration	Start	Finish
1	**AFN High-Level Schedule Strategy**	**823 wks**	**Mon 23-07-03**	**Fri 39-04-08**
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	**Prefabricated Construction**	**695 wks**	**Mon 24-12-30**	**Fri 38-04-23**
10	**Package #1A - Community Assets (Priority 1)**	**347 wks**	**Mon 24-12-30**	**Fri 31-08-22**
11	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
12	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
13	Construction	234 wks	Mon 27-03-01	Fri 31-08-22
14	**Package #1B - Housing (Priority 3)**	**695 wks**	**Mon 24-12-30**	**Fri 38-04-23**
15	Package #1.1B	347 wks	Mon 24-12-30	Fri 31-08-22
16	Planning, Design & Approvals	174 wks	Mon 24-12-30	Fri 28-04-28
17	Procurement	174 wks	Mon 25-12-29	Fri 29-04-27
18	Construction	269 wks	Mon 26-06-29	Fri 31-08-22
19	Package #1.2B	347 wks	Mon 28-05-01	Fri 34-12-22
20	Planning, Design & Approvals	174 wks	Mon 28-05-01	Fri 31-08-29
21	Procurement	174 wks	Mon 29-04-30	Fri 32-08-27
22	Construction	269 wks	Mon 29-10-29	Fri 34-12-22
23	Package #1.3B	347 wks	Mon 31-09-01	Fri 38-04-23
24	Planning, Design & Approvals	174 wks	Mon 31-09-01	Fri 34-12-29
25	Procurement	174 wks	Mon 32-08-30	Fri 35-12-28
26	Construction	269 wks	Mon 33-02-28	Fri 38-04-23
27	**Package #1C - Education and Training (Priority 7)**	**430 wks**	**Mon 24-12-30**	**Fri 33-03-25**
28	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
29	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
30	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
31	**Package #1D - Health (Priority 8)**	**200 wks**	**Mon 24-12-30**	**Fri 28-10-27**
32	Planning, Design & Approvals	70 wks	Mon 24-12-30	Fri 26-05-01
33	Procurement	26 wks	Mon 26-05-04	Fri 26-10-30
34	Construction	104 wks	Mon 26-11-02	Fri 28-10-27
35	**Package #3A - Social Programs (Priority 10)**	**200 wks**	**Mon 31-05-26**	**Fri 35-03-23**
36	Planning, Design & Approvals	70 wks	Mon 31-05-26	Fri 32-09-24
37	Procurement	26 wks	Mon 32-09-27	Fri 33-03-25
38	Construction	104 wks	Mon 33-03-28	Fri 35-03-23
39	**Package #3B - Emergency Services (Priority 12)**	**322 wks**	**Mon 31-05-26**	**Fri 37-07-24**
40	Planning, Design & Approvals	87 wks	Mon 31-05-26	Fri 33-01-21
41	Procurement	26 wks	Mon 33-01-24	Fri 33-07-22
42	Construction	209 wks	Mon 33-07-25	Fri 37-07-24
43	**Linear Construction**	**573 wks**	**Mon 24-12-30**	**Fri 35-12-21**
44	**Package #2A - Electronic Connectivity (Priority 2)**	**417 wks**	**Mon 24-12-30**	**Fri 32-12-24**
45	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
46	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
47	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
48	**Package #2B - Drinking Water Advisories (Priority 4)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
49	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
50	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
51	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
52	**Package #2C - Community Accessibility Assets (Priority 5)**	**521 wks**	**Mon 25-12-29**	**Fri 35-12-21**
53	Planning, Design & Approvals	365 wks	Mon 25-12-29	Fri 32-12-24
54	Procurement	338 wks	Mon 27-06-28	Fri 33-12-16
55	Construction	417 wks	Mon 27-12-27	Fri 35-12-21
56	**Package #2D - Transportation Infrastructure (Priority 9)**	**430 wks**	**Mon 24-12-30**	**Fri 33-03-25**
57	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
58	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
59	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
60	**Infrastructure & Renovation Construction**	**745 wks**	**Mon 24-12-30**	**Fri 39-04-08**
61	**Package #4A - Waste, Wastewater & Utilities (Priority 6)**	**461 wks**	**Mon 24-12-30**	**Fri 33-10-28**
62	Planning, Design & Approvals	122 wks	Mon 24-12-30	Fri 27-04-30
63	Procurement	26 wks	Mon 27-05-03	Fri 27-10-29
64	Construction	313 wks	Mon 27-11-01	Fri 33-10-28
65	**Package #4B - Recreation Assets & Cultural Assets (Priority 1:**	**430 wks**	**Mon 24-12-30**	**Fri 33-03-25**
66	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
67	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
68	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
69	**Package #4C - Solid Waste & Recycling (Priority 13)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
70	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
71	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
72	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
73	**Package #5A - Climate Adaptation (Priority 14)**	**580 wks**	**Mon 28-02-28**	**Fri 39-04-08**
74	Planning, Design & Approvals	172 wks	Mon 28-02-28	Fri 31-06-13
75	Procurement	172 wks	Mon 29-02-26	Fri 32-06-11
76	Construction	502 wks	Mon 29-08-27	Fri 39-04-08
77	**Package #5B - Net Zero Carbon (Priority 15)**	**461 wks**	**Mon 28-02-28**	**Fri 36-12-26**
78	Planning, Design & Approvals	122 wks	Mon 28-02-28	Fri 30-06-28
79	Procurement	26 wks	Mon 30-07-01	Fri 30-12-27
80	Construction	313 wks	Mon 30-12-30	Fri 36-12-26
81	**Package #5C - Accessibility (Priority 16)**	**260 wks**	**Mon 31-03-31**	**Fri 36-03-21**
82	Planning, Design & Approvals	78 wks	Mon 31-03-31	Fri 32-09-24
83	Procurement	26 wks	Mon 32-09-27	Fri 33-03-25
84	Construction	156 wks	Mon 33-03-28	Fri 36-03-21
85	**ISC Direct Asks**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
86	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
87	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
88	Construction	469 wks	Mon 26-06-29	Fri 35-06-22



AFN SCHEDULE STRATEGY (ONTARIO)

KEY PROJECT MILESTONES

ID	Task Name	Duration	Start	Finish
1	**AFN High-Level Schedule Strategy**	**823 wks**	**Mon 23-07-03**	**Fri 39-04-08**
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	**Prefabricated Construction**	**695 wks**	**Mon 24-12-30**	**Fri 38-04-23**
10	**Package #1A - Community Assets (Priority 1)**	**347 wks**	**Mon 24-12-30**	**Fri 31-08-22**
11	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
12	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
13	Construction	234 wks	Mon 27-03-01	Fri 31-08-22
14	**Package #1B - Housing (Priority 3)**	**695 wks**	**Mon 24-12-30**	**Fri 38-04-23**
15	Package #1.1B	547 wks	Mon 24-12-30	Fri 35-06-22
16	Planning, Design & Approvals	174 wks	Mon 24-12-30	Fri 28-04-28
17	Procurement	174 wks	Mon 25-12-29	Fri 29-04-27
18	Construction	469 wks	Mon 26-06-29	Fri 35-06-22
19	Package #1.2B	347 wks	Mon 28-05-01	Fri 34-12-22
20	Planning, Design & Approvals	174 wks	Mon 28-05-01	Fri 31-08-29
21	Procurement	174 wks	Mon 29-04-30	Fri 32-08-27
22	Construction	269 wks	Mon 29-10-29	Fri 34-12-22
23	Package #1.3B	347 wks	Mon 31-09-01	Fri 38-04-23
24	Planning, Design & Approvals	174 wks	Mon 31-09-01	Fri 34-12-29
25	Procurement	174 wks	Mon 32-08-30	Fri 35-12-28
26	Construction	269 wks	Mon 33-02-28	Fri 38-04-23
27	**Package #1C - Education and Training (Priority 7)**	**430 wks**	**Mon 24-12-30**	**Fri 33-03-25**
28	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
29	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
30	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
31	**Package #1D - Health (Priority 8)**	**200 wks**	**Mon 24-12-30**	**Fri 28-10-27**
32	Planning, Design & Approvals	70 wks	Mon 24-12-30	Fri 26-05-01
33	Procurement	26 wks	Mon 26-05-04	Fri 26-10-30
34	Construction	104 wks	Mon 26-11-02	Fri 28-10-27
35	**Package #3A - Social Programs (Priority 10)**	**260 wks**	**Mon 31-05-26**	**Fri 36-05-16**
36	Planning, Design & Approvals	78 wks	Mon 31-05-26	Fri 32-11-19
37	Procurement	26 wks	Mon 32-11-22	Fri 33-05-20
38	Construction	156 wks	Mon 33-05-23	Fri 36-05-16
39	**Package #3B - Emergency Services (Priority 12)**	**322 wks**	**Mon 31-05-26**	**Fri 37-07-24**
40	Planning, Design & Approvals	87 wks	Mon 31-05-26	Fri 33-01-21
41	Procurement	26 wks	Mon 33-01-24	Fri 33-07-22
42	Construction	209 wks	Mon 33-07-25	Fri 37-07-24
43	**Linear Construction**	**573 wks**	**Mon 24-12-30**	**Fri 35-12-21**
44	**Package #2A - Electronic Connectivity (Priority 2)**	**430 wks**	**Mon 24-12-30**	**Fri 33-03-25**
45	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
46	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
47	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
48	**Package #2B - Drinking Water Advisories (Priority 4)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
49	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
50	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
51	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
52	**Package #2C - Community Accessibility Assets (Priority 5)**	**521 wks**	**Mon 25-12-29**	**Fri 35-12-21**
53	Planning, Design & Approvals	365 wks	Mon 25-12-29	Fri 32-12-24
54	Procurement	338 wks	Mon 27-06-28	Fri 33-12-16
55	Construction	417 wks	Mon 27-12-27	Fri 35-12-21
56	**Package #2D - Transportation Infrastructure (Priority 9)**	**443 wks**	**Mon 24-12-30**	**Fri 33-06-24**
57	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
58	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
59	Construction	313 wks	Mon 27-06-28	Fri 33-06-24
60	**Infrastructure & Renovation Construction**	**745 wks**	**Mon 24-12-30**	**Fri 39-04-08**
61	**Package #4A - Waste, Wastewater & Utilities (Priority 6)**	**487 wks**	**Mon 24-12-30**	**Fri 34-04-28**
62	Planning, Design & Approvals	122 wks	Mon 24-12-30	Fri 27-04-30
63	Procurement	26 wks	Mon 27-05-03	Fri 27-10-29
64	Construction	339 wks	Mon 27-11-01	Fri 34-04-28
65	**Package #4B - Recreation Assets & Cultural Assets (Priority 1**	**430 wks**	**Mon 24-12-30**	**Fri 33-03-25**
66	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
67	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
68	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
69	**Package #4C - Solid Waste & Recycling (Priority 13)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
70	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
71	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
72	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
73	**Package #5A - Climate Adaptation (Priority 14)**	**580 wks**	**Mon 28-02-28**	**Fri 39-04-08**
74	Planning, Design & Approvals	172 wks	Mon 28-02-28	Fri 31-06-13
75	Procurement	172 wks	Mon 29-02-26	Fri 32-06-11
76	Construction	502 wks	Mon 29-08-27	Fri 39-04-08
77	**Package #5B - Net Zero Carbon (Priority 15)**	**461 wks**	**Mon 28-02-28**	**Fri 36-12-26**
78	Planning, Design & Approvals	122 wks	Mon 28-02-28	Fri 30-06-28
79	Procurement	26 wks	Mon 30-07-01	Fri 30-12-27
80	Construction	313 wks	Mon 30-12-30	Fri 36-12-26
81	**Package #5C - Accessibility (Priority 16)**	**322 wks**	**Mon 31-03-31**	**Fri 37-05-29**
82	Planning, Design & Approvals	87 wks	Mon 31-03-31	Fri 32-11-26
83	Procurement	26 wks	Mon 32-11-29	Fri 33-05-27
84	Construction	209 wks	Mon 33-05-30	Fri 37-05-29
85	**ISC Direct Asks**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
86	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
87	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
88	Construction	469 wks	Mon 26-06-29	Fri 35-06-22



AFN SCHEDULE STRATEGY (QUEBEC)

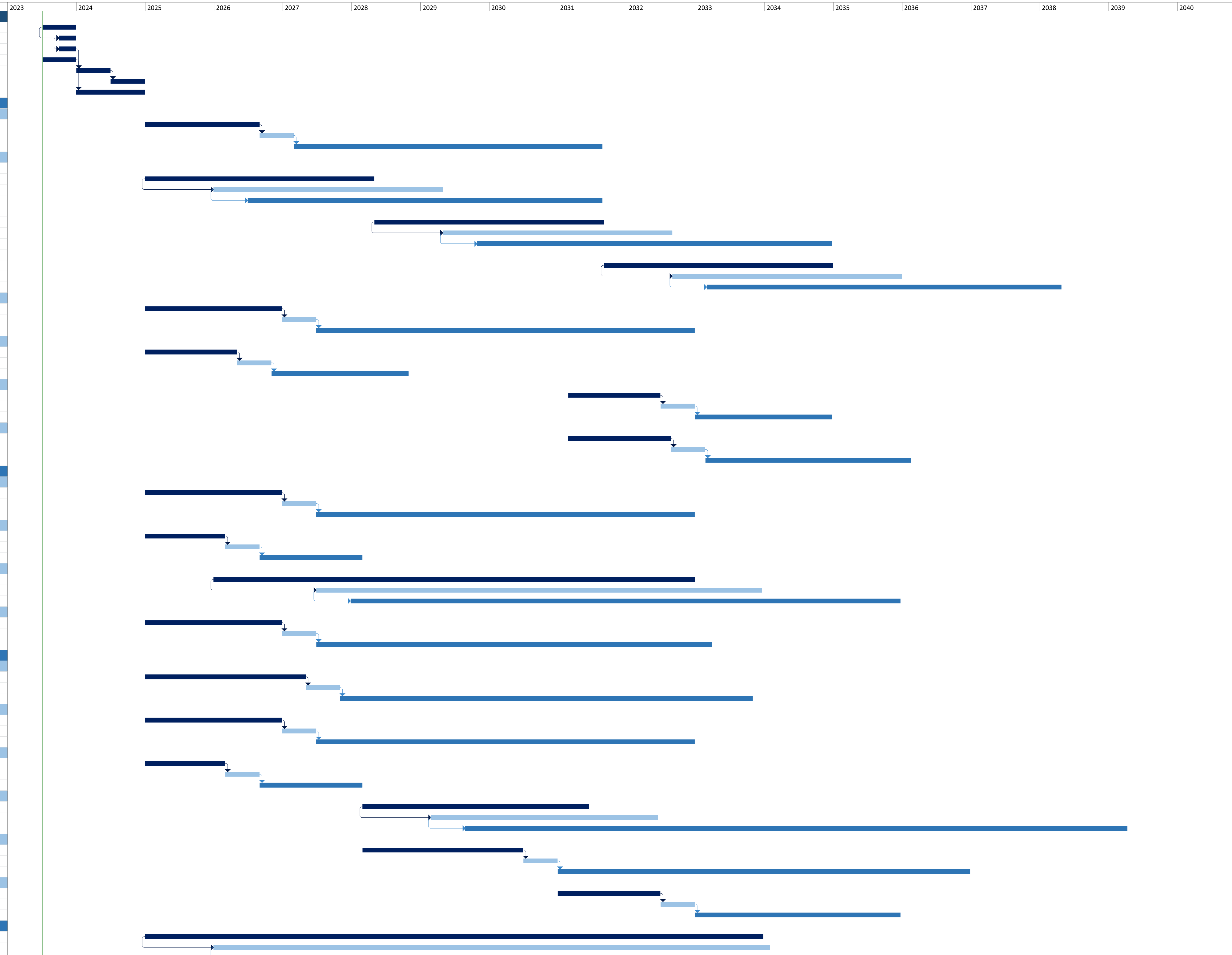
KEY PROJECT MILESTONES

ID	Task Name	Duration	Start	Finish
1	**AFN High-Level Schedule Strategy**	**656 wks**	**Mon 23-07-03**	**Fri 36-01-25**
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	**Prefabricated Construction**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
10	**Package #1A - Community Assets (Priority 1)**	**322 wks**	**Mon 24-12-30**	**Fri 31-02-28**
11	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
12	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
13	Construction	209 wks	Mon 27-03-01	Fri 31-02-28
14	**Package #1B - Housing (Priority 3)**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
15	Planning, Design & Approvals	174 wks	Mon 24-12-30	Fri 28-04-28
16	Procurement	174 wks	Mon 25-12-29	Fri 29-04-27
17	Construction	469 wks	Mon 26-06-29	Fri 35-06-22
18	**Package #1C - Education and Training (Priority 7)**	**374 wks**	**Mon 24-12-30**	**Fri 32-02-27**
19	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
20	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
21	Construction	261 wks	Mon 27-03-01	Fri 32-02-27
22	**Package #1D - Health (Priority 8)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
23	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
24	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
25	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
26	**Package #3A - Social Programs (Priority 10)**	**200 wks**	**Mon 30-04-29**	**Fri 34-02-24**
27	Planning, Design & Approvals	70 wks	Mon 30-04-29	Fri 31-08-29
28	Procurement	26 wks	Mon 31-09-01	Fri 32-02-27
29	Construction	104 wks	Mon 32-03-01	Fri 34-02-24
30	**Package #3B - Emergency Services (Priority 12)**	**260 wks**	**Mon 30-04-29**	**Fri 35-04-20**
31	Planning, Design & Approvals	78 wks	Mon 30-04-29	Fri 31-10-24
32	Procurement	26 wks	Mon 31-10-27	Fri 32-04-23
33	Construction	156 wks	Mon 32-04-26	Fri 35-04-20
34	**Linear Construction**	**573 wks**	**Mon 24-12-30**	**Fri 35-12-21**
35	**Package #2A - Electronic Connectivity (Priority 2)**	**374 wks**	**Mon 24-12-30**	**Fri 32-02-27**
36	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
37	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
38	Construction	261 wks	Mon 27-03-01	Fri 32-02-27
39	**Package #2B - Drinking Water Advisories (Priority 4)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
40	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
41	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
42	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
43	**Package #2C - Community Accessibility Assets (Priority 5)**	**521 wks**	**Mon 25-12-29**	**Fri 35-12-21**
44	Planning, Design & Approvals	365 wks	Mon 25-12-29	Fri 32-12-24
45	Procurement	338 wks	Mon 27-06-28	Fri 33-12-16
46	Construction	417 wks	Mon 27-12-27	Fri 35-12-21
47	**Package #2D - Transportation Infrastructure (Priority 9)**	**417 wks**	**Mon 24-12-30**	**Fri 32-12-24**
48	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
49	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
50	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
51	**Infrastructure & Renovation Construction**	**578 wks**	**Mon 24-12-30**	**Fri 36-01-25**
52	**Package #4A - Waste, Wastewater & Utilities (Priority 6)**	**417 wks**	**Mon 24-12-30**	**Fri 32-12-24**
53	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
54	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
55	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
56	**Package #4B - Recreation Assets & Cultural Assets (Priority 1**	**374 wks**	**Mon 24-12-30**	**Fri 32-02-27**
57	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
58	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
59	Construction	261 wks	Mon 27-03-01	Fri 32-02-27
60	**Package #4C - Solid Waste & Recycling (Priority 13)**	**130 wks**	**Mon 24-12-30**	**Fri 27-06-25**
61	Planning, Design & Approvals	52 wks	Mon 24-12-30	Fri 25-12-26
62	Procurement	26 wks	Mon 25-12-29	Fri 26-06-26
63	Construction	52 wks	Mon 26-06-29	Fri 27-06-25
64	**Package #5A - Climate Adaptation (Priority 14)**	**448 wks**	**Mon 27-06-28**	**Fri 36-01-25**
65	Planning, Design & Approvals	122 wks	Mon 27-06-28	Fri 29-10-26
66	Procurement	26 wks	Mon 29-10-29	Fri 30-04-26
67	Construction	300 wks	Mon 30-04-29	Fri 36-01-25
68	**Package #5B - Net Zero Carbon (Priority 15)**	**443 wks**	**Mon 27-06-28**	**Fri 35-12-21**
69	Planning, Design & Approvals	104 wks	Mon 27-06-28	Fri 29-06-22
70	Procurement	26 wks	Mon 29-06-25	Fri 29-12-21
71	Construction	313 wks	Mon 29-12-24	Fri 35-12-21
72	**Package #5C - Accessibility (Priority 16)**	**260 wks**	**Mon 30-03-04**	**Fri 35-02-23**
73	Planning, Design & Approvals	78 wks	Mon 30-03-04	Fri 31-08-29
74	Procurement	26 wks	Mon 31-09-01	Fri 32-02-27
75	Construction	156 wks	Mon 32-03-01	Fri 35-02-23
76	**ISC Direct Asks**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
77	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
78	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
79	Construction	469 wks	Mon 26-06-29	Fri 35-06-22

AFN SCHEDULE STRATEGY (SASKATCHEWAN)

KEY PROJECT MILESTONES

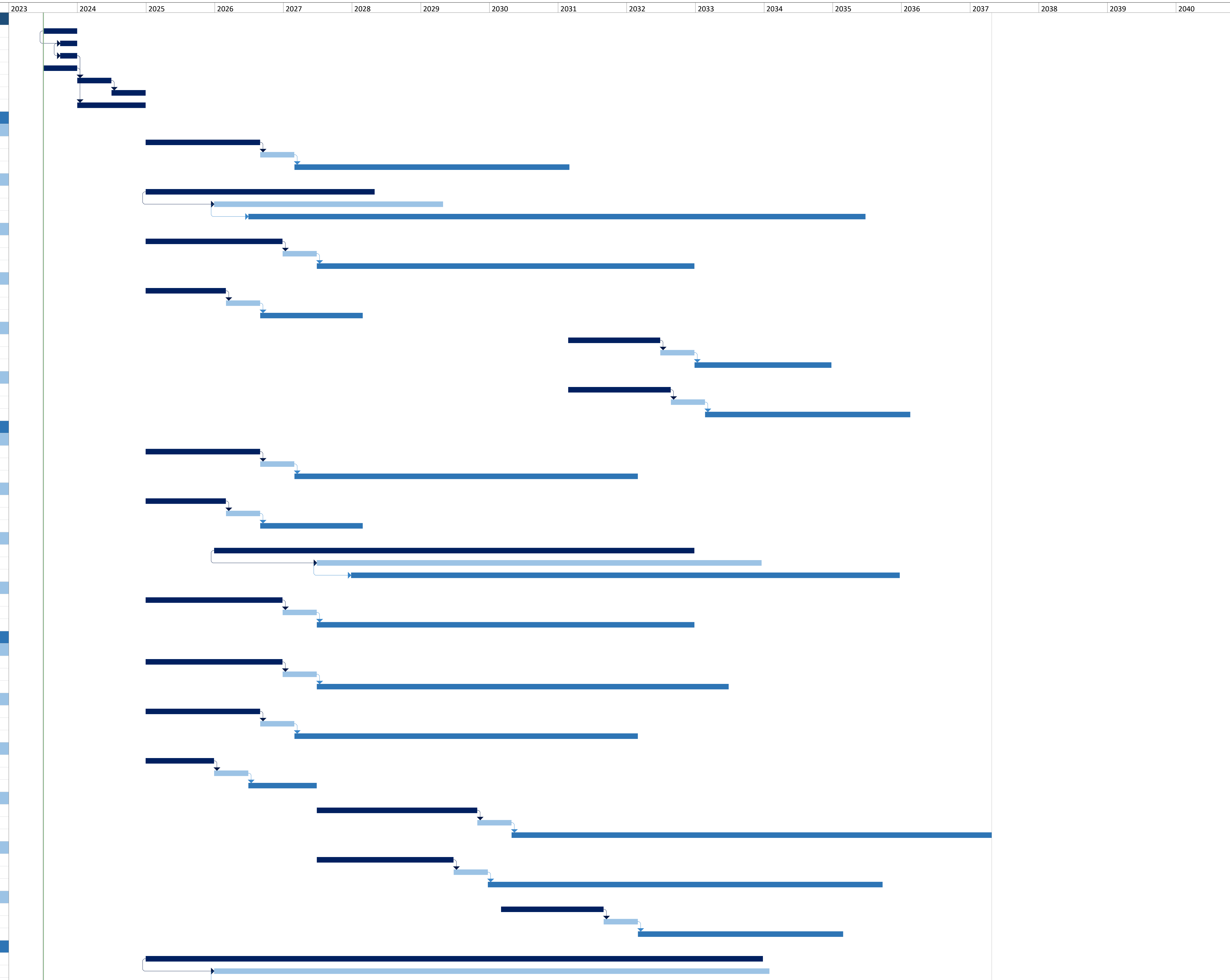
ID	Task Name	Duration	Start	Finish
1	**AFN High-Level Schedule Strategy**	**823 wks**	**Mon 23-07-03**	**Fri 39-04-08**
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	**Prefabricated Construction**	**695 wks**	**Mon 24-12-30**	**Fri 38-04-23**
10	**Package #1A - Community Assets (Priority 1)**	**347 wks**	**Mon 24-12-30**	**Fri 31-08-22**
11	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
12	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
13	Construction	234 wks	Mon 27-03-01	Fri 31-08-22
14	**Package #1B - Housing (Priority 3)**	**695 wks**	**Mon 24-12-30**	**Fri 38-04-23**
15	Package #1.1B	347 wks	Mon 24-12-30	Fri 31-08-22
16	Planning, Design & Approvals	174 wks	Mon 24-12-30	Fri 28-04-28
17	Procurement	174 wks	Mon 25-12-29	Fri 29-04-27
18	Construction	269 wks	Mon 26-06-29	Fri 31-08-22
19	Package #1.2B	347 wks	Mon 28-05-01	Fri 34-12-22
20	Planning, Design & Approvals	174 wks	Mon 28-05-01	Fri 31-08-29
21	Procurement	174 wks	Mon 29-04-30	Fri 32-08-27
22	Construction	269 wks	Mon 29-10-29	Fri 34-12-22
23	Package #1.3B	347 wks	Mon 31-09-01	Fri 38-04-23
24	Planning, Design & Approvals	174 wks	Mon 31-09-01	Fri 34-12-29
25	Procurement	174 wks	Mon 32-08-30	Fri 35-12-28
26	Construction	269 wks	Mon 33-02-28	Fri 38-04-23
27	**Package #1C - Education and Training (Priority 7)**	**417 wks**	**Mon 24-12-30**	**Fri 32-12-24**
28	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
29	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
30	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
31	**Package #1D - Health (Priority 8)**	**200 wks**	**Mon 24-12-30**	**Fri 28-10-27**
32	Planning, Design & Approvals	70 wks	Mon 24-12-30	Fri 26-05-01
33	Procurement	26 wks	Mon 26-05-04	Fri 26-10-30
34	Construction	104 wks	Mon 26-11-02	Fri 28-10-27
35	**Package #3A - Social Programs (Priority 10)**	**200 wks**	**Mon 31-02-24**	**Fri 34-12-22**
36	Planning, Design & Approvals	70 wks	Mon 31-02-24	Fri 32-06-25
37	Procurement	26 wks	Mon 32-06-28	Fri 32-12-24
38	Construction	104 wks	Mon 32-12-27	Fri 34-12-22
39	**Package #3B - Emergency Services (Priority 12)**	**260 wks**	**Mon 31-02-24**	**Fri 36-02-15**
40	Planning, Design & Approvals	78 wks	Mon 31-02-24	Fri 32-08-20
41	Procurement	26 wks	Mon 32-08-23	Fri 33-02-18
42	Construction	156 wks	Mon 33-02-21	Fri 36-02-15
43	**Linear Construction**	**573 wks**	**Mon 24-12-30**	**Fri 35-12-21**
44	**Package #2A - Electronic Connectivity (Priority 2)**	**417 wks**	**Mon 24-12-30**	**Fri 32-12-24**
45	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
46	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
47	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
48	**Package #2B - Drinking Water Advisories (Priority 4)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
49	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
50	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
51	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
52	**Package #2C - Community Accessibility Assets (Priority 5)**	**521 wks**	**Mon 25-12-29**	**Fri 35-12-21**
53	Planning, Design & Approvals	365 wks	Mon 25-12-29	Fri 32-12-24
54	Procurement	338 wks	Mon 27-06-28	Fri 33-12-16
55	Construction	417 wks	Mon 27-12-27	Fri 35-12-21
56	**Package #2D - Transportation Infrastructure (Priority 9)**	**430 wks**	**Mon 24-12-30**	**Fri 33-03-25**
57	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
58	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
59	Construction	300 wks	Mon 27-06-28	Fri 33-03-25
60	**Infrastructure & Renovation Construction**	**745 wks**	**Mon 24-12-30**	**Fri 39-04-08**
61	**Package #4A - Waste, Wastewater & Utilities (Priority 6)**	**461 wks**	**Mon 24-12-30**	**Fri 33-10-28**
62	Planning, Design & Approvals	122 wks	Mon 24-12-30	Fri 27-04-30
63	Procurement	26 wks	Mon 27-05-03	Fri 27-10-29
64	Construction	313 wks	Mon 27-11-01	Fri 33-10-28
65	**Package #4B - Recreation Assets & Cultural Assets (Priority 1**	**417 wks**	**Mon 24-12-30**	**Fri 32-12-24**
66	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
67	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
68	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
69	**Package #4C - Solid Waste & Recycling (Priority 13)**	**165 wks**	**Mon 24-12-30**	**Fri 28-02-25**
70	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
71	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
72	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
73	**Package #5A - Climate Adaptation (Priority 14)**	**580 wks**	**Mon 28-02-28**	**Fri 39-04-08**
74	Planning, Design & Approvals	172 wks	Mon 28-02-28	Fri 31-06-13
75	Procurement	172 wks	Mon 29-02-26	Fri 32-06-11
76	Construction	502 wks	Mon 29-08-27	Fri 39-04-08
77	**Package #5B - Net Zero Carbon (Priority 15)**	**461 wks**	**Mon 28-02-28**	**Fri 36-12-26**
78	Planning, Design & Approvals	122 wks	Mon 28-02-28	Fri 30-06-28
79	Procurement	26 wks	Mon 30-07-01	Fri 30-12-27
80	Construction	313 wks	Mon 30-12-30	Fri 36-12-26
81	**Package #5C - Accessibility (Priority 16)**	**260 wks**	**Mon 30-12-30**	**Fri 35-12-21**
82	Planning, Design & Approvals	78 wks	Mon 30-12-30	Fri 32-06-25
83	Procurement	26 wks	Mon 32-06-28	Fri 32-12-24
84	Construction	156 wks	Mon 32-12-27	Fri 35-12-21
85	**ISC Direct Asks**	**547 wks**	**Mon 24-12-30**	**Fri 35-06-22**
86	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
87	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
88	Construction	469 wks	Mon 26-06-29	Fri 35-06-22



AFN SCHEDULE STRATEGY (YUKON & THE NORTHWEST TERRITORIES)

KEY PROJECT MILESTONES

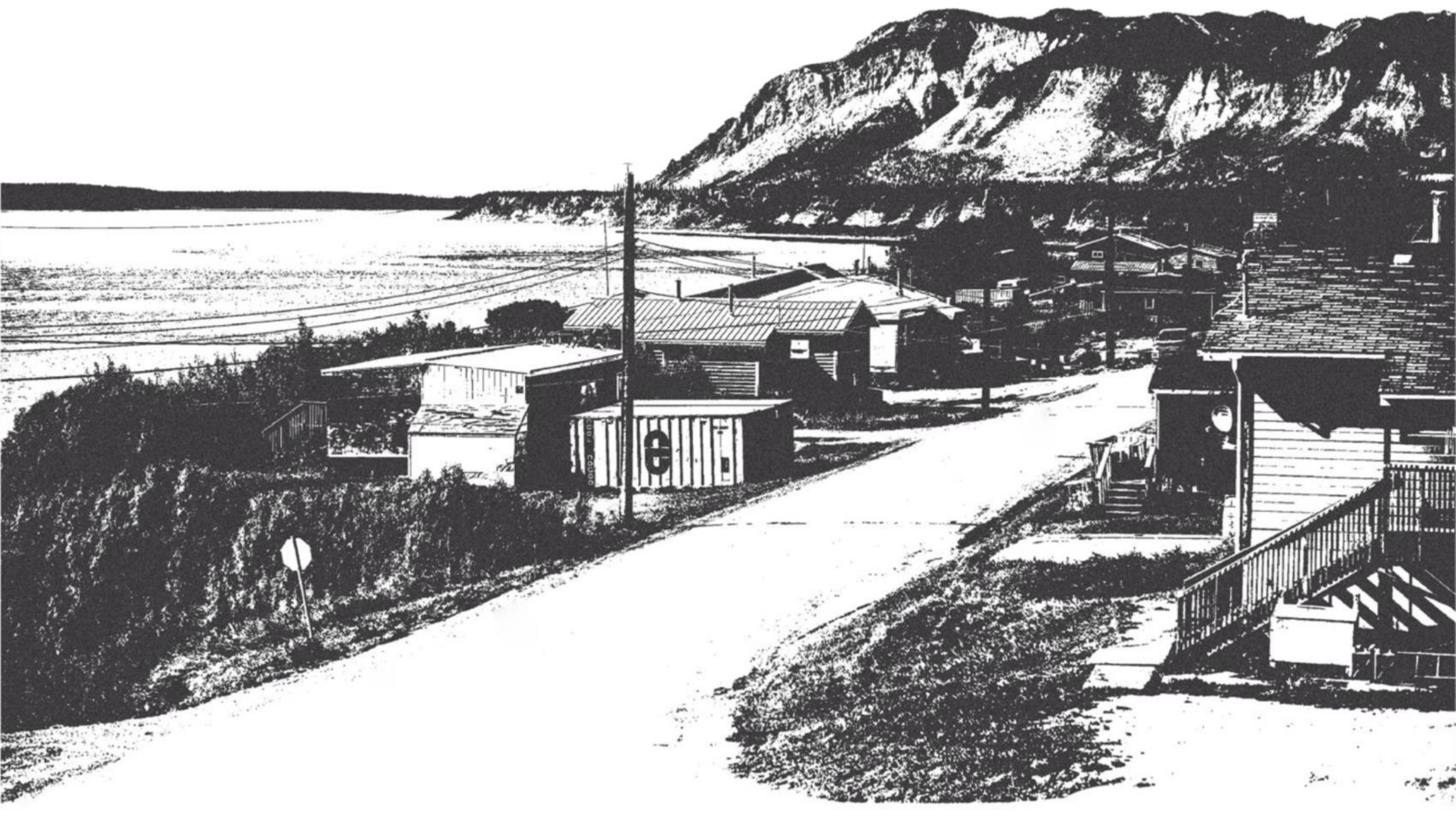
ID	Task Name	Duration	Start	Finish
1	AFN High-Level Schedule Strategy	721 wks	Mon 23-07-03	Fri 37-04-24
2	Establish First Nations Investment Bank	26 wks	Mon 23-07-03	Fri 23-12-29
3	Define Project Governance Structure	13 wks	Mon 23-10-02	Fri 23-12-29
4	Program Planning	13 wks	Mon 23-10-02	Fri 23-12-29
5	Develop Inventory of Existing Asset Conditions	26 wks	Mon 23-07-03	Fri 23-12-29
6	Scope Definition	26 wks	Mon 24-01-01	Fri 24-06-28
7	Procurement of Consultants	26 wks	Mon 24-07-01	Fri 24-12-27
8	Ramp-Up of Modularization Industry	52 wks	Mon 24-01-01	Fri 24-12-27
9	Prefabricated Construction	581 wks	Mon 24-12-30	Fri 36-02-15
10	Package #1A - Community Assets (Priority 1)	322 wks	Mon 24-12-30	Fri 31-02-28
11	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
12	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
13	Construction	209 wks	Mon 27-03-01	Fri 31-02-28
14	Package #1B - Housing (Priority 3)	547 wks	Mon 24-12-30	Fri 35-06-22
15	Planning, Design & Approvals	174 wks	Mon 24-12-30	Fri 28-04-28
16	Procurement	174 wks	Mon 25-12-29	Fri 29-04-27
17	Construction	469 wks	Mon 26-06-29	Fri 35-06-22
18	Package #1C - Education and Training (Priority 7)	417 wks	Mon 24-12-30	Fri 32-12-24
19	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
20	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
21	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
22	Package #1D - Health (Priority 8)	165 wks	Mon 24-12-30	Fri 28-02-25
23	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
24	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
25	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
26	Package #3A - Social Programs (Priority 10)	200 wks	Mon 31-02-24	Fri 34-12-22
27	Planning, Design & Approvals	70 wks	Mon 31-02-24	Fri 32-06-25
28	Procurement	26 wks	Mon 32-06-28	Fri 32-12-24
29	Construction	104 wks	Mon 32-12-27	Fri 34-12-22
30	Package #3B - Emergency Services (Priority 12)	260 wks	Mon 31-02-24	Fri 36-02-15
31	Planning, Design & Approvals	78 wks	Mon 31-02-24	Fri 32-08-20
32	Procurement	26 wks	Mon 32-08-23	Fri 33-02-18
33	Construction	156 wks	Mon 33-02-21	Fri 36-02-15
34	Linear Construction	573 wks	Mon 24-12-30	Fri 35-12-21
35	Package #2A - Electronic Connectivity (Priority 2)	374 wks	Mon 24-12-30	Fri 32-02-27
36	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
37	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
38	Construction	261 wks	Mon 27-03-01	Fri 32-02-27
39	Package #2B - Drinking Water Advisories (Priority 4)	165 wks	Mon 24-12-30	Fri 28-02-25
40	Planning, Design & Approvals	61 wks	Mon 24-12-30	Fri 26-02-27
41	Procurement	26 wks	Mon 26-03-02	Fri 26-08-28
42	Construction	78 wks	Mon 26-08-31	Fri 28-02-25
43	Package #2C - Community Accessibility Assets (Priority 5)	521 wks	Mon 25-12-29	Fri 35-12-21
44	Planning, Design & Approvals	365 wks	Mon 25-12-29	Fri 32-12-24
45	Procurement	338 wks	Mon 27-06-28	Fri 33-12-16
46	Construction	417 wks	Mon 27-12-27	Fri 35-12-21
47	Package #2D - Transportation Infrastructure (Priority 9)	417 wks	Mon 24-12-30	Fri 32-12-24
48	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
49	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
50	Construction	287 wks	Mon 27-06-28	Fri 32-12-24
51	Infrastructure & Renovation Construction	643 wks	Mon 24-12-30	Fri 37-04-24
52	Package #4A - Waste, Wastewater & Utilities (Priority 6)	443 wks	Mon 24-12-30	Fri 33-06-24
53	Planning, Design & Approvals	104 wks	Mon 24-12-30	Fri 26-12-25
54	Procurement	26 wks	Mon 26-12-28	Fri 27-06-25
55	Construction	313 wks	Mon 27-06-28	Fri 33-06-24
56	Package #4B - Recreation Assets & Cultural Assets (Priority 1	374 wks	Mon 24-12-30	Fri 32-02-27
57	Planning, Design & Approvals	87 wks	Mon 24-12-30	Fri 26-08-28
58	Procurement	26 wks	Mon 26-08-31	Fri 27-02-26
59	Construction	261 wks	Mon 27-03-01	Fri 32-02-27
60	Package #4C - Solid Waste & Recycling (Priority 13)	130 wks	Mon 24-12-30	Fri 27-06-25
61	Planning, Design & Approvals	52 wks	Mon 24-12-30	Fri 25-12-26
62	Procurement	26 wks	Mon 25-12-29	Fri 26-06-26
63	Construction	52 wks	Mon 26-06-29	Fri 27-06-25
64	Package #5A - Climate Adaptation (Priority 14)	513 wks	Mon 27-06-28	Fri 37-04-24
65	Planning, Design & Approvals	122 wks	Mon 27-06-28	Fri 29-10-26
66	Procurement	26 wks	Mon 29-10-29	Fri 30-04-26
67	Construction	365 wks	Mon 30-04-29	Fri 37-04-24
68	Package #5B - Net Zero Carbon (Priority 15)	430 wks	Mon 27-06-28	Fri 35-09-21
69	Planning, Design & Approvals	104 wks	Mon 27-06-28	Fri 29-06-22
70	Procurement	26 wks	Mon 29-06-25	Fri 29-12-21
71	Construction	300 wks	Mon 29-12-24	Fri 35-09-21
72	Package #5C - Accessibility (Priority 16)	260 wks	Mon 30-03-04	Fri 35-02-23
73	Planning, Design & Approvals	78 wks	Mon 30-03-04	Fri 31-08-29
74	Procurement	26 wks	Mon 31-09-01	Fri 32-02-27
75	Construction	156 wks	Mon 32-03-01	Fri 35-02-23
76	ISC Direct Asks	547 wks	Mon 24-12-30	Fri 35-06-22
77	Planning, Design & Approvals	469 wks	Mon 24-12-30	Fri 33-12-23
78	Procurement	422 wks	Mon 25-12-29	Fri 34-01-27
79	Construction	469 wks	Mon 26-06-29	Fri 35-06-22



CLOSING THE INFRASTRUCTURE GAP BY 2030
PRIORITIZATION AND IMPLEMENTATION PLAN

Appendix 4

PRIORITIZATION OF ALL SEASON ACCESS ROADS



Contents

1.0 Purpose and Introduction

1.1 Context

Remote First Nations across Canada are currently served by a network of winter roads that seasonally enable tens of thousands of people a short window of road availability to supply essential goods, machinery, building materials and fuel to last throughout the remainder of the year. The winter road network is both expensive to operate and increasingly unreliable as the climate warms.

This investigation builds on the "Closing the Infrastructure Gap by 2030: A Collaborative and Comprehensive Cost Report" to evaluate the all-season access roadway infrastructure needs of remote First Nations communities up to 2030 and beyond.

The vision for this Closing the Infrastructure Gap by 2030 study is an all-season road network that recognizes the context of remote First Nations and addresses immediate needs and supports longer term opportunities for their communities.

Winter Road: a seasonal road built with snow or ice, over land and/or over frozen water (ice road or ice bridge) for the purpose of transportation. Winter Roads can be further categorized into light-duty (under forty tonnes maximum gross vehicle weight) and heavy-duty industrial roads that require a rigorous monitoring program to actively address weaknesses in the ice sheet.

1.2 Drivers and Benefits of All Season Road Development

Closing the infrastructure gap on roads to remote First Nations requires a comprehensive community planning based approach aligned with standards enjoyed by the rest of Canada. The strategy supports addressing the social needs such as connectivity, access to education and healthcare services; economic development; First Nations sovereignty; and supports improved community resilience.

These considerations have been used to establish criteria for prioritizing winter road transitions to all-season roads and are further described in the following sections.

1.2.1 Socio-cultural Connections

Communities accessed by winter roads are, in a word, isolated. They are isolated from other Nations with whom they share cultural or political identity, from basic social services that most of Canada takes for granted, and from the changes that are transforming Canada. While some may welcome this isolation as a means to preserve traditions and culture, others would likely enjoy the opportunity to access government services on their own terms, or to see a movie, or to visit relatives outside the community on a Sunday afternoon.

Improved access to major centres would also enable First Nations to collaborate with outsiders and to keep pace with changing trends in these dynamic times. Canadians regularly benefit from socio-cultural connections and services. Previously isolated First Nation have reported improved socio-cultural connections as a significant outcome of an all-season road network. Consequently, socio-cultural connections present an opportunity and rationale for developing an all-season road.

1.2.2 Economic development opportunities

All-season roads provide access to economic development opportunities. Improved all season road access has historically been established to facilitate access to mines in some jurisdictions such as the Northwest Territories. In these jurisdictions community access is a secondary benefit. Economic development opportunities and the potential for public-private partnerships serve as significant opportunities for converting winter roads to all-season roads.

Economic development opportunities can support the offsetting of capital and operating costs, improving community revenue streams, and improving the business case for the road. Improved access to communities can provide new opportunities for local businesses, tourism and energy generation. While not all communities will wish to act on these potential benefits, others will likely choose to develop private sector partnerships that benefit citizens and the community. Such partnerships can tangibly improve the potential for converting a winter road to an all-season one.

Another dimension of economic opportunity is the ability of roads to help manage the cost of transportation of goods and heavy equipment. Winter roadways are currently necessary to support the growing and changing mobility needs of remote regions, which would otherwise be confined to alternatives such as air or water-based transport. These modes of transport are not efficient for conveying large quantities of goods and heavy equipment or construction materials. Winter roads and access to ground transportation services for remote communities is necessary to their existence.

1.2.3 Sovereignty

First Nation sovereignty is a critical element for closing the infrastructure gap. The need for sovereignty was most recently affirmed by Canada’s endorsement of the United Nations Declaration on the Rights of Indigenous People (UNDRIP), which formally received Royal Assent in 2021, and is now established as a part of Canadian legislation. The UNDRIP Act recognizes the rights of First Nations to create and manage their own affairs and protect their lands, waters, traditions, and culture in the spirit of reconciliation and healing.

Sovereignty is key to ensuring First Nations benefit from all-season roads in the manner that they expect. Recognizing First Nation sovereignty acknowledges that not all communities will wish to become more connected with the rest of Canada and establishes a foundation for prioritizing the conversion of winter roads to an all-season alternative. Sovereignty further requires sufficient capacity for a First Nation to fully participate in decision-making processes and understand the implications of resolutions for their self-determination. Consequently, while sovereignty is a benefit to all Nations, a lack of capacity may impede progress toward it and is acknowledged in this report as a barrier to the development of an all-season road network.

1.2.4 Resilience and Adaptation

When considering transportation infrastructure at a community level, the road network that connects people with goods and services becomes a part of the community fabric and supports community resilience against future uncertainties or challenges. A well-integrated network of roadways connects remote communities with the rest of the region, building a sense of security, helping communities to withstand crises (e.g., food, health, emergencies), and improving their ability to adapt to change.

The changing climate with accelerated warming in more northern areas is already compromising the integrity of ice roads when they are constructed and reducing the winter road season. This in turn only compromises the resilience of communities served. Service disruptions are currently difficult to predict and will increasingly create uncertainty for supply chains. The impact to remote First Nations is a constant and preoccupying focus on managing this uncertainty year after year. The alternative is to provide road networks that are sound, long-lasting, and available to serve the community as needed.

1.3 Screening and Prioritization Approach

Associated has made several assumptions that influence the selection and prioritization of all season road development. The approach applies three screens:

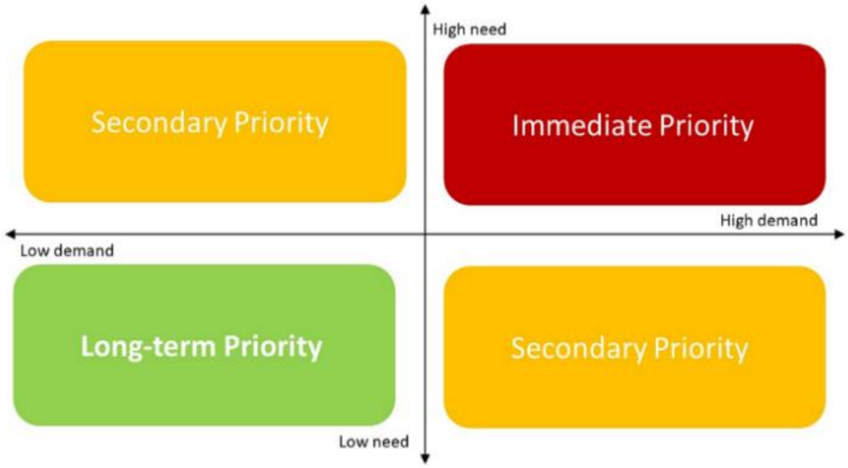
1. **Technical and economic feasibility** – It is assumed that converting a winter road to an all-season alternative is subject to many variables not limited to the technical or economic feasibility of its construction. The road network must be feasible, and it must be appropriate to construct an all-season road corridor across a formerly undisturbed landscape. An absence of environmentally or culturally significant landscape features, topography suitable for road construction, and relatively stable permafrost and/or other ground conditions necessary for the long-term maintenance of the road network, must exist.

2. **Stated demand and support** - A second screen has been established to identify where short-term demand exists on the assumption that engagement, negotiations, and regulatory reviews will be faster for road networks where First Nations have recognized the potential benefits such networks can provide. Evidence for "recognition" has been derived from documented support by isolated First Nations for an all-season conversion of their winter road for economic and/or socio-cultural reasons, where government policy is in support of conversion, and documented partnership opportunities to assist with construction. These reasons all convey momentum over the short-term (i.e., to 2030) necessary to either initiate or conclude regulatory and planning processes necessary for road conversion. A Strengths, Weaknesses, Opportunities, and Threats (SWOT) matrix has been used to identify where demand exists at the provincial scale for this purpose.

3. **Reliability of winter roads** - Associated has looked at the impact of changing climate conditions over the long-term (to 2040) on access periods to suggest where reduced winter road reliability may negatively impact remote First Nations. These longer-term conditions suggest how the need for winter roads may shift in the future and decrease the basic transportation of goods, the provision of emergency support services to isolated communities, and reduce community resilience. Ensuring access to remote communities over the long-term forms the third screen of this report.

Priority road networks identified are characterized by immediate demand and long-term need. Secondary priorities are characterized by either less immediate demand and greater long-term need or by immediate demand and lower long-term need. Long-term priorities are characterized by low demand and low need as indicated in Figure 1-1.

Figure Error! No text of specified style in document.**-1 Priority Matrix for Converting Winter Roads to an All-season Alternative**



1.4 Implementation Considerations

The recommendations of this report work to identify how efforts can be focussed to improve transportation services related to winter road access for all remote First Nations and bring these in-line with the rest of Canada by 2030. A gravel road standard is assumed as the minimum necessary to provide the appropriate level of service for all-season access to these communities. The objective of this report is to establish where, and in what order, winter roads should be converted to a gravel road standard.

The construction of all-season roads requires extensive planning, technical investigation and design, regulatory review, and consultation and is anticipated to take longer than the 7-year period between 2023 and 2030 to deliver robust all-season road networks for remote First Nations. This triggers the need for a longer implementation timeline to 2040.

2.0 Review of Current Practices and Jurisdictions

2.1 Completed and In-Progress All-Season Road Projects

Examining completed all-season road upgrade projects illustrates the timelines necessary for road construction, total construction costs, and required labour. Table 2-1 provides a summary of completed projects. The use of different delivery methods does complicate the question of resource needs but does open up the opportunity for different ownership, construction, and maintenance approaches when compared to traditional design-bid-build projects.

Table 2-1 Known Completed Public All-season Road Projects in Canada (IBI Group, 2016)

Road	Province / Territory	Year Completed	Length (km)	Cost
Tłı̨chǫ Highway	Northwest Territories	2021	97	$185 million plus $7.56 million annual maintenance
Inuvik Tuktoyaktuk Highway	Northwest Territories	2017	138	$300 million plus $1.5 million annual maintenance
PR304 to Berens River Highway	Manitoba	2017	160	$200 million construction cost
Fort Simpson to Wrigley	Northwest Territories	1993	219	Unknown

Table 2-2 indicates projects in progress. These projects are endorsed and supported by the regional government, industry, and First Nations. These roadways present near-term funding opportunities if additional financial support could improve progress.

Table 2-2 Known All Season Roads Projects in Progress

Road	Province / Territory	Progress
Wollaston Lake	Saskatchewan	Political commitment in 2007/8. Began construction in 2020. Currently in the final stages of two-season road and planning for all-season road replacement.
"Project 4" Beren's River to Poplar River	Manitoba	Started in 2011 (planning). Has not progressed after Environment Impact Statement approval in 2017.
"Project 6" Bunibonibee, God's Lake, and Manto Sipi All-Season Road	Manitoba	Started in 2011. Currently seeking Environmental Impact Statement approval. Extension to 2026 required to address concerns and feedback from the Impact Assessment Agency of Canada

Road	Province / Territory	Progress
Mackenzie Valley Highway Project	Northwest Territories	Rolling plans, engagement, and construction have been underway since the highway's conception in the 1960's. (Government of the Northwest Territories, 2013)The Inuvik Tuktoyaktuk Highway is included in this territory spanning corridor. Most recently, 14km of access road from Norman Wells to Canyon Creek opened in 2018.
Slave Geological Province Corridor Project	Northwest Territories	There has been interest in this corridor since mining began in the 1970's. Interest in an all-season road was renewed in 2019 after the federal and territorial governments collaborated to fund planning and environmental studies. Construction of the route is anticipated in three stages. The first stage, from Highway 4 to Lockhart Lake has funding and is underway on environmental and regulatory approvals.
"Ring of Fire" Resource Development Road	Ontario	This route was proposed in 2007 when mining companies discovered significant mineral deposits in the area. Successive governments have shown varying levels of support, notably the Ford government in 2016. Discussions have progressed to the stage that Memorandum of Understandings between the Government of Ontario and affected First Nations were signed in 2022. Marten Falls First Nation and Webequie First Nation are currently performing environmental assessments to connect to the primarily resource development road.

At the current pace of development, no province or territory will provide all-season road access to all First Nations communities before 2100 and emphasizes the importance of effective planning to facilitate road conversion by 2040. Momentum and lessons learned from projects should be carried forward into new projects to improve project delivery.

2.2 All-Season Road Project Timelines

While not all projects follow a stage-gate approach, time is spent in different stages with specific goals/objectives, referred to as stage-gates. Stage-gates are used to ensure projects meet key criteria before progressing ahead of important milestones. Understanding the track record of projects can help identify pitfalls to avoid and provide visibility on the total project delivery timeline. Table 2-3 is Associated's interpretation of the duration of each stage gate, based on available information on each project.

Table 2-3 Analysis of All Season Road Project Timelines

Road	Gate 1: Policy Commitment to Planning and capital funding	Gate 2: Network or Route Planning and community engagement	Gate 3: Engineering Design and permit approvals	Gate 4: Tender and Construction	Total
Tłı̨chǫ Highway	3 years	2 years	2 years	2 years	9 years
Inuvik Tuktoyaktuk Highway	11 years	3 years	concurrent with environmental	4 years	18 years
PR304 to Bloodvein and Berens River	2 years	2 years	concurrent with environmental	3 years to Bloodvein, plus 3 years to Berens River	7 years and 10 years
Wollaston Lake Two then All-Season Access Road	12 years	Not yet begun	Not yet begun	Two-season portion under construction	15+ years

Based on this review, the anticipated project delivery timeline for an all-season roadway is in the range of 9 to 20 years, depending on the roadway length. This expectation further emphasizes the need to start planning all-season road networks simultaneously with the expectation that some projects will be delayed in the planning or design stages while others can move on. This presents further opportunities to fund projects that are "shovel ready."

2.3 Winter Road Inventory

Associated found a total of 74 seasonal road segments in Canada stretching approximately 7689 km as indicated in Table 2 4. There is uncertainty on the total length of winter roads due to the different management approaches and funding models used by provincial and territorial governments. This dispersed responsibility has led to a lack of central knowledge about the winter road network nationally and obscures the situation with regard to their distribution and the services that they provide. The sources of data used for this investigation and are documented in Appendix D.

Table 2-4 Estimated Winter Road Length and Populations by Province and Territory

Province / Territory	Length (km)	Source	Road Count	Population in Winter Road Communities
Alberta	160	(Regional Municipality of Wood Buffalo, 2023)	1	481
Saskatchewan	464	(Government of Saskatchewan, 2022a)	6	3,659
Ontario	3170	(Government of Ontario, 2021)	29	20,510
Manitoba	2197	(Manitoba Infrastructure, 2023)	23	23,331
Northwest Territories	1418	(Government of Northwest Territories, 2023)	11	3,046
Yukon	280	(Government of Yukon, 2022)	1	221
TOTAL	**7689**		**71**	**52,520**

In gathering the above road related information, the owners and operators of the winter roads highlighted that improving technology and construction practices has allowed them to compensate for worsening conditions over the last few decades. However, concerns were also expressed that longer winter road construction times, increased costs, and increased disruptions, are likely if conditions continue to worsen.

2.4 Regional Jurisdiction Review

Associated conducted a high-level regional review of the current winter road and all-season road practices. The regional review has broadly followed a SWOT (strengths, weaknesses, opportunities and threats) type approach that identifies social, environmental, and economic considerations for each region as it relates to all-season roads.

- Strengths – Factors that support the successful construction of an all-season road or a standout characteristic of a region that improve the likelihood of its development such as ready access to gravel to keep construction costs reasonable, economic partnerships to offset costs, or government policy that provides funding.

- Weaknesses – Circumstances that complicate all-season road planning, impede funding or construction, or reduce the attractiveness of the region for all-season roads such as poor economies of scale or complicated regulatory processes.
- Opportunities – Considerations that support the development of all-season roads such as approved plans, demonstrated government support, or documented interest in private partnerships by First Nations.
- Threats – Aspects of a region that reduce the likelihood of an all-season road project being successful and that cannot be easily mitigated, such as low First Nations support for conversion, or the presence of unique environmental or cultural features.

This review was conducted using publicly available data, together with information provided by engineers, road operators and government officials willing to meet in the timespan available for this report. The SWOT findings are a snapshot in time but are subject to change with changing social, environmental, economic and political changes. Further investigation with more stakeholder engagement is recommended.

2.4.1 Established Federal Support for All-Season Roads

The federal government's goal of close the infrastructure gap by 2030 is key to reconciliation with First Nation peoples. The transportation network is foundational to enable more efficient investment in infrastructure (e.g., housing, education, health care facilities) that supports social wellbeing and economic growth. Although essential to closing the infrastructure gap, there is not a clear mechanism for how federal agencies can collaborate internally and achieve this goal closing the infrastructure gap.

Accountability between federal and provincial agencies in toward closing the infrastructure gap as partners or independently is not well defined and, based on conversations with Transport Canada, the complex relationship between federal and provincial governing bodies will continue. Ongoing meetings between federal, provincial and territorial ministers is likely to continue as the primary method for discussing transportation issues along with supporting information on how challenges should be addressed by, and for, First Nations.

Broadly, the Federal government has committed to all-season road access to remote communities in the Transportation 2030 strategic plan, and the National Adaptation Strategy Building Resilient Communities and a Strong Economy 2022. The National Adaptation Strategy commits to funding future transportation networks via a "whole of society" approach. The document identifies roles and responsibilities of the federal government in key contributions to adaptation, building knowledge and capacity, convening partners to coordinate action, and investing in adaptation solutions. Very specifically, the plan identifies Indigenous peoples as key partners who hold rights to lands and territories and are advancing self-determined or self-governed actions.

A refresh of the strategy is currently being conducted to set targets and establish measurable indicators of success. When taken together with Canada's commitment to equity and reconciliation, these two policy directions support the conversion of winter roads to all-season alternatives for First Nations.

Large federal grant programs such as the National Trade Corridors fund, Disaster Mitigation and Adaptation Fund, Canada Community-Building Fund and the First Nations Infrastructure Fund are some of the available programs currently available to obtain infrastructure funding. However, these programs do not necessarily focus on all-season roads at a community level at this time. The challenges of navigating the application process and obtaining the correct information to support a business case are often beyond the capacity of many First Nations. Although these challenges are recognized by Transport Canada, there are no alternatives available.

Grant programs and a case-by-case approach for each project can create a bias toward applicants who understand the process verses those who need the infrastructure. This situation is further complicated by provincial jurisdiction over some winter road rights of way. Federal support for all-season road construction does exist but will require holistic planning to effectively and equitably target road corridors for investment.

2.4.2 Ontario

All-season road projects in Ontario have historically and continue to be driven primarily by resource development, from the Northern Ontario Resource Trail (NORT) in the 1960's, to the Ring of Fire project currently underway. A total of 31 First Nations, over 20,000 people, rely on winter roads in Ontario. These roads are funded by a lump sum payment from the government to individual First Nations in the amount of $6 million per year, for the construction of 3,170 km of winter roads. Communities receive between $15,000 and $600,000 each, with an average of $170,000. The communities receiving these funds are responsible for contracting and collaborating on winter road construction. The lump sum funding is also intended to "support special projects, including bridge improvements, maintenance of crossings and other repairs".

Looking forward, the government of Ontario released the "Connecting the North" report in 2020 (Government of Ontario, 2020). This report outlines six goals and 67 actions to improve transportation in the province. Goal six "Reliable Travel Options for Remote and Far North Communities" includes several actions related to First Nation all-season roads. The Government of Ontario has further committed to supporting Marten Falls and Webequie First Nations complete environmental impact assessments essential to connecting to the 'Ring of Fire' development road. Ontario also committed to funding the long-term maintenance of a road from Weagamow First Nation (North Caribou Lake First Nation) to the Pickle Lake NORT road. The Weagamow First Nation still relies on a 42km stretch of winter road to connect to the NORT.

The Government of Ontario has also committed to initiate the all-season roads strategy for Far North communities, in conjunction with a process to coordinate land use and transportation planning on an ongoing basis, for the 28 First Nations communities not directly mentioned in an action. A Northern Transportation Task Force was established in early 2022 to further this objective (Government of Ontario, 2022). Following up with the task force and the government on their progress is an opportunity to advance conversations with the remaining First Nations in Ontario.

Based on the SWOT analysis, demand for all-season roads in Ontario is supported by many strengths, and subject to some significant weaknesses – including a lack of clear communication with remote First Nation communities. Given the nature of documented threats, including a need for improved coordination between Nations and the province, and the environmental significance associated with the region, this report categorizes road network conversion in Ontario as low priority.

Table -1 Ontario SWOT Analysis

Strengths	Weaknesses
• Existing winter road network that can act as a template for an all-season road network. • Dense network that allows for multiple route options and travel between Nations, not just to an existing highway network.	• Current funding feedback loop and data are sparse. • No centralized data space. Multiple operators so also no central database. No feedback loop from operators to First Nations. • Ontario Ministry of Transportation does not publicize the winter road opening like Manitoba and NWT. • Inconsistent engagement and/or consultation with First Nations. Unknown demand for all-season road conversion.
Opportunities	**Threats**
• Development of Ring-of-Fire road underway which can have co-construction advantages. • Several First Nations located along a Bayshore corridor, allowing for sealift access and a single road alignment. • Closely correlated cultural connections between First Nation communities.	• Lack of coordination between development interests (First Nation and non-First Nation). • Lack of provincial strategy. • Notoriously difficult terrain over which to construct all-season roads likely to escalate design and construction costs. • Lack of streamlined environmental assessment process. • Significant regulatory commitments for environmental conservation in Northern Ontario.

2.4.3 Manitoba

Recent announcements by the Manitoba government have focused on funding the province's winter road system. In 2022, $9.5 Million was committed to northern communities for 2,356 km of seasonal roads serving 30,000 residents in 22 communities. In the past, a strong commitment to develop an all-season surface transportation system to serve communities was laid out in the East Side of Lake Winnipeg (ESLW) Large Area Transportation Network Study, completed in 2011. The study defines preferred road alignments based on robust community engagement, environmental considerations, and socio-economic benefits. The resulting nine projects, operationalizing a total of 872 km of all-season road, was approved by the Province and aimed at serving First Nation communities, at an estimated cost of $3 billion over 30 years. The authority was intended to ensure construction of the all-season road network and oversee "capacity building allowances" in which private companies were to partner with First Nations corporations, providing mentoring and training with the goal that they eventually become independent businesses. Unfortunately, the Manitoba East Side Road Authority overseeing this initiative could only deliver *Project 1: Berens River All-Season Road* before it was dissolved in 2016 due to lack of transparency and poor administrative and accounting practices, as reported by the Manitoba Auditor General.

Manitoba Infrastructure now oversees the ESLW all-season road construction, however progress has stalled on several projects, and no recent announcements for new projects from the study area were found in the public record. A lack of defined plans or current planning processes for all-season roads on the west side of Lake Winnipeg is considered a weakness for this area.

Strengths	Weaknesses
• All-season road engagement led by Manitoba Infrastructure Remote Roads. • East Side Transportation Initiative (ESTI) all-season road Berens River and Bloodvein First Nation completed December 2017. • Approved East Side of Lake Winnipeg (ESLW) Large Area Transportation Study March 31, 2011 (covers southern Manitoba all-season roads) still published on Government of Manitoba website. • Buy-in from First Nations in the southern region. • Environmental Impact Statement (EIS) completed on Project 6 all-season road linking Manto Sipi Cree Nation, Bunibonibee Cree Nation and God's Lake First Nation. • Project 4 all-season road Berens River to Poplar River First Nation assigned a decision to proceed with conditions 2017 in accordance with the Canadian Environmental Assessment Act Environmental Assessment Decision Statement (iaac-aeic.gc.ca)	• Manitoba East Side Road Authority overseeing East Side Transportation Initiative (ESTI) dissolved in 2016 due to poor oversight. • ESLW Large Area Transportation Study timelines identified for nine all-season road projects (872 km) estimated construction from 2016 to 2035. This timeline is not on schedule. • No north region all-season road plans. • Unable to link Projects 4 & 6 (all-season roads in progress) with the original projects and priorities in ESLW LATS 2011. • No progress reports or plans available on higher priority all-season road projects from the ESLW LATS.
Opportunities	**Threats**
• Leverage already endorsed/approved ESLW for all-season roads. • Project 6 all-season road still in Federal approvals (extension to August 28, 2026); can still be finished. • Project 4 all-season road Berens River to Poplar River First Nation completed. • Project 3a all-season road St Theresa Point First Nation to Wasagamack First Nation (on hold awaiting transfer of land from Canada to Manitoba). • Project 7a all-season road from Paugingassi First Nation and Little Grand Rapids First Nation and to little Grand Rapids Airport Project (pending approval by Manitoba Sustainable Development. Submitted in January 2016). • Rapids Airport Project (pending approval by Manitoba Sustainable Development. Submitted in January 2016).	• No recent announcements or commitments to all-season roads after Project 6. • No other ESLW all-season road program still being implemented. • All-season roads no longer a priority for the current Manitoba government.

All-season road conversion in Manitoba is characterized by significant opportunities identified in the SWOT and limited threats. The considerable strengths attributed to the conversion process, including dedicated engagement processes, buy-in from First Nations, and ongoing environmental assessments indicate that a high demand for conversion exists in the province. The major challenge to road conversion in the province appears to be related to transition of leadership and governance for road development. This raises opportunities for First Nation self-determination with regard to their road service.

2.4.4 Northwest Territories

The Northwest Territories (NWT) has long used winter roads and also has a history of converting these roads to the all-season gravel standard envisioned in this report. Successful conversion projects include the Dempster Highway corridor (1979), the Inuvik Tuktoyaktuk Highway Project (2017), and the Tlicho Highway Project (2021). This successful track record and recent experience with road conversion creates an important foundation for future work to connect the Territory's 4,444 residents living in remote communities with the rest of the Territory's road network.

The NWT also has a history of building ice roads to serve industrial development needs. These needs present the opportunity for cost-sharing and public-private partnership (3P) opportunities, which can reduce the economic burden of infrastructure development and the long-term costs associated with their operation and maintenance. In many cases, 3P relationships can make the difference for the economic viability of converting winter roads. The experience of the Government of the Northwest Territories with negotiating 3P relationships, in addition to the established sovereignty of NWT First Nations to influence these negotiations, establishes tangible opportunities for advancing conversion of winter roads.

The NWT has streamlined its environmental assessment process thereby providing certainty with regard to regulatory outcomes and a single portal for consulting with territorial First Nations. This certainty, when combined with public policy in support of winter road conversion to support climate resilience, creates a positive context in which First Nations can negotiate the construction of all-season road connections for their communities. This dynamic has led to openings for several all-season roads and the planning of many more in the Territory when compared to the rest of Canada.

Strengths	Weaknesses
• Two major all-season roads are already far along in planning: Slave Geological Province Corridor and Mackenzie Valley Highway. • Recent all-season road construction means there are local contractors and professionals skilled and knowledgeable in construction of these road types. • Alternative delivery models already been utilized with the ITH (design-build) and T (P3) highway, gov't already familiar with process etc.	• Limited territorial funding. • Access to labour force, could not suddenly build 100's of km. Requires more planning and consistency. • Past focus on all-season road plans toward resource industry. • Mixed support for all-season road conversion expressed by NWT Indigenous communities. Concern noted with regard to impacts of ASR development on caribou habitat. • Low population density driving road connectivity.
Opportunities	**Threats**
• Strong economic forces for all-season roads. • Policy commitment in support of winter road conversion as a potential adaptation to climate change. • Single portal environmental impact assessment process designed to streamline regulatory approvals.	• Higher construction costs. • Shorter construction season.

The strengths and opportunities for all-season road conversions in the NWT suggest this may be a jurisdiction of high priority. However, the low economies of scale associated with the projects presents a significant weakness and may decrease the priority of this jurisdiction as a negotiation priority

2.4.5 Saskatchewan

Three Saskatchewan First Nations do not have all-season highway access: Hatchet Lake, Fond du Lac, and Black Lake. Cumberland House Cree Nation has a winter road providing a second, shorter connection to the highway network in the winter.

Construction is currently underway on a two-season road to connect Hatchet Lake Denesuline Nation to highway 905 in Saskatchewan. This all-season road project was first announced in 2008 by the Government of Saskatchewan, but it was not until Indigenous Services Canada committed $6.5 million to capital funds in 2020 that the interim two-season solution began in earnest (Prince Albert Grand Council et al., 2020). The 104 km road will extend the road access duration to the First Nation by two months. Since 2022 an additional $11 million has been provided by the federal and provincial governments (Government of Saskatchewan, 2022b).

Saskatchewan has one other route identified for conversion to a two-season road. The “Athabasca Seasonal Road” is a 184 km seasonal route connecting Points North to Stony Rapids/Black Lake and is made up by approximately 84 km of overland/ice roads from Stony Rapids to Fond du Lac and approximately 100 km of ice roads from Fond du Lac to Uranium City. This route forms part of a strategic northern road system.

Significant groundworks were performed in 1999 that allowed the more regular opening of this winter road. By 2007, this portion was expected to be upgraded to an all-season, paved standard, and the farther north section of Stony Rapids to Fond du Lac was expected to be upgraded to a gravel standard (Government of Saskatchewan, 2007). None of these projects have begun and the cause of the delay is unclear.

Strengths	Weaknesses
• Northern Saskatchewan has rich uranium deposits necessary for renewed national and provincial interest in small modular reactors. • The Canadian Shield begins further north in the province than in neighbouring Manitoba. Province has developed comprehensive ASR plans for Fond du Lac, and Black Lake and Cumberland House Cree Nation.	• History of statements in support of upgrading to all-season access but without further publicly available plans to deliver. • Saskatchewan is the only jurisdiction to use "two-season" road standard (an intermediary solution between winter and all-season roads). • Past two-season road intended for upgrade to paved standard has remained a two-season road since 1999. • A reactive method of responding to First Nations regarding ASR needs. • The Saskatchewan Ministry of Highways works with local contractors to build and maintain winter roads.
Opportunities	**Threats**
• The primary corridor would provide the most northern link to Alberta and nearby NWT, shortening the all-season route from communities in the mid-north of Saskatchewan to NWT by hundred of kilometres. • Complete the upgrade of the Athabasca Seasonal Road to all-season as planned. Determine funding gap and seek partnerships.	• Lack of progress for scheduled ASR conversions suggest the presence of unarticulated policy or regulatory barriers.

The historical demand for all season road access in combination with the slow progress for their development leads to the conclusion that Saskatchewan First Nations need additional support to advance their concerns. The two-season road standard may also prove problematic given its nature as an interim solution and historic delays moving away from it. If such a standard is acceptable to communities, then it could be an effective strategy to improve access. However, as an intermediate step to an all-season road, they also incur an additional and unnecessary cost and are viewed in this report as a possible threat.

2.4.6 Yukon

Yukon has an extensive all-season road and highway network. There is still a continuing interest in resource development, such as the Yukon Resource Gateway Project (YRGP) (Government of Yukon, 2021). Interestingly, the only recent example of all-season road application found is the private ATAC mining road, which was rejected in 2020 due to issues related to peregrine falcon habitat, negative impacts to moose populations, and relocation of trapping interests (Yukon News, 2020).

The rejection of the ATAC mining company's environmental impact application demonstrates the influence of environmental sensitivity and need to consult with First Nations on the approval of proposed all-season road corridors. Opposition by an affected First Nation, the First Nation of Na'Cho Nyak Dun, is cited as the primary reason for rejecting ATAC's application.

Strengths	Weaknesses
• Extensive highway network in place. • Vuntut Gwitchin First Nation strongly recognizes the climate emergency and have received national attention multiple time sin recent years for their leadership (CBC News, 2020, 2021).	• The one still unconnected First Nation (Vuntut Gwitchin First Nation) is significantly removed from the established network. • Documented impacts to road network attributable to climate change have already decreased construction opportunities. • Existing regulatory policy (North Yukon Land Use Plan) does not necessarily permit construction of an all-season road to Old Crow. • Protection of Porcupine Caribou habitat and environmentally sensitive wetlands/waterways conflicts directly with ASR construction. • Low population density to rationalize the cost of road conversion. • Vuntut Gwitchin First Nations owns majority shares in the airline that serves the community, which offsets the economic benefits of investing in this road network. • No economic partnerships exist to offset the cost of ASR conversion. • No declared need for ASR conversion. While the winter road is not operating perfectly – it is operating within the expectations of the First Nation.
Opportunities	**Threats**
• Vuntut Gwitchin First Nation is self-governing and well-positioned to negotiate route and benefits associated with road construction. • Single portal environmental impact assessment process.	• The Government of Yukon 5-year capital plan 2022-23 does not consider any new access to the Vuntut Gwitchin First Nation. • Regulatory certainty may be complicated by the regional land use planning process.

The SWOT for the Yukon summarizes the limitations of this road network: a significant investment in infrastructure to benefit very few people who do not necessarily rely on it or want it. While there is significant opportunity to construct an all-season road alternative, the lack of demand for it, in tandem with the potential for negative environmental impacts on the Porcupine Caribou herd (among other environmental priorities), suggests that an all-season road connection to Old Crow is not necessarily a priority.

2.4.7 Alberta

Reconciliation in Alberta aims to build stronger relationships with First Nations through steps to improve education and action-taking. Alberta's commitment includes making progress on more than 20 calls to action in education, justice, child welfare, infrastructure, identified by the Truth and Reconciliation Commission of Canada (TRC).

These actions have led to the engagement with First Nation communities and organizations to make informed plans, including the Moose Lake Access Management Plan (2021). This plan provides land use resource development direction for industry and regulators for the Moose Lake 10 km zone, a planning area located approximately 100 km northwest of Fort McMurray in the Lower Athabasca planning region. Undisrupted access road needs specific to First Nations are identified in the plan, including the location of traditionally and culturally important lands and resources. The plan states that the resource development sector seeking an access road/right of way must seek input from First Nation traditional land users, and that prior to undertaking any restoration activity or resource development activity input will also be required.

The plan emphasizes the Moose Lake Trail to provide consistent, reliable and safe access for the Fort McKay First Nation and the Moose Lake reserves. Specific management actions are aimed at reducing use by resource developers. The Moose Lake Technical Advisory Committee (TAC) will be convened by the Government of Alberta as an informal committee to implement the plan. The committee will include the Government of Alberta, Fort McKay First Nation, Fort McKay Métis, and industrial stakeholders.

A Memorandum of Understanding with the Fort McKay Métis Nation Association (FMMNA) captures the spirit of partnership and prosperity between Alberta's government and Indigenous communities. This partnership is meant to increase access to provincial skills training opportunities and better education outcomes. The agreement is a shared vision to work together on infrastructure funding and toward community sustainability. Although no specific direction has been defined for winter road conversion to all-season, these needs have an opportunity to be discussed.

Strengths	Weaknesses
• P3 partnership for the Fort Chipewyan road. • Trust is being built by the Alberta government in recent actions toward reconciliation. • Guiding strategies for the 20-year capital investment plan identify partnerships with Indigenous communities as key. • Resource companies are already funding infrastructure (capital, operations and maintenance) within the RMWB in partnership with the province.	• No history in delivering all-season roadway projects. • No plans approved for ASR timing or costs, considerations.
Opportunities	**Threats**
• Leverage newly formed agreements to consider whether all-season roads apply. • The connection in the northeast of Alberta would provide a corridor over to Uranium City and north to NWT.	• The one First Nation without existing all-season road access (Athabasca Chipewyan First Nation) has not shown united interest in an all-season road.

Alberta is in the preliminary stages of planning road improvements in the province. The Government of Alberta is also working towards modernizing its relationship with provincial First Nations. The initial phase of both endeavours, when combined with the interjurisdictional and multiple uses associated with the conversion of the province's only winter road, suggests that an all-season road in Alberta is a medium priority. The need for additional consultation with the Athabasca Chipewyan First Nation is necessary to further this project.

2.4.8 Prioritizing Regions Result from SWOT

The SWOT assessment suggests that high demand for all-season road conversion exists in Manitoba. Communities in the NWT and Saskatchewan constitute secondary priorities for which high demand could support immediate emphasis for negotiations. An all-season-road connection for the limited road networks in the Yukon and Alberta also constitute a second priority given that circumstances support development of the Old Crow Winter Road and the Fort Chipewyan Road Network, but low or inconsistent demand and environmental challenges may impede their development. Finally, while some priority exists for all-season road networks in Ontario, the lack of cohesive partnerships, funding, and policy create relatively large barriers when compared with the rest of the country. These barriers inhibit the conversion of winter roads and suggest that Ontario is likely a long-term priority unless road network conversion is supported by potential P3 relationships, close socio-cultural connections, and improved economies of scale.

2.5 Winter Road Risk to Climate Change Model

In this section, the engineering standards of winter road construction and climate prediction models are combined to investigate which regional winter road networks are facing a notable decline in their operating windows and suggest which road networks are most vulnerable to a changing climate. A consistent methodology is paramount for relative comparison where previous studies have focused only on certain regions. This information should not however, be used for design and the findings are relevant to within the context of this report.

Associated developed an analytical model with inputs from climate data to estimate future winter road construction and operating season lengths, for a 2020 benchmark, and 2030, 2040, and 2050 projections. Daily average temperature data from 2014 to 2060 for the RCP 8.5 trajectory was collected through PAVICS (Power Analytics and Visualization for Climate Science). Freezing Degree Days (FDD) and Melting Degree Days (MDD) were used to define the start of winter road construction and the end of the winter road operations, with the difference being an indicator for service length. Appendix E expands on the methodology in further detail.

Table 2-6 and **Table 2-7** show the results of applying this method. **Table 2-6** shows the anticipated average change in service days for winter roads by province and territory. Ontario, followed by Manitoba, communities are most at risk of losing the necessary winter road service time required for the resupply of goods, and are expected to experience the greatest loss in social connection. **Table 2-7** shows how the winter road service days are anticipated to reduce over time. By 2050, most winter roads may expect at least two weeks fewer service days.

Table 2-6 Anticipated Average Change in Service and Most At-Risk Winter Roads by Province/Territory by 2040

Province / Territory	Anticipated Average Change in Service Days by 2040	Most at Risk Winter Roads (Anticipated Change in Service Days by 2040)
Ontario	-14 days	1. Temagami (-24 days) 2. Northwest Angle #37 (-21 days) 3. Moose Cree (-21 days)
Manitoba	-10 days	1. Brochet Jct to Lac Brochet (-14 days) 2. PR 280 to Shamattawa (-12 days) 3. Red Sucker Lake Jct to Garden Hill (-12 days)
Saskatchewan	-6 days	1. Cumberland House to Manitoba Border (-9 days) 2. Wollaston Lake (-8 days) 3. Athabasca Seasonal Road (-7 days)
Alberta	-6 days	1. Fort Chipewyan Winter Road (-6 days)
Northwest Territories	-1 day	1. Dettah Ice Road (-7 days) 2. Gamètì Winter Road (-5 days) 3. Wekweètì Winter Road (-5 days)
Yukon	+3 days	1. Old Crow Private Winter Road (+3 days)

Table 2-7 Winter Roads at Risk by Future Years

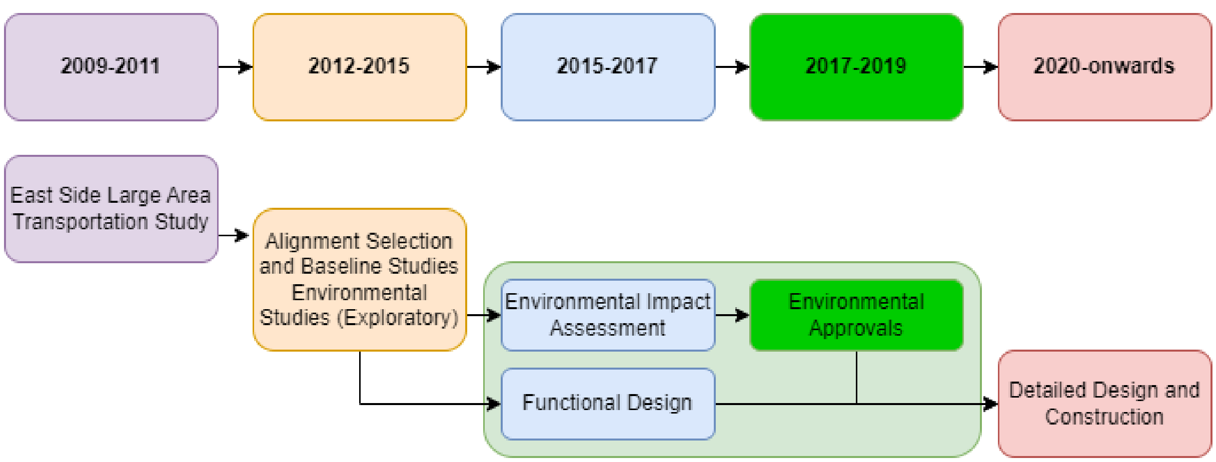
Anticipated Average Loss of Service	Number of Winter Roads at risk by 2030's	%	Number of Winter Roads at risk by 2040's	%	Number of Winter Roads at risk by 2050's	%
More than four weeks	0	0%	0	0%	3	5%
More than three weeks	0	0%	1	2%	8	13%
More than two weeks	4	6%	6	9%	37	60%
One to two weeks	43	67%	45	69%	10	16%
Less than one week	17	27%	13	20%	4	6%

The model found no significant change in the service opening range or standard deviation. However, recent reports and conversations with First Nations suggest that even the current variation in winter road service length causes supply issues and community anxiety, and increased variability is likely to occur due to climate change. Roads at risk to disruption over periods between 2 and 3 weeks by 2040 have therefore been characterized as high need.

2.6 Short-term, Medium-term, and Long-term Estimated Redevelopment Costs

Error! Reference source not found. demonstrates a typical winter road project schedule. The four stages are: Large Area Study, Alignment Selection, concurrent environmental impact assessment plus approvals and detailed design, and construction.

Figure 2-1 Example Timeline for an All-Season Road Project from Manitoba Project 6



Continuing the unit cost estimate for the construction of an all-season road of $2.804 million per kilometre, Associated leveraged internal expert opinion to estimate costs for each project stage (Associated Engineering, 2022a).

Table -2 **Project Stage Cost Planning Approximations**

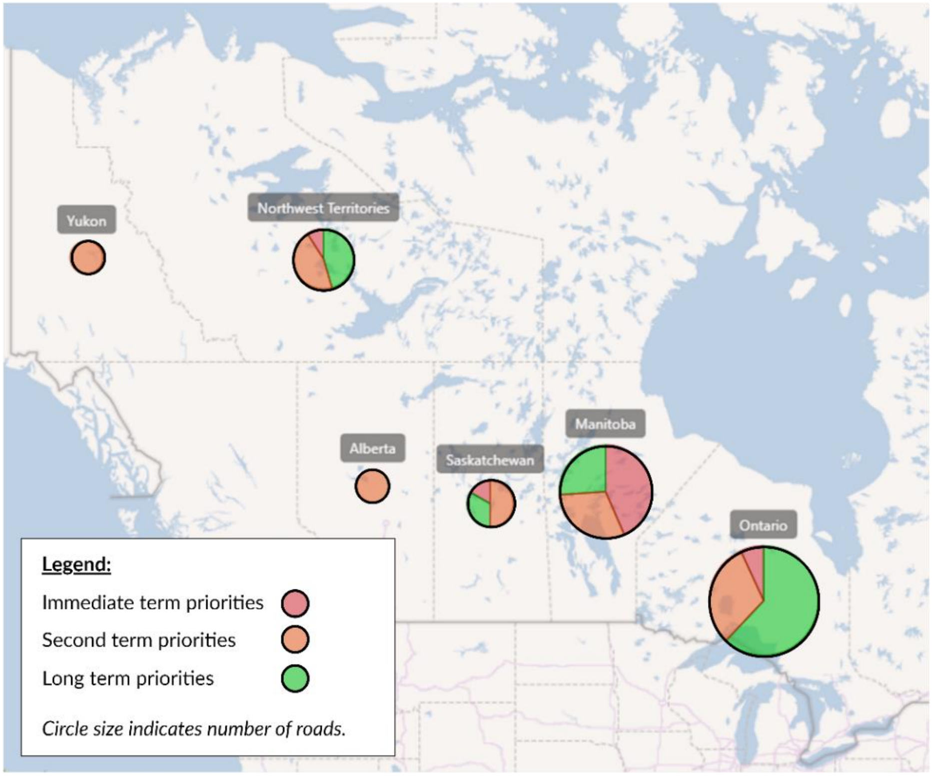
Project Stage	$ million per kilometre	% of Construction
Large Area Plan	0.07	2.5%
Alignment Plan	0.07	2.5%
EIA & Design	0.56	20.0%
Construction	2.8	100%
TOTAL	**3.5**	**125%**

These values provide context and scale to the prioritization and the scale and schedule of investment required.

3.0 Conclusions

There are clear social and economic reasons related to demand and need that rationalize the development of all-season roads to First Nations communities. The SWOT analysis exercise identified regions and roads of high demand due to past plans, First Nation interest, committed support, and co-development opportunities. Further details are described in section 2.4. Supplementary to this qualitative analysis, the climate model highlights communities that may not be able to rely on current winter roads for annual resupply and community connectivity moving forward. Communities at higher risk to climate change and with high demand for all season connectivity should be prioritized.

Figure 3-1 shows the distribution of all-season road upgrade priorities by province and territory.



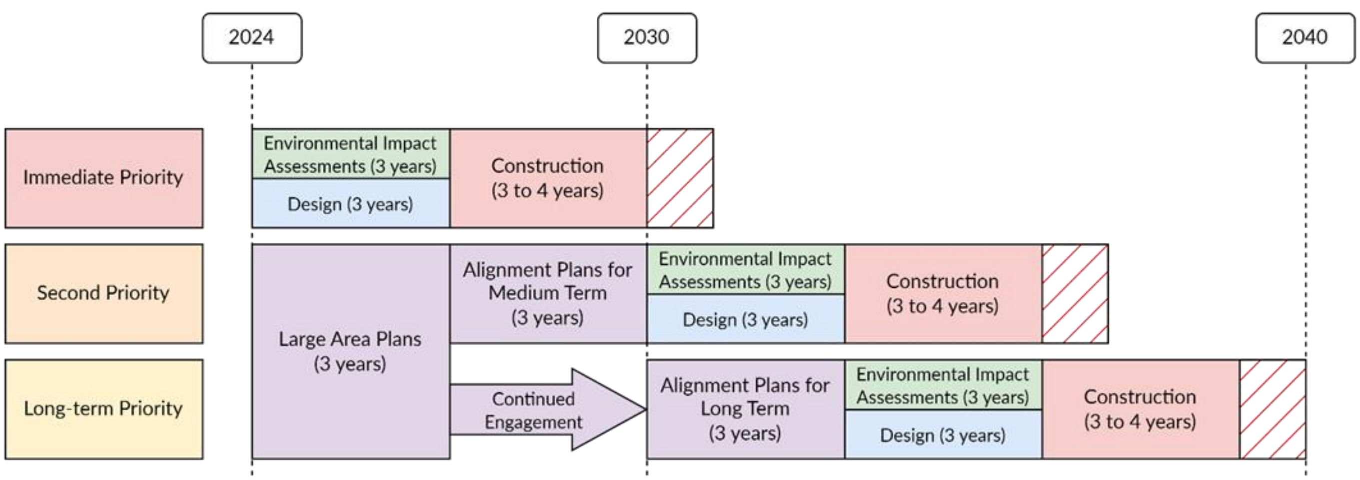
The analysis suggests that Manitoba has the greatest demand, given recent and ongoing plans for all-season roads. Roads in Manitoba are also at a high relative risk of climate change disruptions. Communities in Saskatchewan also have a demand for all-season access and an average climate disruption risk. No actionable plans are publicized, therefore routes in Saskatchewan will require support as a second-term priority to move beyond the two-season roads currently being delivered. The NWT has strong plans and policies that result in strong, available opportunity for investment. However, routes thus far are among the least susceptible to climate disruption, therefore also classified as a second-term priority.

Ontario has the most complex regulatory and political environment, and the demand and opportunity to deploy infrastructure investment for all-season conversion is low, except in the context of mining opportunities. However, in Ontario a number of winter roads are the most susceptible to climate disruption, the need for conversion may outpace planning and construction unless they are purposefully prioritized in the near term. A large area network plan and First Nation engagement should begin immediately to prepare for these all-season road conversions and identify the impacts for the province.

Finally, communities in Alberta and the Yukon that are still without all-season road access have expressed comfort with the current winter road connectivity, and these winter roads are at the least risk of disruption. While these communities are considered secondary priorities, due to the lack of significant barriers for all-season road construction they could easily be long-term priorities as dictated by engagement and the wishes of the communities themselves.

Figure 3-2 shows how these projects could be scheduled. Immediate priorities represent past projects with strong political backing and follow-through (see Table 2 3). Such conditions are necessary for all-season roads to be delivered by 2030. Moreover, the large area planning will be essential for equitable and effective delivery of second term and long-term priority all-season roads.

Figure 3-2 Recommended Timeline for All Season Road Projects by Priority



A large area plan, like the East Side Transportation Initiative plan in Manitoba, is intended to identify the regional all-season road networks, preferred alignments for each route, consider ways to reduce road length and costs, and additional social, economic, and environmental factors for road prioritization. The current funding model on a road-by-road basis is unable to realize economies of scale benefits and therefore, more costly overall in addition to being less equitable.

Once large area plans are completed, studies to support permitting and regulatory approvals can then be undertaken for networks identified as secondary and long-term priorities with work starting on planned all-season roads over the next decade. Achieving the timelines of the schedule could accomplish all-season road connections to all First Nation communities that desire them by 2040 assuming availability of labour and capacity in the marketplace for engineering and construction services.

The proposed project schedule informs the investment schedule for all-season road conversion by 2040. Figure 3 3 and Figure 3 4 show how the costs approximated per stage from Table 2 8 would progress over time if the schedule in Figure 3 2 were strictly followed for all roads. The cumulative cost shows that approximately $5.2 billion is necessary by 2030 to accelerate the completion of immediate-term priority projects, complete large area plans for the second and long-term priorities and confirm route alignment for second-term priorities.

Figure 3-3 Investment Schedule by Priority

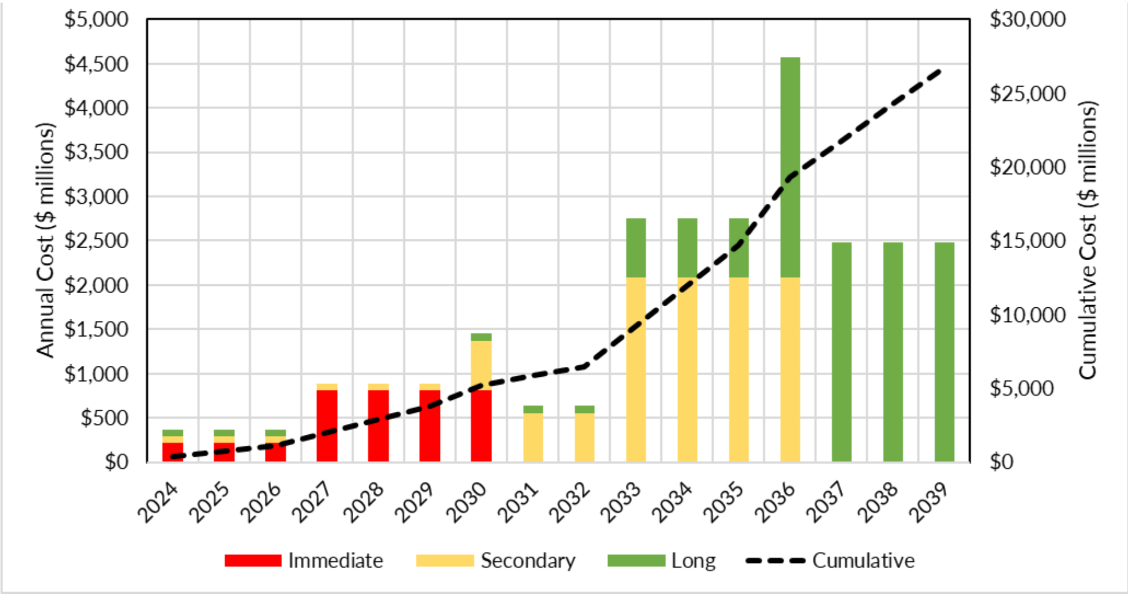
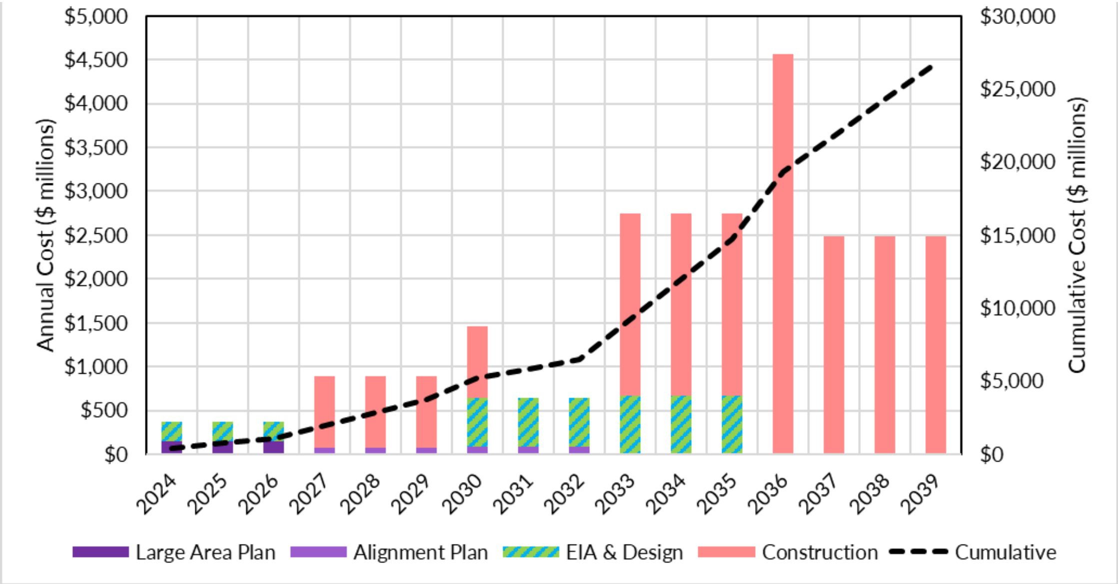


Figure 3-4 Investment Schedule by Activity



Associated has estimated that construction timelines will require a four-year period based on past projects. The four-year period does impact the proposed investment schedule for 2030 and 2036, creating a spike in total investment in those years. Opportunities to begin permitting such as environmental impact assessments, design, or even construction of second-term priority projects should be pursued if they become possible over the period leading up to 2030 and would lead to some smoothing of the investment schedule.

Approximately $9.5 billion is required between 2030 and 2036 to complete necessary studies including environmental assessments obtain approvals to proceed, complete detailed designs, and begin construction for the second term-priorities. These funds also enable the completion of alignment plans, environmental assessments, and detailed designs for the long-term priorities by 2036. A final $12 billion is required to complete construction for the second and long-term priorities by 2040. These values are all presented in 2023-dollar values and do not account for inflation, contingency, or increased cost due to regional variation in material and labour availability.

3.1 Recommendations

Over the course of the investigations supporting this report, Associated noted several best practices and opportunities that may facilitate the vision and timeline for all-season road conversion nation wide. These best practices have informed our recommendations. Put simply focusing on engagement with Fist Nations communities should be an immediate priority, with subsequent steps taken to initiate large area planning, and environmental impact assessments and other studies as circumstances allow. Table 3 1 shows the communities of immediate priority to engage regarding the ongoing plans for all-season roads and relative risk of their current winter roads to climate change.

Table 3-1 Immediate Priority Communities by Jurisdiction

Province / Territory	Immediate Priority Communities	Province / Territory	Immediate Priority Communities
Manitoba	• Garden Hill First Nations • Wasagamack First Nation • Manto Sipi Cree Nation • Bunibonibee Cree Nation • Little Grand Rapids • Pauingassi First Nation • God's Lake First Nation • Red Sucker Lake	Ontario	• Martin Falls • Webequie
		Saskatchewan	• Hatchet Lake
		Northwest Territories	• Tulita Dene

Large area plans are proposed as a critical step for proceeding with geotechnical investigations, studies (environmental, historical, archeological) necessary to support engineering design, tendering and construction, and for effective collaboration with First Nations. The plans are a means to identify the proposed network of roads, route options, prioritization criteria, and to clearly communicate the most preferred routes for the area. Plan recommendations can then be leveraged to inform funding allocation, sequencing, help to steer conversations around alternative deliver options.

Environmental impact assessments and other studies that require regulatory approvals are a second necessary step for the implementation of all-season road projects. The contents and needs of these assessments and studies vary by jurisdiction and as such frequently a barrier or cause of delays. Mechanisms and methods to streamline these assessments and studies should be investigated whilst acknowledging legislated requirements and responsibilities.

Establishing a separate provincial or territorial authority to manage the all-season road network build-out is not advised. The experience of the East Side Transportation Authority demonstrates the susceptibility of such organizations being decommissioned due to duplication of some tasks with existing government departments. The development of all-season roads should be the responsibility of existing government agencies and ideally, with expanded capacity.

An alternative responsible agency may be a novel First Nation transportation authority. This option would increase the sovereignty of First Nations and empower those needing to tailor ASR projects to meet specific needs. This method may also further promote First Nations involvement in project delivery, as is the case for Hatchet/Wollaston lake, where the prime contractor for the two-season road is partially owned by the community. Such a task will be another step to building First Nations' self-governance capacity that can be continued to other infrastructure project management in the future.

Similarly, even without the development of such a First Nations-owned transportation authority, Associated recommends the sharing of best practises between First Nations on the topic of all-season and winter roads as projects progress. Such information sharing will allow ongoing lessons learned to develop into best practises potentially adopted across the country. The resulting outcomes will benefit First Nations and counter one of the core challenges of winter to all-season road conversion: the limited sharing of information across provinces where the Provincial governments have sole responsibility for road development.

Large area planning and future scheduling may also consider co-development opportunities with other service infrastructure, such as telecommunications. Appendix G shows the telecommunications access that winter road serviced communities. Communities with no reliable internet access may given higher priority for an all-season road given efficiencies and cost savings resulting from the construction of both the road and fibre access at networks at the same time.

An example of such a co-development opportunity is the Northwest Angle communities, which have a poor telecommunications backbone, and have been identified as a medium-term investment priority by for all season road conversion. The installation of a telecommunications backbone could be considered during the planning of the all-season road and could present a reason to deliver this road ahead of other second-tier priorities. Associated recommends consideration of internet connectivity be integrated in the large-area planning for all-season roads.

3.2 Next Steps

This report constitutes another step toward Closing the Infrastructure Gap by 2030. This cross-Canada investigation into a highly regionalized topic on converting winter roads to all-season roads has consolidated and interpreted challenges and opportunities within jurisdictions in a way not presented before. The recommendations at this strategic level are limited by the nature of publicly available data, the limitations on time and research, inherent uncertainties of Canada's climate future, and the changing nature of the political landscape. Next steps that can build on the momentum of the report findings include:

- A rigorous investigation of the implications of climate change on the operating window for winter roads serving those most at risk First Nations. Our report findings provide some insight into reduced operating days without quantifying their actual impact on winter road construction. In reality, the number of operating days is further decreased by the time it takes to build the kilometres of portage or ice road sections within the winter road. The length of portage on a winter road greatly increases construction timelines and therefore further decreasing the operating days for goods movement. An additional resilience strategy for the winter road may be needed to offset the risk of operating days if there is a clear indication that the ASR may not be constructed in time.

- Developing frameworks and plans for community engagement with identified immediate priority First Nations in Ontario, Manitoba, Saskatchewan and Northwest Territories to establish effective start/ end dates and/or confirm activities related to planning and approval processes. Opportunities for cost sharing and alternative deliver options should also be considered at this time.

- Interviews with provincial highway ministries and authorities to further inform the proposed timeline and refine where necessary. The estimated timelines provided in the report are informed by past projects and do not necessarily reflect changes in provincial priorities for all-season roads. Having open conversations with individual regions can provide key insights into development processes and identify resources needs, such as labour availability, unique to each jurisdiction thereby ensuring proposed timelines reflect the realities in specific regions. Large highway projects that are approved for funding should be noted for construction timelines. Provincial authorities can help identify the location, date and potential impacts to all-season road projects (if any). Holistic planning for materials and labour availability in mind will contribute to successful outcomes.

- Interviews with past all-season road project delivery teams, owners, engineer, contractors and First Nation communities to compile lessons learned for the purpose of developing best practices for all-season road development. The resulting best practices can inform technical processes, skills development, in addition to the articulation of roles and responsibilities. A regular presentation of these findings with opportunities for questions from First Nations is further recommended.

- Secure funding for large area plans for First Nations regions that are without approved plans. Roads within a common region can be further prioritize in the study using multiple account evaluation or multi-criteria weighted decision matrix frameworks that enable the inclusion of additional parameters for stakeholders to evaluate options for route alignment. It should be assumed that most ASR alignments will not follow the same footprint as the previously constructed winter roads. Opportunities to involve private sector stakeholders in decision making and cost sharing should occur at this level of planning.

References

Associated Engineering. (2022a). *Assembly of First Nations-Closing the Infrastructure Gap by 2030 Reducing Climate Risk*. www.northernpolicy.ca/article/weathering-winter-roads-%E2%80%93-what-is-the-best-route-1354.asp

Associated Engineering. (2022b). *Closing the Infrastructure Gap by 2030: A Collaborative and Comprehensive Cost Report Identifying the Infrastructure Investment Needs of Canada's First Nations*.

Canadian Climate Institute. (2022). *Facing the Cost of Climate Change for Northern Infrastructure*.

CBC News. (2020, February 19). *Yukon First Nations declare climate emergency*. https://www.cbc.ca/news/canada/north/yukon-first-nations-climate-change-1.5468701

CBC News. (2021, November 8). *In taking action on climate, this Arctic community wants to be a beacon to the world* . https://www.cbc.ca/news/old-crow-yukon-climate-change-1.6238750

Government of Canada. (2019). *Changes in Snow, Ice, and Permafrost Across Canada*.

Government of Northwest Territories. (2015). *Guideline for Safe Ice Construction 2015*.

Government of Northwest Territories. (2023). *Highways, Ferries, and Winter Roads* | *Infrastructure*. https://www.inf.gov.nt.ca/en/transportation

Government of Ontario. (2020). *Connecting the North*.

Government of Ontario. (2021). *Ontario Making Long-Term Investment in Winter Roads Network* | *Ontario Newsroom*. https://news.ontario.ca/en/backgrounder/59951/ontario-making-long-term-investment-in-winter-roads-network

Government of Ontario. (2022, January 21). *Ontario Launches Northern Transportation Task Force*. https://news.ontario.ca/en/release/1001458/ontario-launches-northern-transportation-task-force

Government of Saskatchewan. (2007). *Ice Road Construction Underway In Far North*. https://www.saskatchewan.ca/government/news-and-media/2007/february/08/ice-road-construction-underway-in-far-north

Government of Saskatchewan. (2022a). *Ice roads and winter roads*. https://www.saskatchewan.ca/residents/transportation/highways/winter-roads

Government of Saskatchewan. (2022b, January 17). *Premier Commits to Completing Saskatchewan's Portion of the La Loche to Fort McMurray All-Weather Road* | *News and Media* | *Government of Saskatchewan*. https://www.saskatchewan.ca/government/news-and-media/2022/january/17/premier-commits-to-completing-saskatchewans-portion-of-the-la-loche-to-fort-mcmurray-allweather-road

Government of the Northwest Territories. (2013). *Mackenzie Valley Highway Terms of Reference for the Environmental Assessment*.

Government of Yukon. (2021). *Learn about the Yukon Resource Gateway Program* | *Government of Yukon*. https://yukon.ca/en/doing-business/funding-and-support-business/learn-about-yukon-resource-gateway-project

Government of Yukon. (2022). *Old Crow winter road is complete | Government of Yukon*. https://yukon.ca/en/news/old-crow-winter-road-complete

Hori, Y., Cheng, V. Y. S., Gough, W. A., Jien, J. Y., & Tsuji, L. J. S. (2018). Implications of projected climate change on winter road systems in Ontario's Far North, Canada. *Climatic Change*, *148*(1–2), 109–122. https://doi.org/10.1007/s10584-018-2178-2

IBI Group. (2016). *Highways and Roads Technical Backgrounder Northern Ontario Multimodal Transportation Strategy*.

Manitoba Infrastructure. (2023). *Winter Roads in Manitoba*. https://www.gov.mb.ca/mit/winter/reports.html

National Research Council of Canada. (2022). *Winter Road Climate Risk and Vulnerability Research*.

Prince Albert Grand Council, Indigenous Services Canada, & Government of Saskatchewan. (2020). *Media Release For Immediate Release Saskatchewan Communities of Wollaston Lake and Hatchet Lake Denesuline First Nation to get Seasonal Road*.

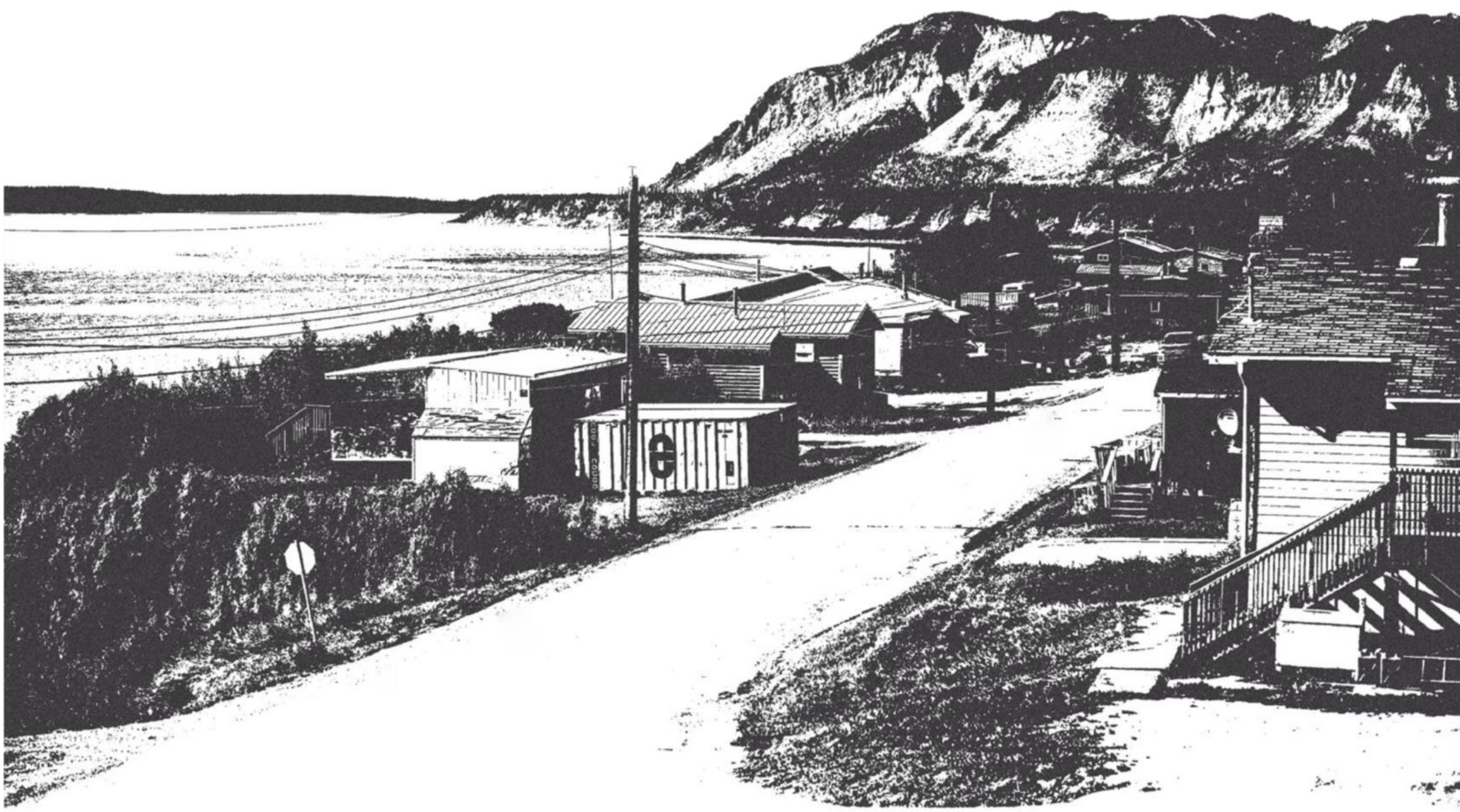
Regional Municipality of Wood Buffalo. (2023). *Winter Roads*. https://www.rmwb.ca/en/roads-and-construction/winter-roads.aspx#How-long-are-the-winter-roads

Yukon News. (2020). *Government rejects ATAC mining road proposal north of Keno City - Yukon News*. https://www.yukon-news.com/news/government-rejects-atac-mining-road-proposal-north-of-keno-city/

CLOSING THE INFRASTRUCTURE GAP
PRIORITIZATION OF ALL-SEASON ACCESS ROADS

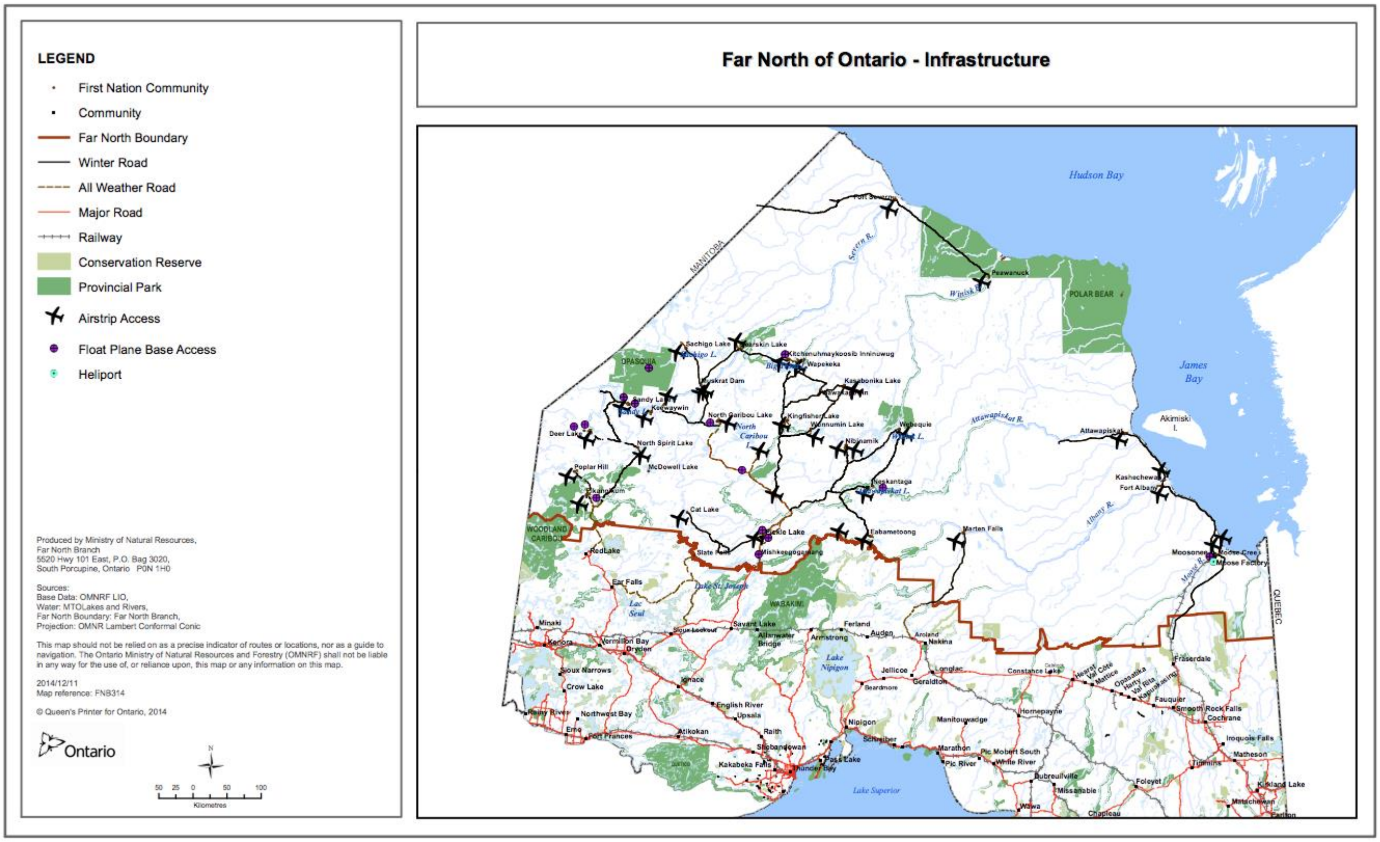
Appendix A

SOURCED MAPS



A-1: ONTARIO

Figure 3-1 Ontario Winter Road Network



A-2: MANITOBA

Figure 1-2 Northern Region of Winter Roads in Manitoba

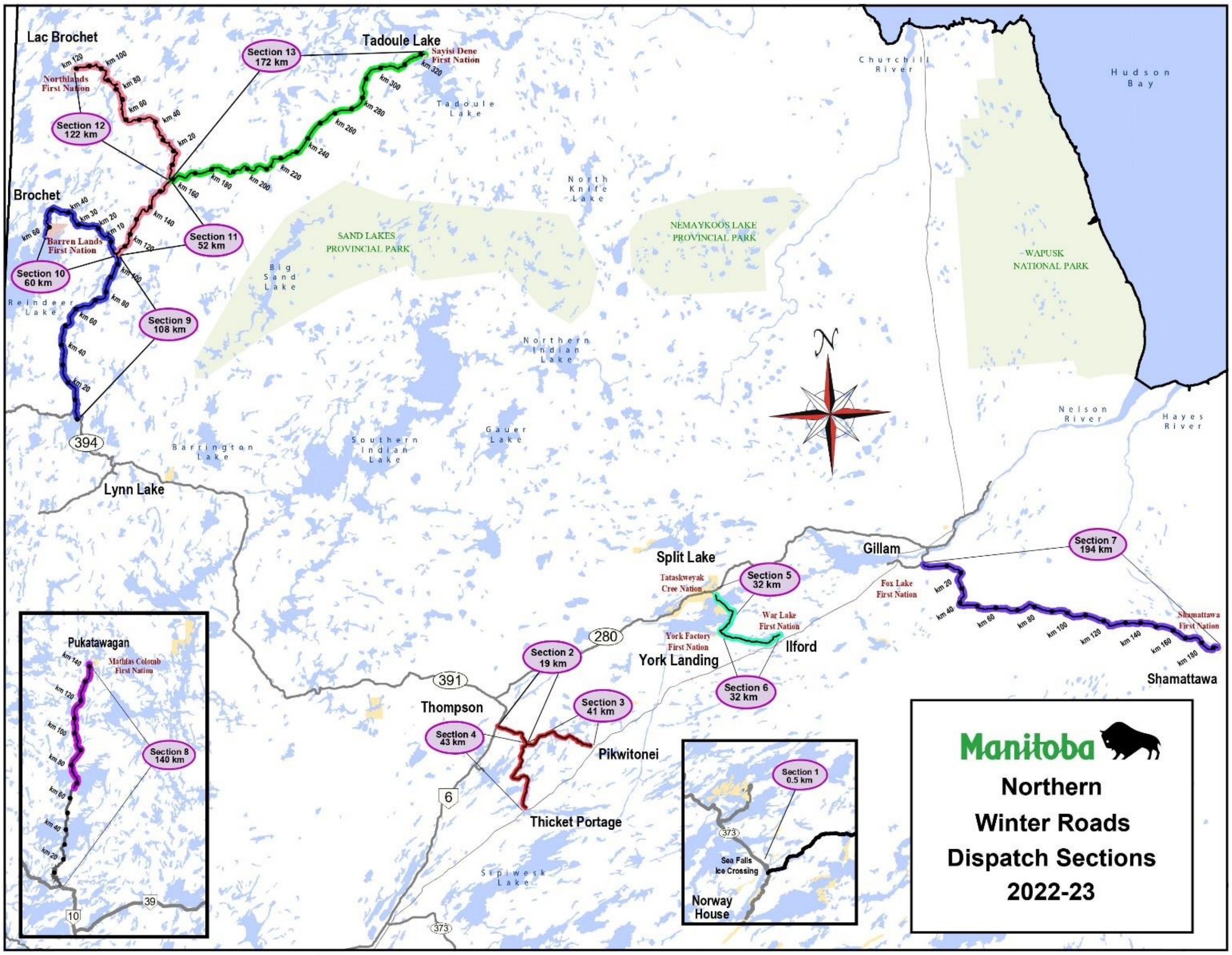
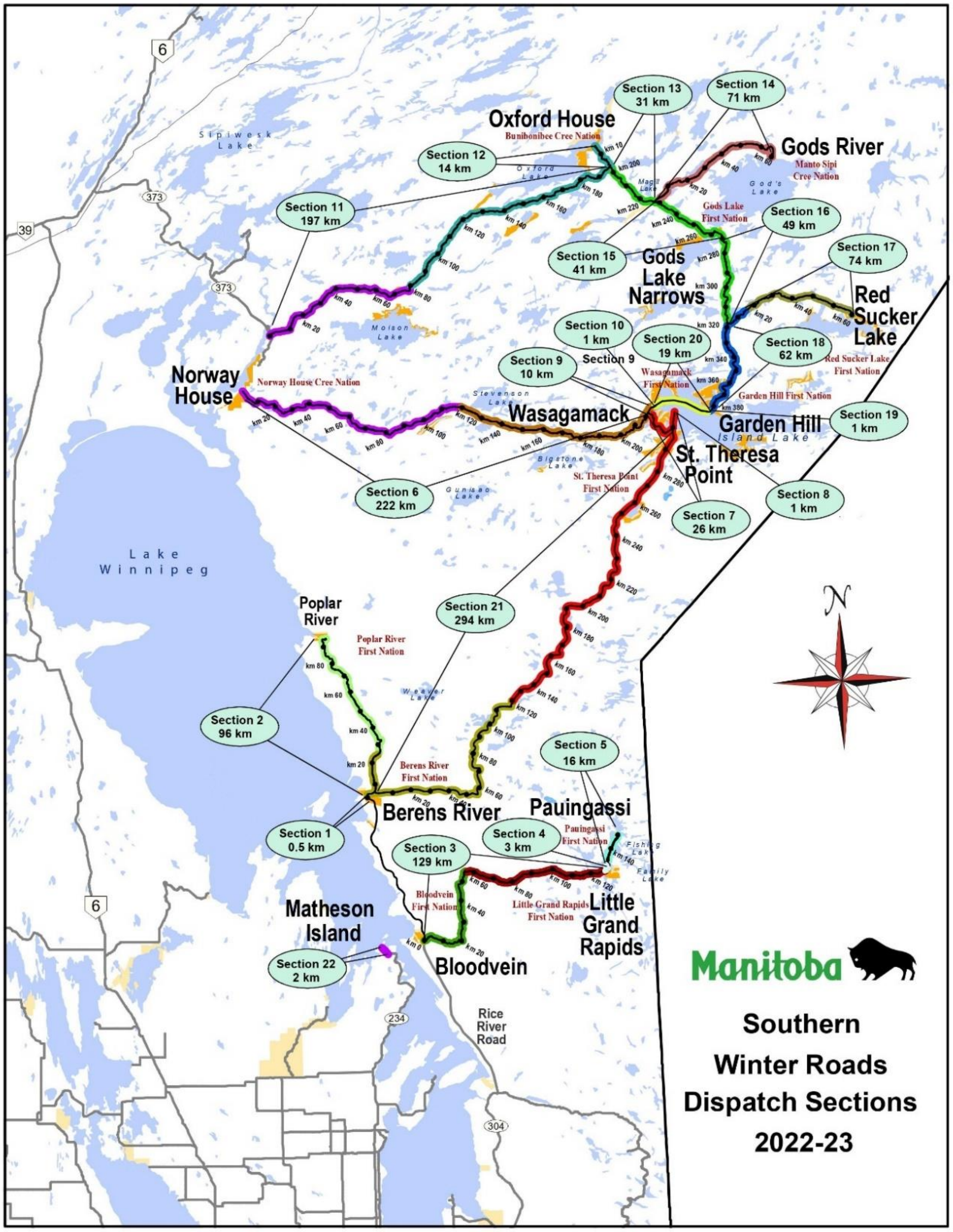
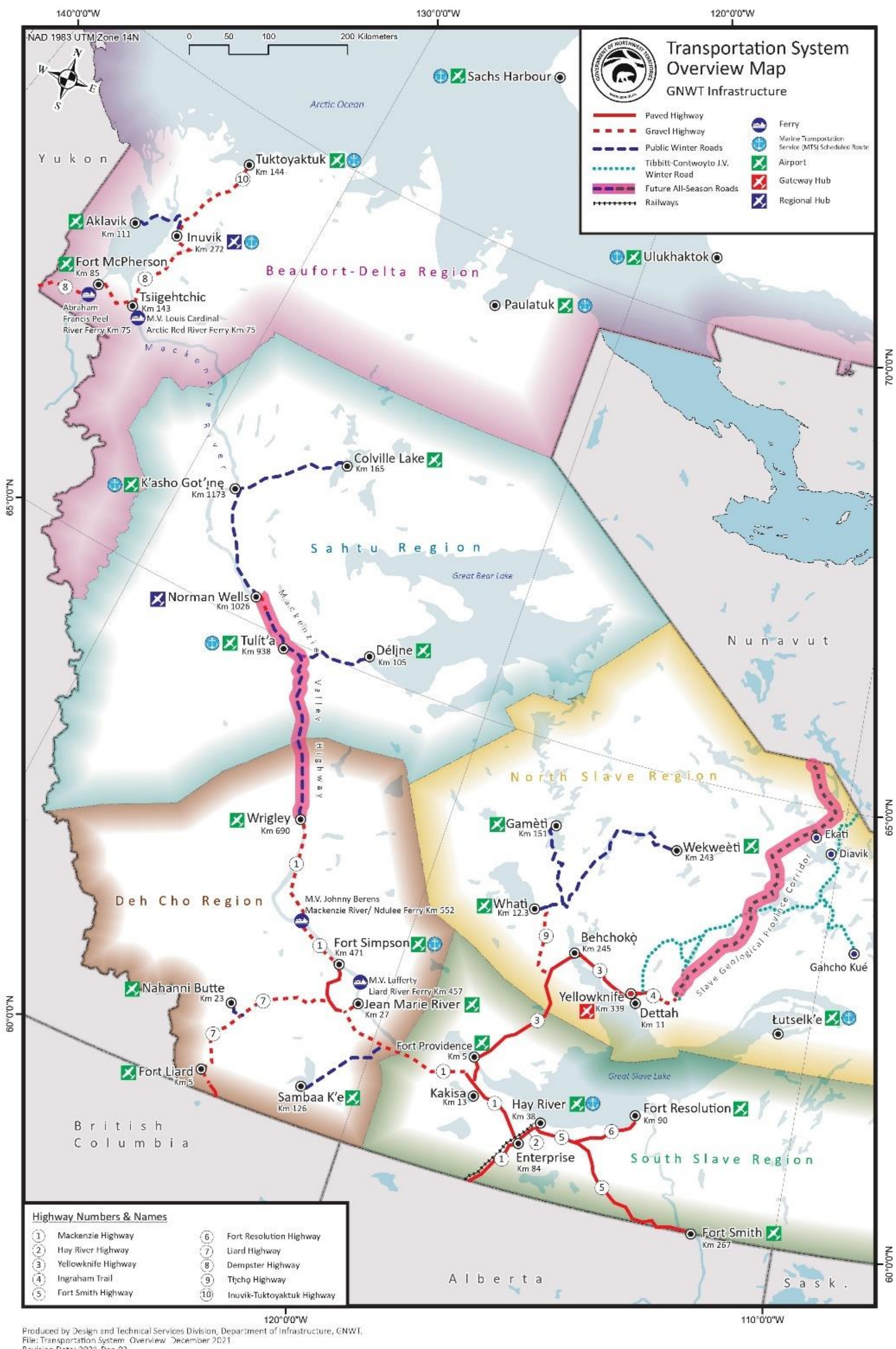


Figure 1-3 Southern Region of Winter Roads in Manitoba



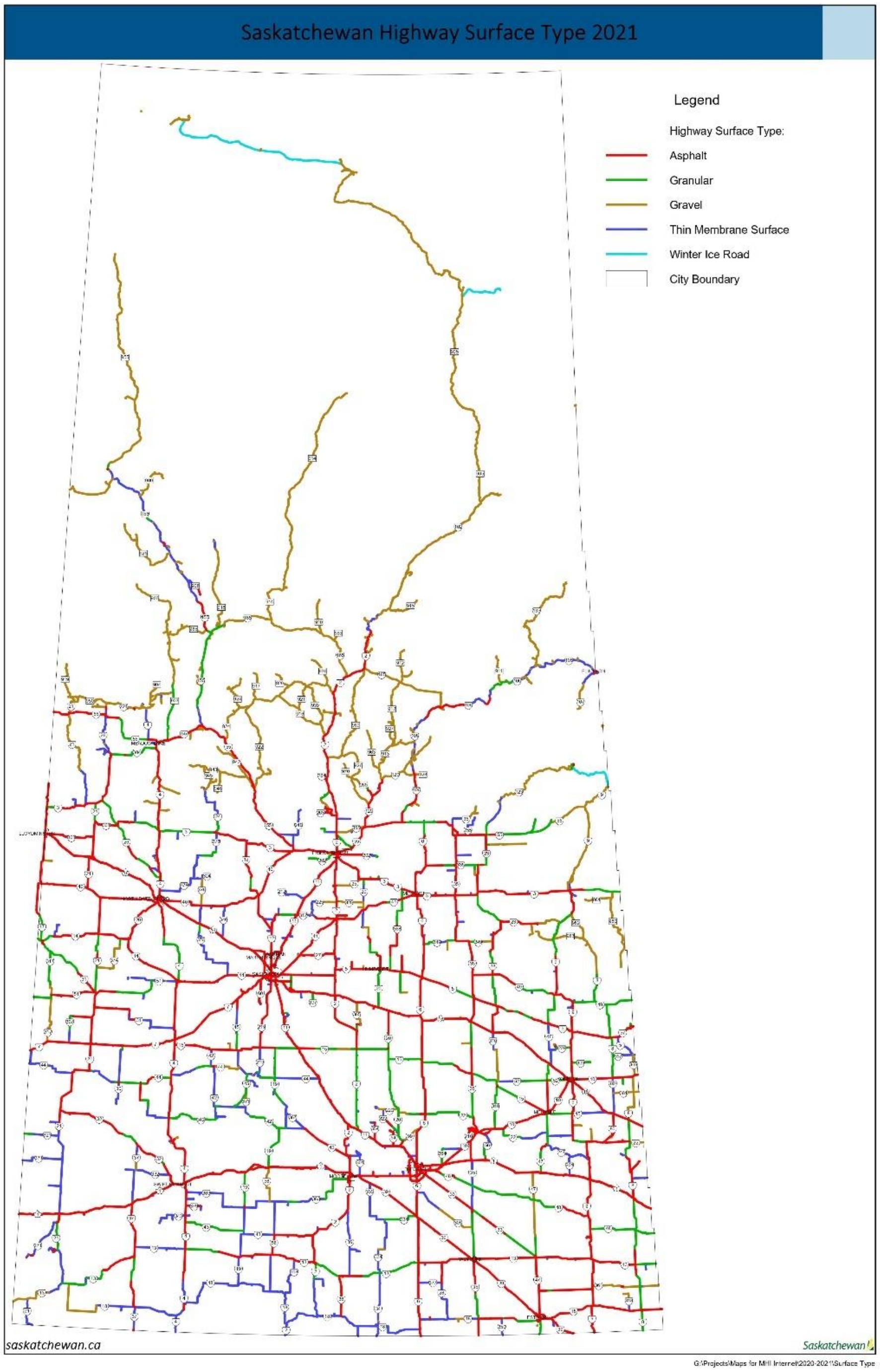
A-3: NORTHWEST TERRITORIES

Figure 1-4 Winter Roads in Northwest Territories



A-4: SASKATCHEWAN

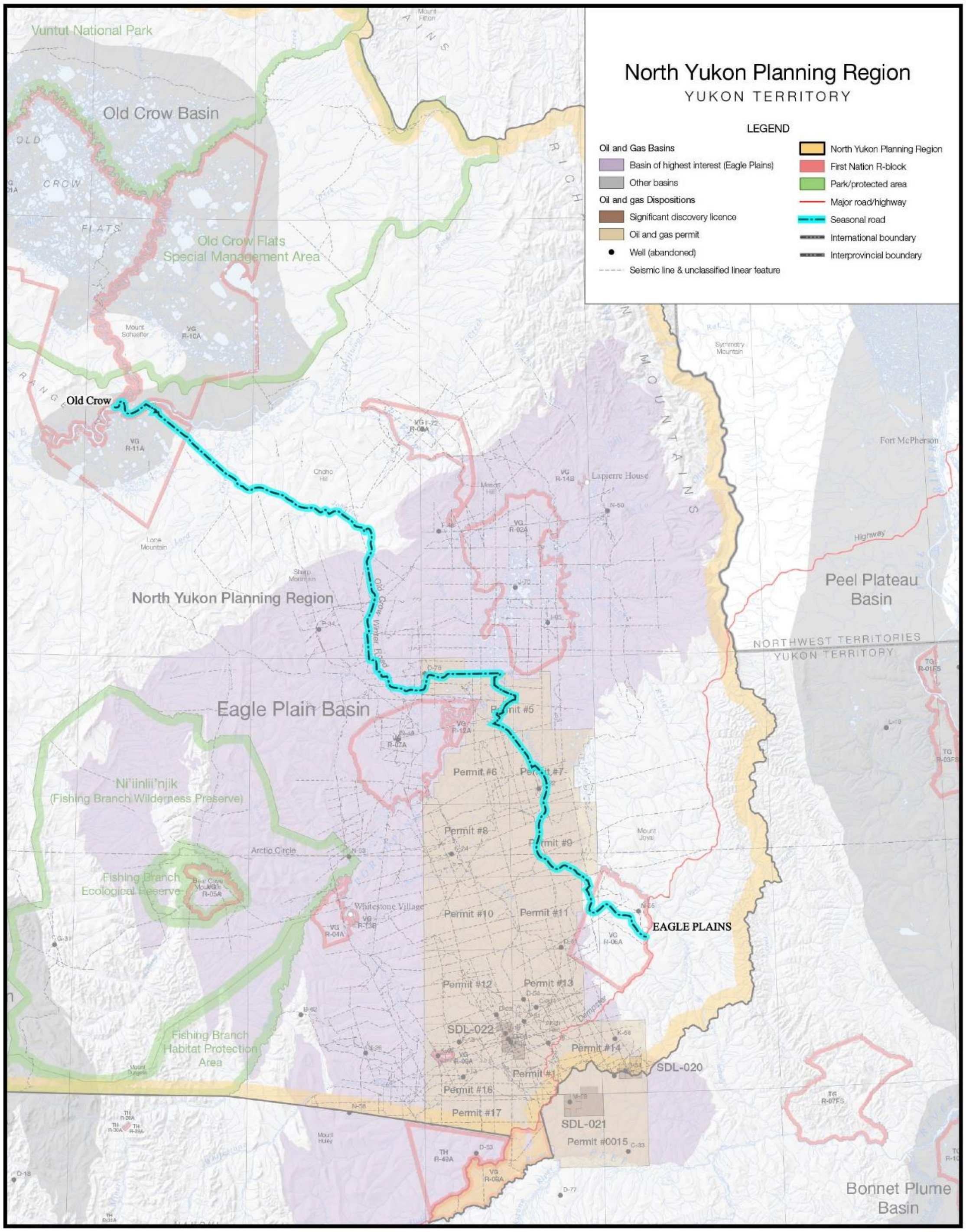
Figure -2 Road Network, Including Winter Roads, in



Saskatchewan

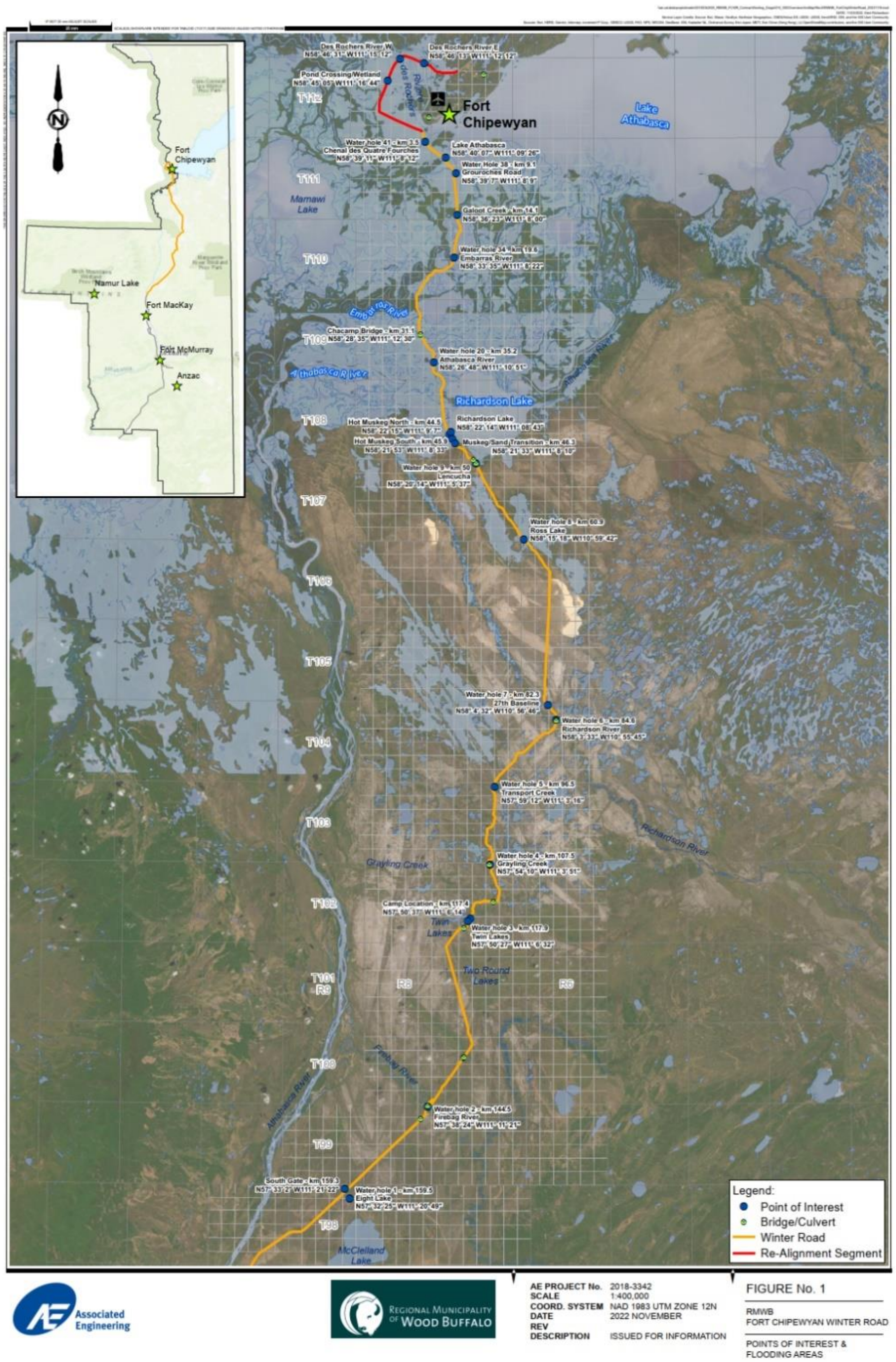
A-5: YUKON

Figure -3 Old Crow Winter Road Route



A-6: ALBERTA

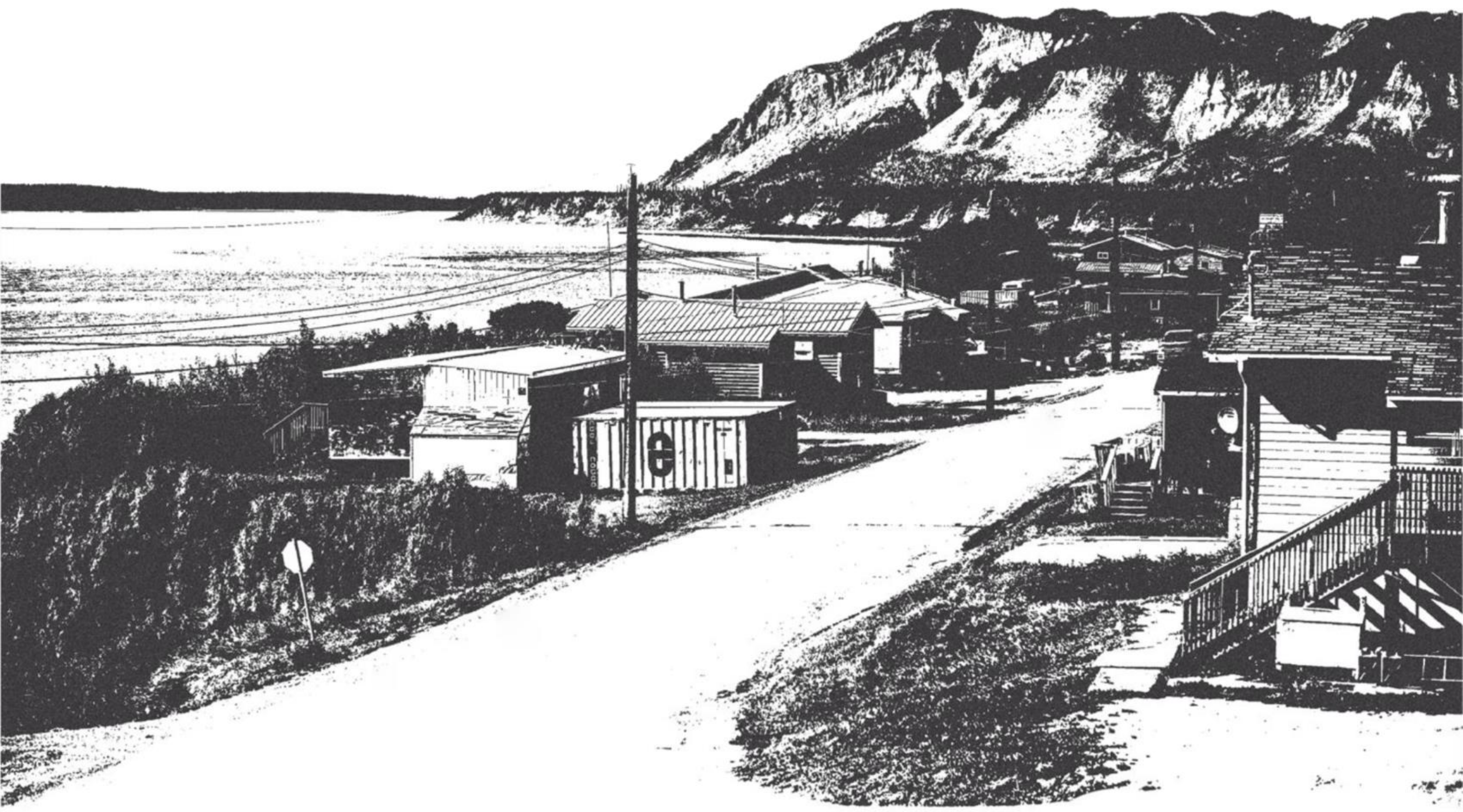
Figure -4 Fort Chipewyan Winter Road Route



CLOSING THE INFRASTRUCTURE GAP
PRIORITIZATION OF ALL-SEASON ACCESS ROADS

Appendix B

HISTORICAL OPENING AND CLOSING DATES



B.1 ONTARIO

Figure-5 James Bay Winter Road Opening Dates

JAMES BAY WINTER ROAD HISTORIC OPENING AND CLOSED DATES

	Light Traffic 7,500 kgs max	Heavy Loads 55,000 kgs max	Road Closed
2010-11	January 11	February 7	March 25
2011-12	January 12	February 7	March 16
2012-13	January 19	February 6	March 29
2013-14	January 15	February 7	April 3
2014-15	January 14	February 4	March 30
2015-16	January 25	February 8	March 24
2016-17	January 29	February 10	March 26

Figure 1-9: Shibogama Council Winter Road Opening Dates

Shibogama First Nations Council members include Kasabonika Lake First Naiton, Kingfisher Lake First Naitone, Wapakeka First Nation, Wawakapewin First Nation, and Wunnumin Lake First Nation.

Jacob Lamb

From:	Vivian Waswa <vivianw@shib.ca>
Sent:	Thursday, January 19, 2023 3:33 PM
To:	Christa Luckasavitch
Subject:	Corridor #3 Winter Road Openings / Closures 2020-2022

Hi Krista,

Here are the best dates I can give you from what was documented at the time, but they may have been subjected to change due to weather, covid, ice thickness, etc. Also, I don't have information 2019 and years before that as I wasn't working here yet.

2020: Open possibly January 29 (Light traffic) – Closure March 28
2021: Open February 15 – Closure March 30 (for incoming); April 2 (for outgoing)
2022: Open January 31 (light traffic) – Closure April 7

As for 2023, they are still working on the lake crossings. No specific date yet.

Hope this is helpful.

Vivian Waswa
Program Advisor – Emergency Mgmt & Solid Waste Program
Shibogama First Nations Council Technical Services

Phone: 807-737-2662
Mobile: 807-738-5763
Email: vivianw@shib.ca

81 King St, Box 387
Sioux Lookout, ON
P8T 1A5

www.shibogama.on.ca

1

Figure 1-10: Webequie First Nation Winter Road Opening Dates

Jacob Lamb

From:	Coulter, Ken (MND) <Ken.Coulter@ontario.ca>
Sent:	Monday, January 23, 2023 7:37 AM
To:	Christa Luckasavitch
Cc:	Judy Yu; Fenlon, Ann-Marie (MND)
Subject:	RE: Webequie Nation: Winter Roads Opening Closures

Hi Christa,

Our detailed records only go back to 2014-15. Here are the opening/closing dates for Webequie First Nation's winter road:

Year	Open	Close
14/15	1/10/15	3/31/15
15/16	1/28/16	3/23/16
16/17	1/30/17	3/24/17
17/18	1/22/18	4/13/18
18/19	1/14/19	4/7/19
19/20	2/10/20	3/29/20
20/21	n/a	3/28/21
21/22	2/18/22	4/8/22

As mentioned, we've learned that opening and closing dates do not tell the whole story with respect to the impacts of climate change on winter roads. What we are seeing are more frequent interruptions due to sudden temperature spikes and heavy snow.

Other researchers, including those with the National Research Council and York University have looked to study the patterns associated with "freezing degree days" as a better approach to determining climate change impacts. Many of the remote Indigenous communities on the winter roads network have Environment Canada weather stations on site, and the data is available through Environment Canada's website.

Regards,

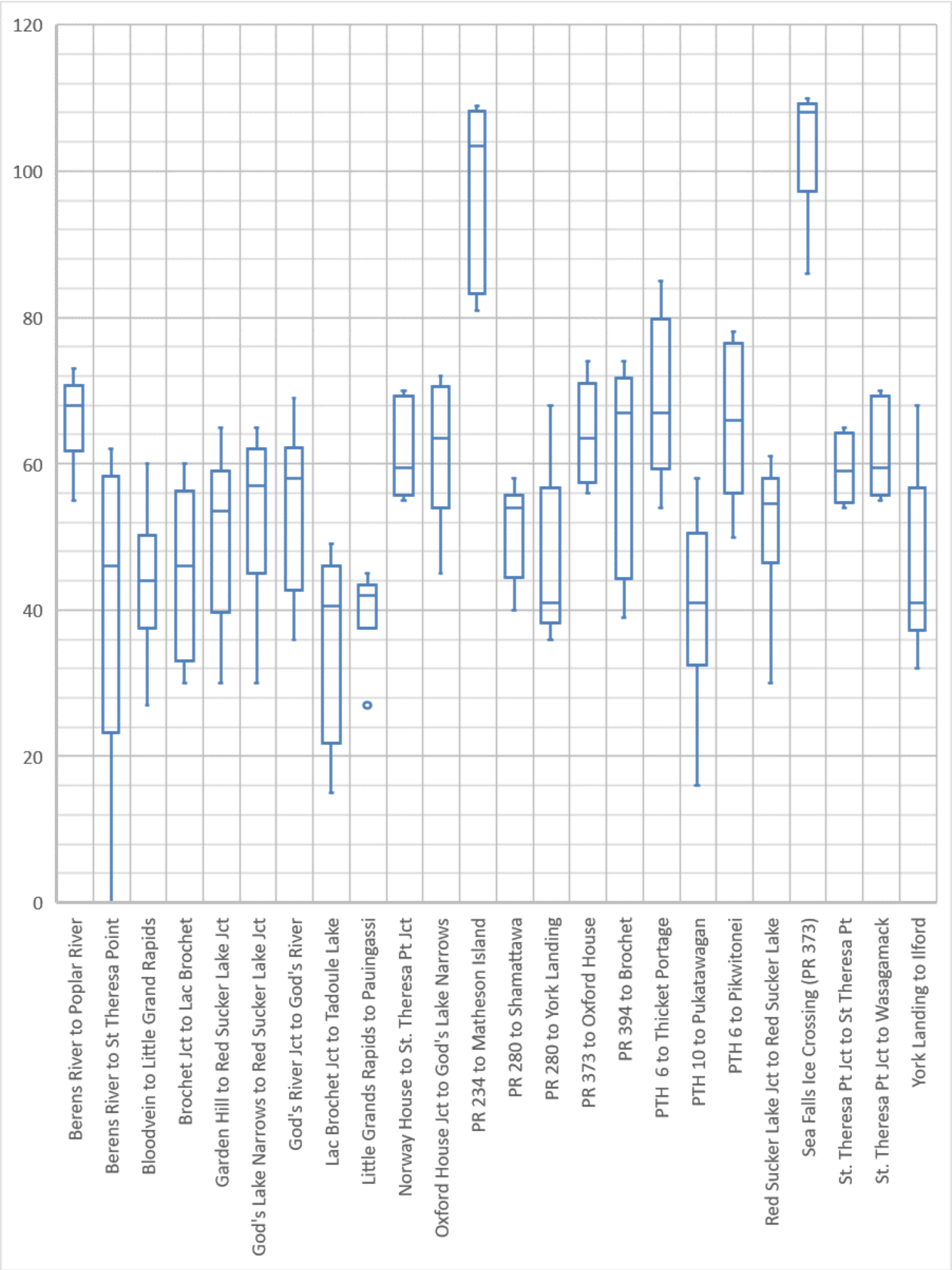
Ken Coulter
Senior Infrastructure Advisor
Ministry of Northern Development, Mines, Natural Resources and Forestry
70 Foster Drive, Suite 200
Sault Ste. Marie Ontario
Email ken.coulter@ontario.ca
Phone (705) 255-2441

AMAPCEO
ONTARIO'S PROFESSIONAL EMPLOYEES

B-2: MANITOBA

Discrete data available 2004 to 2021

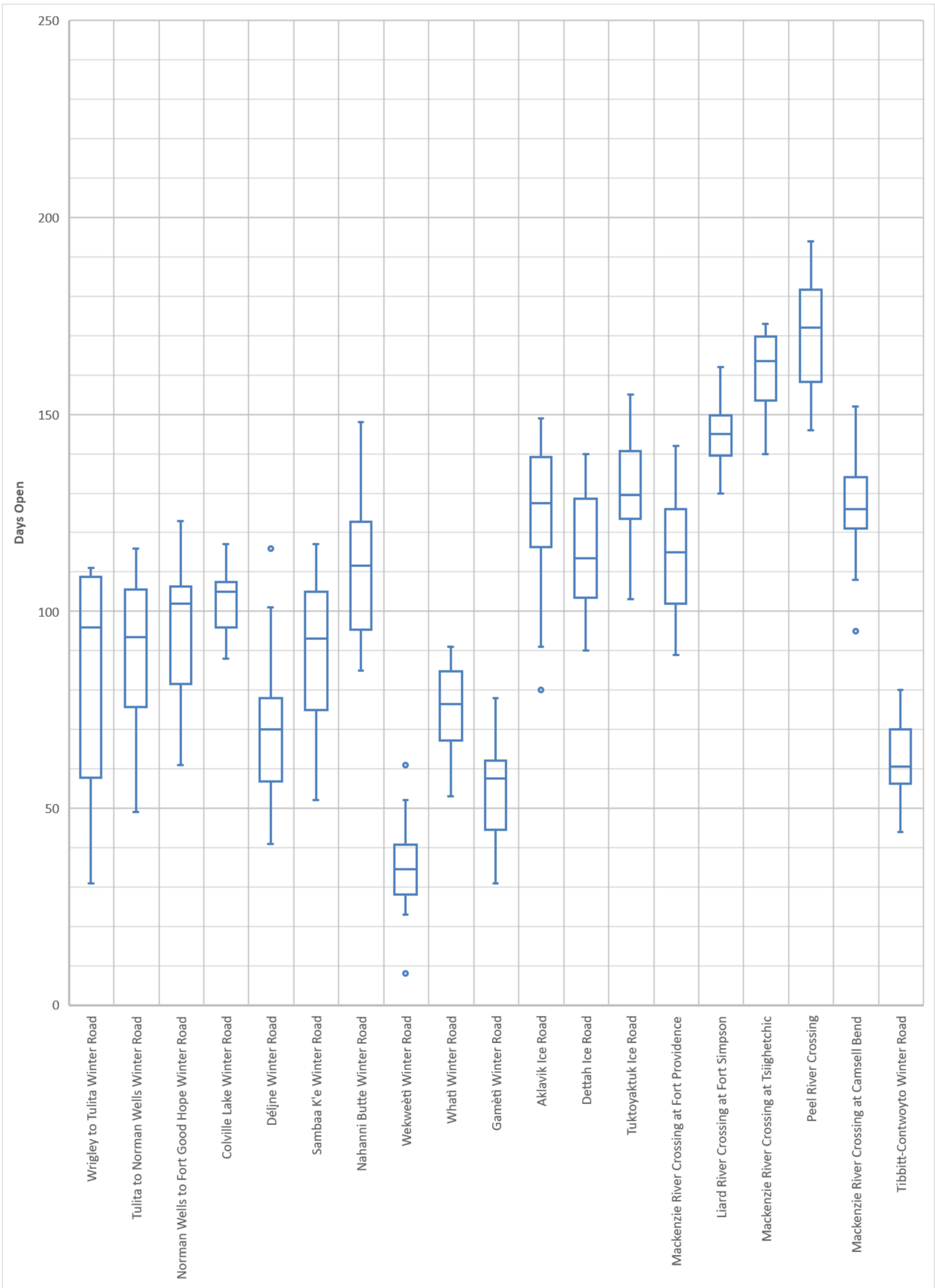
Figure 1-11: Summary of Manitoba Winter Roads Opening Durations 2004 to 2021



B-3: NORTHWEST TERRITORIES

Discrete data available for seasons from 1993 to 2021.

Figure 1-12: Summary of Northwest Territories Winter Road Opening Durations 1993 to 2021



B-4: SASKATCHEWAN

From Steve Shaheen, Senior Communications Consultant, at Government of Saskatchewan

Table 1-1 Athabasca Seasonal Road (Stony Rapids to Fond du Lac)

Year	Opened	Closed
2005-06	Mar 2	Mar 31
2006-07	Feb 7	Mar 31
2007-08	Feb 7	Mar 31
2008-09	Jan 22	Mar 31
2009-10	Jan 22	Mar 31
2010-11	Jan 22	Mar 31
2011-12	Feb 16	Mar 31
2012-13	Feb 11	Mar 31
2013-14	Feb 11	Apr 4
2014-15	Jan 23	Apr 7
2015-16	Feb 3	Apr 10
2016-17	Jan 30	Apr 10
2017-18	Jan 25	Apr 6
2018-19	Feb 12	Mar 31
2019-20	Feb 5	Apr 16

Table -3 Athabasca Seasonal Road (Fond du lac to Uranium City)

Year	Opened	Closed
2005-06	Mar 17	Mar 31
2006-07	Mar 5	Mar 31
2007-08	Mar 5	Mar 31
2008-09	Feb 23	Mar 31
2009-10	Feb 23	Mar 31
2010-11	Mar 2	Mar 31
2011-12	Feb 17	Mar 31
2012-13	Feb 13	Mar 28
2013-14	Feb 28	Apr 4
2014-15	Jan 30	Apr 7
2015-16	Feb 3	Mar 23
2016-17	Feb 2	Apr 10
2017-18	Jan. 25	Apr. 6
2018-19	Feb 15	Mar 31
2019-20	Feb 5	Apr 16

Table -4 **Wollaston Lake Ice road**

Year	Opened	Closed
2005-06	Feb 21	Mar 31
2006-07	Feb 2	Mar 31
2007-08	Jan 24	Mar 31
2008-09	Jan 23	Mar 31
2009-10	Jan 23	Mar 31
2010-11	Jan 22	Mar 31
2011-12	Feb 17	Mar 31
2012-13	Feb 6	Mar 31
2013-14	Feb 6	Apr 12
2014-15	Jan 22	Apr 7
2015-16	Feb 26	Apr 16
2016-17	Feb 1	Apr 5
2017-18	Feb 8	Apr. 16
2018-19	Feb 21	Apr 10
2019-20	Feb 5	Apr 16

B-5: YUKON

Table 1-4 Known Opening Dates for the Vuntut Gwitchin (Old Crow) First Nation Winter Road

Season	Opened	Closed
2022-23	Not opened	
2021-22	March 1st	Unknown
2020-21	Not opened	
2019-20	Not opened	
2018-19	Not opened	
2017-18	Not opened	
2016-17	Not opened	
2015-16	Not opened	
2014-15	Not opened	
2013-14	Feb 26th	Unknown
2012-13	Not opened	
2011-12	Not opened	
2010-11	Not opened	
2009-10	Not opened	
2008-09	Not opened	
2007-08	Not opened	
2006-07	Not opened	
2005-06	Not opened	
2004-05	Not opened	
2003-04	Opened but opening date unknown	Unknown
Earlier than 2003	Unknown	

B-6: ALBERTA

Information received on January 19th, 2023, from Michelle Brewer Manager of Rural Operation at Public Works of the Regional Municipality of Wood Buffalo, Alberta.

Figure 1-13: Known Fort Chipewyan Winter Road Opening Dates

Fort Chipewyan Winter Road - 5 year Comparison

	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022
Actual Cost	$ 2,028,270	$ 2,536,819	$ 2,340,677	$ 2,687,939	$ 3,643,711	
North Bound Traffic	3361	3025	3271	4248	3223	
South Bound Traffic	3360	3208	3549	3986	3715	
Total Traffic	6757	6033	6820	8234	6938	
Road Opening (5,000 kg)	Dec 18th	Dec 15th	Dec 14th	Dec 18th	Dec 31st	22-Dec
Temporary Closure*	-	-	-	-	Jan 13th - 30th	
Road Re-opening (5,000 kg)	-	-	-	-	Jan 31st	
15,000 kg	Jan 3rd	Jan 5th	Jan 3rd	Jan 16th	Feb 12th	29-Dec
20,000 kg	-	-	-	Feb 7th	Feb 17th	
27,500 kg	Jan 13th	Jan 15th	Jan 10th	-	Feb 21st	7-Jan
35,000 kg	Feb 1st	Jan 25th	Jan 17th	-	Feb 26th	9-Jan
40,000 kg	-	-	-	Feb 15th	Mar 8th	
45,000 kg	Feb 17th	Jan 31st	Jan 23rd	Feb 21st	-	28-Jan
Road Closure	Mar 25th	Mar 19th	Mar 17th	Mar 26th	Mar 23rd	22-Mar

** 2020/2021 actuals to date and including the change orders for this year.*

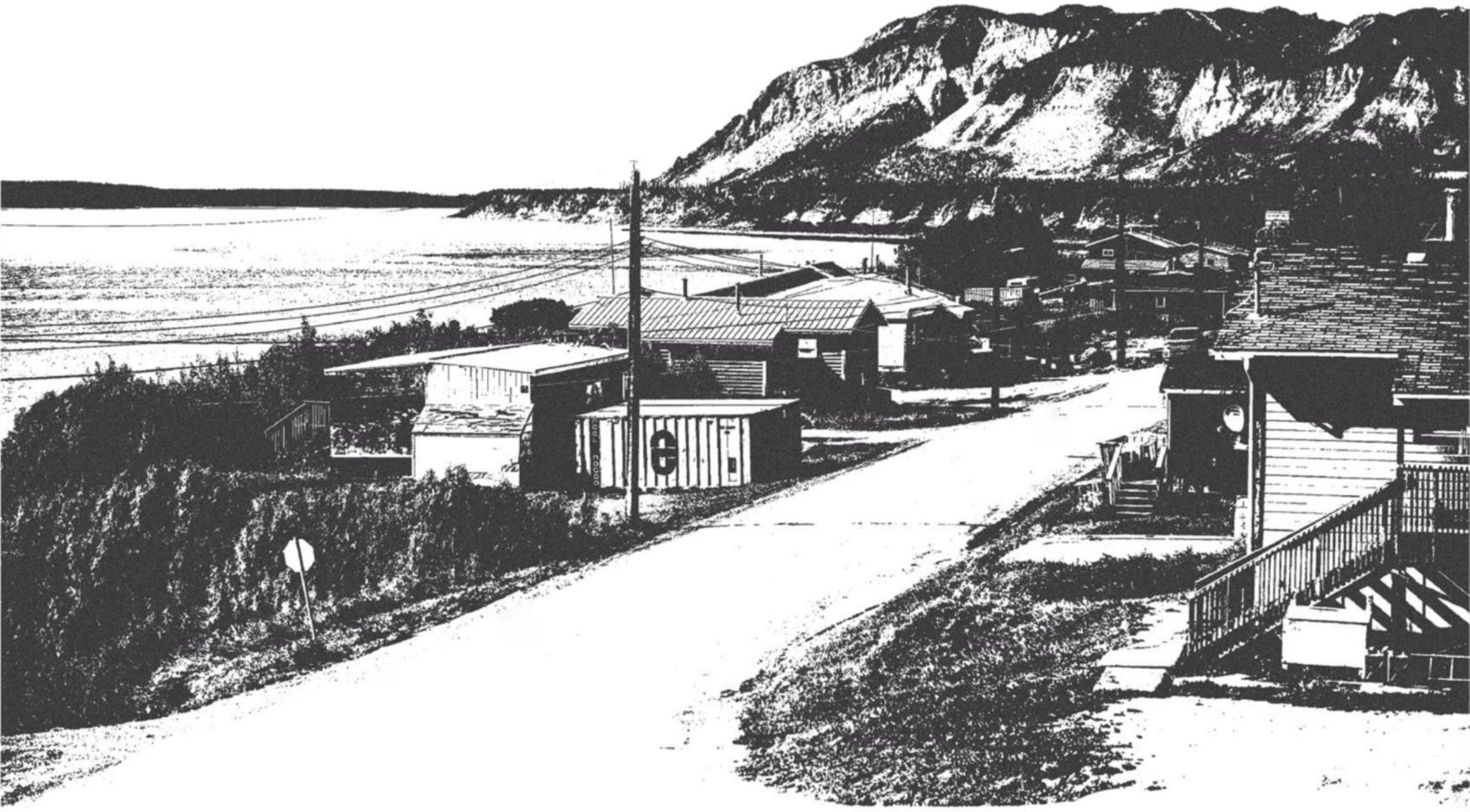
**Previous winter road seasons with temporary road closures are 2005/06, 2006/07 & 2008/09. 2021/2022 Daytime clousure for repairs to Athabasca Ramp night time travel for 5000kg only, Jan 25 to 27 opened on Jan 28.*

Daytime travel began on March 16, 2022

CLOSING THE INFRASTRUCTURE GAP
PRIORITIZATION OF ALL-SEASON ACCESS ROADS

Appendix C

POSSIBLE REDUCTION IN WINTER ROAD DAYS IN SERVICE



C-1: ONTARIO

Table -5 Potential Reduction in Service for Ontario Winter Roads

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service Days by 2050
Amimakee Wa Zhing #37 (Northwest Angle #37)	45	186	-28
Bearskin Lake	96	355	-19
Cat Lake	160	565	-19
Deer Lake	80	867	-19
Eabametoong (Fort Hope)	100	1014	-20
Fort Severn	212	361	-18
Kasabonika Lake	143	849	-21
Keewaywin	110	421	-19
Kimesskanamenow LP	339	2260	-13
Kingfisher Lake	167	511	-19
Kitchenuhmaykoosib Inninuwug (KI)	111	1024	-33
Marten Falls	127	252	-24
Moose Cree	227	1560	-33
Muskrat Dam	96	281	-18
Neskantaga	203	237	-21
Nibinamik	93	382	-21
North Caribou Lake	73	886	-19
North Spirit Lake	142	293	-19
Northwest Angle #33	11	191	-28
Pikangikum	30	2830	-18
Poplar Hill	44	473	-20
Sachigo Lake	63	514	-17
Sandy Lake	100	2017	-19

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service Days by 2050
Temagami	11	153	-34
Wapekeka	29	440	-18
Wawakapewin	22	22	-20
Webequie	100	778	-22
Weenusk	181	195	-21
Wunnumin Lake	54	593	-20

C-2: MANITOBA

Table -6 Potential Reduction in Service for Manitoba Winter Roads

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service Days by 2050
PR 234 to Matheson Island	2	0	-22
Berens River to Poplar River	96	866	-22
Berens River to St Theresa Point	294	3262	-22
Bloodvein to Little Grand Rapids	129	810	-22
PR 280 to Shamattawa	194	1019	-14
PR 280 to York Landing	32	443	-17
PR 373 to Oxford House	197	1950	-17
PR 394 to Brochet	168	383	-14
PTH 6 to Thicket Portage**	43	150	-17
PTH 10 to Pukatawagan	140	1734	-12
PTH 6 to Pikwitonei**	41	64	-16
Norway House to St. Theresa Pt Jct	222	4927	-16
St. Theresa Pt Jct to St Theresa Pt	1	3262	-18
St. Theresa Pt Jct to Wasagamack	26	1403	-18
Little Grands Rapids to Pauingassi	16	271	-20
York Landing to Ilford**	32	106	-15
Garden Hill to Red Sucker Lake Jct	62	2591	-19
God's Lake Narrows to Red Sucker Lake Jct	49	982	-17
God's River Jct to God's River	71	643	-17

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service Days by 2050
Oxford House Jct to God's Lake Narrows	14	982	-17
Red Sucker Lake Jct to Red Sucker Lake	74	675	-17
Brochet Jct to Lac Brochet	122	728	-18
Lac Brochet Jct to Tadoule Lake	172	324	-17

**Community has year-round rail access.

C-3: NORTHWEST TERRITORIES

Table -7 Potential Reduction in Service for Northwest Territories Winter Roads

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service Days by 2050
Nahanni Butte Winter Road	23	87	2
Sambaa K'e Winter Road	126	88	1
Wrigley to Tulita Winter Road	248	477	2
Dettah Ice Road*	11	219	-5
Gamètì Winter Road	151	278	-2
Wekweètì Winter Road	243	129	-2
Colville Lake Winter Road	165	129	5
Déljne Winter Road	105	533	5
Norman Wells to Fort Good Hope Winter Road	147	516	3
Tulita to Norman Wells Winter Road	88	477	5
Aklavik Ice Road	111	590	3

*Community has an existing all season road alternative, the winter road reduces travel distances.

C-4: SASKATCHEWAN

Table -8 Potential Reduction in Service for Saskatchewan Winter Roads

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service Days by 2050
Wollaston Lake	50	1377	-13
Riverhurst	2	0	0
Cumberland House to Manitoba Border*	52	795	-14
Athabasca Seasonal Road	185	1379	-12
Stony Rapids to Fond du Lac	85	903	-8
Fond du Lac to Uranium City	90	0	-10

*Community has an existing all season road alternative, the winter road reduces travel distances.

C-5: YUKON

Table -9 Potential Reduction in Service for Yukon Winter Roads

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service days by 2050
Old Crow Private Winter Road	280	221	3

C-6: ALBERTA

Table -10 Potential Reduction in Service for Alberta Winter Roads

Winter Road	Approximate Length (kms)	Approximate Population	Potential Annual Change in Winter Road Service Days by 2050
Fort Chipewyan Winter Road	160	255	-13

CLOSING THE INFRASTRUCTURE GAP
PRIORITIZATION OF ALL-SEASON ACCESS ROADS

Appendix D

INFORMATION AVAILABILITY

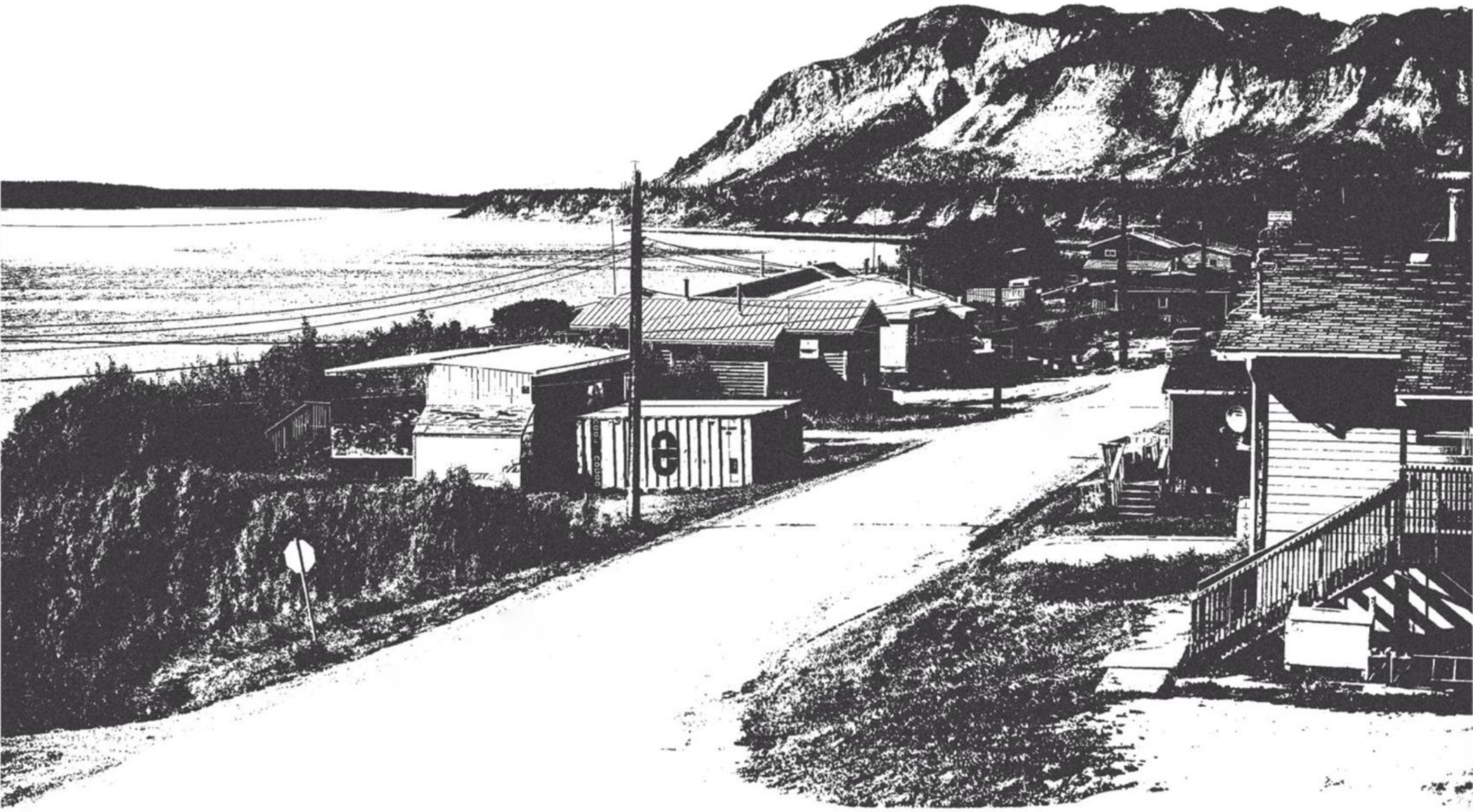


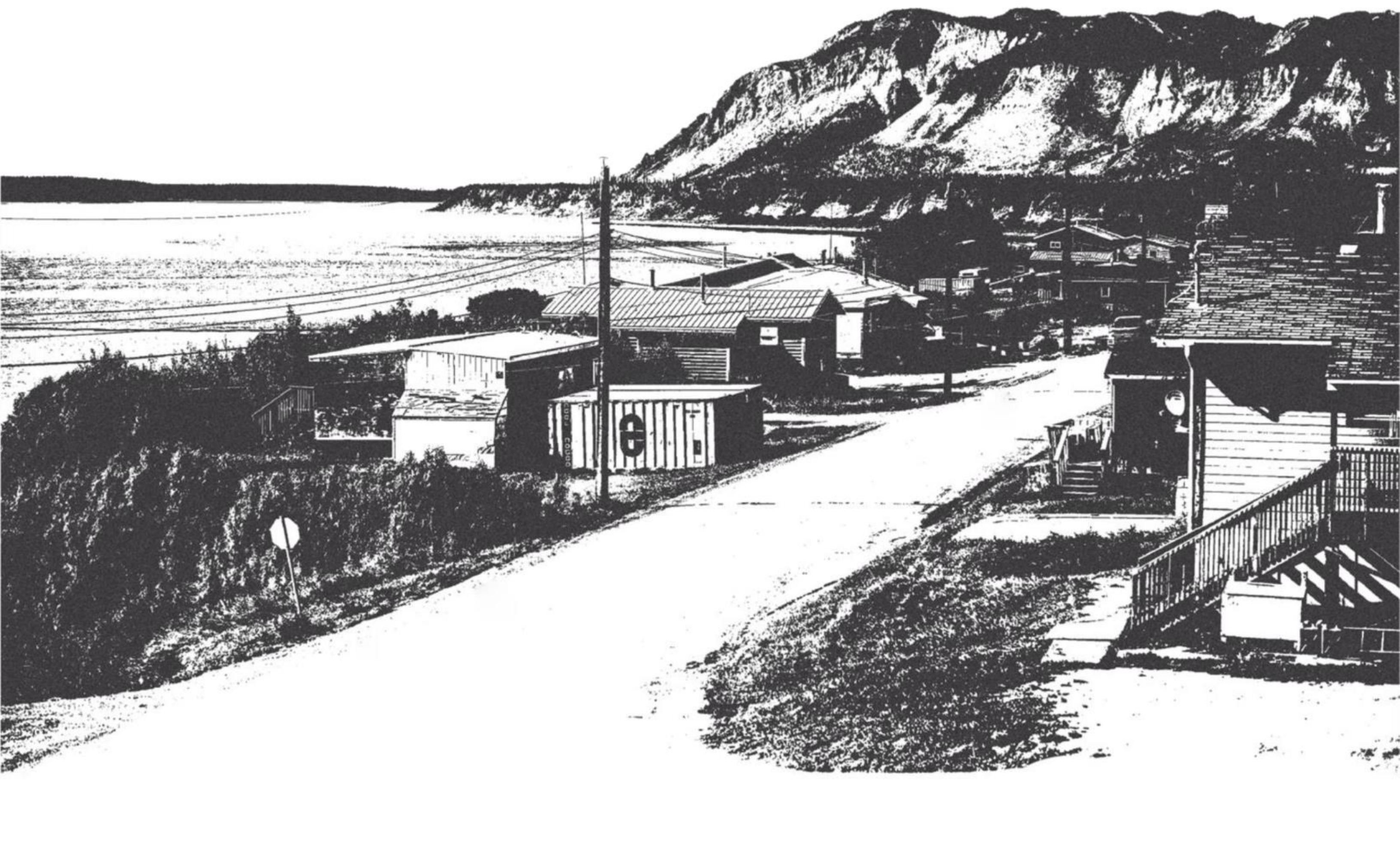
Table -11 **Historical Data Availability**

Types of Data	Province of Ontario	Province of Saskatchewan	Province of Manitoba	Province of Alberta	Northwest Territories	Yukon Territory
Historical opening dates	James Bay Road (2011-2017), Webequie First Nation (2014-2022)	Not yet determined	All roads (2016 2022)	Fort Chipewyan (2016 – 2022)	All roads (1993-2021)	Approximate dates (2014-2022)
Historical closing dates	James Bay Road (2011-2017), Webequie First Nation (2014-2022)	Not yet determined	All roads (2016 2022)	Fort Chipewyan (2016 – 2022)	All roads (1993-2021)	Not available
Historical seasonal interruptions	Not yet determined	Not yet determined	Not yet determined	Fort Chipewyan (2016 – 2022)	Not yet determined	Journalistic evidence
Historical weight limit dates	James Bay Road (2011-2017)	Not yet determined	Not yet determined	Not yet determined	Not yet determined	Not applicable
Rated traffic weight limits	Not yet determined	Not yet determined	Not yet determined	Not yet determined	Not yet determined	Not yet determined
Shape files	Not yet determined	Not yet determined	Not yet determined	Not yet determined	Not yet determined	Not available
Information on route changes	Not available	Not available	Maps of planned all-season road alignments	Not available	Maps of planned all-season road alignments	Not available
Source	Direct communications	Direct communications	Publicly published data	Direct communications	Publicly published data	Journalism

CLOSING THE INFRASTRUCTURE GAP
PRIORITIZATION OF ALL-SEASON ACCESS ROADS

Appendix E

FURTHER METHODOLOGY



In this appendix, engineering standards of winter road construction and safe operation will be used to define what is technically required based on industry standards and which regional winter road networks are facing a notable decline in operating windows.

E.1 Primer

Winter roads are made up of varying lengths of overland portions and over frozen lake or floating ice portions. All segments are temporary structures built to meet the traffic volume and loads within an expected operating window (typically 50-90 days).

The over land portion of winter roads relies on a frozen native soil (subgrade) that remains functional for one winter season. Frost penetrates the native ground surface and provides a stable subgrade cover over soft, active layer soils. The subgrade is overlain by a pavement-like structure consisting of a layer of snow or snow and man-made ice. To improve carrying capacity an icecap (solid ice surface) is created by soaking the snow with water.

Ice roads placed over lakes can extend several kilometres (ice roads) whereas ice bridges are built to cross a river over the shortest distance possible. Ice structures, built and operated properly, leave no environmental footprint. Ice roads can be thickened by flooding with water in areas where naturally grown ice might not have the necessary carrying capacity.

Poor ice conditions associated with changes in water level, erosion of ice, extensive cracking, or excessive wear due to use can increase the risk of breakthrough failure. The impacts of temperature changes to ice include

Rapid Cooling

Sudden drops in air temperature (e.g., more than 20pC over 24 hours) produce severe thermal stressing as ice contracts. Ice contraction can either initiate new cracks or extend existing cracks, each with a risk of growing to the bottom and becoming wet cracks.

Warming of Ice

When air temperatures are above freezing for more than 24 hours, the ice begins to warm rapidly from the surface down. These effects are greatest on bare ice as snow insulates the ice. Even though the ice may have adequate thickness, ice strength can be substantially reduced by exposure to above freezing temperatures and sunlight. Best practice for safety reason is to temporarily close ice roads after 48 hours of 0pC.

Normally, ice covers are closed well before spring thaw begins and the ice cover begins to decay. Decay of ice covers are affected mainly by solar radiation and by the reflecting power of the ice surface. Ice growth stops and ice decay starts before air temperatures rise above the melting point of the ice.

E.2 Model

Following expert advice and academic research, AE developed an analytical model with inputs from climate data to estimate future winter road construction and operating season lengths, for a 2020 benchmark, and 2030, 2040, and 2050 projections. A consistent methodology is paramount for relative comparison where previous studies have focused only on certain regions. There has been recent research by academia and the National Research Council into this topic, that we shall not duplicate, so we focus on a construction-informed metric to use as a relative risk indicator between winter roads (Canadian Climate Institute, 2022; Government of Canada, 2019; Hori et al., 2018; National Research Council of Canada, 2022). Such more specific studies are recommended when planning within regions is conducted.

To project the length of time when a seasonal road is open, climate data was collected for each seasonal road connecting to a First Nation community. Daily average temperature data from 2014 to 2060 for the RCP 8.5 trajectory was collected through PAVICS (Power Analytics and Visualization for Climate Science)1. Point data was collected at the southern most point for each seasonal road. These midways points represent the minimum, worst-case, conditions of those roads.

For each day, the difference between the daily mean temperature and 0°C was calculated to determine melting and freezing degree days. Melting degree days begin to accumulate when the daily mean temperature rises above 0°C and are the difference between a temperature above 0°C and 0°C. Freezing degree days begin to accumulate when the daily mean temperature drops below 0°C and are the difference between a temperature below 0°C and 0°C. Average melting and freezing degree day over a 20-year period were calculated for 2023 (2014-2034) and 2050 (2041-2060) to smooth out the variance between years. This process was repeated using data from 24 CMIP 5 climate models and the values for all models were averaged together to get the final melting and freezing degree day values.

Freezing Degree Days (FDDS) is a measure of temperature over time that winter road operators use as a guideline for ice and ground frost accumulation. FDDs is the sum of the mean average temperature of negative temperature days since a start date.

Melting Degree Days (MDDs) is another measure of temperature over time that is instead used to understand when ice and frost may be significantly thawing. MDDs is the sum of the mean average temperature of positive temperature days since a start date.

The earliest day that construction could begin on a winter road was set at 305 Freezing Degree Days after November 1st. 305 FDDs is a threshold used by academia and the National Research Council of Canada (National Research Council of Canada, 2022) and November 1st is a typical date for earliest mobilization reported by expert opinion. The 305 FDD threshold indicates that river and lake ice is thick enough to begin construction of over ice winter road portions with at least light-duty equipment.

The end of the winter road season is marked by warming temperatures. The critical failure for heavy goods vehicles is often the portage section as the top layer of road thaws and can no longer support heavy weights. Other failure modes include water overrun that makes ice portions too slippery and uneven for travel and ice thinning where the capacity of the ice is reduced below safe levels. The modelled end date of the season was set at 10 MDDs after March 1st. Current operator best practice is to close a winter road after two consecutive days of above freezing temperatures, but roads typically become stable again in a few days as the temperature returns to below freezing. Therefore, a series of days above freezing are required to indicate the unrecoverable end of the winter road season.

[2] Data access and analysis environment was provided through the Power Analytics and Visualization for Climate Science (PAVICS) platform (Ouranos and CRIM, 2018-2023). PAVICS is funded through Ouranos, the Computer Research Institute of Montreal (CRIM), Environment and Climate Change Canada (ECCC), CANARIE, the Fonds Vert and the Fonds d'électrification et de changements climatiques, the Canadian Foundation for Innovation (CFI), and the Fonds de Recherche du Québec (FRQ)

Figure-6
Example Freezing Degree Day Model – December 1st Start Date

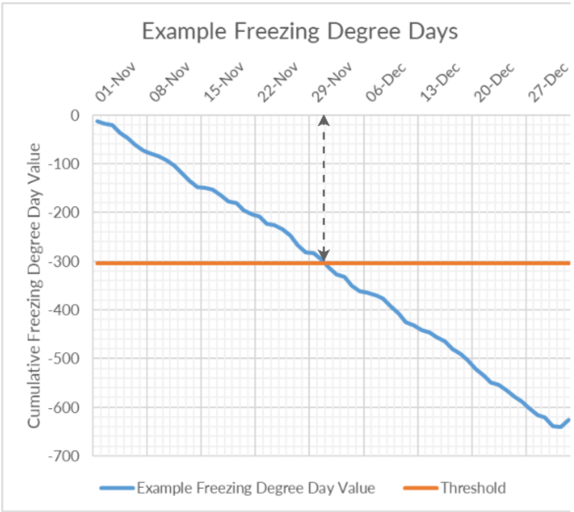
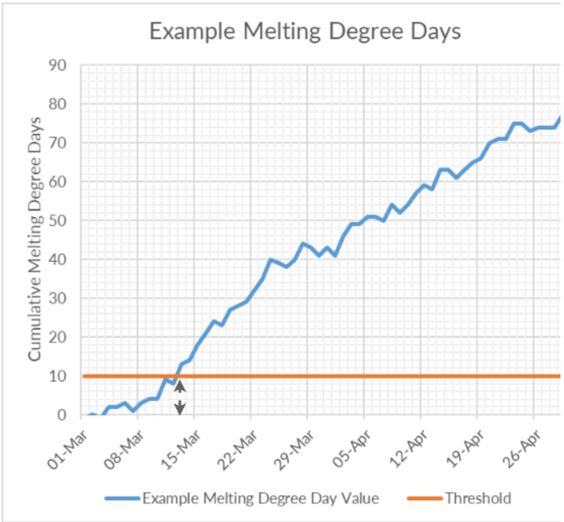


Figure -7 Example Melting Degree Day Model – March 13th End Date



The difference between the opening day and the closing day based on these two parameters is the maximum time window for construction and operation of the winter road. We averaged the opening times across the ten-year time spans from to represent an average expectation of this time window for a given decade in the future.

E.3 Contextual Construction Timelines

The construction time needed for a winter road varies significantly based on the operator's working practises, available equipment, available labour, intermittent weather conditions, and if the road is over ice or a portage over land (Government of Northwest Territories, 2015). AE does not include construction time into our model due to the high variability caused by differing construction methods and practises. More intensive construction practises may be employed to compensate for any reduction in environmental condition days.

Table -12 Approximate Length of Winter Road Constructed per Crew per 12-hour Shift

Surface Type	Low Estimate	High Estimate
Ice	2 km	5 km
Brownfield Ground	300m	500m
Greenfield Ground	100m	200m

For example, the Tibbitt-Contwoyto Winter Road (TCWR) in the Northwest Territories has approximately 62km of portage over land and 630km of over ice road to clear each year. The operators of this road utilize enhanced techniques and overnight shifts when required to open the road quickly. Construction typically begins in mid-December and completes at the end of January for approximately 6 weeks of construction time.

CLOSING THE INFRASTRUCTURE GAP
PRIORITIZATION OF ALL-SEASON ACCESS ROADS

Appendix F

PRIORITIZATION BY JURISDICTION

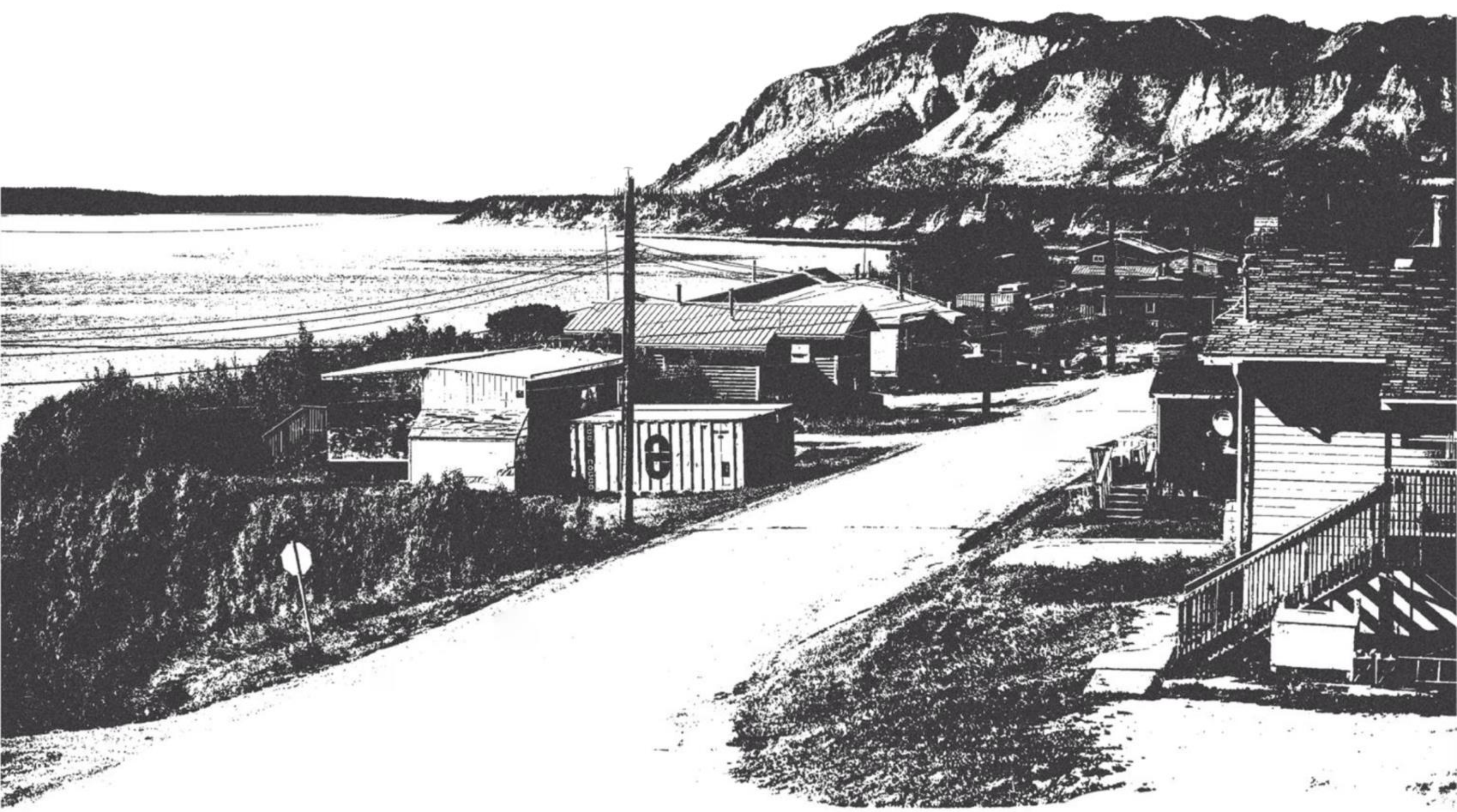


Figure 1-16 Prioritization Map of Communities

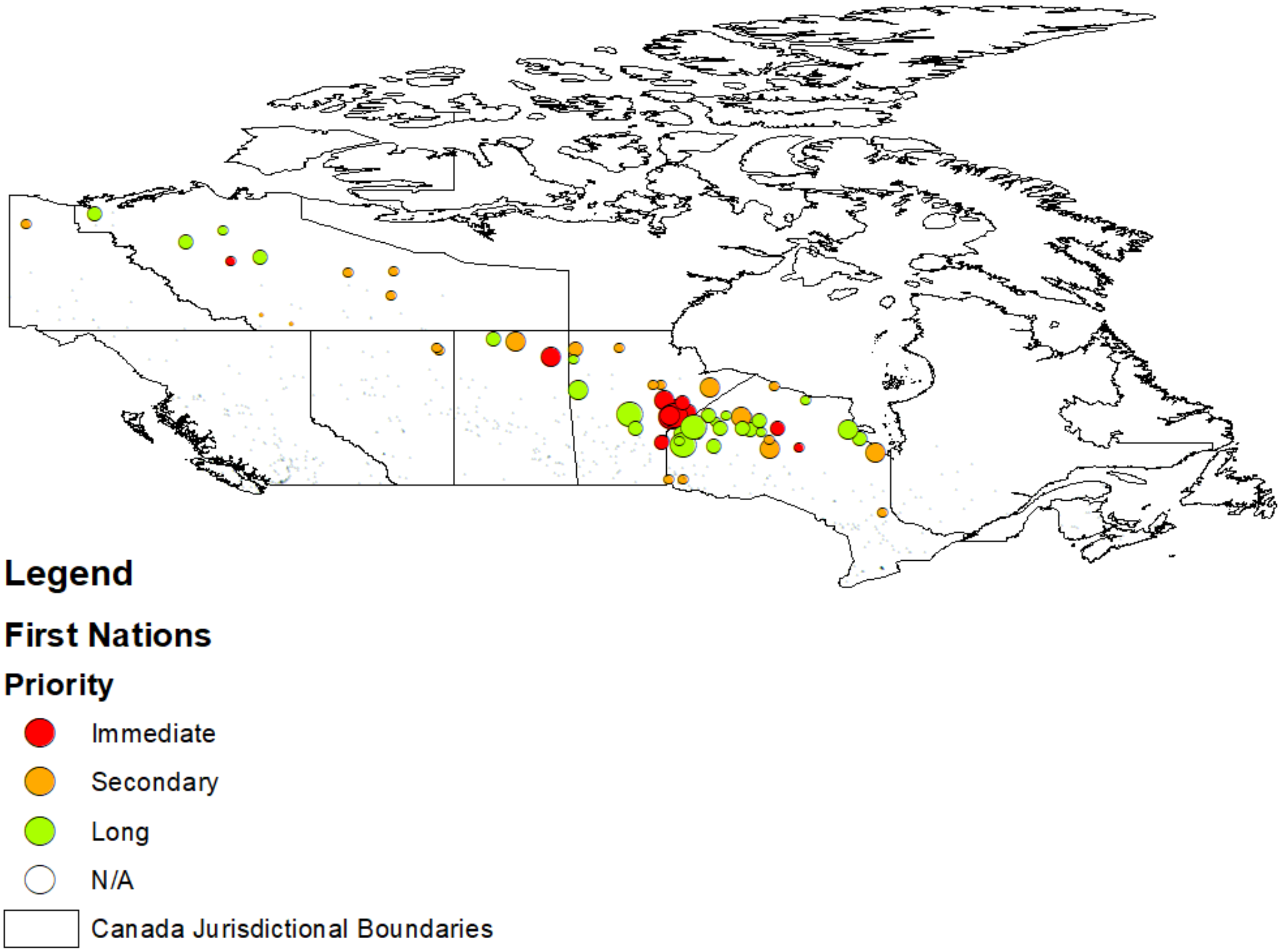


Table -13 Priority by Community

Province / Territory	Nation	Reported Population	Road Priority
Manitoba	Garden Hill First Nations	2591	Immediate
Manitoba	Wasagamack First Nation	1403	Immediate
Manitoba	Manto Sipi Cree Nation	643	Immediate
Manitoba	Bunibonibee Cree Nation	1950	Immediate
Manitoba	Little Grand Rapids	810	Immediate
Manitoba	Pauingassi First Nation	271	Immediate
Manitoba	God's Lake First Nation	982	Immediate
Manitoba	Red Sucker Lake	675	Immediate
Northwest Territories	Tulita Dene	477	Immediate
Ontario	Martin Falls	252	Immediate
Ontario	Webequie	778	Immediate
Saskatchewan	Hatchet Lake	1377	Immediate
Alberta	Mikisew Cree First Nation	226	Secondary
Alberta	Athabasca Chipewyan First Nation	255	Secondary
Manitoba	York Factory First Nation	443	Secondary
Manitoba	War Lake First Nation	106	Secondary
Manitoba	Northlands	728	Secondary
Manitoba	Sayisi Dene First Nation	324	Secondary
Manitoba	Shamattawa First Nation	1019	Secondary
Northwest Territories	Nahanni Butte	87	Secondary
Northwest Territories	Sambaa K'e (Trout Lake) Dene	88	Secondary
Northwest Territories	Dechi Laot'i First Nations	129	Secondary
Northwest Territories	Gameti First Nation	278	Secondary
Northwest Territories	Yellowknives Dene First Nation	219	Secondary

Province / Territory	Nation	Reported Population	Road Priority
Ontario	Animakee Wa Zhing #37/Northwest Angle No.37	186	Secondary
Ontario	Northwest Angle No.33	191	Secondary
Ontario	Kitchenuhmaykoosib Inninuwug	1024	Secondary
Ontario	Moose Cree First Nation	1560	Secondary
Ontario	Temagami First Nation	153	Secondary
Ontario	North Spirit Lake	293	Secondary
Ontario	Eabametoong First Nation	1014	Secondary
Ontario	Neskantaga First Nation	237	Secondary
Ontario	Fort Severn	361	Secondary
Saskatchewan	Black Lake	1379	Secondary
Yukon	Vuntut Gwitchin First Nation	221	Secondary
Manitoba	St. Theresa Point	3262	Long
Manitoba	Norway House Cree Nation	4927	Long
Manitoba	Poplar River First Nation	866	Long
Manitoba	Barren Lands	383	Long
Manitoba	Mathias Colomb	1734	Long
Northwest Territories	Deline First Nation	533	Long
Northwest Territories	Aklavik	590	Long
Northwest Territories	Fort Good Hope	516	Long
Northwest Territories	Behdzi Ahda" First Nation	129	Long
Ontario	Kasabonika Lake	849	Long
Ontario	Kashechewan	759	Long
Ontario	Kingfisher	511	Long
Ontario	Muskrat Dam Lake	281	Long

Province / Territory	Nation	Reported Population	Road Priority
Ontario	North Caribou Lake	886	Long
Ontario	Wapekeka	440	Long
Ontario	Wunnumin	593	Long
Ontario	Bearskin Lake	355	Long
Ontario	Cat Lake	565	Long
Ontario	Deer Lake	867	Long
Ontario	Kee-Way-Win	421	Long
Ontario	Poplar Hill	473	Long
Ontario	Sachigo Lake	514	Long
Ontario	Sandy Lake	2017	Long
Ontario	Wawakapewin	22	Long
Ontario	Attawapiskat	1501	Long
Ontario	Nibinamik First Nation	382	Long
Ontario	Weenusk	195	Long
Ontario	Pikangikum	2830	Long
Saskatchewan	Fond du Lac	903	Long

Table 14 Roads by Candidate Priority

Province/Territory	Immediate Candidates	Second Term Candidates	Long-Term Candidates
Ontario	Marten Falls Webequie	Temagami Amimakee Wa Zhing #37 (Northwest Angle #37) Moose Cree Northwest Angle #33 Kitchenuhmaykoosib Inninuwug (KI) Eabametoong (Fort Hope) Fort Severn Neskantaga North Spirit Lake	Cat Lake Deer Lake Keewaywin Nibinamik Poplar Hill Sandy Lake Wawakapewin Weenusk North Caribou Lake Wunnumin Lake Bearskin Lake Kasabonika Lake Kingfisher Lake Muskrat Dam Pikangikum Sachigo Lake Wapekeka Kimesskanamenow LP
Manitoba	Garden Hill to Red Sucker Lake Jct Little Grands Rapids to Pauingassi Oxford House Jct to God's Lake Narrows Red Sucker Lake Jct to Red Sucker Lake St. Theresa Pt Jct to St Theresa Pt St. Theresa Pt Jct to Wasagamack Bloodvein to Little Grand Rapids God's Lake Narrows to Red Sucker Lake Jct God's River Jct to God's River PR 373 to Oxford House	Brochet Jct to Lac Brochet PR 280 to Shamattawa Lac Brochet Jct to Tadoule Lake PR 280 to York Landing York Landing to Ilford PR 234 to Matheson Island PTH 6 to Thicket Portage	Berens River to Poplar River Norway House to St. Theresa Pt Jct PTH 6 to Pikwitonei Berens River to St Theresa Point PR 394 to Brochet PTH 10 to Pukatawagan
Northwest Territories	Wrigley to Tulita Winter Road	Dettah Ice Road* Gamètì Winter Road Wekweètì Winter Road Sambaa K'e Winter Road Nahanni Butte Winter Road	Norman Wells to Fort Good Hope Winter Road Délįne Winter Road Tulita to Norman Wells Winter Road Aklavik Ice Road Colville Lake Winter Road
Saskatchewan	Wollaston Lake	Cumberland House to Manitoba Border* Athabasca Seasonal Road	Stony Rapids to Fond du Lac Riverhurst

Province/Territory	Immediate Candidates	Second Term Candidates	Long-Term Candidates
		Fond du Lac to Uranium City	
Yukon		Old Crow Private Winter Road	
Alberta		Fort Chipewyan Winter Road	

*Road shortens a community connection, but community is also served by an existing all-season road.

CLOSING THE INFRASTRUCTURE GAP
PRIORITIZATION OF ALL-SEASON ACCESS ROADS

Appendix G

TELECOMMUNICATIONS INFRASTRUCTURE

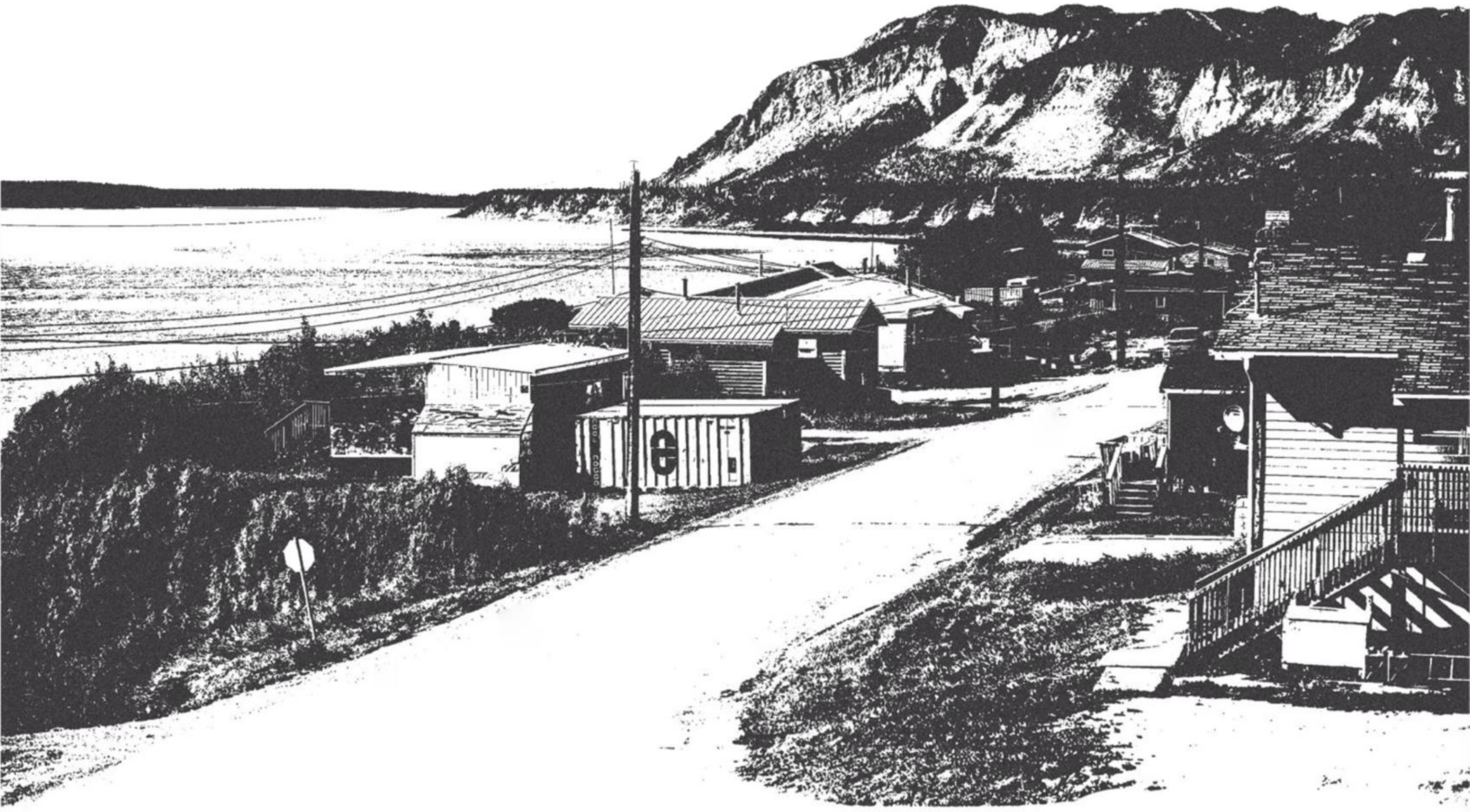


Figure-8 **Telecommunications Connectivity**

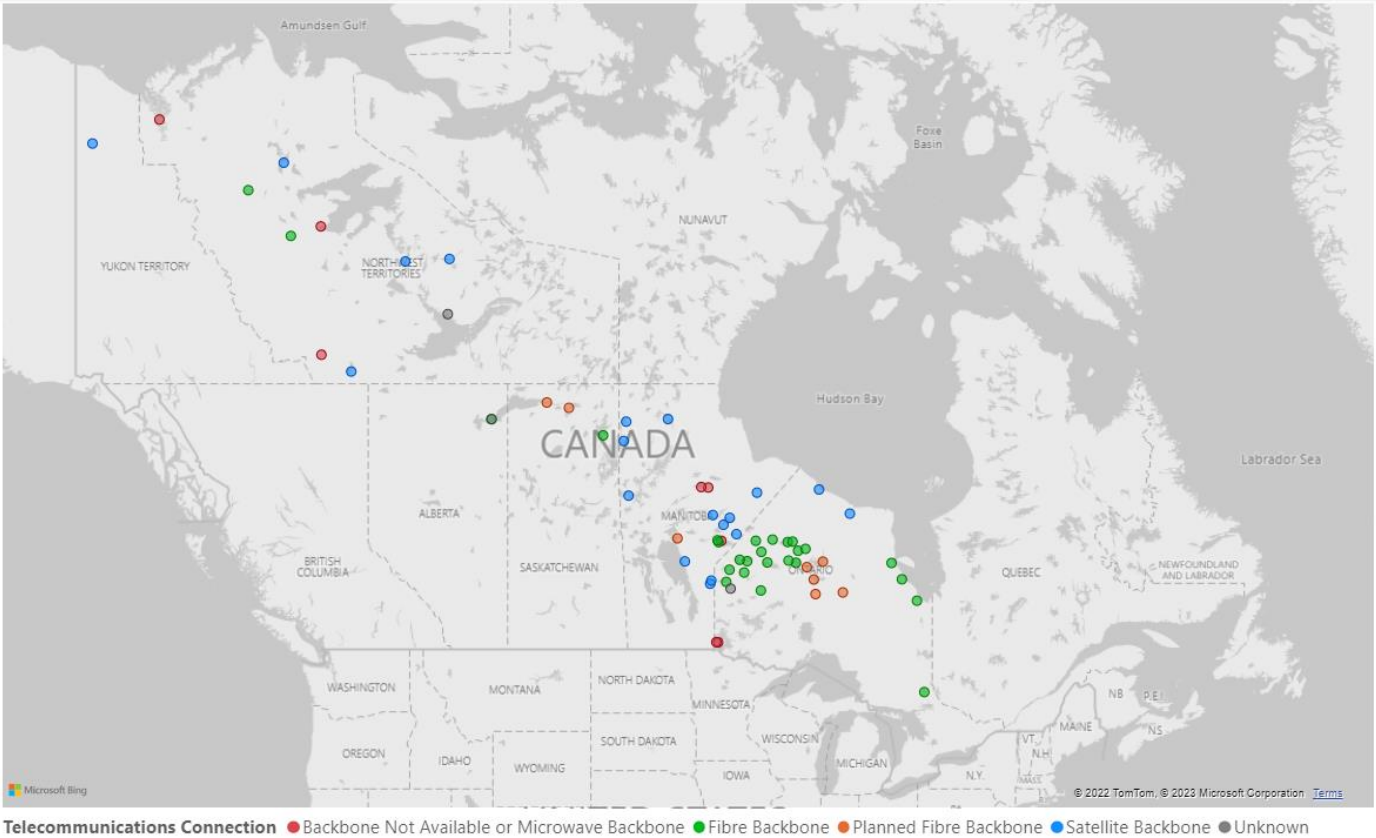


Table -15 List of Community Telecommunications Connectivity

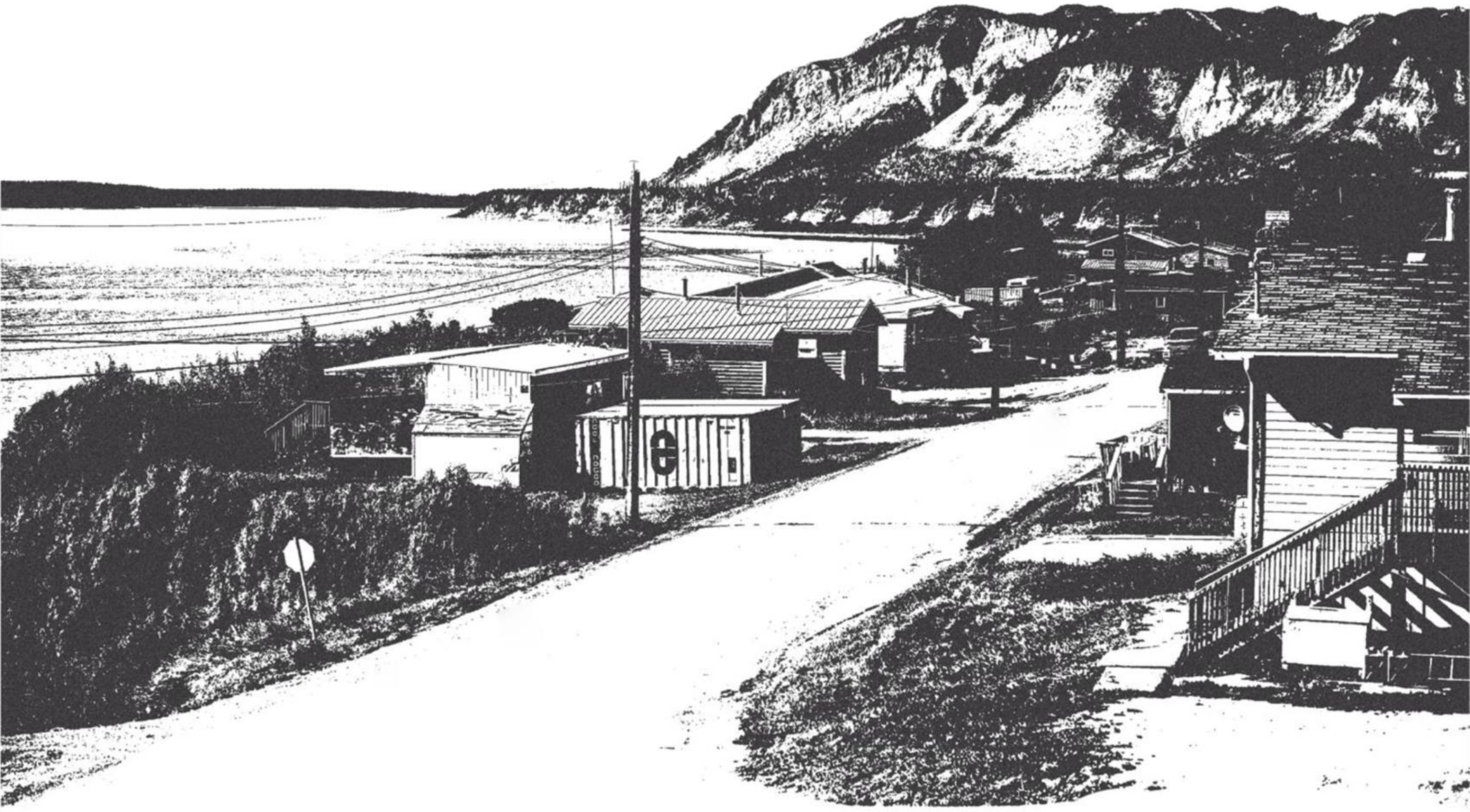
Community	Connectivity
Animakee Wa Zhing #37/Northwest Angle No.37	Backbone Not Available or Microwave Backbone
Garden Hill First Nations	Backbone Not Available or Microwave Backbone
York Factory First Nation	Backbone Not Available or Microwave Backbone
War Lake First Nation	Backbone Not Available or Microwave Backbone
Deline First Nation	Backbone Not Available or Microwave Backbone
Aklavik	Backbone Not Available or Microwave Backbone
Northwest Angle No.33	Backbone Not Available or Microwave Backbone
Nahanni Butte	Backbone Not Available or Microwave Backbone
Mikisew Cree First Nation	Fibre Backbone
Hatchet Lake	Fibre Backbone
Kasabonika Lake	Fibre Backbone
Kashechewan	Fibre Backbone
Kingfisher	Fibre Backbone
Kitchenuhmaykoosib Inninuwug	Fibre Backbone
Moose Cree First Nation	Fibre Backbone
Muskrat Dam Lake	Fibre Backbone
North Caribou Lake	Fibre Backbone
Temagami First Nation	Fibre Backbone
Wapekeka	Fibre Backbone
Wunnumin	Fibre Backbone
Wasagamack First Nation	Fibre Backbone
Tulita Dene	Fibre Backbone
Bearskin Lake	Fibre Backbone
Cat Lake	Fibre Backbone
Deer Lake	Fibre Backbone
Kee-Way-Win	Fibre Backbone
North Spirit Lake	Fibre Backbone
Poplar Hill	Fibre Backbone
Sachigo Lake	Fibre Backbone
Sandy Lake	Fibre Backbone
Wawakapewin	Fibre Backbone
St. Theresa Point	Fibre Backbone

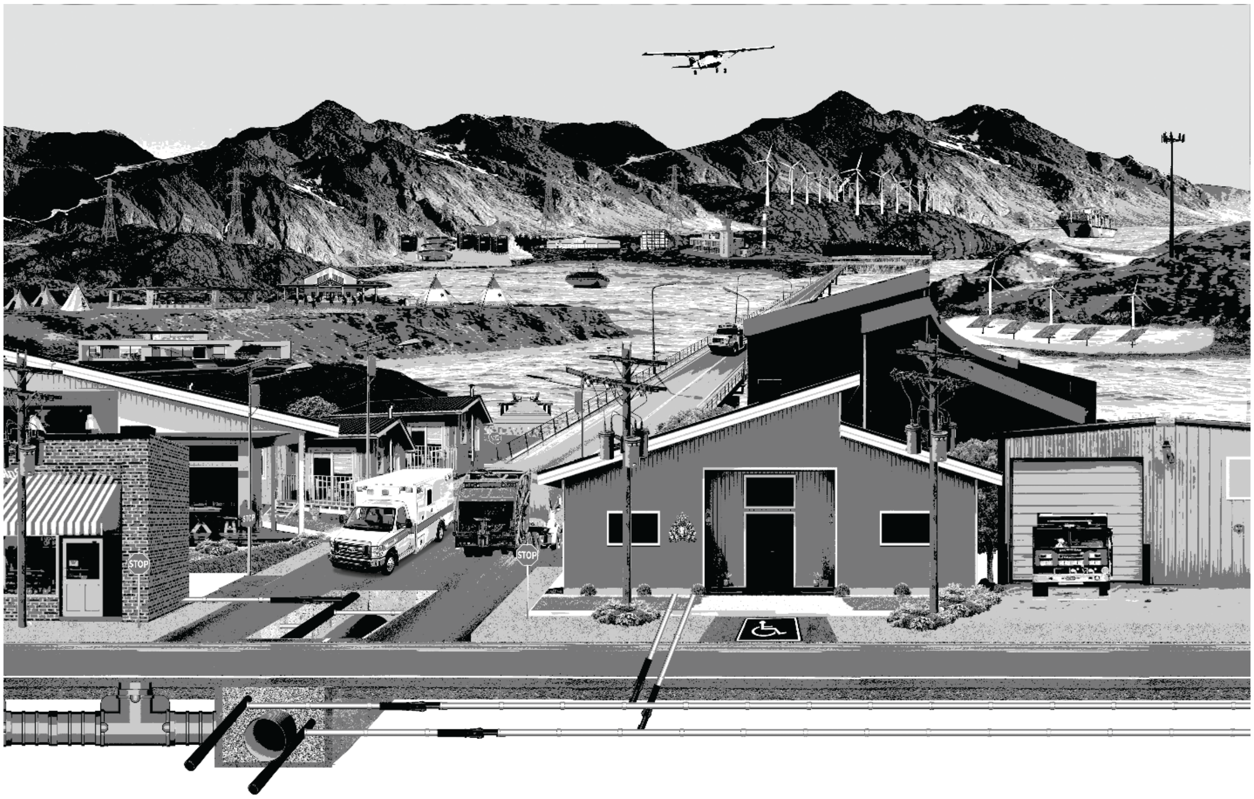
Community	Connectivity
Fort Good Hope	Fibre Backbone
Attawapiskat	Fibre Backbone
Eabametoong First Nation	Planned Fibre Backbone
Martin Falls	Planned Fibre Backbone
Nibinamik First Nation	Planned Fibre Backbone
Norway House Cree Nation	Planned Fibre Backbone
Fond du Lac	Planned Fibre Backbone
Black Lake	Planned Fibre Backbone
Neskantaga First Nation	Planned Fibre Backbone
Webequie	Planned Fibre Backbone
Weenusk	Satellite Backbone
Poplar River First Nation	Satellite Backbone
Northlands	Satellite Backbone
Manto Sipi Cree Nation	Satellite Backbone
Sayisi Dene First Nation	Satellite Backbone
Bunibonibee Cree Nation	Satellite Backbone
Barren Lands	Satellite Backbone
Mathias Colomb	Satellite Backbone
Behdzi Ahda" First Nation	Satellite Backbone
Sambaa K'e (Trout Lake) Dene	Satellite Backbone
Dechi Laot'i First Nations	Satellite Backbone
Vuntut Gwitchin First Nation	Satellite Backbone
Fort Severn	Satellite Backbone
Little Grand Rapids	Satellite Backbone
Pauingassi First Nation	Satellite Backbone
God's Lake First Nation	Satellite Backbone
Shamattawa First Nation	Satellite Backbone
Red Sucker Lake	Satellite Backbone
Gameti First Nation	Satellite Backbone
Athabasca Chipewyan First Nation	Unknown
Pikangikum	Unknown
Yellowknives Dene First Nation	Unknown

CLOSING THE INFRASTRUCTURE GAP BY 2030
PRIORITIZATION AND IMPLEMENTATION PLAN

Appendix 5

CLIMATE RISK MAPPING





Executive Summary

Climate change will impact many aspects of Indigenous community life, from long-held cultural practices to a variety of economic activities. While it is true that climate change brings opportunities, it also produces negative impacts that will affect food security, travel, traditional practices and health. This study identifies the most significant climate hazards that will affect First Nations, ranking hazards as low, medium, or high risk or no increase, or decreasing. The study is based on projections for the 2021-2050 time frame and reveals what the future will be like for current readers' grandchildren.

Eight hazards are mapped for nine regions or provinces: the Atlantic provinces, Québec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, and the Yukon and Northwest Territories. The eight hazards are extreme heat, drought, wildfires, high winds, freezing rain, localized flooding, creek/river/lake flooding, and sea level rise.

Flooding is the top hazard faced in each of the regions or provinces. Other hazards threatening communities include extreme heat, freezing rain, drought, high winds, and wildfires. The maps clearly indicate which communities are most at risk in the next 30 years. This study did not ascertain the historical impacts of climate change. Some communities, already hard hit by flooding or forest fire, will see their risks increase, compounding the challenges they face.

A section on shifting ecoregions examines how rising heat will affect plant and animal life and result in dramatic ecoregion changes. These changes will have a profound impact on traditional practices and could contribute to a loss of food sources and traditional knowledge.

The maps and data for each region captured in this report will assist First Nations in seeking funding for further studies related to a changing climate, and help these communities understand their immediate and short-term vulnerability to climate hazards and impacts.

Contents

1.0 Introduction

1.1 Background

This study builds on a previous report, Closing the Infrastructure Gap by 2030: A Collaborative and Comprehensive Cost Report Identifying the Infrastructure Investment Needs of Canada's First Nations (Nov. 2022). That report was the first of its kind to quantify the capital and operating costs to "Close the Infrastructure Gap by 2030" for First Nations across Canada. The federal funding required to close this gap represents a critical step toward urgently needed economic reconciliation between First Nations and the Government of Canada. The report's framework incorporated sustainable practices, climate resiliency, and preparation for Canada's Net-Zero commitments as part of its service delivery model.

1.2 Purpose of the current project

The objective of the current project is to use climate data analysis to paint a picture of how climate change will impact each First Nation (FN) in Canada, which climate hazards are of most concern, and determine the level of concern for each hazard, ranked from low level (less concerning) to medium (of concern) and high (very concerning). The maps and data for each region captured in this report will assist FNs to seek funding for further studies related to a changing climate, and help these communities understand their immediate and short-term vulnerability to climate hazards and impacts.

In addition, Associated Engineering (AE) considered climate change impacts from a social and economic perspective. For instance, how changing climate will affect:

- Traditional activities such as cultivating and gathering of berries, wild rice, medicinal herbs, and hunting and fishing (a warmer climate means some plants and wildlife will flourish, others will move north to cooler areas, and some species may die out)
- Forestry activities (a warmer climate means more pine beetle and other disease, and invasive species spread)
- Agrarian activities (how will shifting ecozones impact current crop selection or the spread of disease?)

This report used climate, ecological and locational data for 634 FNs, and other background information to analyze and assess climate risk changes across nine regions. Atlantic provinces were combined into one regional map; six provinces were shown individually (Québec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia); and the Yukon and Northwest Territories were combined into one map.

The results are displayed in regional maps by climate hazard type showing each FN and each hazard's severity from low to high.

2.0 Methodology

In an earlier phase of the Closing the Infrastructure Gap project, AE identified a list of climate hazards that might impact FNs and estimated the total funding needed to protect FN infrastructure from climate change. In the current phase of the project, AE estimated the exposure of each community to climate hazards between the present and 2050, to support FN leaders in determining which hazards are most consequential for their communities, and to help them make decisions about how climate adaptation resources could be allocated.

In accomplishing this current phase, we used data from (Power Analytics and Visualization for Climate Science) PAVICS, a reputable source for climate data. We chose the climate scenario, RCP of 8.5, which assumes a worst-case scenario approach to mitigating climate change. We chose climate parameters with data available that could act as an indicator of the change in a climate hazard. For example, the "number of days exceeding +30°C" parameter was chosen as an indicator for extreme heat conditions. To assess which communities are most likely to be affected by climate change in a time frame meaningful for readers, the change in each climate parameter between 2023 and 2050 is presented.

To estimate the change in climate parameters for each FN, climate data for the location of each FN were collected. FN locations were obtained from Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and Indigenous Services Canada (ISC) official maps. This provided a point location for each FN. While the point location is not exact for all FN infrastructure, climate trends will be similar across the FN's territory for most hazards.

The projections used are from down-scaled climate models—models that take climate trends over a larger area and provide projections for a smaller area. The outputs of these down-scaled models may not capture all the features of a location's micro-climate, and there will always be some uncertainty introduced when down-scaling projections. In addition, there will be natural climate variability on a year-by-year basis that is not accounted for (e.g., climate patterns like El Niño), and projections may not capture all climate phenomena or extreme weather events (e.g., an increase in atmospheric rivers in western Canada or increases in hurricanes in Atlantic Canada). Despite these limitations, these models are likely to provide the best estimates available of the present for what can be expected in an uncertain future.

2.1 Climate Hazard's

Climate hazards in Canada present unique challenges for FNs due to the country's size and geographic diversity. For example, coastal FNs face risks from sea level rise and storms, while inland communities are vulnerable to extreme heat, wildfires, and droughts. A range of climate hazards were assessed to capture impacts to FNs across the country.

Figure 2-1 Climate Hazards in Canada

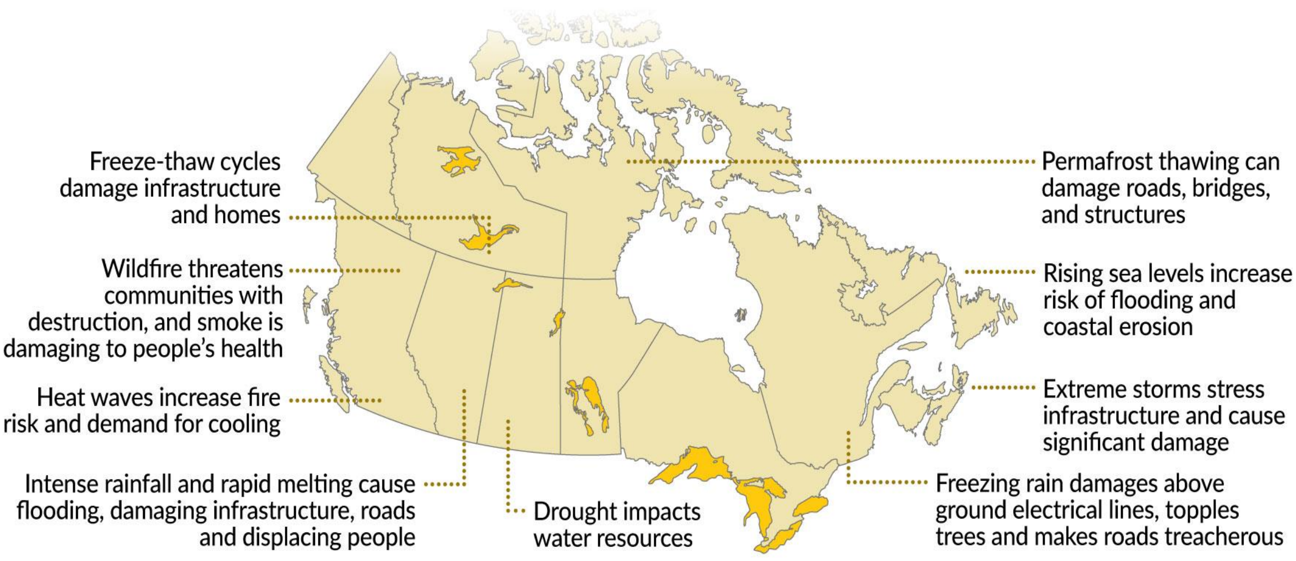


Table 2-1 **Climate Hazards and Climate Parameters Assessed**

Climate Hazard	Climate Parameter
Extreme Heat	# of days exceeding +30°C
Drought	Standardized Precipitation-Evapotranspiration Index (SPEI)
Wildfires	Average area burned within an ecozone (FNs outside of wildfire risk Ecozones are tagged as "Not Applicable")
High Winds	Maximum 1-in-50-year wind speeds
Freezing Rain	Change in Ice Accumulation
Localized Flooding	10 minute 1-in-25-year rainfall intensity
River/Creek/Lake Flooding	1 hour 1-in-100-year rainfall intensity
Sea Level Rise	Change in sea level (with non-coastal FNs tagged as "Not Applicable")

Changes in these climate hazards over the coming decades indicate whether a certain climate hazard is likely to be more severe in the future. However, a change to a hazard in the future does not account for whether a community is already vulnerable to that hazard. The infrastructure in a FN may already have been built to manage many days above +30°C, so a change in the hazard may not imply as significant a change in risk as a similar change would to infrastructure not built to handle those conditions. The climate indicators chosen are not perfect indicators of the risk to a community; however, they provide a reasonable indication of a trend in the likelihood of actual climate risks a FN might experience.

2.2 Estimating Changes in Hazards by Changes in Climate Parameters

While all FNs may be exposed to, for example, extreme heat, some FNs may see more significant changes than others between now and 2050. Hazards were categorized ("High", "Medium", "Low", or "No Increase or Decreasing") based on the change in the climate parameter across all FNs by 2050. Grouping the hazards into these categories reveals who is at risk soonest. Comparing across FNs helps determine the relative spread in risk, which could be used to support the prioritization of resources for climate adaptation actions to protect against certain hazard types.

Appendix A includes tables summarizing the number of FNs in each hazard category for each region. **Appendix B** includes further tables with the projected change in hazard for each FN.

Maps for each region and each hazard were created and are included in Appendix D to help visualize trends across Canada.

2.3 Limitations

The confidence in climate parameter data varies between parameters and even within a parameter. Effort has been made to use the most well-established data sources.

- Data confidence for a given hazard, like high winds, may overall be low to very low, reflecting limitations in current knowledge about future wind behaviour.
- Within a dataset, some locations may be nearer to weather stations, which use historical data to inform projections (especially for wind, freezing rain, and rainfall intensity), improving the accuracy of the climate projections. Locations have less accurate projections as the distance between them and weather stations increases.
- Down-scaled climate models may not fully capture micro-climate effects, even if those models provide the best projections available. High-level exposure screening, like the proximity of an FN to a waterbody for river/creek/lake flooding, is imperfect and is not a substitute for local flood mapping. As a result, the parameters provided in this study provide an indication of the direction of trends that will be seen in the future and are not a guarantee that the results in the future will exactly match the results projected today.

As noted above, a local climate risk assessment is required to fully understand the climate risks to an FN. Local climate risk assessments provide a benchmark of the current exposure to different hazards that a community already faces. They can provide the context necessary to determine how much an increase in a given climate parameter could contribute to greater risk to people and infrastructure.

This study looks only to 2050 and is intended to support near-term climate adaptation decision-making. The climate will continue to change, often more significantly between 2050 and 2080 than between 2020 and 2050. The relative difference in risk between FNs may look quite different in 2080 than in 2050. Funding to adapt to climate change in the later half of the century should re-evaluate the level of risk each FN experiences out to 2080 or beyond.

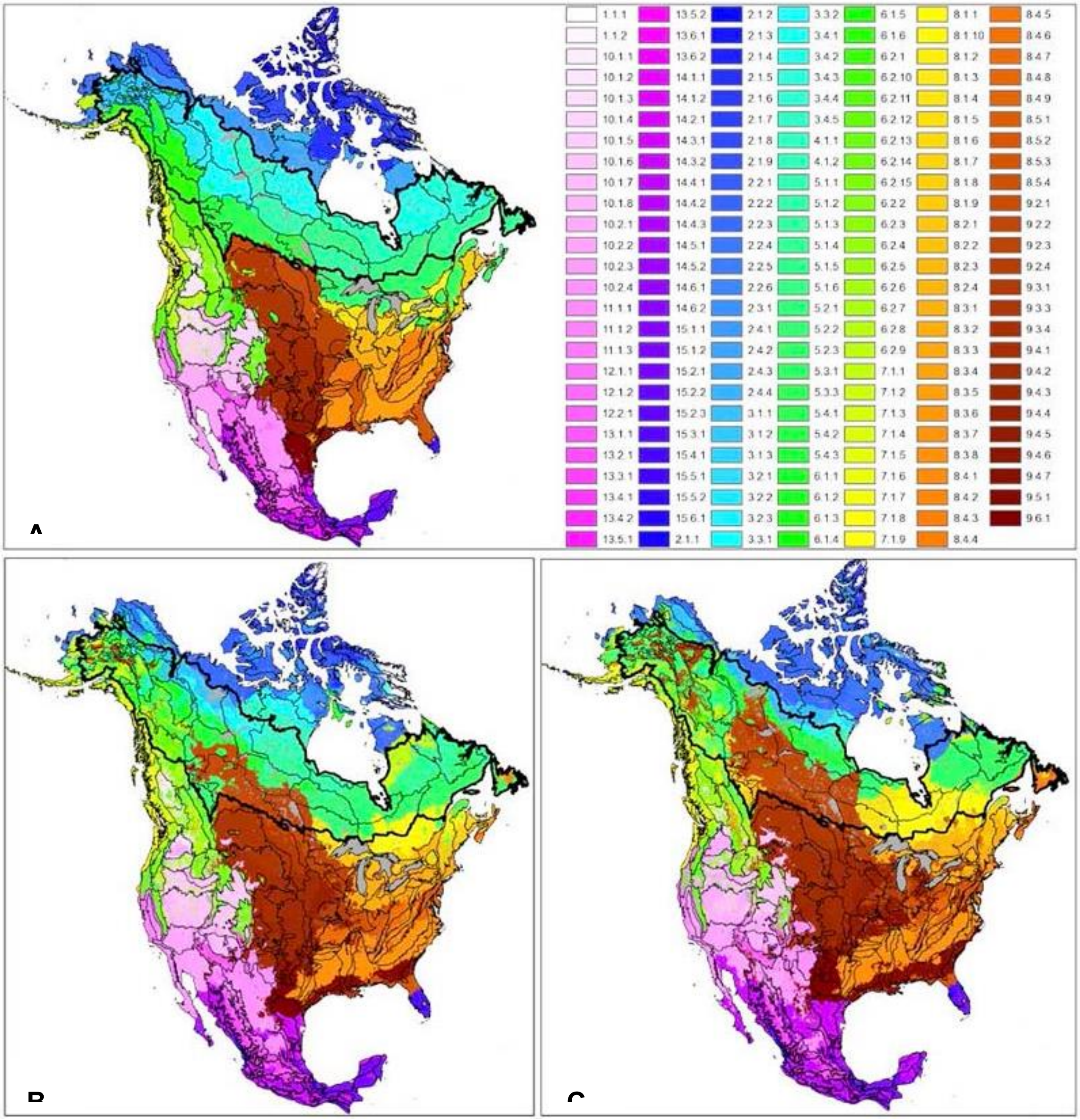
3.0 Impact of Climate Change on Ecoregions

Climate change across North America will significantly impact existing ecoregions, resulting in shifts in where these ecoregions occur in future, and impact traditional Indigenous activities and FN economies. As ecoregions change due to climate change, many traditional activities, such as hunting, fishing, and gathering food that once relied on specific environmental conditions, may become unsustainable. With the loss of these traditional activities, FNs risk losing access to traditional foods and medicines and the traditional knowledge and culture to which it is tied.

The implications of ecoregion changes are immense: what is boreal forest today will gradually shift to prairie and parkland. Traditional knowledge associated with an ecoregion could be lost if the plants and animals in the ecoregion profoundly change.

The following maps show the model-predicted (a) baseline, (b) mid-century and (c) end-of-century changes in North American ecoregions for the RCP 8.5 climate scenario. Boreal, hemi-boreal, and western forested regions are shown in green and blue-green shades; arctic ecoregions are in blue shades; prairie/parkland ecoregions are in brown shades; and temperate forest ecoregions are in yellow and orange shades. The Boreal ecoregion is outlined with a black border.

Figure 0-1 Shifting Ecoregions in North America



Impact of shifting ecoregions on traditional activities such as cultivating and gathering of berries, wild rice, traditional medicinal herbs, and hunting and fishing.

A warmer climate means some plants and wildlife will flourish, others will gradually spread north to cooler areas, and some species may die out. A US Department of Agriculture and US Forest Service study of national parks and other protected natural preserves suggests that vegetation shifts will be widespread in North America, and that at least half of these ecoregions "may have very different vegetation by the late-21st century compared to contemporary conditions. The general trend is toward vegetation associated with warmer or drier climates, such as forests transitioning away from cold montane conifer to more temperate conifer forests. Near complete losses of alpine communities are anticipated at the highest elevations and high latitudes, to be replaced with coniferous forest. At low elevation and latitudes, vegetation associated with novel climate conditions may form entirely new communities." Canadian studies such as Alberta's Natural Subregions Under a Changing Climate: Past, Present and Future reinforce this understanding.

Environmental changes can also affect the migration patterns of animals and birds (earlier or later migrations or the disappearance of a species from a region). Changing species can also alter the landscape in ways that are difficult to predict; beaver migration is reshaping waterways in the NWT and vegetation loss can increase erosion along coastal areas or by waterbodies.

Indigenous communities are familiar with the impacts of overfishing Pacific salmon, which has resulted in drastically reduced numbers. Climate change will further exacerbate the situation by warmer water temperatures, a threat to Chinook salmon, which breed and thrive in colder freshwater rivers and streams in the Pacific Northwest. These salmon are currently living at the upper range of their heat tolerance; another shift of 1-2□C will significantly impact their spawning activity. Fish in cold water lakes in other parts of northern Canada face similar impacts from climate change.

Hunting is also impacted by climate change. Formerly stable travel routes to hunting grounds in the north are no longer reliable because of rising temperatures. A decline in caribou populations in the Territories is attributed partly to climate change and means that communities that used to eat caribou must resort to expensive, store-bought meat. These threats to traditional food supplies have health and economic impacts that create a domino effect.

Traditional medicines are not exempt from the ravages of climate change. Heat can cause declines in biomass production and changes in chemical content, potentially affecting the efficacy of some plants. Some medicinal species may die out in a region or be replaced with invasive species with no medicinal value.

The environment plays a substantial role in shaping traditional knowledge. Loss of, and changes to habitat undermine long-held knowledge about the plants and animals that once thrived in a location. This impact is not well understood and needs further study.

Given the magnitude of these ecoregion changes, Indigenous communities can expect their traditional harvesting activities to be disrupted as some species disappear with habitat loss. However, some ecoregion shifts may prove a benefit, expanding the range of plants and animals present in these communities.

Impact on forestry activities

The Canadian government predicts that forest composition may change, as eco-systems favour the populations of tree species best able to adapt to new climate conditions and altered ecoregions. Some other changes may include:

- Forests can be converted into grasslands in some regions.
- Forestry activity may increase in some regions and decrease in others as rates of tree growth and tree mortality fluctuate.
- Some habitats may disappear, and some will shift northwards or to higher elevations.
- Some tree species may become increasingly maladapted to new climate regimes and will therefore undergo stress.
- A warmer climate means more pine beetle and other disease, and the introduction and spread of invasive species.
- Fire activity may increase, with the area burned each year potentially doubling by the end of this century.

"Forestry-dependent communities and Aboriginal communities will be the first to feel the impacts of any timber supply disruptions or losses of other forest values as a result of changing climate conditions."

Impact on agrarian activities

Climate change imperils food security, while also making it possible to grow new crops and increase productivity because of a longer growing season and higher temperatures. Agriculture Canada notes that annual and seasonal mean temperatures across Canada have increased due to climate change, with the greatest warming occurring in winter. Between 1948 and 2016, the best estimate of mean annual temperature increase is 1.7°C for Canada as a whole and 2.3°C for northern Canada.

In addition to heat, climate change is associated with extreme weather events which threaten crops: flooding, hailstorms, tornadoes, and wildfires. Peak streamflow dates have shifted, with spring peak streamflow following snowmelt occurring earlier in the spring, with higher winter and early spring flows. Droughts and associated soil moisture deficits, while a naturally occurring phenomenon historically, will likely increase in frequency and become more intense. Areas that did not previously require irrigation will have to introduce it in the future to sustain crop yields. Other negative impacts of climate change include the spread of new diseases and invasive species.

Farm animals are impacted by climate change, especially heat stress which lowers weight gain in cattle and reduces reproductive capacity and milk and egg production. Finally, climate change introduces uncertainty about whether crops and animals will thrive in any given growing season, which is a concern for Indigenous farmers and ranchers.

The implications of these changes are immense: what is boreal forest today will gradually shift to prairie and parkland. New crops could include soybean and corn in places they never grew previously in Canada. New invasive species, water insufficiency and drought, and sudden heavy rainfall events will impact natural and cultivated landscapes. These dramatic environmental changes will touch every aspect of community life.

4.0 Climate Hazard and Projections Across Canada

While climate change affects all FNs, it will affect FNs differently between regions. Looking at the trends on a hazard-by-hazard basis can help discern which areas will be most impacted. Appendix C includes maps for all hazards by region to help visualize these trends.

Extreme heat

Rising global temperatures will cause an increase in hot days and heat waves across nearly every FN in Canada. Extreme heat can have significant impacts on human health and infrastructure. As temperatures rise, the risks of heat-related illnesses and death increase. High temperatures can also increase strain on infrastructure and lead to early degradation of roads and building systems, and stress power supply systems.

Using the change in the number of days above +30°C to indicate the frequency of heat events in the future, we can see that some FNs are impacted to a greater degree than others. FNs in southern regions, particularly in south-central British Columbia, the Prairies, southern Ontario, and western New Brunswick, see the greatest increase in the number of days above +30°C, with some FNs seeing increases of over half a month in days above +30°C. Coastal FNs in more temperate regions, like central British Columbia, the northern Great Lakes, the Hudson Bay region, and some parts of the Atlantic region seeing the least increase.

While FNs in southern regions see the greatest increase, it does not mean they are necessarily the least equipped to handle the coming changes. Northern FNs may be less equipped to handle very high temperatures if buildings and infrastructure are designed primarily for colder climates. While some areas will need to improve their existing capacity to handle extreme heat events, other areas will need to build up these systems for the first time.

Drought

Higher temperatures can cause an increase in dry conditions and water scarcity in many FNs, which can strain natural ecosystems and water supply, and wastewater infrastructure. While most regions will be warmer and may have greater evaporation and transpiration in the future, higher temperatures also increase the amount of moisture in the atmosphere, and in some regions, this may offset the higher evaporation and transpiration and lead to wetter conditions overall.

Using the SPEI, a commonly used measure of drought conditions in North America, we can see that central and southern British Columbia, the Prairies, the southern regions of the Northwest Territories, and Ontario are most impacted by drought. Northern and coastal British Columbia, the Yukon, the northernmost regions of the Northwest Territories, and Québec and the Atlantic region are likely to see wetter conditions in the future and may be at less risk of drought.

It is likely that FNs already facing water scarcity issues will be most impacted by these changes, and this trend will increase throughout this century. A mix of natural and built solutions to conserve water or increase water storage will become increasingly important to mitigate drought conditions.

Wildfires

Hotter and drier conditions can lead to an increased likelihood of wildfires. All regions across Canada currently at risk of wildfires are likely to see an increase in wildfire risk. As with extreme heat, some areas will see more significant increases than others.

The average annual area burned within an ecozone was chosen as an indicator of the likelihood of wildfires in a region. Wildfire data depends heavily on local conditions, but projections at the ecozone level can be used to provide an indication of the trends in wildfire frequency and intensity. While it is difficult to predict the likelihood that a given FN will be impacted by a wildfire in a given year, as the average area burned across a region increases, it is more likely that a FN will be affected.

Coastal and central British Columbia, northern and eastern Ontario, southern Québec, and Newfoundland will likely see the greatest increase in annual areas burned. Except for the southern Prairies regions, southern Ontario, and the Maritimes, all FNs across the country will see an increase in wildfire risk.

High winds

High winds can cause damage to structures, down trees, and topple power lines. While confidence in wind speed projections is lower than for other indicators, projections show a trend of increased maximum wind speeds during wind storms across most of the country, with trends continuing to increase toward the end of the century.

As an indicator for damaging high wind events, AE used maximum wind speeds during 1-in-50-year wind storms, the design criteria used in the National Building Codes of Canada. By 2050 maximum gust speeds are projected to increase by 1 to 3 km/h across most FNs. While this is a relatively small increase (+2.5% to +5% in most locations), FNs that have already experienced damaging wind events are likely to see increases in the future.

While maximum wind speeds are likely to increase, the future likelihood of severe storms and other extreme weather events (e.g., tornadoes, derechos, hurricanes) is uncertain. It is likely that hotter summers will lead to more intense thunderstorms and FNs, particularly in the southern Prairies, should be prepared for more extreme wind events.

Freezing rain

Freezing rain can break tree branches, knock down power lines, and damage crops. It can cause power outages, traffic accidents, and dangerous conditions for pedestrians.

Ice accumulation (the total amount of ice built up over a period of time) is a design criteria used in the National Building Code of Canada and was used in this study as an indicator for the change in likelihood or severity of freezing rain events. Confidence in ice accumulation is lower than for other indicators and may not provide a full picture of the change in likelihood of ice storms. As with wind, ice accumulation is very difficult to project, and is affected by localized micro-climate differences. Consequently different localities in close proximity can differ significantly with respect to ice accumulation.

Projections for the change in ice accumulation vary across the country. Ice accumulation is likely to increase in the Prairies as temperatures increase and storms that would previously have occurred during colder temperatures occur nearer to 0°C. Ice accumulation is projected to decrease in the Pacific, Maritime, and southern Ontario regions.

Flooding: localized and river/creek/lake flooding

As temperatures increase, the amount of moisture that can be carried in the atmosphere increases. Even as some areas get drier overall, the intensity of major storms may increase.

Localized flooding is often caused by intense, short-duration rainfall events. The change in 10-minute, 1-in-25-year rainfall intensity was used as an indicator for localized flooding. Several factors may contribute to river/creek/lake flooding, such as glacial melt, soil conditions, and other characteristics of a catchment area. Rainfall within a certain area alone is not enough to fully determine flood risk, but an increase in intense longer-duration rainfall events is likely to contribute toward an increased risk of flooding. The change in 1-hour 1-in-100-year rainfall intensity was used as an indicator for river/creek/lake flooding.

The most recent rainfall intensity-duration-frequency projections project a +5% to +12% increase in rainfall intensity for both indicators (10-minute 1-in-25-year and 1-hour 1-in 100-year rainfall intensities) across all FNs. FNs in the Northwest Territories and Hudson Bay region are projected to see the most significant increases, while FNs in coastal BC are expected to see the lowest increase relative to FNs. As discussed above, the projections for this indicator may not account for the impact of all extreme weather events or climate trends, like the trends toward a greater number of high-intensity atmospheric rivers projected to impact the west coast of North America.

Localized and river/creek/lake flooding is highly dependent on local factors such as topography, elevation differences, hydraulic constrictions, and local geology that were unavailable or could not be assessed as part of this study. Local knowledge of past flooding or historical flood maps should be used to supplement this study, and climate-projected flood maps should be used in place of the indicators in this study when they become available.

Sea level rise

Sea level rise can lead to flooding, erosion, and other hazards, like increased salinity, for low-lying coastal areas. Flooding from storm surges can damage infrastructure and inundate low-lying areas. As the sea level rises, beaches, dunes, and other natural features that protect the coastline can erode. Increased salinity can make it difficult for some plants and animals to survive.

The change in sea level was used as an indicator for the likelihood of damaging impacts from sea level rise. While sea level rise alone cannot predict the likelihood of damaging storm surges or fully predict the rate of erosion, it is indicative of a trend toward those impacts.

Sea level rise will impact FNs in British Columbia and the Atlantic, with the Atlantic region seeing relatively larger increases in sea level. Forecasts show that sea level will decrease in the Hudson Bay area, as melting ice sheets cause land elevations to rise slightly in the southern Nunavut and Hudson Bay region. This does not mean that FNs along the Hudson Bay area are entirely safe from the effects of erosion. Sea level decreases are likely to present their own challenge to ecosystems in that region.

The projected sea level rise data used in this project does not include modelling for the Great Lakes. Recent research suggests that water levels along the Great Lakes may rise due to climate change, and that FNs along the Great Lakes may be impacted similarly to coastal FNs.

5.0 Identifying Top Hazards Within Regions

Understanding which hazards within a region are likely to see the greatest change can help identify how future climate change adaptation needs may change. Assessing how many FNs in a region fall under a "High", "Medium", "Low", or "No Increase or Decreasing" hazard category can provide a picture of how the types of climate risk within an FN may change in the future.

Many FNs already experience the impacts of climate change, and deal with extreme weather events. This analysis aims to show how those impacts may change from the impacts experienced in the present. For example, many FNs in northern Alberta experience a high risk of wildfires today, a "Low" change in hazard category for an FN implies that it will continue to experience a high risk of wildfires in the future—but the change in risk may not be as high as it would be for an FN at low risk of wildfires today but at much higher risk in the future. For some FNs, new climate risks they currently do not experience may rise in importance relative to the risks that they experience today.

The top three hazards by the number of FNs experiencing a "High" or "Medium" change for each region are summarized below. Appendix A includes summary tables of how many FNs fall into each change in hazard category for each region.

Table 5-1 Top Three Climate Hazards Affecting First Nations

Region	Climate Hazard#1	Climate Hazard#2	Climate Hazard#3
Alberta	Flooding	Freezing Rain	Drought
Atlantic Provinces	Flooding	High Winds	Extreme Heat
British Columbia	Wildfires	High Winds	Extreme Heat
Manitoba	Flooding	Drought	Extreme Heat
Northwest Territories	Flooding	Freezing Rain	Wildfires
Ontario	Flooding	Extreme Heat	High Winds
Québec	Flooding	Wildfires	High Winds
Saskatchewan	Flooding	Drought	Extreme Heat
Yukon	Flooding	Freezing Rain	High Winds

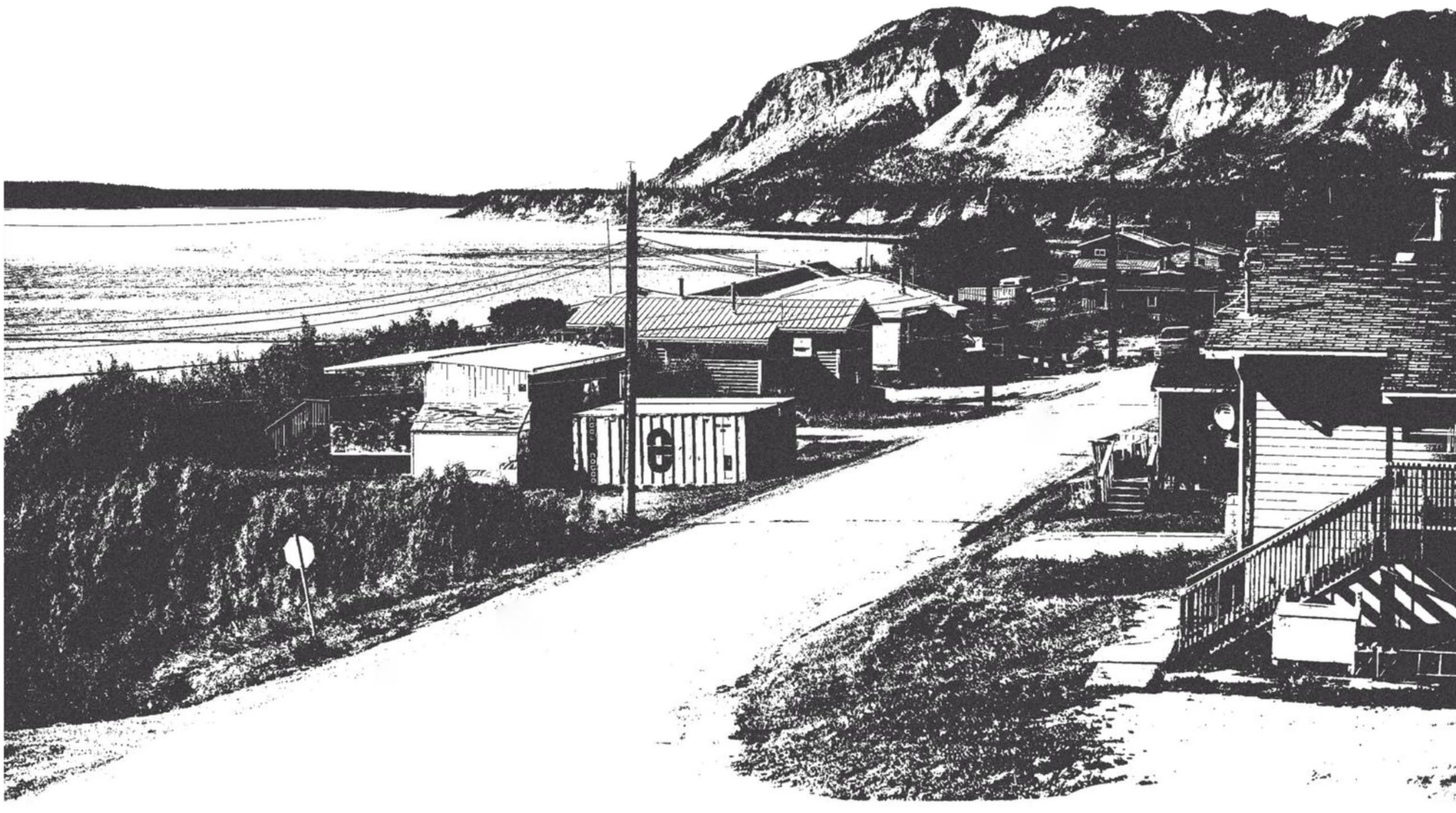
Adaptation needs for both current hazards and future hazards need to be addressed to close the infrastructure gap by 2030. Balancing the need to adapt to pressing present-day climate impacts with climate impacts that will increase by 2050 is important to protect FNs in the short and long term.

While this study provides a high-level projection of the change in climate indicators that can lead to greater climate risk in an FN, it is no substitute for a local climate risk assessment or climate action plan. Climate adaptation is inherently local, and local knowledge and local data will be needed to fully understand an FN current, and future climate risk. Adaptation actions must be tailored to meet local needs and local priorities. It will be important that federal funding is sufficient and flexible enough to allow FN to address adaptation needs in ways that make sense for each community.

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP CLIMATE HAZARDS & RISKS FACING FIRST NATIONS

Appendix A

CLIMATE HAZARD REGIONAL SUMMARY TABLES



Alberta

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	4	4	11	0	47	0	0	0
Medium	34	1	35	4	1	48	48	0
Low	10	33	2	11	0	0	0	0
No Increase or Decrease	0	0	0	33	0	0	0	0
N/A	0	10	0	0	0	0	0	48

Atlantic Provinces

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	15	3	0	22	0	0	0	6
Medium	8	1	0	5	4	30	30	14
Low	10	0	0	5	2	4	4	1
No Increase or Decrease	1	0	34	2	28	0	0	1
N/A	0	30	0	0	0	0	0	12

British Columbia

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	54	188	8	114	23	0	0	0
Medium	62	2	44	33	76	93	94	64
Low	60	9	64	38	52	106	105	7
No Increase or Decrease	23	0	83	14	48	0	0	0
N/A	0	0	0	0	0	0	0	128

Manitoba

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	31	9	44	2	21	0	0	0
Medium	25	18	15	26	23	63	63	0
Low	7	23	4	31	16	0	0	0
No Increase or Decrease	0	0	0	4	3	0	0	0
N/A	0	13	0	0	0	0	0	63

Northwest Territories

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	0	0	0	0	22	14	14	0
Medium	5	19	6	0	1	12	12	0
Low	21	7	8	14	1	0	0	0
No Increase or Decrease	0	0	12	12	2	0	0	0
N/A	0	0	0	0	0	0	0	26

Ontario

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	81	62	6	31	0	5	5	0
Medium	47	37	82	90	47	134	134	0
Low	11	0	50	17	59	0	0	0
No Increase or Decrease	0	0	1	1	33	0	0	4
N/A	0	40	0	0	0	0	0	135

Quebec

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	10	26	0	13	0	5	5	0
Medium	14	5	0	16	20	35	35	10
Low	12	0	18	11	16	0	0	1
No Increase or Decrease	4	0	22	0	4	0	0	5
N/A	0	9	0	0	0	0	0	24

Saskatchewan

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	47	0	65	0	47	0	0	0
Medium	19	2	4	1	10	70	70	0
Low	4	36	1	38	12	0	0	0
No Increase or Decrease	0	0	0	31	1	0	0	0
N/A	0	32	0	0	0	0	0	70

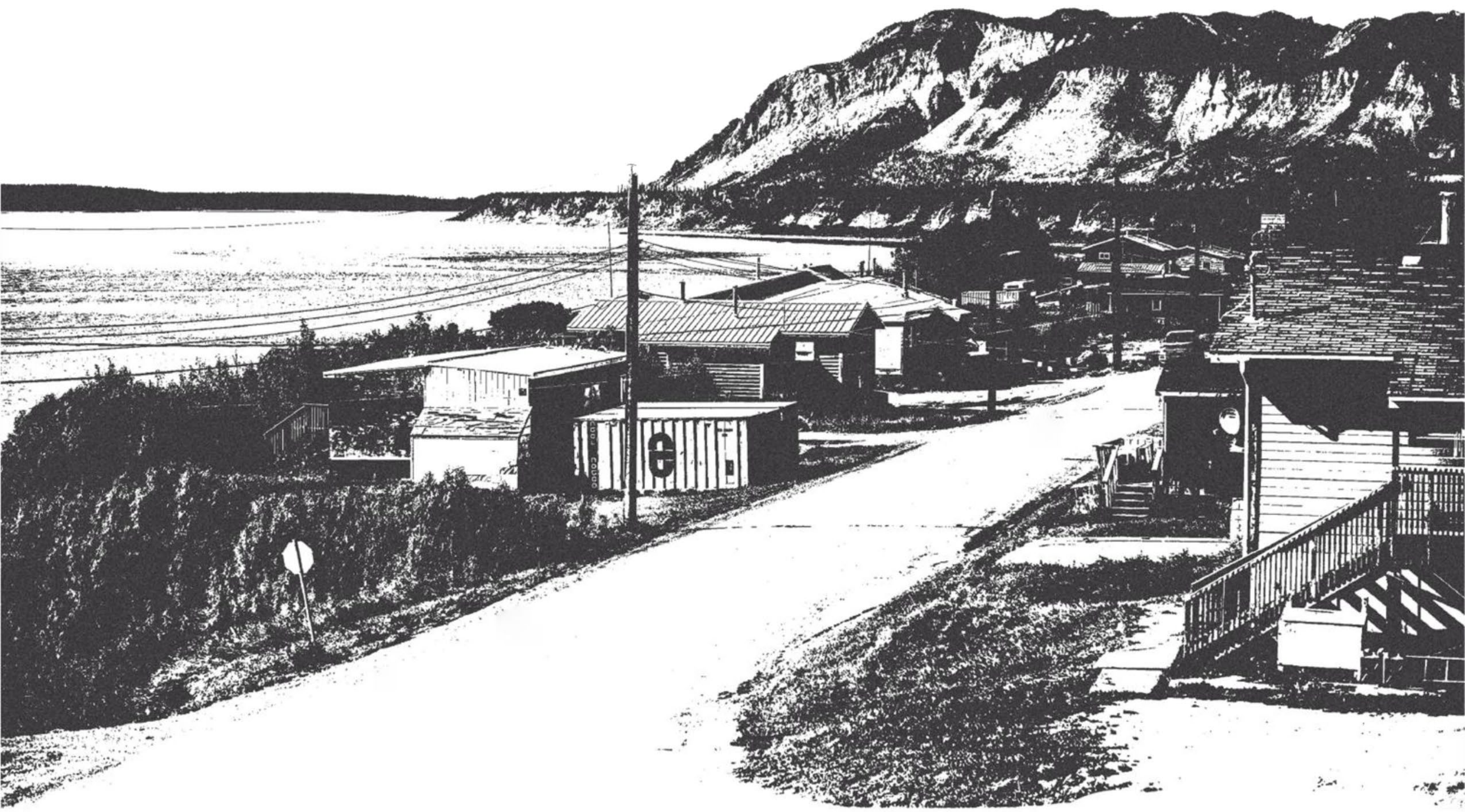
Yukon

Change in Hazard	Extreme Heat - # of FNs	Wildfires - # of FNs	Drought - # of FNs	High Winds - # of FNs	Freezing Rain - # of FNs	Localized Flooding - # of FNs	River/ Creek/ Lake Flooding - # of FNs	Sea Level Rise - # of FNs
High	0	0	0	0	17	0	0	0
Medium	0	1	0	3	0	18	18	0
Low	18	17	0	10	0	0	0	0
No Increase or Decrease	0	0	18	5	1	0	0	0
N/A	0	0	0	0	0	0	0	18

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP CLIMATE HAZARDS & RISKS FACING FIRST NATIONS

Appendix B

CHANGE IN CLIMATE HAZARD BY FIRST NATION SUMMARY TABLES



Alberta

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A
Alexis Nakota Sioux Nation	7.8	79%	-3%	1.5	27%	8%	0%	N/A
Athabasca Chipewyan First Nation	5.5	79%	-8%	1.3	33%	9%	0%	N/A
Bearspaw	7.6	288%	0%	1.1	35%	8%	8%	N/A
Beaver First Nation	5.8	79%	-4%	1.0	29%	9%	0%	N/A
Beaver Lake Cree Nation	7.1	79%	-3%	1.7	38%	8%	0%	N/A
Bigstone Cree Nation	4.4	79%	-1%	1.3	31%	8%	0%	N/A
Blood	15.5	N/A	-2%	1.9	9%	8%	0%	N/A
Chiniki	7.6	288%	0%	1.1	35%	8%	8%	N/A
Chipewyan Prairie First Nation	6.1	79%	-5%	1.3	30%	9%	0%	N/A
Cold Lake First Nations	9.0	79%	-5%	1.8	33%	9%	0%	N/A
Dene Tha'	5.2	151%	-7%	1.6	30%	9%	9%	N/A
Driftpile Cree Nation	5.3	79%	-2%	1.1	35%	8%	0%	N/A
Duncan's First Nation	4.9	79%	-4%	1.4	32%	8%	0%	N/A
Enoch Cree Nation #440	8.3	N/A	-4%	2.1	19%	8%	0%	N/A
Ermineskin Tribe	9.8	N/A	-2%	1.8	33%	8%	0%	N/A
Fort McKay First Nation	8.1	79%	-2%	1.3	30%	9%	0%	N/A
Fort McMurray #468 First Nation	5.4	79%	-4%	1.3	30%	9%	9%	N/A
Frog Lake	9.2	79%	-2%	1.8	33%	9%	0%	N/A
Goodstoney	7.6	288%	0%	1.1	35%	8%	8%	N/A
Heart Lake	6.0	79%	-2%	1.7	38%	8%	8%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Horse Lake First Nation	4.5	79%	-2%	1.3	31%	8%	0%	N/A
Kapawe'no First Nation	5.1	79%	-2%	1.1	35%	8%	0%	N/A
Kehewin Cree Nation	9.3	79%	1%	1.1	22%	9%	0%	N/A
Little Red River Cree Nation	6.3	79%	-3%	1.3	24%	9%	0%	N/A
Loon River Cree	4.6	79%	-1%	1.1	35%	8%	0%	N/A
Louis Bull	9.0	N/A	-4%	1.8	33%	8%	0%	N/A
Lubicon Lake	4.2	79%	-2%	1.1	35%	8%	0%	N/A
Mikisew Cree First Nation	5.1	79%	-6%	1.3	33%	9%	0%	N/A
Montana	9.7	N/A	-2%	1.8	33%	8%	0%	N/A
O'Chiese	6.9	79%	-1%	1.7	17%	8%	0%	N/A
Paul	8.0	79%	-5%	1.9	36%	8%	0%	N/A
Peerless Trout First Nation	2.7	79%	-2%	1.1	35%	8%	0%	N/A
Piikani Nation	13.9	N/A	-6%	2.8	23%	8%	0%	N/A
Saddle Lake Cree Nation	8.8	79%	-1%	1.1	22%	8%	0%	N/A
Samson	9.5	N/A	-3%	1.8	33%	8%	0%	N/A
Sawridge First Nation	3.5	79%	-2%	1.1	35%	8%	0%	N/A
Siksika Nation	14.1	N/A	0%	1.5	26%	8%	0%	N/A
Smith's Landing First Nation	5.5	79%	-3%	1.1	16%	10%	0%	N/A
Stoney	7.6	288%	0%	1.1	35%	8%	8%	N/A
Sturgeon Lake Cree Nation	5.6	79%	1%	1.4	32%	8%	0%	N/A
Sucker Creek	5.4	79%	-1%	1.1	35%	8%	0%	N/A
Sunchild First Nation	7.1	79%	0%	1.7	17%	8%	0%	N/A
Swan River First Nation	4.6	79%	-2%	1.1	35%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Tallcree Tribal Government	5.9	79%	-4%	1.0	29%	9%	0%	N/A
Tsuut'ina Nation	11.0	N/A	-4%	1.3	35%	8%	0%	N/A
Whitefish Lake	3.8	79%	-3%	1.1	35%	8%	0%	N/A
Woodland Cree First Nation	4.4	79%	-3%	1.2	25%	8%	0%	N/A

Atlantic Provinces

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Abegweit	6.5	N/A	-2%	1.6	-23%	8%	0%	0.30
Acadia	0.0	N/A	0%	1.4	4%	7%	0%	0.24
Annapolis Valley	11.5	N/A	-2%	1.3	-9%	8%	0%	N/A
Bear River	3.1	N/A	0%	1.3	-14%	8%	0%	0.26
Bilijk	13.6	N/A	-3%	1.3	-28%	9%	0%	N/A
Buctouche MicMac	11.2	N/A	-1%	1.3	-25%	9%	0%	0.30
Eel River Bar First Nation	7.9	N/A	-6%	2.0	-19%	9%	0%	0.23
Elsipogtog First Nation	11.5	N/A	-4%	1.9	-21%	9%	0%	0.27
Esgenoopetitj First Nation	10.4	N/A	-2%	1.9	-21%	9%	0%	0.27
Eskasoni	1.8	N/A	0%	1.4	-38%	7%	0%	0.33
Fort Folly	7.3	N/A	0%	1.3	-25%	8%	0%	N/A
Glooscap First Nation	10.8	N/A	0%	2.1	-9%	8%	0%	0.31
Indian Island	10.9	N/A	0%	1.9	-21%	9%	0%	0.27
Lennox Island	8.0	N/A	-1%	1.5	-10%	8%	0%	0.30
Madawaska Maliseet First Nation	10.0	N/A	-4%	1.4	9%	9%	0%	v

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Membertou	3.0	N/A	-3%	2.2	-38%	7%	0%	0.33
Metepenagiag Mi'kmaq Nation	12.9	N/A	-1%	1.7	-10%	9%	0%	N/A
Miawpukek	0.2	277%	-1%	1.9	-1%	7%	0%	0.26
Millbrook	9.9	N/A	1%	1.5	-23%	8%	0%	N/A
Mushuau Innu First Nation	0.4	188%	-2%	2.1	8%	9%	0%	-0.05
Natoaganeg	12.8	N/A	-2%	1.3	-8%	9%	0%	0.27
Oromocto First Nation	13.5	N/A	-4%	1.4	-6%	9%	0%	N/A
Pabineau	11.7	N/A	-2%	2.0	-19%	9%	9%	N/A
Paqtnkek Mi'kmaw Nation	6.2	N/A	-2%	1.6	-22%	8%	0%	0.30
Pictou Landing	9.0	N/A	-3%	1.2	1%	8%	0%	0.30
Potlotek First Nation	0.7	N/A	-1%	1.4	-31%	8%	0%	0.33
Qalipu Mi'kmaq First Nation	1.9	277%	-4%	1.7	8%	8%	0%	0.22
Saint Mary's	13.4	N/A	-2%	1.8	-1%	9%	0%	N/A
Sheshatshiu Innu First Nation	3.5	277%	-5%	2.1	8%	9%	9%	0.07
SIPEKNE'KATIK	9.7	N/A	1%	1.6	-15%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Tobique	11.6	N/A	-2%	1.9	2%	9%	0%	N/A
Wagmatcook	3.1	N/A	-1%	1.4	-14%	8%	0%	0.30
We'koqma'q First Nation	3.6	N/A	-1%	1.4	-14%	8%	0%	0.30
Woodstock	13.8	N/A	-2%	1.3	-2%	9%	0%	N/A
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A

British Columbia

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
?Akisq'nuk First Nation	12.5	288%	2%	1.3	0%	8%	0%	N/A
?aqam	14.9	288%	1%	1.3	2%	8%	0%	N/A
?Esdilagh First Nation	11.2	288%	-3%	1.0	13%	8%	0%	N/A
Adams Lake	12.8	288%	3%	2.0	-1%	8%	8%	N/A
Ahousaht	0.0	1201%	4%	2.4	-7%	6%	0%	0.16
Aitchelitz	11.2	1201%	5%	1.5	10%	7%	0%	N/A
Ashcroft	15.6	288%	1%	1.8	6%	8%	0%	N/A
Beecher Bay	1.9	1201%	8%	2.0	-3%	7%	0%	0.23
Binche Whut'en	4.2	288%	-5%	1.4	10%	8%	8%	N/A
Blueberry River First Nations	3.9	79%	-3%	1.8	32%	8%	0%	N/A
Bonaparte First Nation	10.9	288%	-2%	1.8	6%	8%	0%	N/A
Boothroyd	11.0	288%	6%	1.4	3%	8%	0%	N/A
Boston Bar First Nation	10.8	288%	6%	1.4	3%	8%	0%	N/A
Bridge River	8.9	288%	0%	1.2	9%	8%	0%	N/A
Burns Lake	3.6	288%	-3%	1.4	10%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Campbell River	4.6	1201%	7%	1.2	-9%	7%	0%	0.16
Canim Lake	8.2	288%	-2%	1.3	17%	8%	0%	N/A
Cape Mudge	5.2	1201%	8%	1.2	-9%	7%	0%	0.16
Cayoose Creek	10.7	288%	3%	1.2	9%	8%	0%	N/A
Chawathil	8.7	1201%	8%	1.5	10%	8%	0%	N/A
Cheam	11.6	1201%	6%	1.5	10%	7%	0%	N/A
Cheslatta Carrier Nation	4.3	288%	-3%	1.4	10%	8%	0%	N/A
Coldwater	10.3	288%	5%	1.1	3%	8%	0%	N/A
Cook's Ferry	13.1	288%	2%	1.8	6%	8%	8%	N/A
Cowichan	6.8	1201%	9%	2.0	-3%	7%	0%	0.23
Da'naxda'xw First Nation	0.1	1201%	7%	1.8	4%	6%	0%	0.16
Ditidaht	1.4	1201%	10%	2.1	-1%	6%	0%	N/A
Doig River First Nation	4.0	79%	-1%	1.1	32%	8%	0%	N/A
Douglas	10.7	1201%	5%	1.4	9%	7%	0%	N/A
Dzawada'enuxw First Nation	0.3	1201%	10%	1.8	4%	6%	7%	0.16
Ehattesaht	0.0	1201%	2%	1.7	-7%	6%	0%	0.16

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Esk'etemc	9.0	288%	-2%	1.1	18%	8%	8%	N/A
Esquimalt	2.4	1201%	8%	1.7	-9%	7%	0%	0.23
Fort Nelson First Nation	8.0	151%	-4%	1.2	36%	8%	0%	N/A
Gitanmaax	5.8	1201%	0%	1.4	8%	8%	0%	N/A
Gitanyow	3.4	1201%	-3%	1.3	8%	7%	0%	N/A
Gitga'at First Nation	0.0	1201%	3%	1.3	11%	7%	0%	0.14
Gitlaxt'aamiks Village Government	4.3	1201%	2%	1.3	8%	7%	0%	N/A
Gitsegukla	6.3	1201%	0%	1.4	8%	8%	0%	N/A
Gitwangak	5.8	1201%	-1%	1.3	8%	7%	0%	N/A
Gitxaala Nation	0.0	1201%	3%	1.5	-39%	6%	0%	0.14
Glen Vowell	5.8	1201%	0%	1.4	8%	8%	0%	N/A
Gwa'Sala-Nakwaxda'xw	0.0	1201%	6%	1.3	-10%	6%	0%	0.19
Gwawaenuk Tribe	0.0	1201%	11%	1.8	4%	6%	0%	0.19
Hagwilget Village Council	5.6	1201%	-3%	1.4	8%	8%	0%	N/A
Haisla Nation	2.9	1201%	3%	1.3	11%	7%	7%	0.14

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Halalt	7.4	1201%	10%	1.5	6%	7%	0%	0.21
Halfway River First Nation	3.9	79%	-2%	1.8	32%	8%	0%	N/A
Heiltsuk	0.0	1201%	2%	2.0	16%	7%	0%	0.12
Hesquiaht	0.0	1201%	1%	2.4	-7%	6%	0%	0.16
High Bar	12.1	288%	-3%	1.2	9%	8%	0%	N/A
Homalco	5.0	1201%	10%	1.2	-9%	7%	0%	0.16
Hupacasath First Nation	7.0	1201%	12%	1.2	-10%	6%	0%	0.21
Huu-ay-aht First Nations	0.1	1201%	8%	1.3	-1%	6%	0%	0.21
Iskut	0.0	50%	-2%	1.6	12%	8%	0%	N/A
Ka:'yu:'k't'h'/Che:k:tles7et'h' First Nations	0.0	1201%	0%	1.6	-11%	6%	0%	0.19
Kanaka Bar	10.3	288%	5%	1.4	3%	8%	0%	N/A
Katzie	9.5	1201%	8%	1.2	4%	7%	7%	0.23
Kispiox	5.8	1201%	-1%	1.4	8%	8%	0%	N/A
Kitasoo Xai'xais Nation	0.0	1201%	4%	2.0	16%	7%	0%	0.14
Kitselas	3.7	1201%	-1%	1.3	8%	7%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Kitsumkalum	4.3	1201%	0%	1.3	8%	7%	0%	N/A
Klahoose First Nation	5.3	1201%	8%	1.2	-9%	7%	0%	0.16
K'ómoks First Nation	5.6	1201%	8%	2.0	-7%	7%	0%	0.16
Kwadacha	2.6	50%	-5%	1.4	8%	8%	0%	N/A
Kwakiutl	0.0	1201%	7%	1.3	-10%	6%	0%	0.19
Kwantlen First Nation	9.4	1201%	9%	1.2	4%	7%	7%	0.23
Kwaw-kwaw-Apilt	11.6	1201%	7%	1.5	10%	7%	0%	N/A
Kwiakah	3.8	1201%	3%	1.2	-9%	7%	0%	0.16
Kwikwasut'inuxw Haxwa'mis	0.1	1201%	9%	1.8	4%	6%	0%	0.16
Kwikwetlem First Nation	9.5	1201%	8%	1.5	4%	7%	0%	0.21
Lake Babine Nation	3.6	288%	-3%	1.4	10%	8%	0%	N/A
Lax Kw'alaams	0.0	1201%	0%	1.4	-39%	8%	0%	0.16
Leq'á:mel First Nation	8.9	1201%	6%	1.5	10%	7%	0%	N/A
Lheidli T'enneh	7.8	288%	1%	1.3	12%	8%	8%	N/A
Lhoosk'uz Dene Nation	4.3	288%	0%	1.4	10%	7%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Lhtako Dene Nation	10.2	288%	-3%	1.0	13%	8%	0%	N/A
Lil'wat Nation	8.3	1201%	10%	1.0	-5%	7%	0%	N/A
Little Shuswap Lake	13.0	288%	3%	2.0	7%	8%	8%	N/A
Lower Kootenay	14.3	288%	3%	1.8	0%	8%	0%	N/A
Lower Nicola	11.1	288%	3%	1.8	6%	8%	0%	N/A
Lower Similkameen	13.9	288%	2%	1.4	6%	8%	0%	N/A
Lyackson	5.7	1201%	9%	1.5	6%	7%	0%	0.21
Lytton	9.4	288%	6%	1.4	3%	8%	0%	N/A
Malahat Nation	5.7	1201%	7%	1.7	-9%	7%	0%	0.23
Mamalilikulla First Nation	0.0	1201%	10%	1.5	-11%	6%	0%	0.16
Matsqui First Nation	10.1	1201%	11%	1.4	9%	7%	0%	0.23
McLeod Lake	4.7	288%	-3%	1.6	9%	8%	0%	N/A
Metlakatla First Nation	0.0	1201%	1%	1.4	-39%	8%	0%	0.16
Mowachaht/Muchalaht	3.5	1201%	4%	1.2	-10%	6%	0%	N/A
Musqueam	3.9	1201%	8%	1.7	19%	7%	0%	0.21

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Nadleh Whuten	4.5	288%	-3%	1.4	10%	8%	0%	N/A
Nak'azdli Whut'en	4.0	288%	-3%	1.6	9%	8%	0%	N/A
Namgis First Nation	0.0	1201%	10%	1.5	-11%	6%	0%	0.16
Nanoose First Nation	4.8	1201%	11%	2.0	-10%	7%	0%	0.21
Nazko First Nation	5.7	288%	0%	1.0	13%	7%	0%	N/A
Nee-Tahi-Buhn	3.6	288%	-4%	1.4	10%	8%	0%	N/A
Neskonlith	12.8	288%	3%	2.0	-1%	8%	8%	N/A
New Westminster	6.2	1201%	11%	2.0	4%	7%	0%	N/A
Nicomen	11.5	288%	6%	1.4	3%	8%	0%	N/A
Nisga'a Village of Gingolx	0.6	1201%	2%	1.3	8%	8%	0%	0.16
Nisga'a Village of Gitwinksihlkw	3.9	1201%	3%	1.3	8%	7%	7%	N/A
Nisga'a Village of Laxgalt'sap	0.0	1201%	-1%	1.3	8%	8%	0%	0.16
Nooaitch	11.1	288%	5%	1.4	3%	8%	0%	N/A
N'Quatqua	11.3	288%	6%	1.2	9%	7%	0%	N/A
Nuchatlaht	0.0	1201%	0%	1.7	-7%	6%	0%	0.16

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Nuxalk Nation	2.8	1201%	11%	1.1	-1%	7%	0%	0.12
Okanagan	14.8	288%	2%	1.8	5%	8%	0%	N/A
Old Massett Village Council	0.0	1201%	2%	1.4	-39%	6%	0%	0.20
Oregon Jack Creek	13.8	288%	3%	1.8	6%	8%	0%	N/A
Osoyoos	17.0	288%	0%	1.4	6%	8%	0%	N/A
Pacheedaht First Nation	1.2	1201%	10%	2.1	-1%	7%	0%	0.21
Pauquachin	4.3	1201%	7%	1.7	-9%	7%	0%	0.23
Penelakut Tribe	6.4	1201%	11%	1.5	6%	7%	0%	0.21
Penticton	14.2	288%	4%	1.1	1%	8%	0%	N/A
Peters First Nation	7.6	1201%	6%	1.5	10%	7%	0%	N/A
Popkum First Nation	8.3	1201%	9%	1.5	10%	7%	0%	N/A
Prophet River First Nation	4.4	151%	-3%	1.2	36%	8%	0%	N/A
Qualicum First Nation	6.7	1201%	9%	1.5	-10%	6%	0%	0.21
Quatsino	0.0	1201%	7%	1.3	-10%	6%	0%	0.19
Saik'uz First Nation	6.6	288%	-3%	1.3	12%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Samahquam	9.2	1201%	6%	1.0	-5%	7%	0%	N/A
Saulteau First Nations	4.3	79%	-3%	1.8	32%	8%	0%	N/A
Seabird Island	10.2	1201%	8%	1.5	10%	7%	0%	N/A
Sechelt	4.4	1201%	7%	1.5	6%	7%	0%	0.21
Semiahmoo	5.7	1201%	8%	1.5	4%	7%	0%	0.23
Shackan	10.8	288%	3%	1.4	3%	8%	8%	N/A
Shuswap Band	12.0	288%	0%	1.6	0%	8%	0%	N/A
Shxwhá:y Village	11.6	1201%	7%	1.5	10%	7%	0%	N/A
Shxw'ow'hamel First Nation	9.1	1201%	7%	1.5	10%	8%	0%	N/A
Simpcw First Nation	9.9	288%	-2%	1.4	30%	8%	0%	N/A
Siska	10.3	288%	5%	1.4	3%	8%	0%	N/A
Skatin	8.7	1201%	8%	1.0	-5%	7%	7%	N/A
Skawahlook First Nation	9.1	1201%	7%	1.5	10%	8%	0%	N/A
Skeetchestn	11.0	288%	-5%	1.8	6%	8%	0%	N/A
Skidegate	0.0	1201%	3%	2.3	-42%	6%	0%	0.21
Skin Tyee	3.5	288%	-4%	1.4	10%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Skowkale	11.2	1201%	5%	1.5	10%	7%	0%	N/A
Skuppah	9.4	288%	6%	1.4	3%	8%	0%	N/A
Skwah	11.6	1201%	7%	1.5	10%	7%	0%	N/A
Snuneymuxw First Nation	6.7	1201%	9%	1.5	6%	7%	0%	0.21
Soda Creek	9.1	288%	-4%	1.7	23%	8%	0%	N/A
Songhees Nation	2.4	1201%	8%	1.7	-9%	7%	0%	0.23
Soowahlie	6.5	1201%	8%	1.5	10%	7%	0%	N/A
Splatsin	15.0	288%	0%	2.0	7%	8%	0%	N/A
Spuzzum	11.1	1201%	7%	1.4	3%	8%	0%	N/A
Sq'éwlets	8.9	1201%	6%	1.5	10%	7%	0%	N/A
Squamish	5.4	1201%	8%	1.5	6%	7%	0%	0.21
Squiala First Nation	11.2	1201%	5%	1.5	10%	7%	0%	N/A
Stellat'en First Nation	4.9	288%	-3%	1.4	10%	8%	0%	N/A
Sts'ailes	9.5	1201%	7%	1.5	10%	7%	0%	N/A
Stswecem'c Xget'tem First Nation	8.5	288%	-2%	1.1	18%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Stz'uminus First Nation	6.9	1201%	11%	1.5	6%	7%	0%	0.21
Sumas First Nation	9.4	1201%	5%	1.9	9%	7%	0%	N/A
Tahltan	4.7	50%	-7%	1.6	12%	8%	0%	N/A
Takla Nation	3.7	288%	-5%	1.4	10%	8%	8%	N/A
T'it'q'et	10.7	288%	3%	1.2	9%	8%	0%	N/A
Tk'emlúps te Secwépemc	13.3	288%	-2%	1.4	11%	8%	8%	N/A
Tla'amin Nation	5.9	1201%	9%	1.3	-7%	7%	0%	0.16
Tla-o-qui-aht First Nations	0.3	1201%	3%	2.4	-7%	6%	0%	0.16
Tlatlasikwala	0.0	1201%	4%	1.3	-10%	6%	0%	0.19
Tl'azt'en Nation	4.3	288%	-5%	1.4	10%	8%	0%	N/A
Tl'etinqox Government	10.4	288%	-2%	1.1	18%	7%	0%	N/A
Tlowitsis Tribe	5.6	1201%	8%	1.2	-9%	7%	0%	0.16
Tobacco Plains	7.8	288%	-2%	1.8	2%	8%	0%	N/A
Toosey	8.7	288%	-1%	1.1	18%	8%	0%	N/A
Toquaht	0.0	1201%	4%	1.8	-5%	6%	0%	0.21
Tsal'alh	8.8	288%	2%	1.2	9%	8%	8%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Tsartlip	4.9	1201%	7%	1.7	-9%	7%	0%	0.23
Tsawout First Nation	3.6	1201%	7%	1.7	-9%	7%	0%	0.23
Tsawwassen First Nation	3.7	1201%	7%	2.0	4%	7%	0%	0.23
Tsay Keh Dene	4.4	50%	-6%	1.6	9%	8%	0%	N/A
Tseshaht	7.4	1201%	11%	1.2	-10%	6%	0%	0.21
Tseycum	4.3	1201%	7%	1.7	-9%	7%	0%	0.23
Tŝideldel First Nation	8.5	288%	0%	1.0	13%	7%	0%	N/A
Ts'kw'aylaxw First Nation	7.7	288%	1%	1.2	9%	8%	0%	N/A
Tsleil-Waututh Nation	7.4	1201%	8%	2.0	4%	7%	0%	0.21
T'Sou-ke First Nation	1.5	1201%	6%	2.0	-3%	7%	0%	0.23
Ts'uubaa-asatx	4.3	1201%	8%	1.0	-1%	7%	0%	N/A
Tzeachten	11.2	1201%	5%	1.5	10%	7%	0%	N/A
Uchucklesaht	2.1	1201%	9%	1.3	-1%	6%	0%	0.21
Ucluelet First Nation	0.0	1201%	3%	1.8	-5%	6%	0%	0.21
Ulkatcho	3.9	288%	3%	1.1	-1%	7%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Union Bar First Nation	9.3	1201%	9%	1.5	10%	8%	8%	N/A
Upper Nicola	10.7	288%	2%	1.4	11%	8%	8%	N/A
Upper Similkameen	8.5	288%	2%	1.1	3%	8%	0%	N/A
West Moberly First Nations	3.4	79%	-2%	1.8	32%	8%	0%	N/A
Westbank First Nation	12.1	288%	0%	1.1	7%	8%	0%	N/A
Wet'suwet'en First Nation	3.6	288%	-1%	1.4	10%	8%	0%	N/A
Whispering Pines/Clinton	12.0	288%	-1%	1.4	11%	8%	8%	N/A
Williams Lake First Nation	10.1	288%	-3%	1.7	23%	8%	0%	N/A
Witset First Nation	5.3	1201%	-3%	1.4	8%	8%	0%	N/A
Wuikinuxv Nation	0.0	1201%	5%	1.4	16%	7%	0%	0.12
Xaxli'p	10.6	288%	4%	1.2	9%	8%	0%	N/A
Xeni Gwet'in First Nations Government	5.3	288%	5%	1.3	-7%	7%	7%	N/A
Yakweakwioose	11.2	1201%	5%	1.5	10%	7%	0%	N/A
Yale First Nation	10.0	1201%	7%	1.5	10%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Yekooche First Nation	4.0	288%	-7%	1.4	10%	8%	0%	N/A
Yunesit'in Government	10.5	288%	-1%	1.1	18%	7%	0%	N/A
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A

Manitoba

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Barren Lands	3.3	66%	-4%	1.0	20%	9%	0%	N/A
Berens River	7.7	277%	-1%	1.7	11%	10%	0%	N/A
Birdtail Sioux	14.7	N/A	-1%	1.5	21%	9%	0%	N/A
Black River First Nation	11.4	277%	-3%	1.2	11%	9%	0%	N/A
Bloodvein	9.7	277%	-4%	1.7	11%	10%	10%	N/A
Brokenhead Ojibway Nation	12.8	79%	-4%	1.2	11%	10%	0%	N/A
Buffalo Point First Nation	15.5	133%	-4%	1.6	6%	9%	0%	N/A
Bunibonibee Cree Nation	6.2	133%	-2%	1.8	3%	9%	9%	N/A
Canupawakpa Dakota First Nation	15.6	N/A	1%	1.5	21%	9%	0%	N/A
Chemawawin Cree Nation	8.7	79%	-1%	1.8	27%	9%	0%	N/A
Cross Lake Band of Indians	8.1	133%	0%	1.8	3%	10%	10%	N/A
Dakota Plains	15.7	N/A	-2%	1.5	15%	10%	0%	N/A
Dakota Tipi	15.4	N/A	-3%	1.5	15%	10%	0%	N/A
Dauphin River	9.7	79%	0%	1.7	11%	10%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Ebb and Flow	12.8	N/A	-1%	1.9	13%	9%	0%	N/A
Fisher River	10.9	79%	-2%	1.7	11%	10%	10%	N/A
Fort Alexander	12.2	133%	-3%	1.2	11%	10%	0%	N/A
Fox Lake	4.5	777%	-3%	1.8	3%	10%	0%	N/A
Gambler First Nation	13.8	N/A	-3%	1.5	21%	9%	0%	N/A
Garden Hill First Nations	6.8	133%	-2%	1.6	6%	9%	0%	N/A
God's Lake First Nation	6.0	133%	-2%	1.8	3%	9%	9%	N/A
Hollow Water	10.8	277%	-1%	1.6	6%	9%	9%	N/A
Keeseekoowenin	11.6	79%	-3%	2.0	15%	9%	0%	N/A
Kinonjeoshtegon First Nation	9.2	79%	-2%	1.7	11%	10%	0%	N/A
Lake Manitoba	12.8	79%	-2%	1.5	15%	9%	0%	N/A
Lake St. Martin	10.4	79%	0%	1.7	11%	10%	0%	N/A
Little Grand Rapids	8.1	277%	-3%	1.6	6%	9%	0%	N/A
Little Saskatchewan	10.2	79%	-1%	1.4	10%	10%	10%	N/A
Long Plain	15.6	N/A	-3%	1.5	15%	10%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Manto Sipi Cree Nation	5.1	133%	-2%	1.8	3%	9%	0%	N/A
Marcel Colomb First Nation	5.7	133%	-5%	1.1	35%	9%	0%	N/A
Mathias Colomb	7.3	133%	-2%	1.1	35%	9%	9%	N/A
Misipawistik Cree Nation	8.4	79%	0%	1.8	27%	9%	9%	N/A
Mosakahiken Cree Nation	8.4	79%	-4%	1.8	27%	9%	9%	N/A
Nisichawayasihk Cree Nation	7.0	133%	-5%	1.1	35%	10%	0%	N/A
Northlands Denesuline First Nation	1.9	66%	-6%	1.0	20%	9%	0%	N/A
Norway House Cree Nation	8.0	133%	-1%	1.7	11%	10%	0%	N/A
O-Chi-Chak-Ko-Sipi First Nation	12.0	79%	0%	1.4	10%	9%	0%	N/A
Opaskwayak Cree Nation	8.6	79%	-1%	1.8	27%	9%	0%	N/A
O-Pipon-Na-Piwin Cree Nation	4.7	133%	-4%	1.1	35%	10%	10%	N/A
Pauingassi First Nation	8.1	277%	-4%	1.6	6%	9%	9%	N/A
Peguis	11.7	79%	-3%	1.7	11%	10%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Pinaymootang First Nation	11.2	79%	-2%	1.4	10%	9%	0%	N/A
Pine Creek	12.4	79%	1%	1.4	10%	9%	9%	N/A
Poplar River First Nation	5.9	277%	-1%	1.7	11%	10%	10%	N/A
Red Sucker Lake	5.7	133%	-4%	1.8	3%	9%	9%	N/A
Rolling River	10.7	79%	-2%	2.0	15%	9%	0%	N/A
Roseau River Anishinabe First Nation Government	17.9	N/A	-1%	1.9	1%	10%	0%	N/A
Sandy Bay	14.1	N/A	-2%	1.5	15%	10%	0%	N/A
Sapotaweyak Cree Nation	10.6	79%	-3%	1.8	27%	9%	9%	N/A
Sayisi Dene First Nation	1.7	66%	-4%	1.8	3%	10%	0%	N/A
Shamattawa First Nation	3.6	777%	-3%	1.2	9%	10%	0%	N/A
Sioux Valley Dakota Nation	16.2	N/A	0%	2.0	15%	9%	0%	N/A
Skownan First Nation	10.5	79%	-1%	1.4	10%	9%	0%	N/A
St. Theresa Point	6.8	133%	-2%	1.6	6%	9%	0%	N/A
Swan Lake	15.9	N/A	-1%	1.5	15%	9%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Tataskweyak Cree Nation	5.0	133%	-3%	1.8	3%	10%	10%	N/A
Tootinaowaziibeeng Treaty Reserve	12.2	N/A	-3%	1.5	-13%	9%	0%	N/A
War Lake First Nation	5.2	133%	-4%	1.8	3%	10%	0%	N/A
Wasagamack First Nation	6.7	133%	-3%	1.6	6%	9%	0%	N/A
Waywayseecappo First Nation Treaty Four - 1874	12.3	N/A	-2%	1.5	-13%	9%	0%	N/A
Wuskwi Sipihk First Nation	11.3	79%	-3%	1.8	27%	9%	0%	N/A
York Factory First Nation	5.2	133%	-1%	1.8	3%	10%	10%	N/A
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A

Northwest Territories

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Acho Dene Koe First Nation	6.7	151%	-4%	1.2	36%	8%	8%	N/A
Aklavik	1.0	151%	0%	1.8	1%	12%	12%	N/A
Behdzi Ahda" First Nation	0.1	151%	-4%	1.2	37%	10%	0%	N/A
Dechi Laot'i First Nations	0.1	66%	-5%	1.8	27%	10%	0%	N/A
Deh Gáh Got'ie Dene First Nation	4.3	151%	0%	1.1	51%	10%	0%	N/A
Deline First Nation	1.6	151%	-4%	1.4	56%	10%	10%	N/A
Deninu K'ue First Nation	3.2	79%	-2%	1.4	35%	10%	0%	N/A
Dog Rib Rae	2.9	66%	0%	1.4	25%	10%	0%	N/A
Fort Good Hope	4.9	151%	-5%	1.5	19%	10%	10%	N/A
Gameti First Nation	1.8	66%	-3%	1.4	25%	10%	10%	N/A
Gwichya Gwich'in	3.2	151%	4%	1.8	-4%	12%	0%	N/A
Inuvik Native	1.6	151%	-3%	1.8	-4%	12%	0%	N/A
Jean Marie River First Nation	5.8	151%	-3%	1.8	41%	9%	9%	N/A
Ka'a'gee Tu First Nation	4.3	151%	-5%	1.1	51%	10%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
K'atlodeeche First Nation	3.5	151%	-4%	1.3	50%	10%	10%	N/A
Liidlii Kue First Nation	5.9	151%	-1%	1.8	41%	9%	0%	N/A
Lutsel K'e Dene First Nation	1.1	66%	-5%	1.1	16%	10%	10%	N/A
Nahanni Butte	4.8	151%	-2%	1.8	41%	9%	0%	N/A
Pehdzeh Ki First Nation	5.1	151%	-5%	1.4	56%	9%	0%	N/A
Salt River First Nation #195	5.3	79%	-5%	1.1	16%	10%	0%	N/A
Sambaa K'e First Nation	3.3	151%	-3%	1.8	41%	9%	0%	N/A
Teetl'it Gwich'in Band Council	3.1	151%	1%	1.8	13%	12%	12%	N/A
Tulita Dene	4.2	151%	-5%	1.2	37%	10%	0%	N/A
West Point First Nation	3.3	151%	-4%	1.3	50%	10%	10%	N/A
Wha Ti First Nation	2.3	151%	-1%	1.4	25%	10%	0%	N/A
Yellowknives Dene First Nation	1.7	66%	-4%	1.8	27%	10%	0%	N/A
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A

Ontario

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Aamjiwnaang	18.1	N/A	1%	1.2	-10%	8%	0%	N/A
Albany	5.7	777%	-2%	1.9	5%	10%	0%	-0.55
Alderville First Nation	16.8	N/A	-2%	1.2	-2%	9%	0%	N/A
Algonquins of Pikwakanagan First Nation	16.2	277%	0%	1.1	4%	9%	9%	N/A
Animakee Wa Zhing #37	12.8	133%	-3%	1.0	9%	9%	9%	N/A
Animbiigoo Zaagi'igan Anishinaabek	7.1	277%	-4%	1.6	9%	9%	9%	N/A
Anishinabe of Wauzhushk Onigum	12.0	133%	-2%	1.6	6%	9%	9%	N/A
Anishnaabeg of Naongashiing	13.7	133%	-2%	1.6	6%	9%	9%	N/A
Apitipi Anicinapek Nation	9.1	277%	-3%	1.4	6%	9%	0%	N/A
Aroland	8.4	277%	-6%	1.2	9%	9%	0%	N/A
Atikameksheng Anishnawbek	13.3	277%	-1%	1.2	-1%	9%	0%	N/A
Attawapiskat	4.2	777%	-3%	1.9	5%	10%	0%	-0.61

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Aundeck-Omni-Kaning	9.9	N/A	0%	1.9	4%	9%	9%	N/A
Batchewana First Nation	10.1	277%	-2%	1.2	0%	9%	0%	N/A
Bay of Quinte Mohawk	20.6	N/A	2%	1.8	-9%	9%	0%	N/A
Bearfoot Onondaga	20.7	N/A	1%	1.5	-10%	9%	0%	N/A
Bearskin Lake	4.9	133%	-6%	1.2	9%	10%	0%	N/A
Beausoleil	13.6	N/A	-3%	1.1	-2%	9%	9%	N/A
Big Grassy	13.7	133%	1%	1.6	6%	9%	0%	N/A
Biigtigong Nishnaabeg	0.6	277%	-1%	1.6	7%	9%	0%	N/A
Biinjitiwaabik Zaaging Anishinaabek	6.7	277%	-3%	1.6	9%	9%	0%	N/A
Bingwi Neyaashi Anishinaabek	6.7	277%	-3%	1.6	9%	9%	0%	N/A
Brunswick House	9.2	277%	-4%	1.6	28%	9%	0%	N/A
Caldwell	22.7	N/A	1%	1.5	-14%	8%	0%	N/A
Cat Lake	8.1	277%	-3%	1.6	8%	9%	9%	N/A
Chapleau Cree First Nation	8.7	277%	-4%	1.6	28%	9%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Chapleau Ojibway	9.3	277%	-3%	1.6	28%	9%	0%	N/A
Chippewas of Georgina Island	16.9	N/A	-1%	1.3	1%	9%	9%	N/A
Chippewas of Kettle and Stony Point	18.4	N/A	1%	2.0	-1%	8%	0%	N/A
Chippewas of Nawash First Nation	10.0	N/A	0%	1.2	0%	9%	0%	N/A
Chippewas of Rama First Nation	16.0	N/A	-3%	1.3	-2%	9%	0%	N/A
Chippewas of the Thames First Nation	21.7	N/A	0%	1.5	-14%	8%	0%	N/A
Constance Lake	9.2	277%	-4%	1.5	7%	10%	0%	N/A
Couchiching First Nation	13.7	133%	-5%	1.0	10%	9%	0%	N/A
Curve Lake	17.3	N/A	0%	1.4	-2%	9%	9%	N/A
Deer Lake	7.2	277%	-5%	1.6	6%	9%	0%	N/A
Delaware	20.6	N/A	2%	1.8	-9%	9%	0%	N/A
Dokis	14.0	277%	-1%	1.0	4%	9%	0%	N/A
Eabametoong First Nation	7.3	133%	-5%	1.6	6%	9%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Eagle Lake	11.5	133%	-6%	1.0	9%	9%	0%	N/A
Flying Post	10.6	277%	-1%	1.1	5%	9%	0%	N/A
Fort Severn	1.7	777%	-9%	1.2	9%	11%	0%	-0.49
Fort William	7.6	133%	-4%	2.0	-28%	9%	0%	N/A
Garden River First Nation	10.4	277%	-2%	1.2	0%	9%	0%	N/A
Ginoogaming First Nation	9.0	277%	-2%	1.6	10%	9%	9%	N/A
Grassy Narrows First Nation	11.1	277%	-4%	1.0	9%	9%	0%	N/A
Gull Bay	9.1	277%	-5%	1.4	9%	9%	0%	N/A
Henvey Inlet First Nation	12.5	277%	0%	1.0	8%	9%	0%	N/A
Hiawatha First Nation	17.6	N/A	-3%	1.2	2%	9%	0%	N/A
Iskatewizaagegan #39 Independent First Nation	13.2	133%	-2%	1.6	6%	9%	0%	N/A
Kasabonika Lake	5.0	133%	-5%	1.2	9%	10%	10%	N/A
Kee-Way-Win	7.1	277%	-3%	1.2	9%	9%	0%	N/A
Kingfisher	6.3	133%	-5%	1.2	9%	10%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Kitchenuhmaykoosib Inninuwug	4.9	133%	-5%	1.2	9%	10%	10%	N/A
Konadaha Seneca	20.6	N/A	2%	1.5	-10%	9%	0%	N/A
Lac Des Mille Lacs	9.9	277%	-5%	1.6	5%	9%	0%	N/A
Lac La Croix	13.6	133%	-5%	1.8	16%	9%	9%	N/A
Lac Seul	9.6	277%	-2%	1.7	16%	9%	9%	N/A
Long Lake No.58 First Nation	9.0	277%	-2%	1.2	9%	9%	0%	N/A
Lower Cayuga	20.7	N/A	1%	1.5	-10%	9%	0%	N/A
Lower Mohawk	20.6	N/A	2%	1.5	-10%	9%	0%	N/A
Magnetawan	12.1	277%	0%	1.1	5%	9%	9%	N/A
Martin Falls	7.3	777%	-7%	1.2	9%	9%	0%	N/A
Matachewan	10.0	277%	-1%	1.7	4%	9%	0%	N/A
Mattagami	11.1	277%	-1%	1.3	4%	9%	9%	N/A
McDowell Lake	10.0	277%	-4%	1.0	9%	9%	0%	N/A
M'Chigeeng First Nation	7.2	N/A	1%	1.9	5%	9%	9%	N/A
Michipicoten	2.6	277%	0%	1.1	6%	9%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Mishkeegogamang	8.7	277%	-5%	1.6	8%	9%	0%	N/A
Missanabie Cree	10.4	277%	-3%	1.2	0%	9%	0%	N/A
Mississauga	10.7	277%	-2%	1.1	12%	9%	0%	N/A
Mississaugas of Scugog Island First Nation	16.7	N/A	-3%	1.5	1%	9%	0%	N/A
Mississaugas of the Credit	20.6	N/A	2%	1.5	-10%	8%	0%	N/A
Mitaanjigamiing First Nation	13.4	133%	-6%	1.0	10%	9%	9%	N/A
Mohawks of Akwesasne	19.6	N/A	-2%	1.8	2%	9%	0%	N/A
Mohawks of the Bay of Quinte	18.9	N/A	-2%	1.9	0%	9%	0%	N/A
Moose Cree First Nation	7.2	777%	-5%	1.3	5%	10%	10%	-0.55
Moose Deer Point	13.0	277%	-4%	1.1	-2%	9%	9%	N/A
Moravian of the Thames	20.8	N/A	3%	2.1	-22%	8%	0%	N/A
Munsee-Delaware Nation	21.7	N/A	0%	2.0	-17%	8%	0%	N/A
Muskrat Dam Lake	6.3	133%	-3%	1.2	9%	10%	10%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Naicatchewenin	12.9	133%	-4%	1.0	10%	9%	0%	N/A
Naotkamegwanning	12.8	133%	-3%	1.0	9%	9%	0%	N/A
Neskantaga First Nation	6.6	133%	-2%	1.6	6%	9%	9%	N/A
Netmizaaggamig Nishnaabeg	3.8	277%	-3%	1.6	7%	9%	9%	N/A
Nibinamik First Nation	6.2	133%	-5%	1.6	6%	9%	9%	N/A
Nigigoonsiminikaaning First Nation	13.5	133%	-6%	1.0	10%	9%	0%	N/A
Niharondasa Seneca	20.6	N/A	2%	1.5	-10%	9%	0%	N/A
Niisaachewan Anishinaabe Nation	12.2	133%	0%	1.6	6%	9%	0%	N/A
Nipissing First Nation	13.2	277%	-1%	1.0	4%	9%	0%	N/A
North Caribou Lake	6.6	133%	0%	1.2	9%	10%	0%	N/A
North Spirit Lake	7.7	277%	-3%	1.7	16%	9%	9%	N/A
Northwest Angle No.33	14.2	133%	-3%	1.6	6%	9%	9%	N/A
Ojibway Nation of Saugeen	8.3	277%	-5%	1.6	8%	9%	9%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Ojibways of Onigaming First Nation	12.8	133%	-2%	1.0	9%	9%	0%	N/A
Oneida	20.6	N/A	2%	1.8	-9%	9%	0%	N/A
Oneida Nation of the Thames	21.5	N/A	3%	2.0	-13%	8%	0%	N/A
Onondaga Clear Sky	20.7	N/A	1%	1.5	-10%	9%	0%	N/A
Pays Plat	1.7	277%	-3%	1.4	8%	9%	0%	N/A
Pikangikum	8.9	277%	-2%	1.0	9%	9%	9%	N/A
Poplar Hill	7.9	277%	-3%	1.6	6%	9%	0%	N/A
Rainy River First Nations	13.9	133%	-3%	1.0	10%	9%	9%	N/A
Red Rock	5.9	277%	-2%	1.4	9%	9%	0%	N/A
Sachigo Lake	5.3	133%	-5%	1.2	9%	10%	0%	N/A
Sagamok Anishnawbek	11.6	277%	-1%	1.9	4%	9%	0%	N/A
Sandy Lake	7.2	133%	-2%	1.6	6%	9%	0%	N/A
Saugeen	11.8	N/A	1%	1.2	0%	9%	0%	N/A
Seine River First Nation	13.4	133%	-6%	1.8	16%	9%	9%	N/A
Serpent River	11.5	277%	0%	1.4	4%	9%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Shawanaga First Nation	12.1	277%	-2%	1.1	5%	9%	0%	N/A
Sheguiandah	8.6	N/A	-1%	1.9	4%	9%	9%	N/A
Sheshegwaning	8.0	N/A	1%	1.0	37%	9%	9%	N/A
Shoal Lake No.40	13.2	133%	-2%	1.6	6%	9%	9%	N/A
Six Nations of the Grand River	20.6	N/A	2%	1.8	-9%	9%	0%	N/A
Slate Falls Nation	8.8	277%	-2%	1.6	8%	9%	0%	N/A
Taykwa Tagamou Nation	10.0	277%	-4%	1.4	-1%	9%	0%	N/A
Temagami First Nation	10.8	277%	-1%	1.1	6%	9%	9%	N/A
Thessalon	11.1	277%	0%	1.1	12%	9%	0%	N/A
Tuscarora	20.7	N/A	1%	1.5	-10%	9%	0%	N/A
Upper Cayuga	20.7	N/A	1%	1.5	-10%	9%	0%	N/A
Upper Mohawk	20.6	N/A	4%	1.8	-9%	9%	0%	N/A
Wabaseemoong Independent Nations	12.6	133%	-3%	1.6	6%	9%	0%	N/A
Wabauskang First Nation	9.8	277%	-3%	1.0	9%	9%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Wabigoon Lake Ojibway Nation	11.1	133%	-5%	1.7	16%	9%	9%	N/A
Wahnapitae	12.2	277%	-2%	1.2	10%	9%	0%	N/A
Wahta Mohawk	14.9	277%	-2%	1.1	-2%	9%	0%	N/A
Walker Mohawk	20.6	N/A	2%	1.5	-10%	9%	0%	N/A
Walpole Island	21.1	N/A	4%	1.2	-16%	8%	0%	N/A
Wapekeka	4.4	133%	-6%	1.2	9%	10%	0%	N/A
Wasauksing First Nation	12.8	277%	-2%	1.1	5%	9%	9%	N/A
Washagamis Bay	12.1	133%	-1%	1.6	6%	9%	9%	N/A
Wawakapewin	5.3	133%	-2%	1.2	9%	10%	0%	N/A
Webequie	5.1	133%	-5%	1.6	6%	9%	9%	N/A
Weenusk	2.3	777%	-8%	1.9	5%	11%	11%	N/A
Whitefish River	11.1	277%	-2%	1.9	4%	9%	9%	N/A
Whitesand	7.8	277%	-4%	1.4	9%	9%	0%	N/A
Wikwemikong	7.5	N/A	0%	1.2	3%	9%	9%	N/A
Wunnumin	6.3	133%	-4%	1.2	9%	10%	10%	N/A
Zhiibaahaasing First Nation	8.0	N/A	1%	1.0	37%	9%	9%	N/A
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A

Quebec

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Algonquins of Barriere Lake	9.5	277%	-2%	1.2	-1%	9%	9%	N/A
Atikamekw d'Opitciwan	7.2	277%	-5%	1.4	1%	9%	9%	N/A
Bande des Innus de Pessamit	3.4	277%	-6%	1.6	5%	9%	0%	0.20
Communauté anicinape de Kitcisakik	9.1	277%	-2%	1.6	4%	9%	9%	N/A
Conseil de la Première Nation Abitibiwinni	9.6	277%	-2%	1.2	10%	9%	9%	N/A
Conseil des Atikamekw de Wemotaci	7.9	277%	-5%	1.4	1%	9%	9%	N/A
Cree Nation of Chisasibi	2.8	188%	-3%	2.0	9%	11%	0%	-0.68
Cree Nation of Mistissini	5.0	277%	-4%	1.2	7%	10%	0%	N/A
Cree Nation of Nemaska	4.0	277%	-6%	1.2	7%	10%	0%	N/A
Cree Nation of Wemindji	3.7	188%	-4%	2.0	9%	11%	0%	-0.68
Eastmain	4.8	777%	-3%	1.3	5%	11%	0%	-0.56

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Innu Takuaikan Uashat Mak Mani-Utenam	0.8	277%	-1%	1.6	-3%	9%	0%	0.20
Innue Essipit	3.5	277%	-3%	1.4	7%	9%	0%	0.20
Kebaowek First Nation	11.7	277%	-3%	1.0	13%	9%	0%	N/A
Kitigan Zibi Anishinabeg	13.9	277%	-1%	1.6	9%	9%	0%	N/A
La Nation Innu Matimekush-Lac John	0.6	188%	-9%	1.9	14%	10%	0%	N/A
La Nation Micmac de Gespeg	2.8	N/A	-1%	2.0	-10%	9%	9%	0.23
Les Atikamekw de Manawan	8.6	277%	-2%	1.3	3%	9%	9%	N/A
Les Innus de Ekuanitshit	0.0	277%	0%	1.7	10%	9%	0%	0.17
Listuguj Mi'gmaq Government	7.6	N/A	-3%	2.0	-19%	9%	0%	0.23
Long Point First Nation	10.2	277%	-3%	1.2	7%	9%	0%	N/A
Micmacs of Gesgapegiag	5.4	N/A	-4%	2.0	-19%	9%	0%	0.23
Mohawks of Kahnawá:ke	17.8	N/A	0%	1.9	7%	9%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Mohawks of Kanesatake	17.8	N/A	2%	1.8	2%	9%	0%	N/A
Montagnais de Pakua Shipi	0.0	277%	-4%	1.5	4%	8%	0%	0.10
Montagnais de Unamen Shipu	0.0	277%	0%	1.5	4%	8%	0%	0.16
Naskapi Nation of Kawawachikamach	0.6	188%	-8%	1.9	14%	10%	0%	N/A
Nation Anishnabe du Lac Simon	9.3	277%	-4%	1.0	8%	9%	0%	N/A
Nation Huronne Wendat	11.9	N/A	-7%	1.4	14%	9%	0%	N/A
Odanak	16.5	N/A	-3%	1.9	3%	9%	0%	N/A
Oujé-Bougoumou Cree Nation	6.5	277%	-3%	1.4	1%	10%	0%	N/A
Première nation de Whapmagoostui	1.5	188%	-7%	2.0	9%	12%	0%	-0.62
Première Nation des Abénakis de Wôlinak	15.3	N/A	-5%	1.4	7%	9%	0%	N/A
Première Nation des Innus de Nutashkuan	0.0	277%	-1%	1.7	10%	9%	0%	0.18
Première Nation des	9.4	277%	-5%	1.1	11%	9%	9%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Peuakamiulnuatsh								
Première Nation Wolastoqiyik (Malécite) Wahsipekuk	4.2	N/A	-6%	2.0	7%	9%	0%	0.20
The Crees of the Waskaganish First Nation	6.4	777%	-6%	1.3	5%	10%	0%	-0.56
Timiskaming First Nation	10.7	277%	-3%	1.9	6%	9%	0%	N/A
Waswanipi	7.7	277%	-5%	1.0	8%	10%	0%	N/A
Wolf Lake	11.3	277%	-2%	1.0	13%	9%	0%	N/A
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A

Yukon

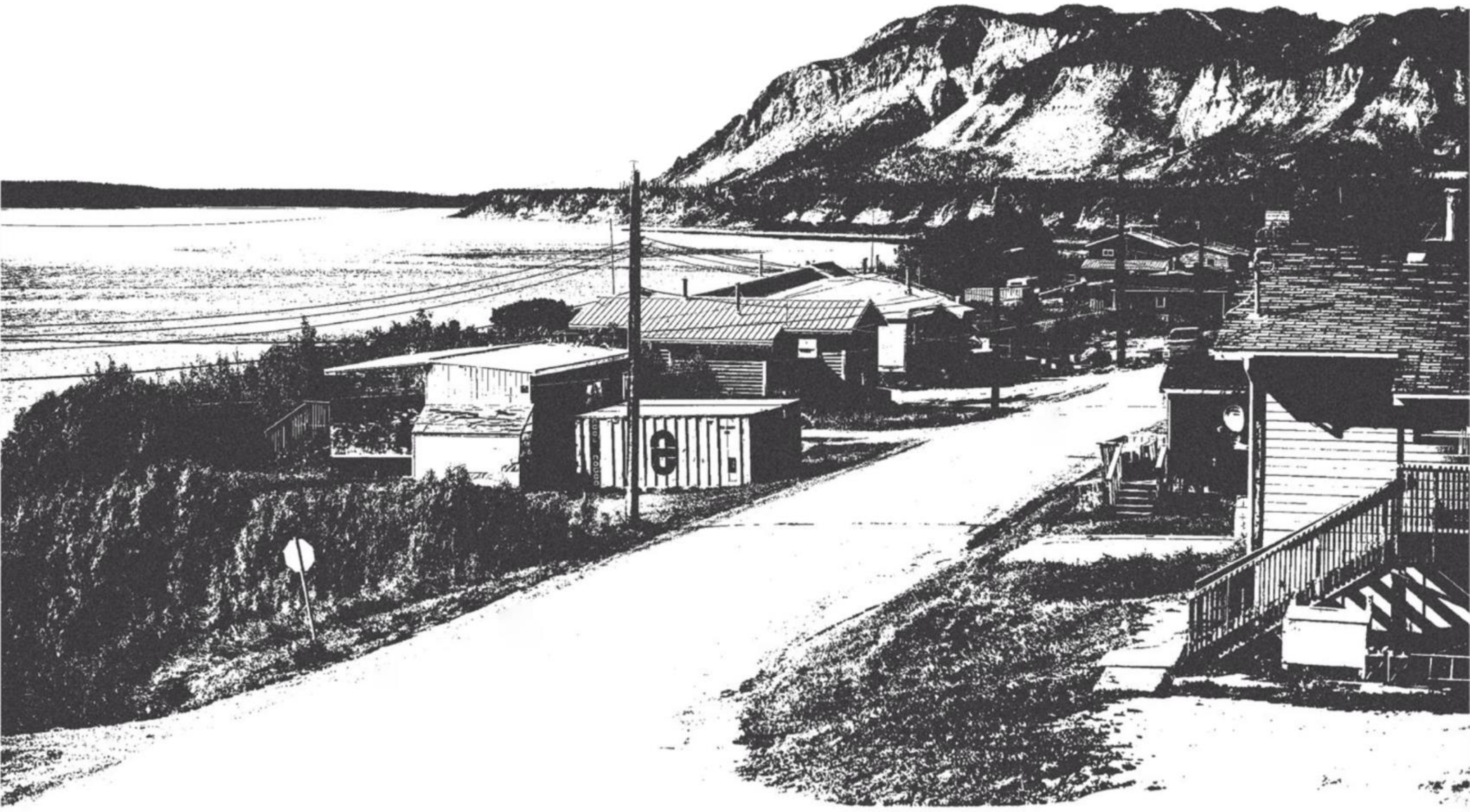
First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Aishihik	0.1	50%	4%	1.8	39%	8%	0%	N/A
Carcross/Tagish First Nation	0.4	50%	0%	1.8	25%	8%	0%	N/A
Champagne	1.7	50%	1%	1.1	39%	8%	8%	N/A
Champagne and Aishihik First Nations	1.6	50%	2%	1.1	39%	8%	0%	N/A
Dease River	0.8	50%	-1%	1.6	12%	8%	0%	N/A
First Nation of Nacho Nyak Dun	4.2	50%	2%	1.8	39%	9%	9%	N/A
Kluane First Nation	0.8	50%	3%	1.7	-33%	8%	0%	N/A
Kwanlin Dun First Nation	2.5	50%	-4%	1.4	25%	8%	0%	N/A
Liard First Nation	3.7	50%	-4%	1.9	12%	8%	0%	N/A
Little Salmon/Carmacks First Nation	4.6	50%	0%	1.8	39%	8%	8%	N/A
Ross River Dena Council	2.0	50%	-2%	1.7	26%	8%	0%	N/A
Selkirk First Nation	5.0	50%	2%	1.8	39%	9%	9%	N/A
Ta'an Kwach'an	3.4	50%	-5%	1.4	25%	8%	0%	N/A

First Nation	Extreme Heat - Change in Days Above +30°C (days)	Wildfires - Average Annual Area Burned (% Change)	Drought - Consecutive Dry Days (% Change)	High Winds - Change in Wind Pressure - Max Gust (km/h)	Freezing Rain - Ice Accumulation (% Change)	Localized Flooding - 10m 25 yr Intensity (% Change)	River/Creek/ Lake Flooding - 60m 100 yr Intensity (% Change)	Sea Level Rise - Change in Sea Level (m)
Taku River Tlingit	0.0	50%	-4%	1.7	23%	8%	8%	N/A
Teslin Tlingit Council	1.2	50%	-4%	1.7	23%	8%	8%	N/A
Tr'ondëk Hwëch'in	3.6	50%	-3%	1.1	4%	9%	0%	N/A
Vuntut Gwitchin First Nation	1.0	101%	2%	1.1	4%	9%	9%	N/A
White River First Nation	2.4	50%	1%	1.2	50%	8%	0%	N/A
Alexander	7.7	N/A	-3%	1.9	36%	8%	0%	N/A

CLOSING THE INFRASTRUCTURE GAP
CLIMATE HAZARDS & RISKS FACING FIRST NATIONS

Appendix C

HAZARD MAPS BY REGION



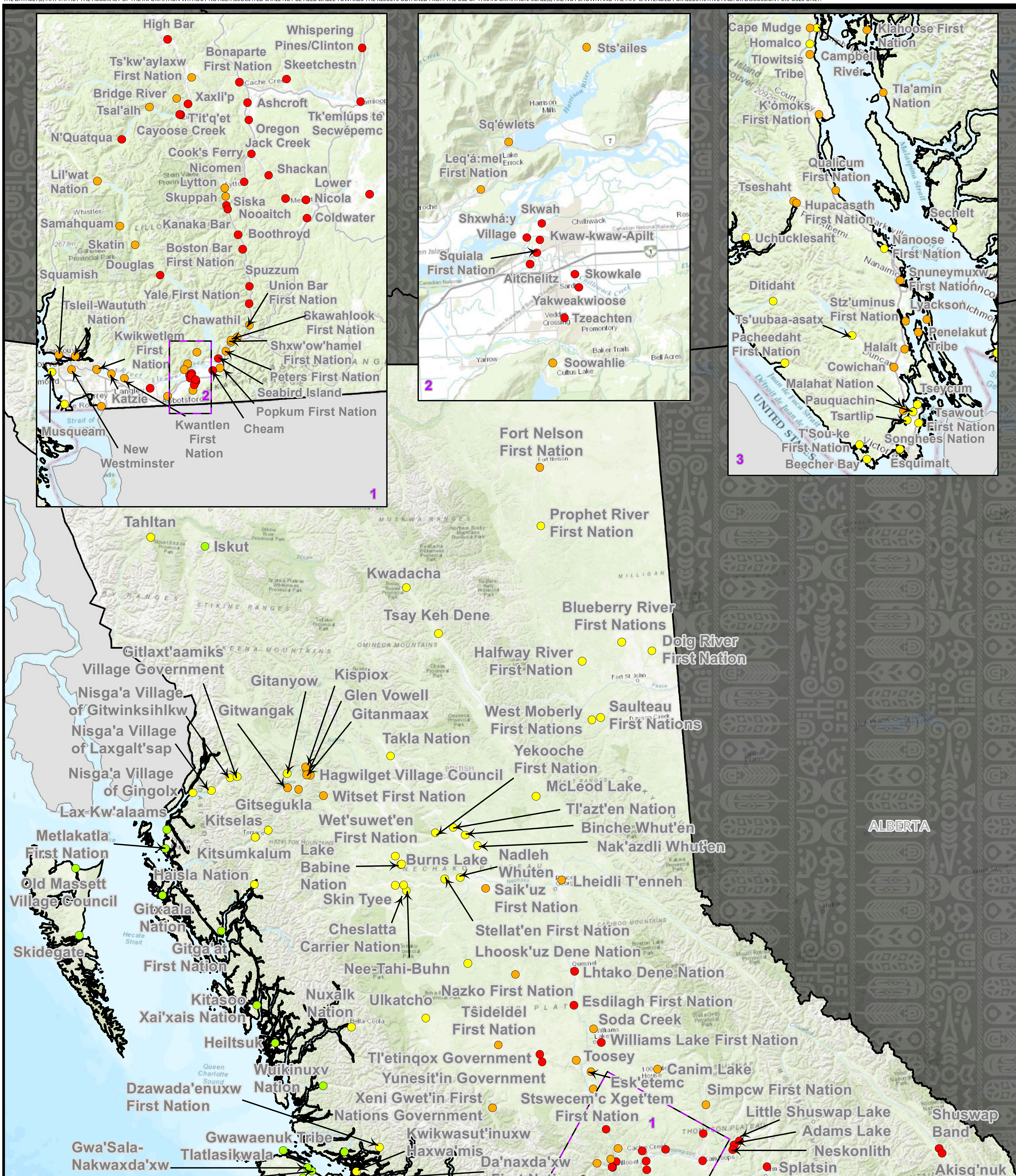


FIGURE 1-1
EXTREME HEAT CHANGE
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat
Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)
- No Increase Or Decreasing (0 Or Fewer Additional Days Above 30°C)

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.

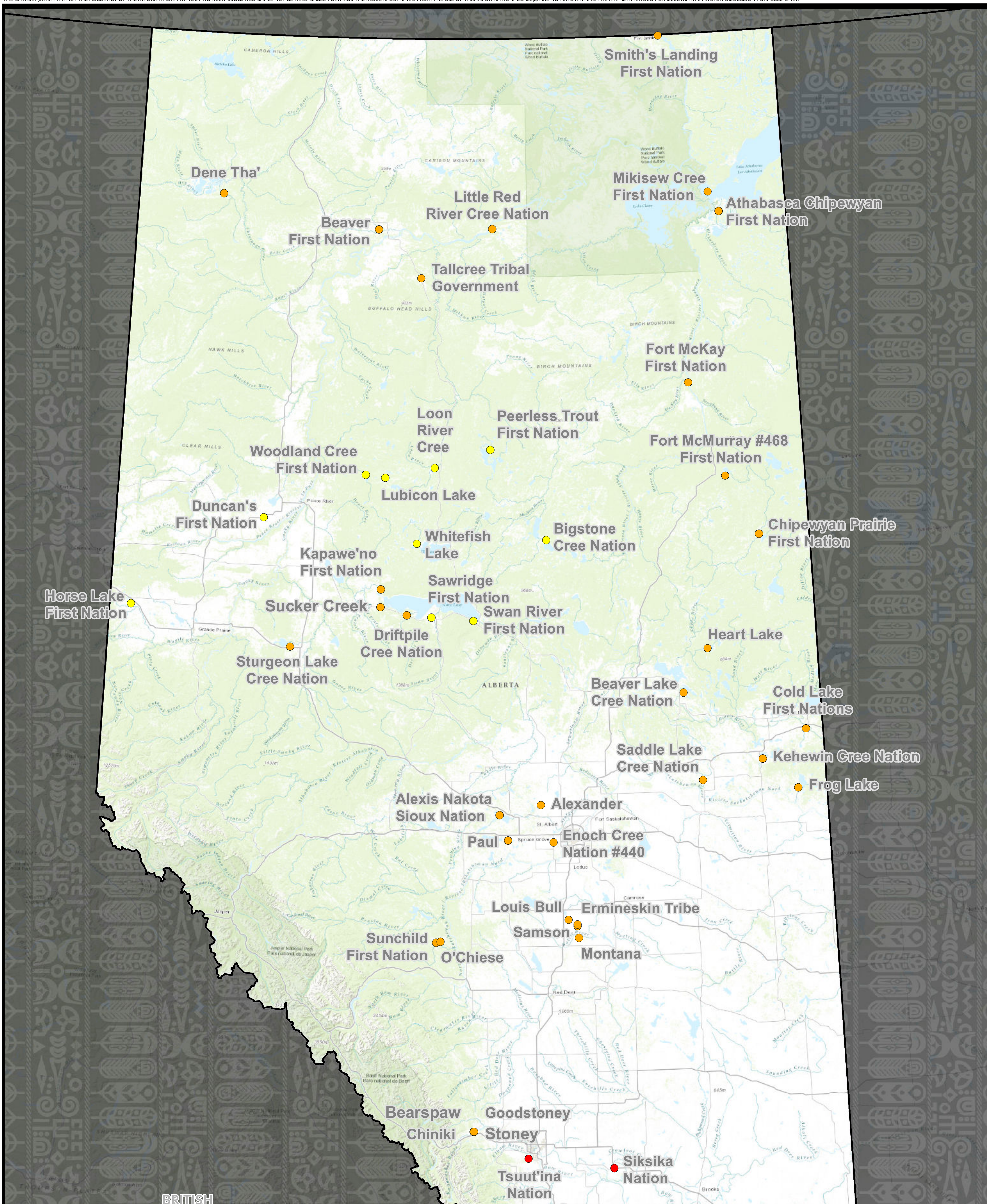


FIGURE 1-2
EXTREME HEAT CHANGE
ALBERTA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

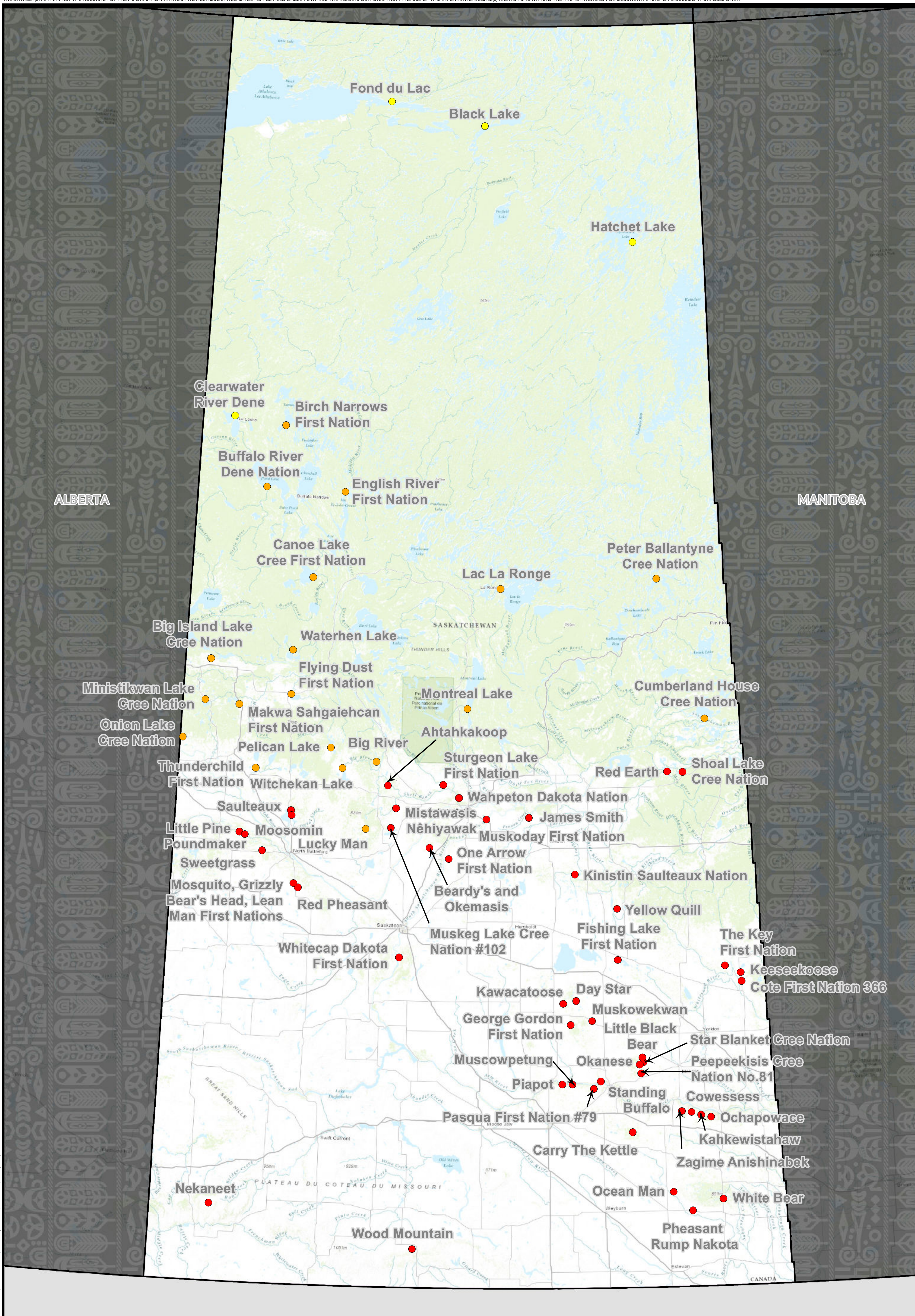
Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

N

Associated Engineering



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-3_SK_EH_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 1-3
EXTREME HEAT CHANGE
SASKATCHEWAN

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

N

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering

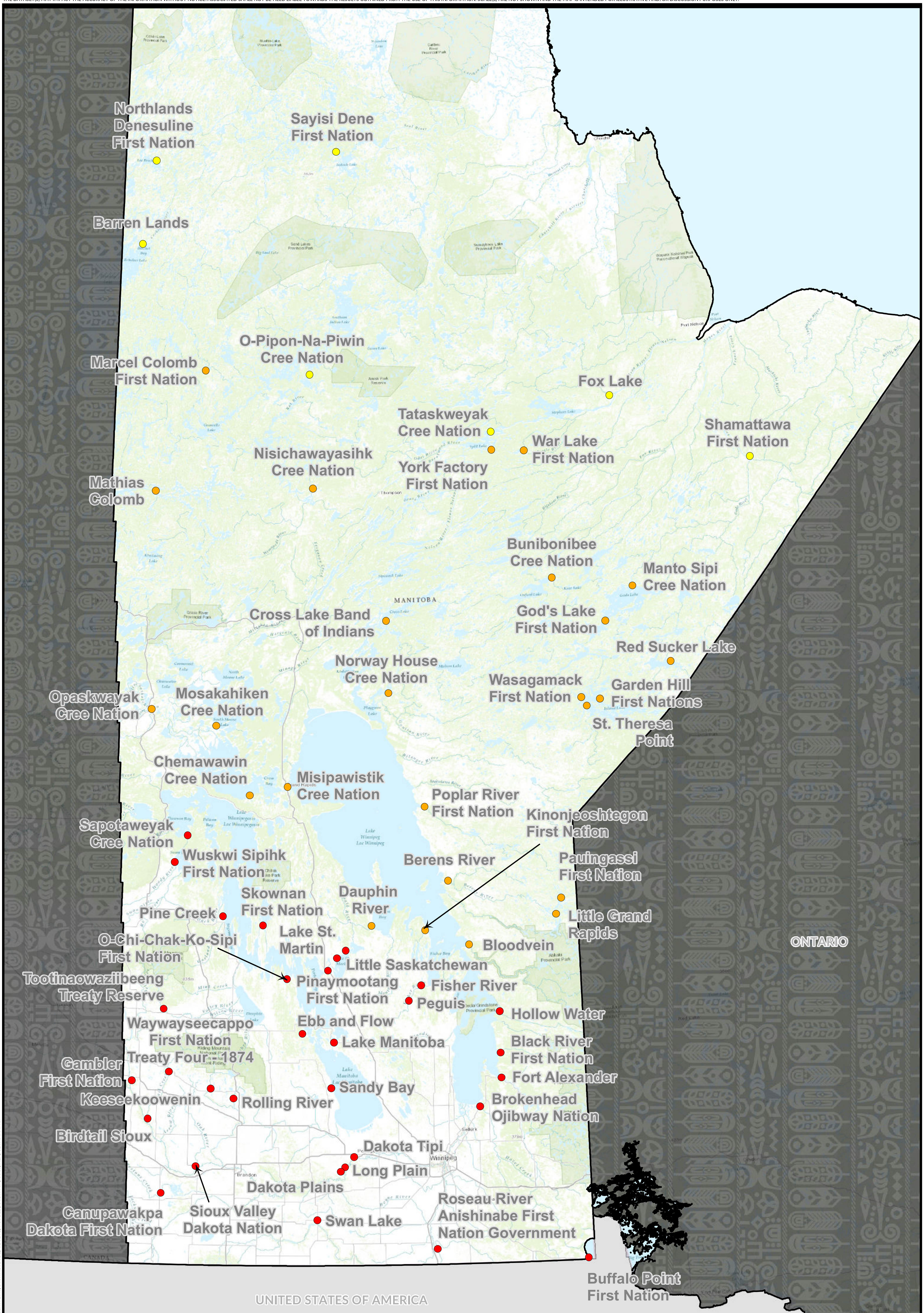


FIGURE 1-4
EXTREME HEAT CHANGE
MANITOBA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

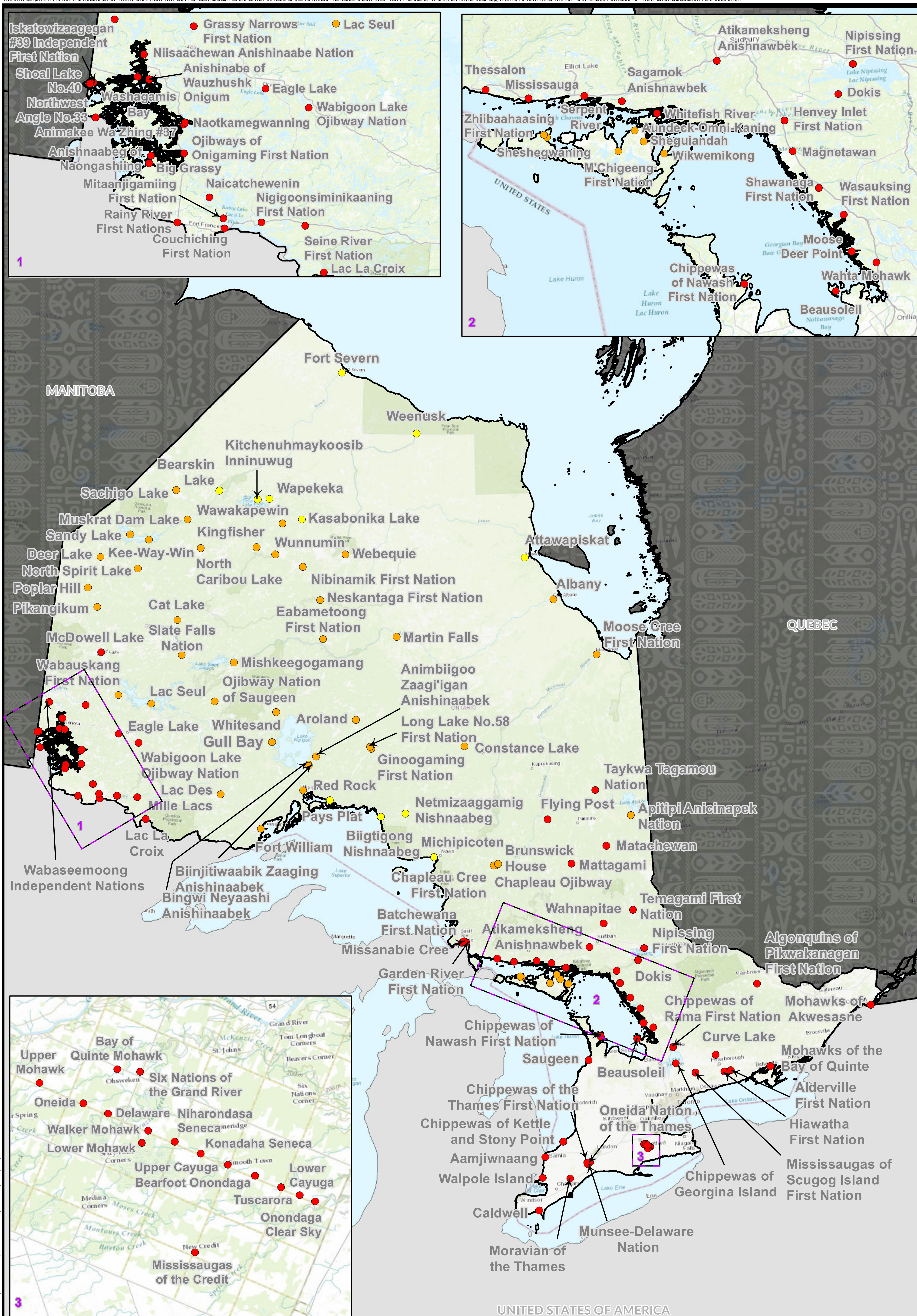
Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

N

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-4_MB_EH_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-5_ON_EH_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AL REV. 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 1-5
EXTREME HEAT CHANGE
ONTARIO

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

Associated Engineering

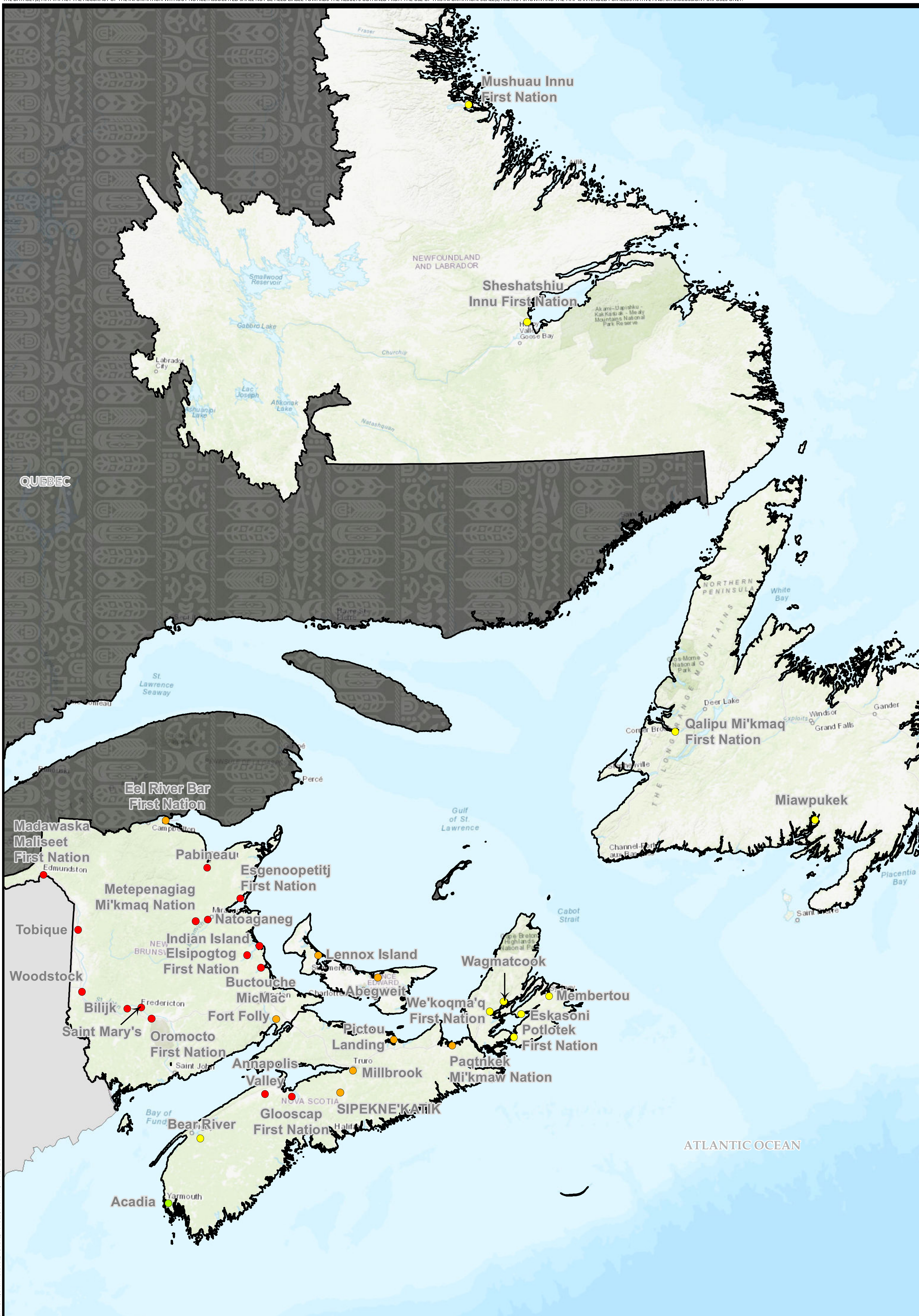
C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-6_QC_EH_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Extreme Heat
Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)
- No Increase Or Decreasing (0 Or Fewer Additional Days Above 30°C)

FIGURE 1-6
EXTREME HEAT CHANGE
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-7_ATL_EH_230814.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 1-7
EXTREME HEAT CHANGE
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat
Change In Days Above 30°C Between 2023 and 2050
- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)
- No Increase Or Decreasing (0 Or Fewer Additional Days Above 30°C)

N

Associated Engineering

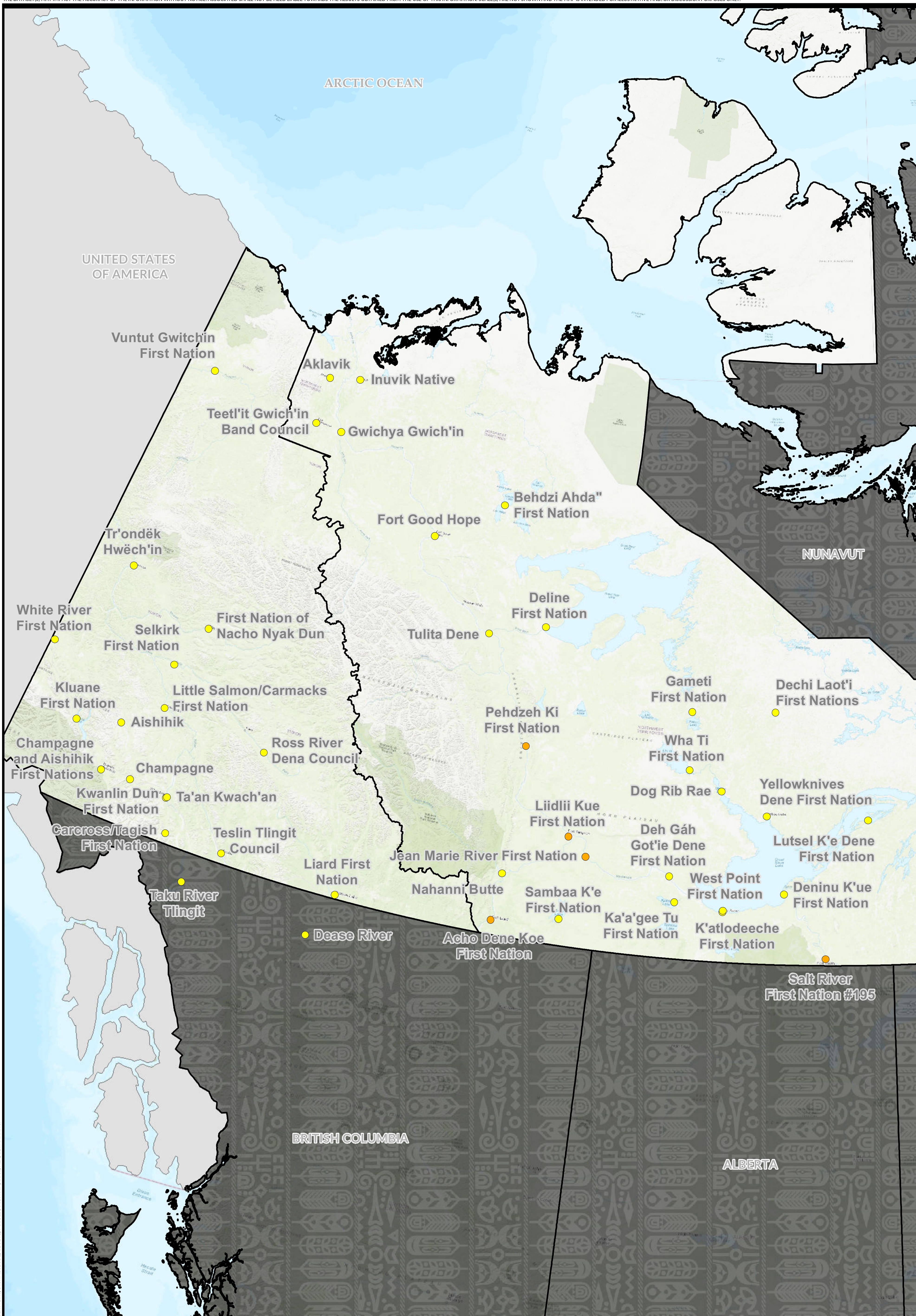


FIGURE 1-8
EXTREME HEAT CHANGE
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

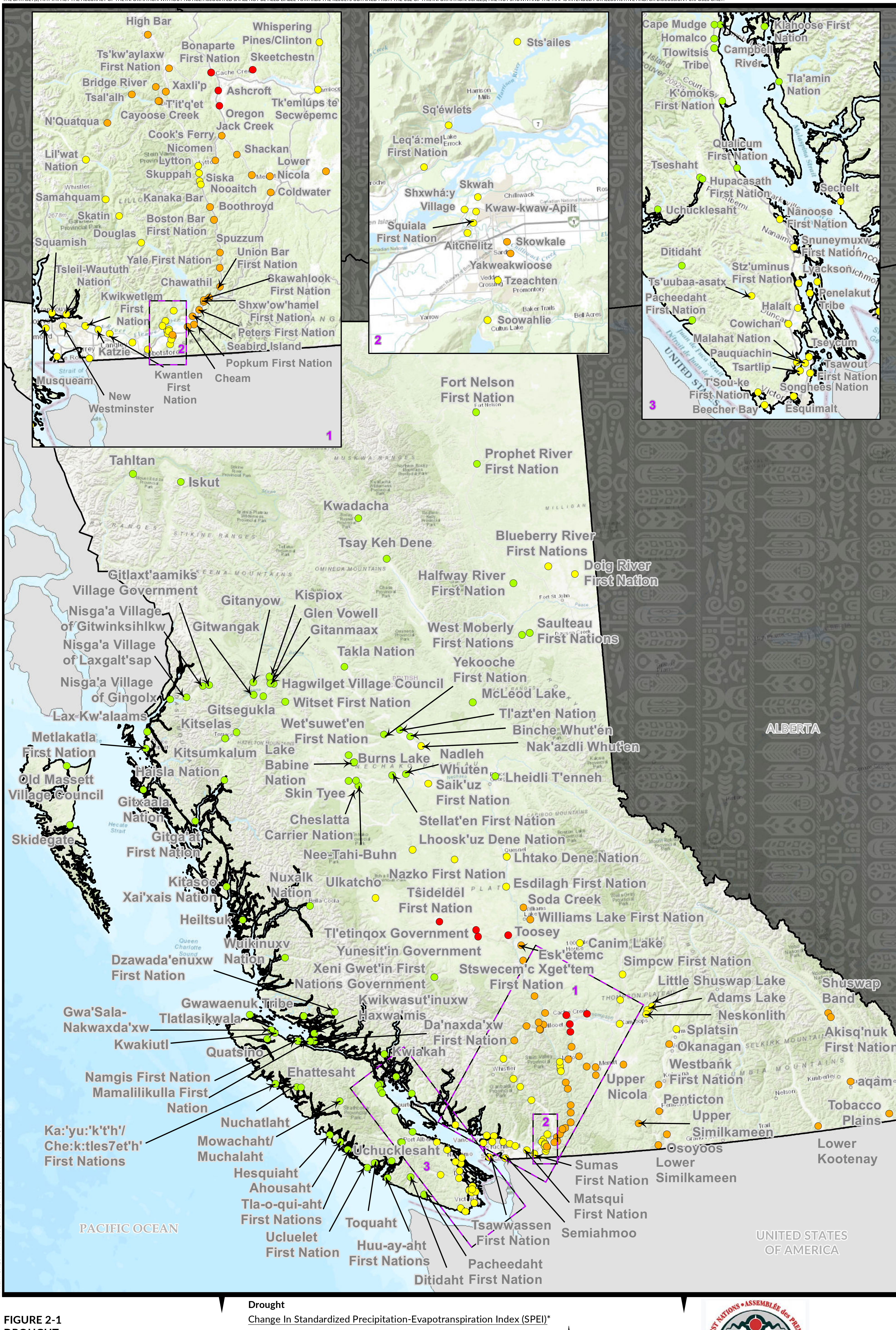
Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-8_NWT_YT_EH_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)
- No Increase Or Decreasing (+0 Or Greater Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

FIGURE 2-1
DROUGHT
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-1_BC_DROUGHT_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

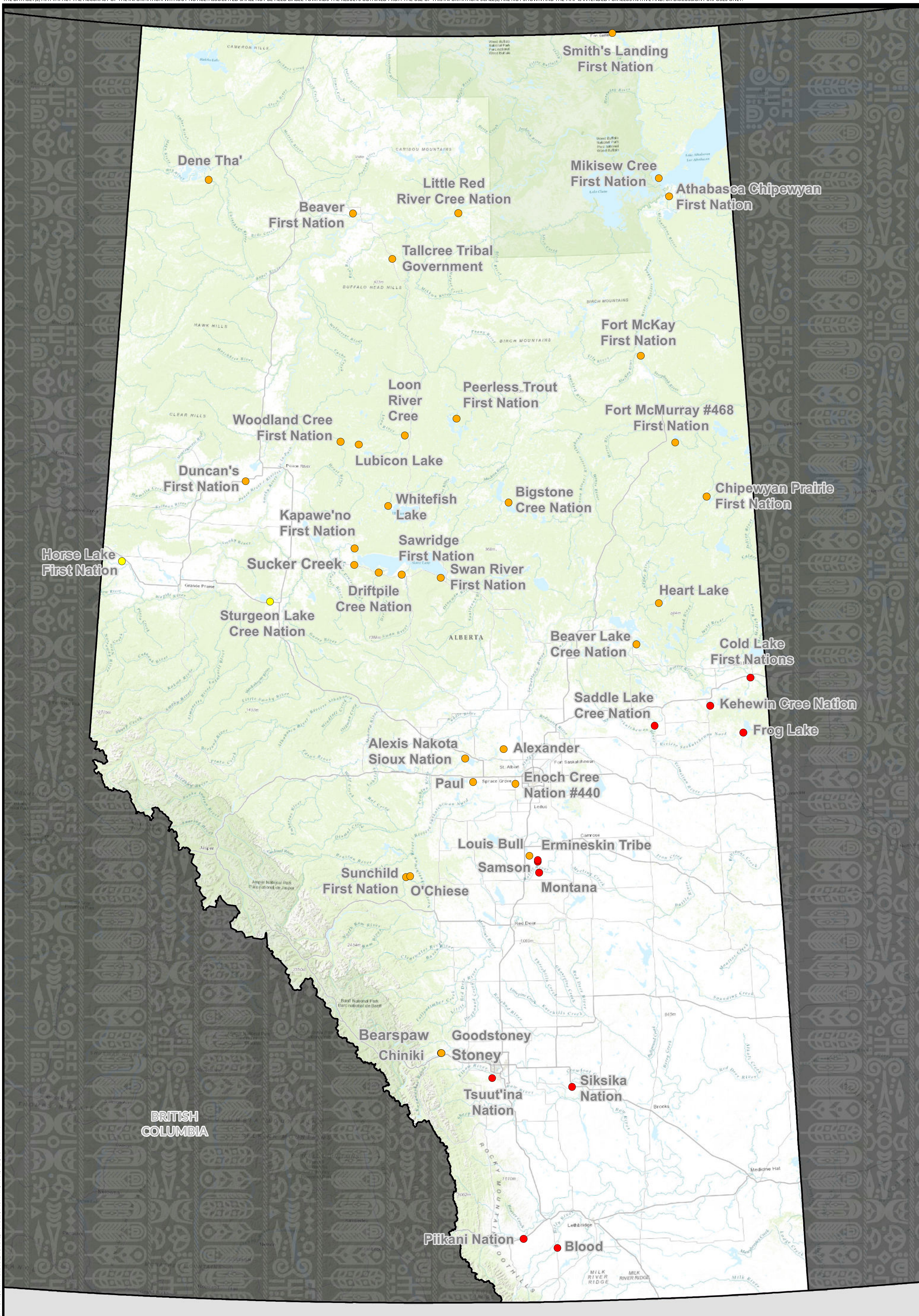


FIGURE 2-2
DROUGHT
ALBERTA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

Associated Engineering

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-2_AB_DROUGHT_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AJ REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

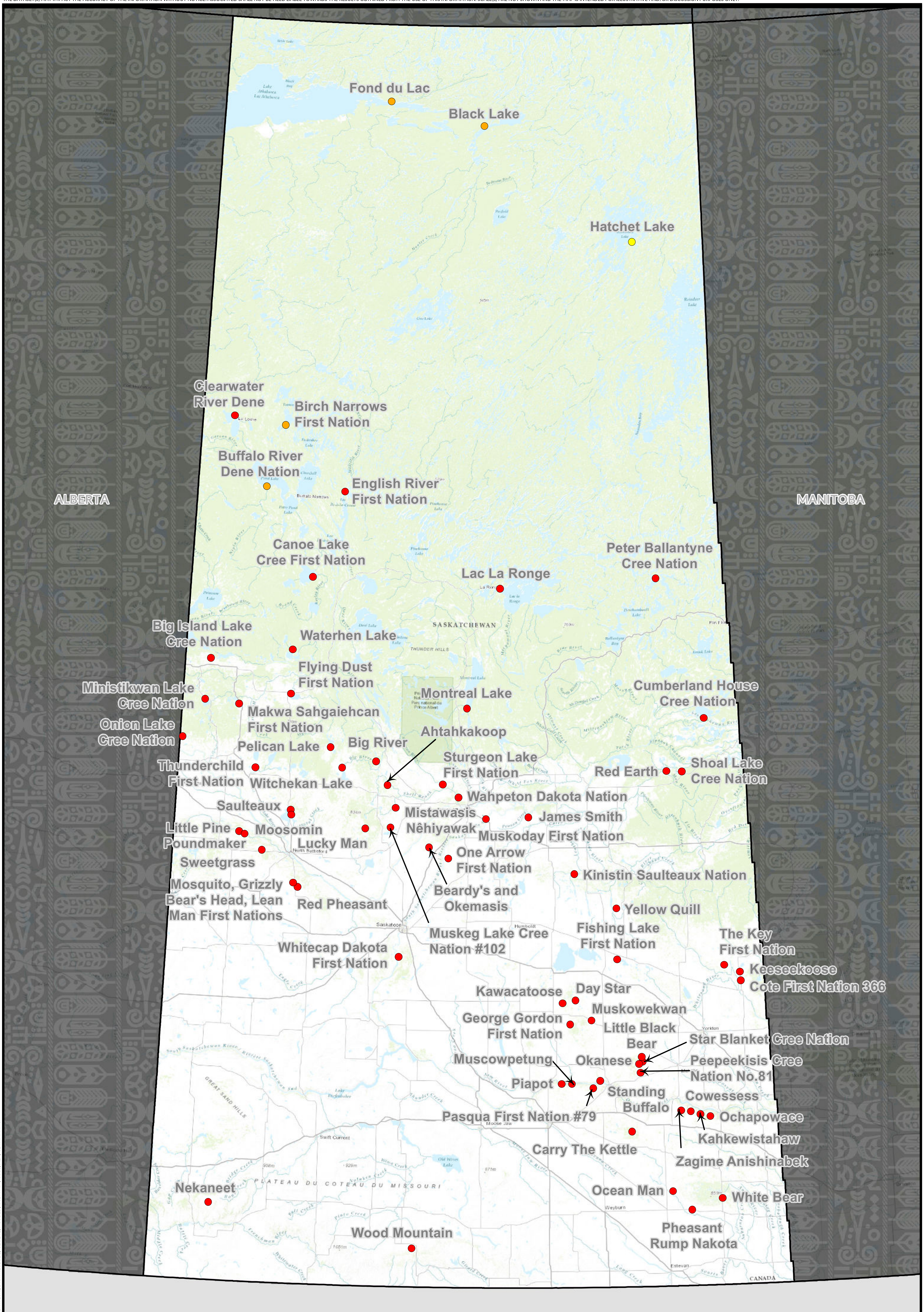


FIGURE 2-3
DROUGHT
SASKATCHEWAN

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

N

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering

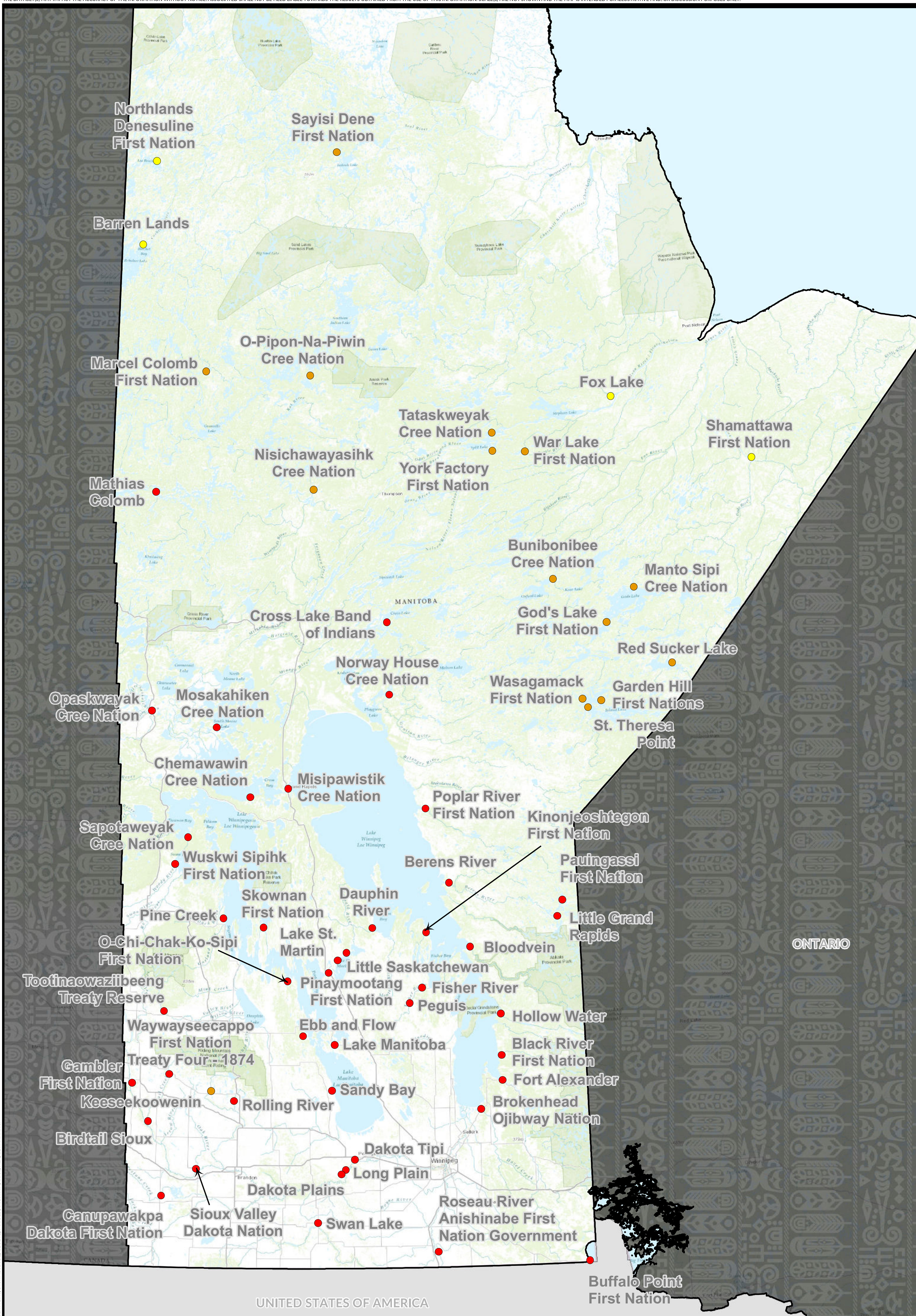


FIGURE 2-4
DROUGHT
MANITOBA

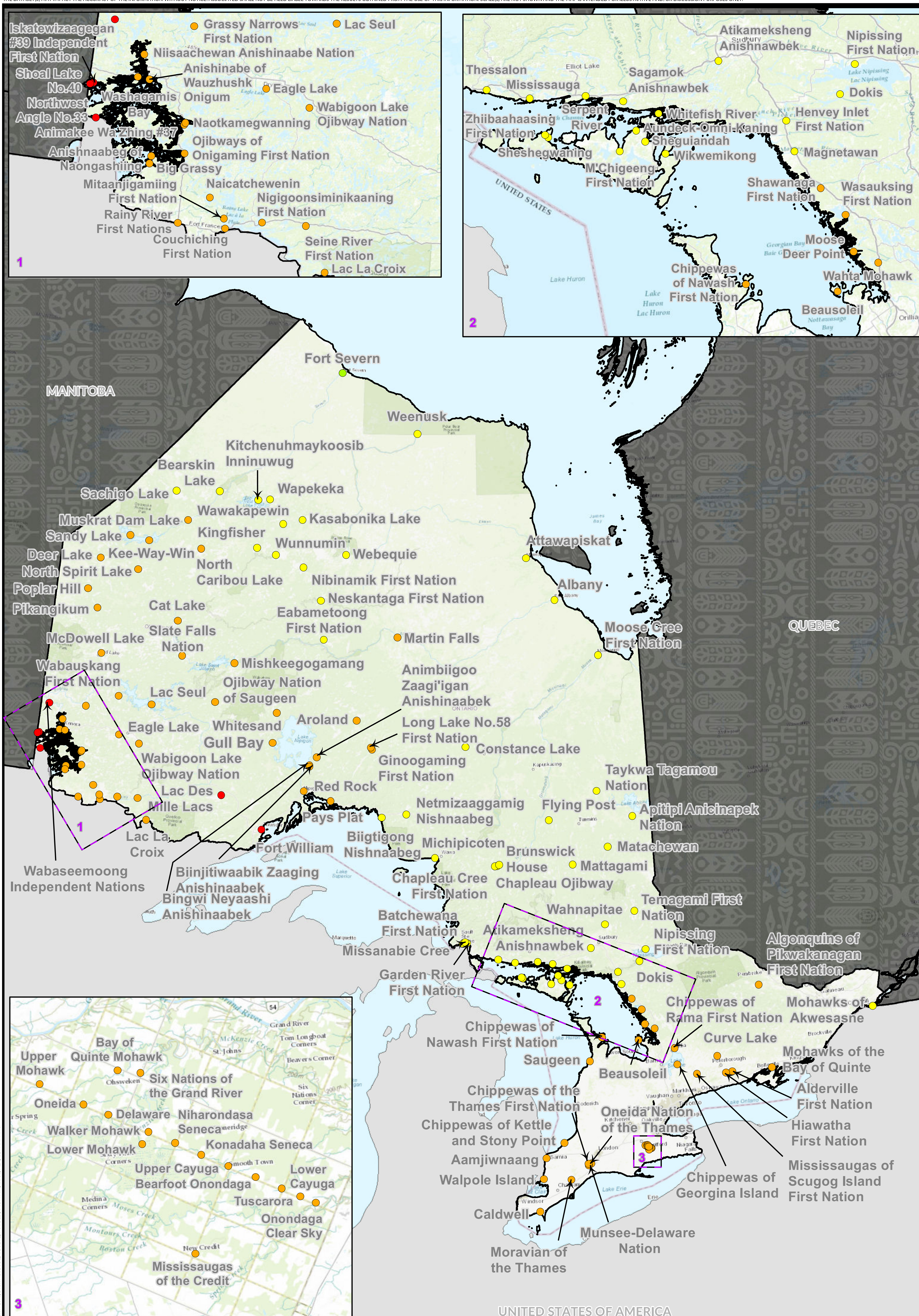
ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)



Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)
- No Increase Or Decreasing (+0 Or Greater Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

FIGURE 2-5
DROUGHT
ONTARIO

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-5_ON_DROUGHT_230314.MXD, DRAWN BY: WL, CHECKED BY: CM/AI, REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-6_QC_DROUGHT_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- Low (0 To -0.25 Change In SPEI)
- No Increase Or Decreasing (+0 Or Greater Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

FIGURE 2-6
DROUGHT
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Associated Engineering

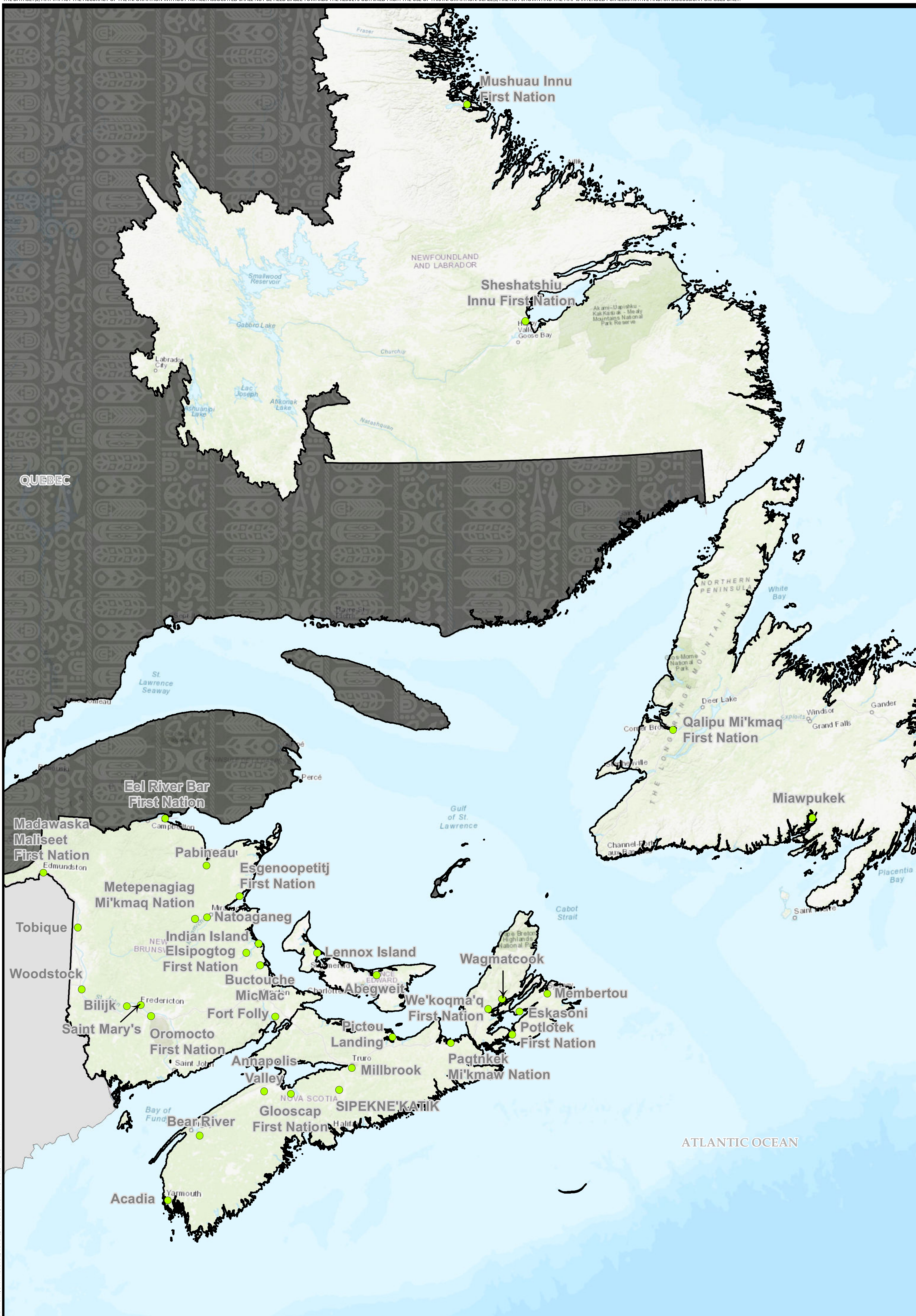


FIGURE 2-7
DROUGHT
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

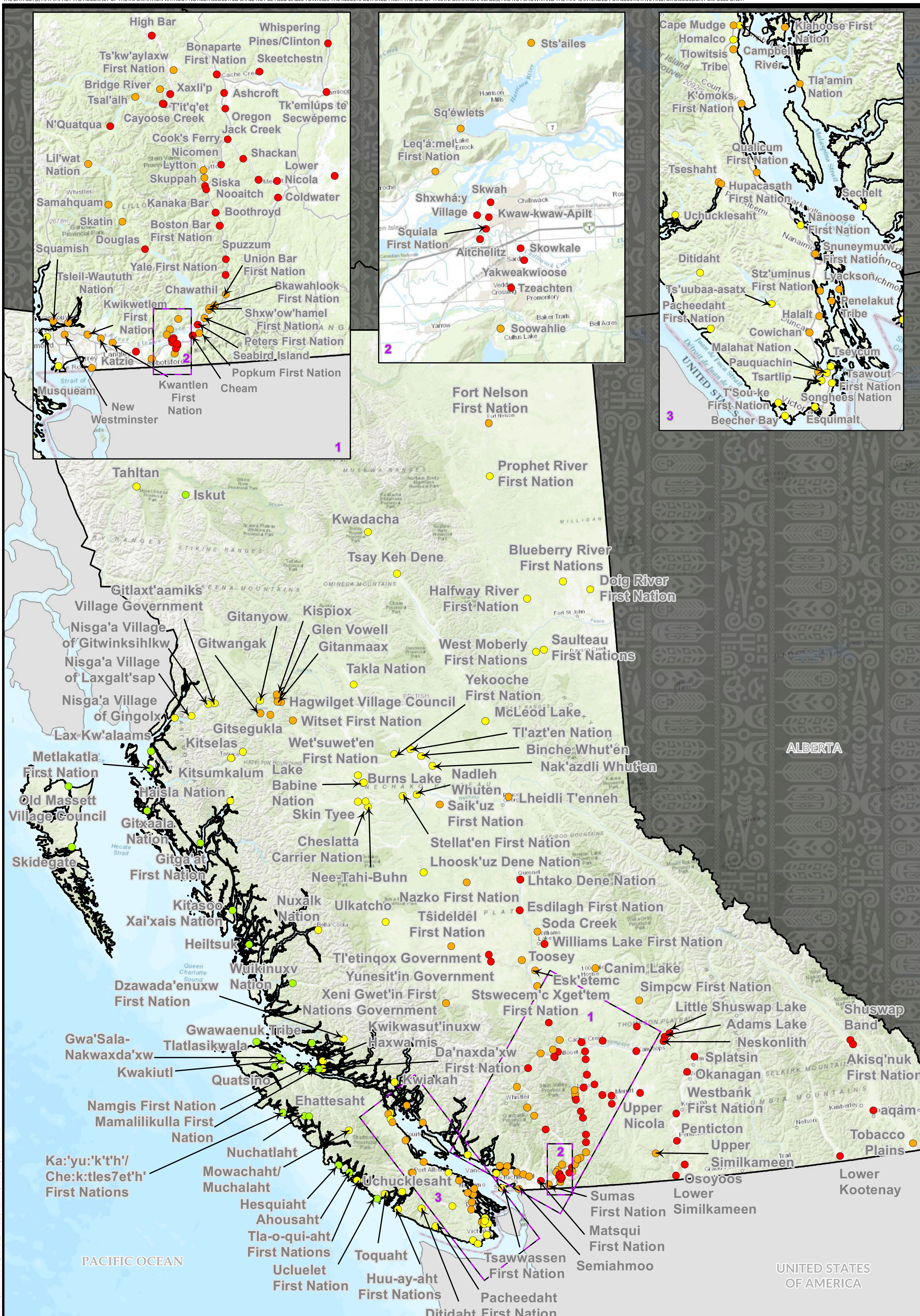
No Increase Or Decreasing
(+0 Or Greater Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

N

Associated Engineering

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-1_BC_EH_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

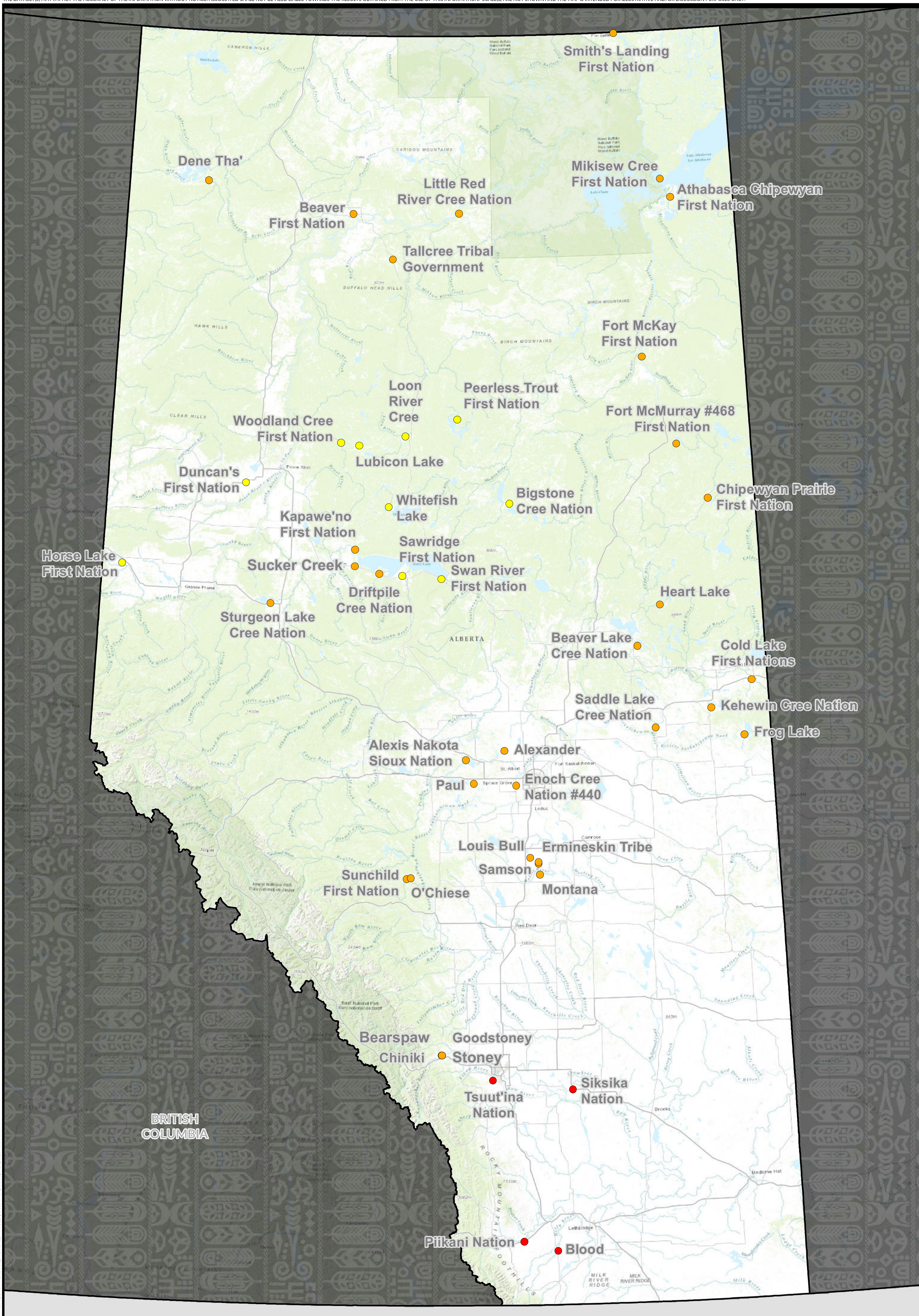
FIGURE 1-1
EXTREME HEAT CHANGE
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat
Change In Days Above 30°C Between 2023 and 2050
- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)
- No Increase Or Decreasing (0 Or Fewer Additional Days Above 30°C)

N

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-2_AB_EH_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Extreme Heat

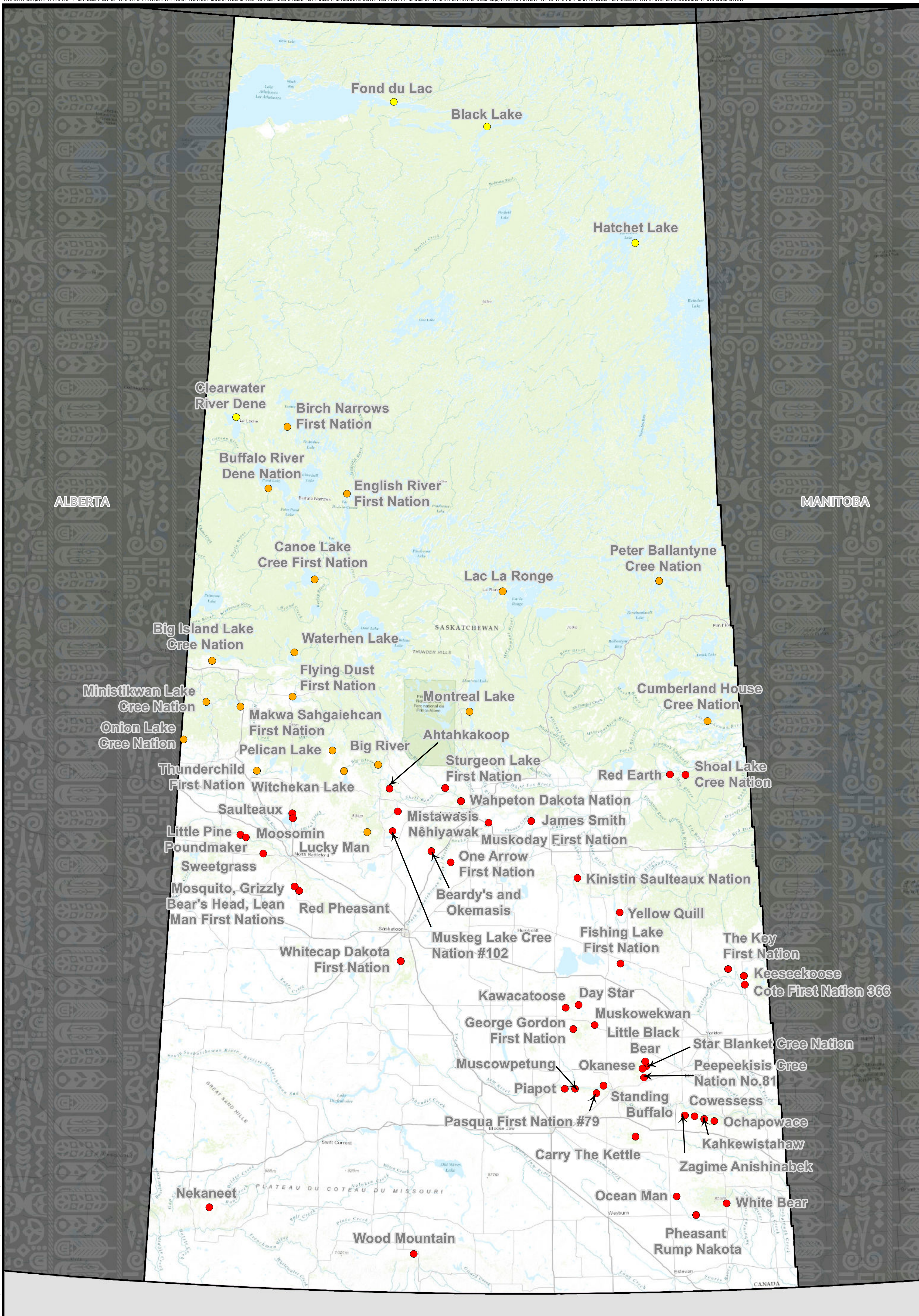
Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

FIGURE 1-2
EXTREME HEAT CHANGE
ALBERTA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-3_SK_EH_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 1-3
EXTREME HEAT CHANGE
SASKATCHEWAN

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

N

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering

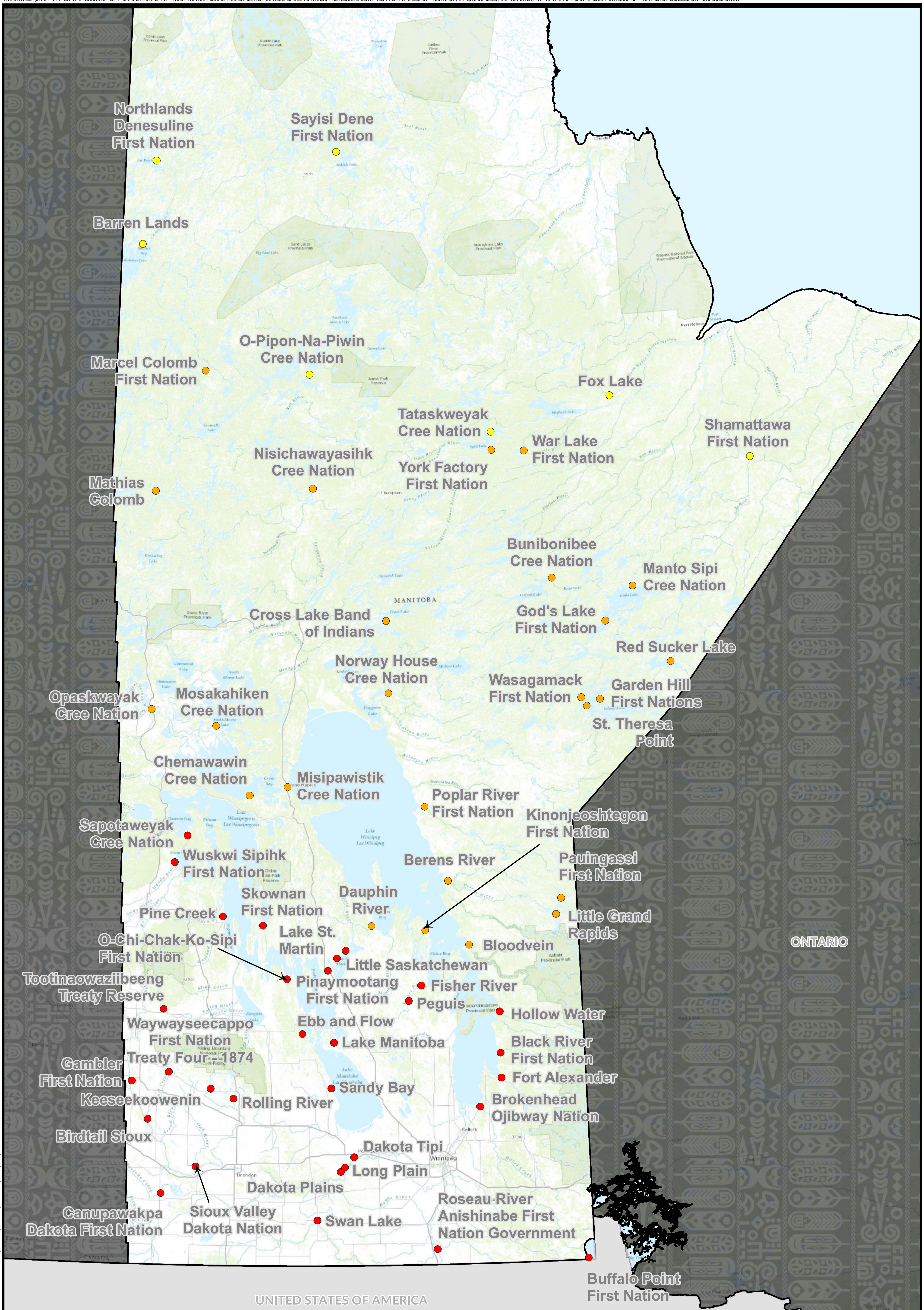


FIGURE 1-4
EXTREME HEAT CHANGE
MANITOBA

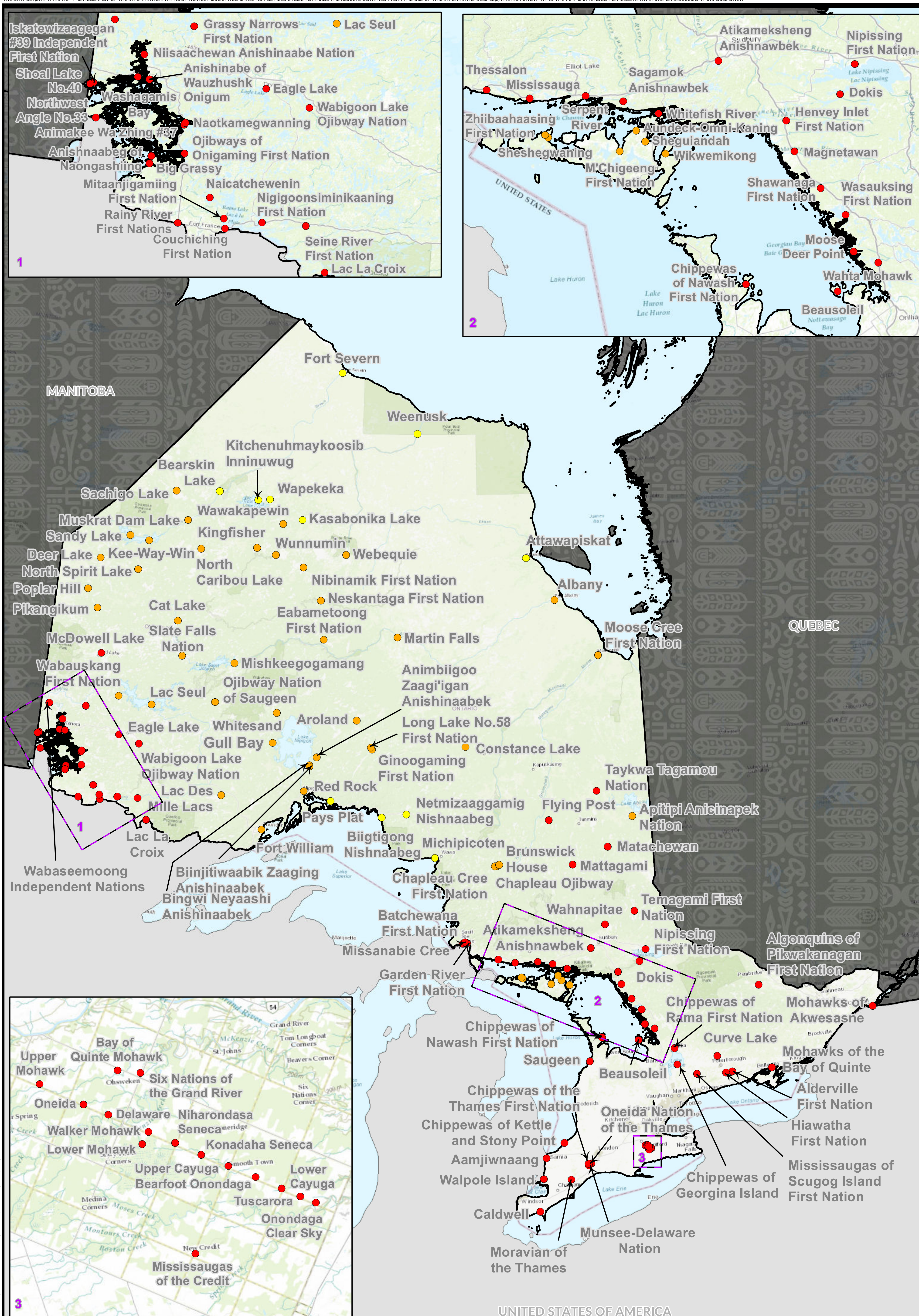
ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-5_ON_EH_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AL REV. 00. IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 1-5
EXTREME HEAT CHANGE
ONTARIO

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

N

Associated Engineering

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE20223439_FIG1-6_QC_EH_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 1-6
EXTREME HEAT CHANGE
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)
- No Increase Or Decreasing (0 Or Fewer Additional Days Above 30°C)

N

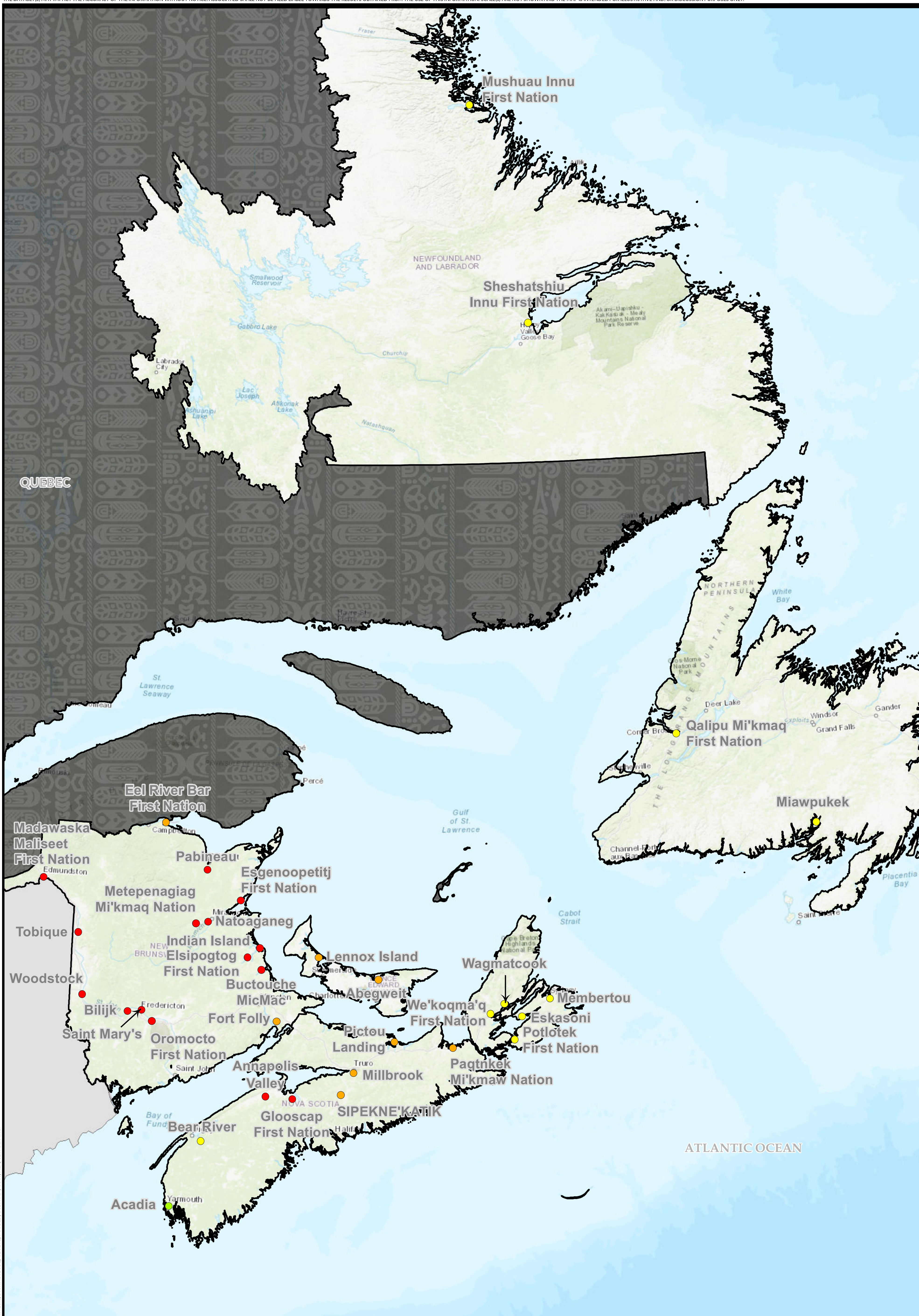


FIGURE 1-7
EXTREME HEAT CHANGE
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

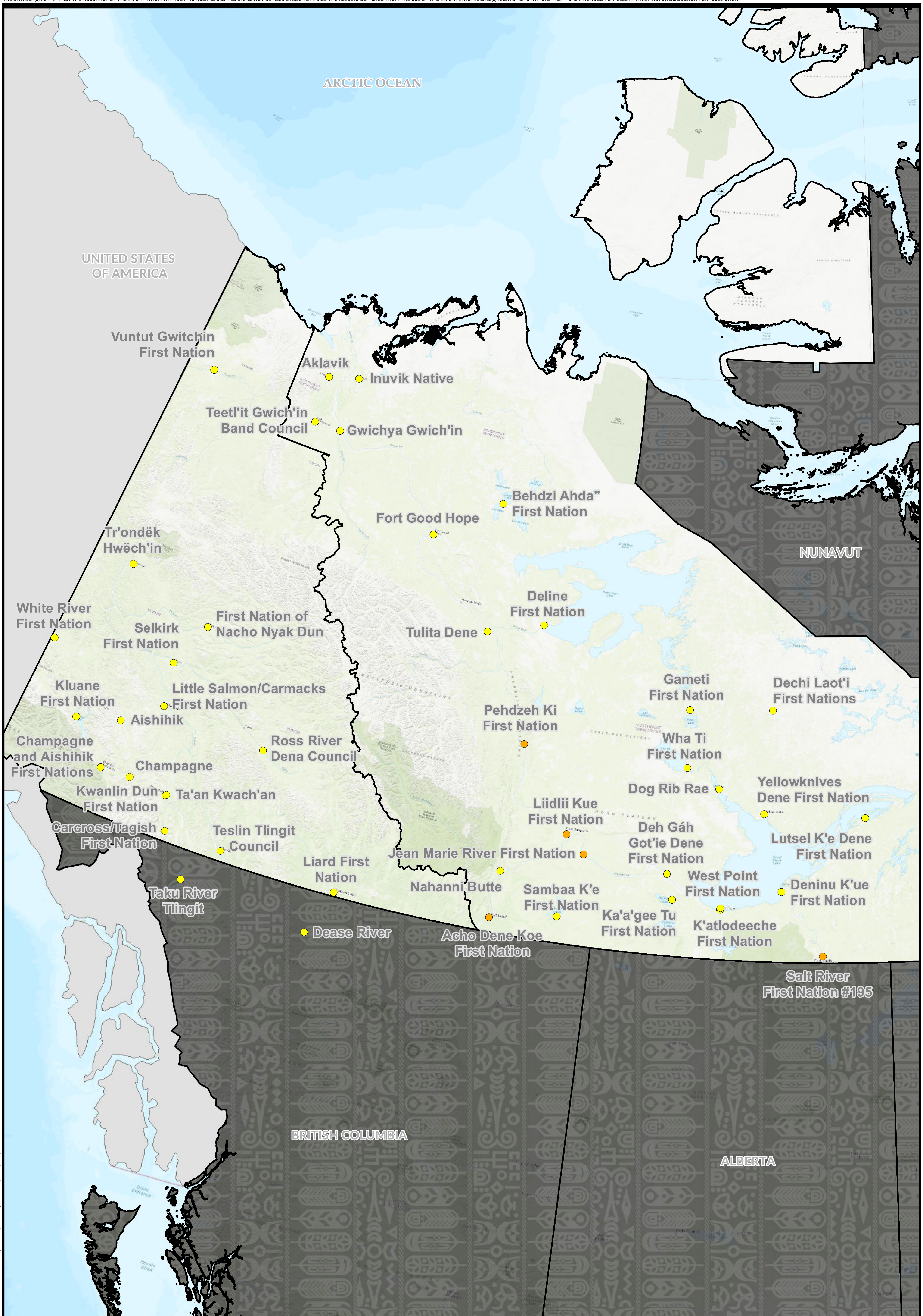
Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

- High (+10 Or More Additional Days Above 30°C)
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)
- No Increase Or Decreasing (0 Or Fewer Additional Days Above 30°C)

N

Associated Engineering



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\1_EXTREME_HEAT\AE2022439_FIG1-8_NWT_YT_EH_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 1-8
EXTREME HEAT CHANGE
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Extreme Heat

Change In Days Above 30°C Between 2023 and 2050

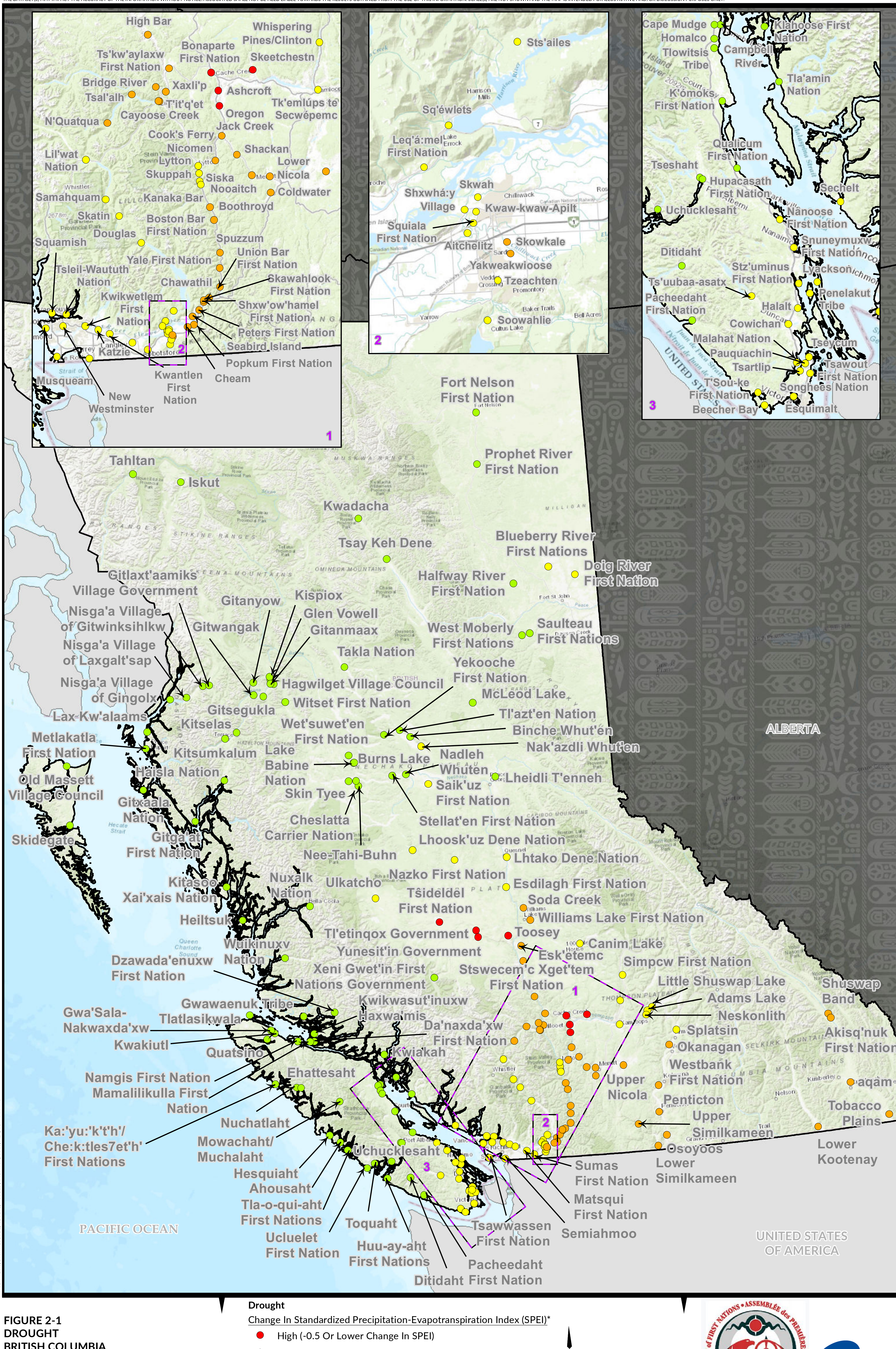
- Medium (+5 To +10 Additional Days Above 30°C)
- Low (+0 to +5 Additional Days Above 30°C)

N

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-1_BC_DROUGHT_230314.MXD. DRAWN BY: WL CHECKED BY: CM/JL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

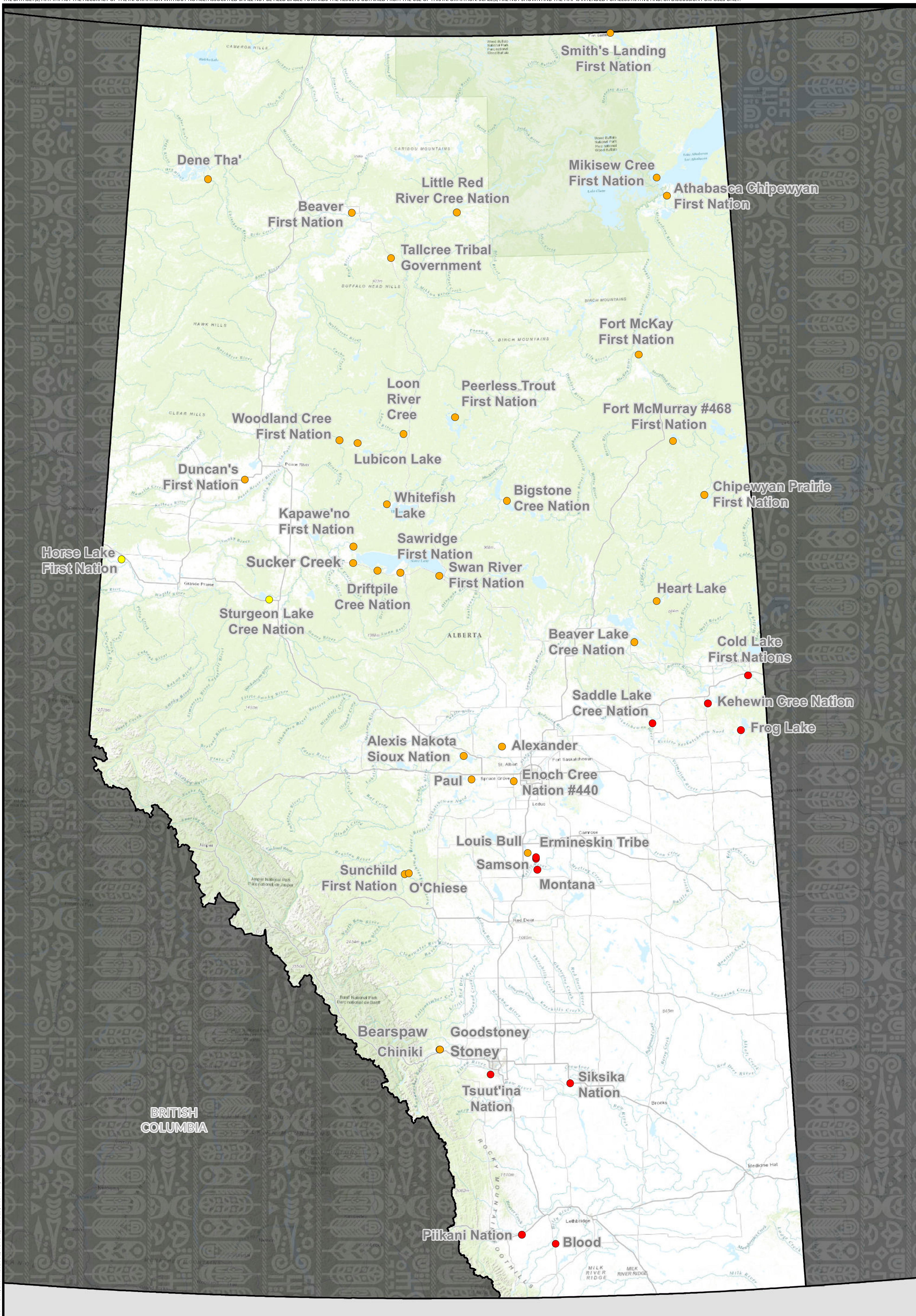
- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)
- No Increase Or Decreasing (+0 Or Greater Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

FIGURE 2-1
DROUGHT
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-2_AB_DROUGHT_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AJ. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 2-2
DROUGHT
ALBERTA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

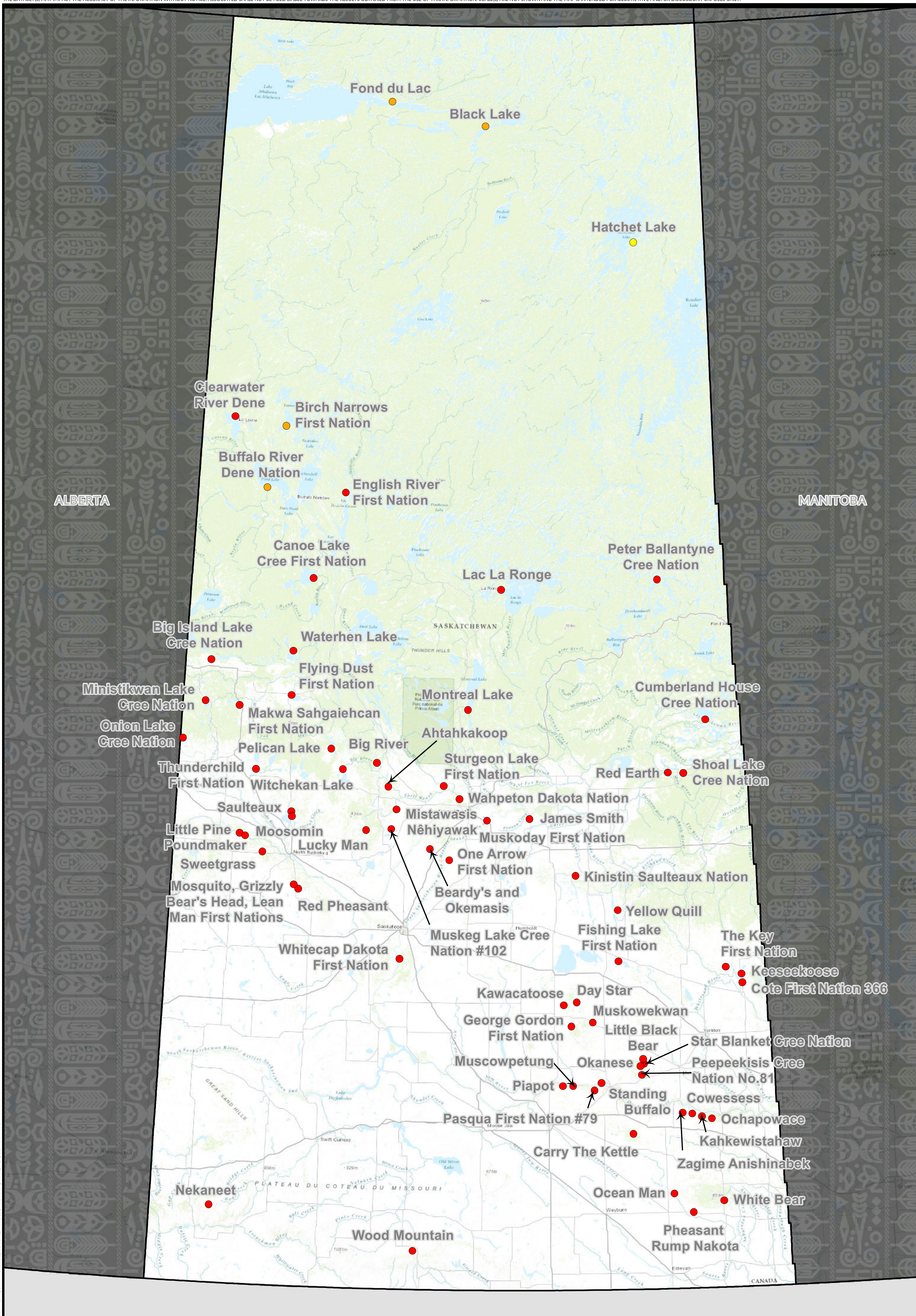
Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-3_SK_DROUGHT_220314.MXD. DRAWN BY: WL. CHECKED BY: CM/AJ. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 2-3
DROUGHT
SASKATCHEWAN

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Drought

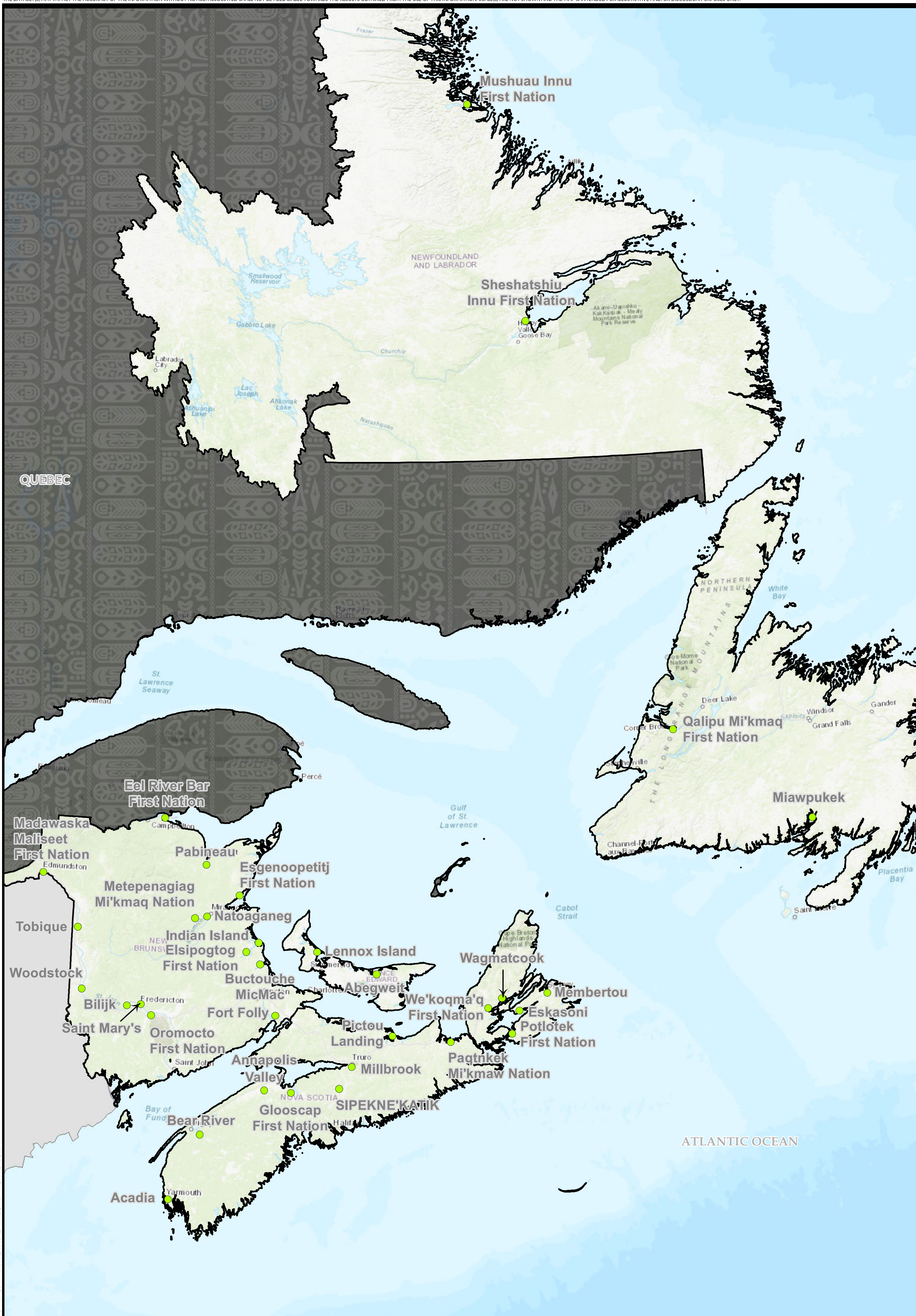
Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- High (-0.5 Or Lower Change In SPEI)
- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

N

Associated Engineering



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-7_ATL_DROUGHT_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 2-7
DROUGHT
ATLANTIC PROVINCES

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

No Increase Or Decreasing
(+0 Or Greater Change In SPEI)

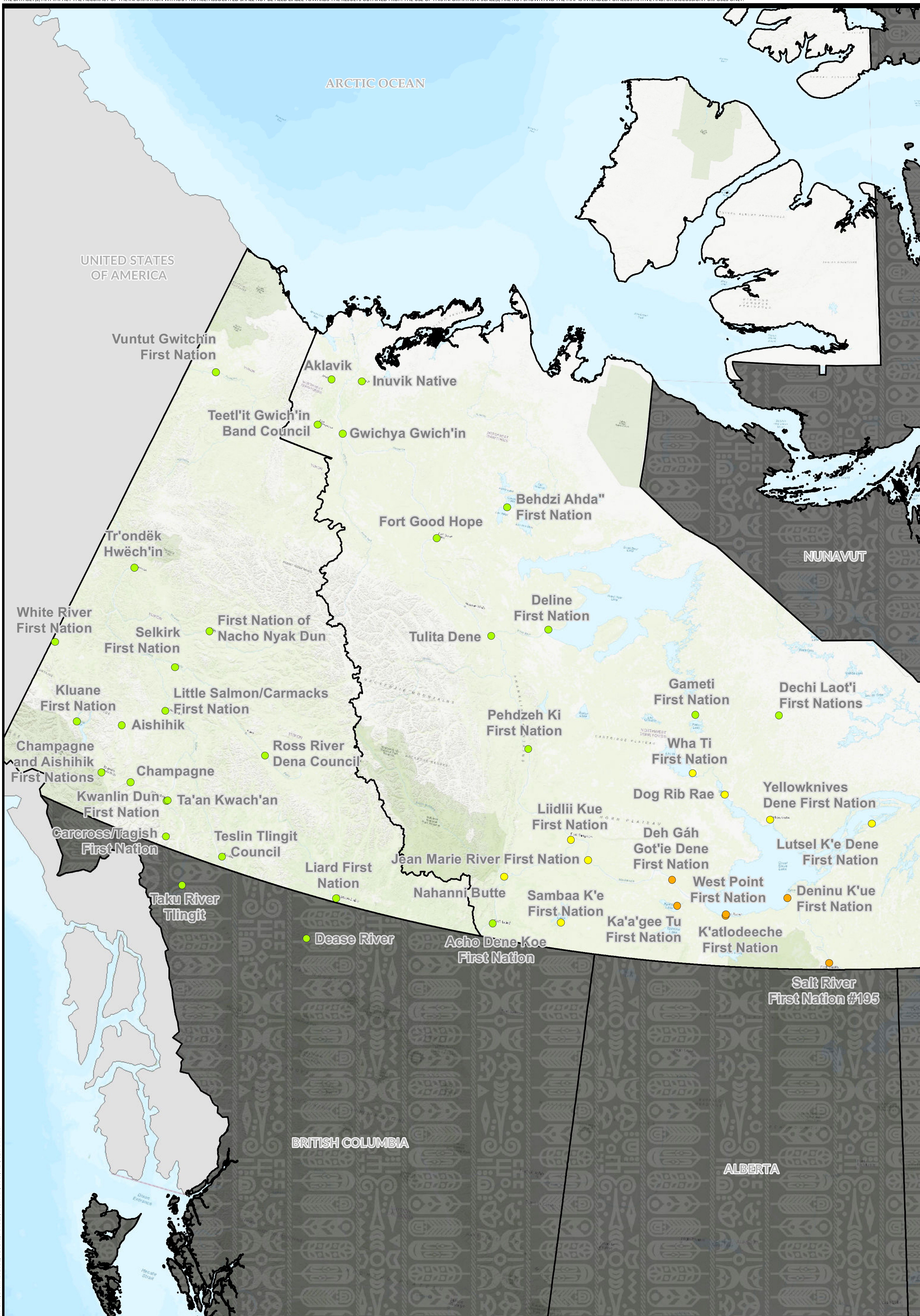
*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

N

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-8_NWT_YT_DROUGHT_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV. 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 2-8
DROUGHT
NORTHWEST TERRITORIES AND YUKON

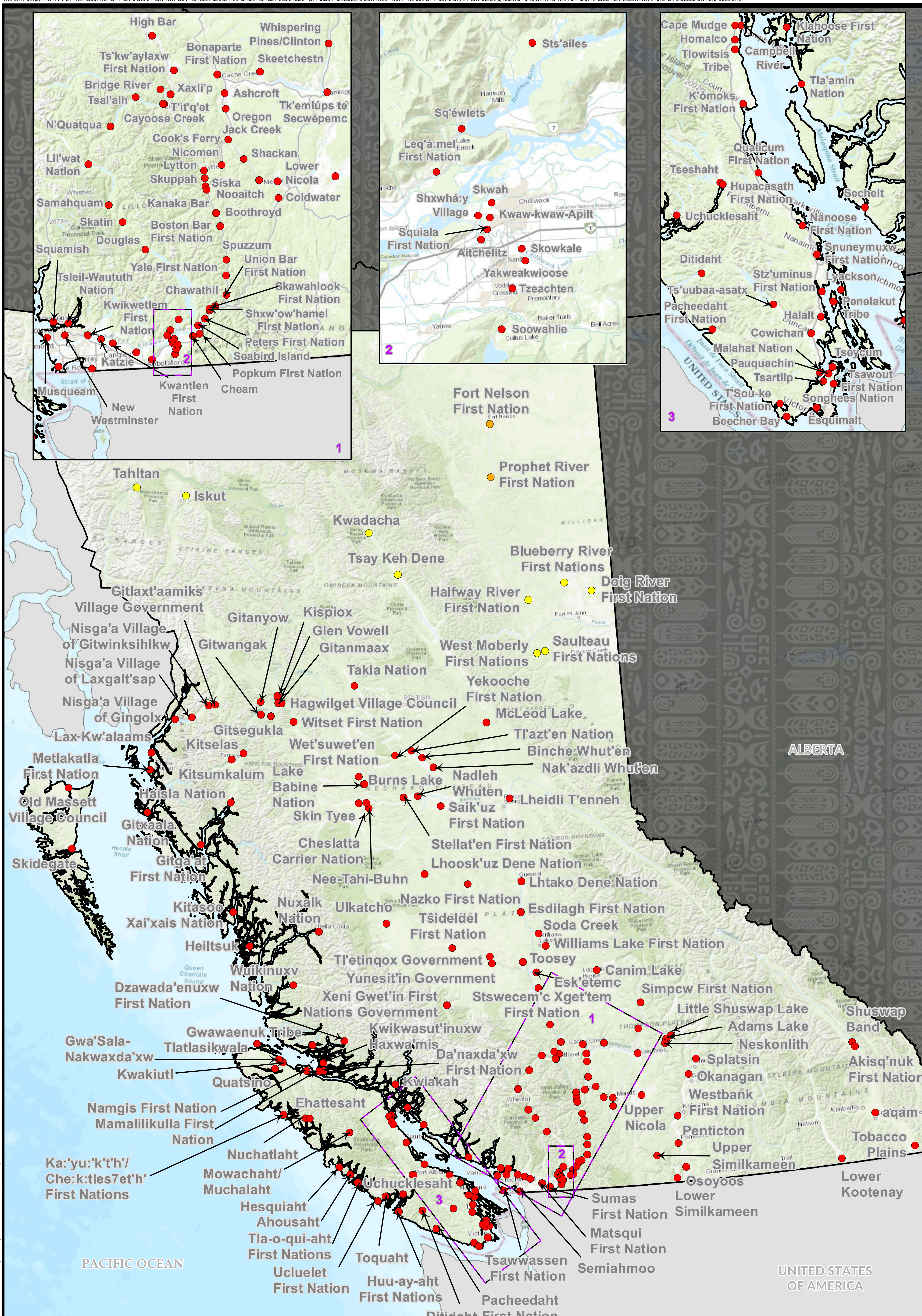
ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)
- No Increase Or Decreasing (+0 Or Greater Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)



Wildfires

Change In Average Area Burned In A Region Between 2023 And 2050)

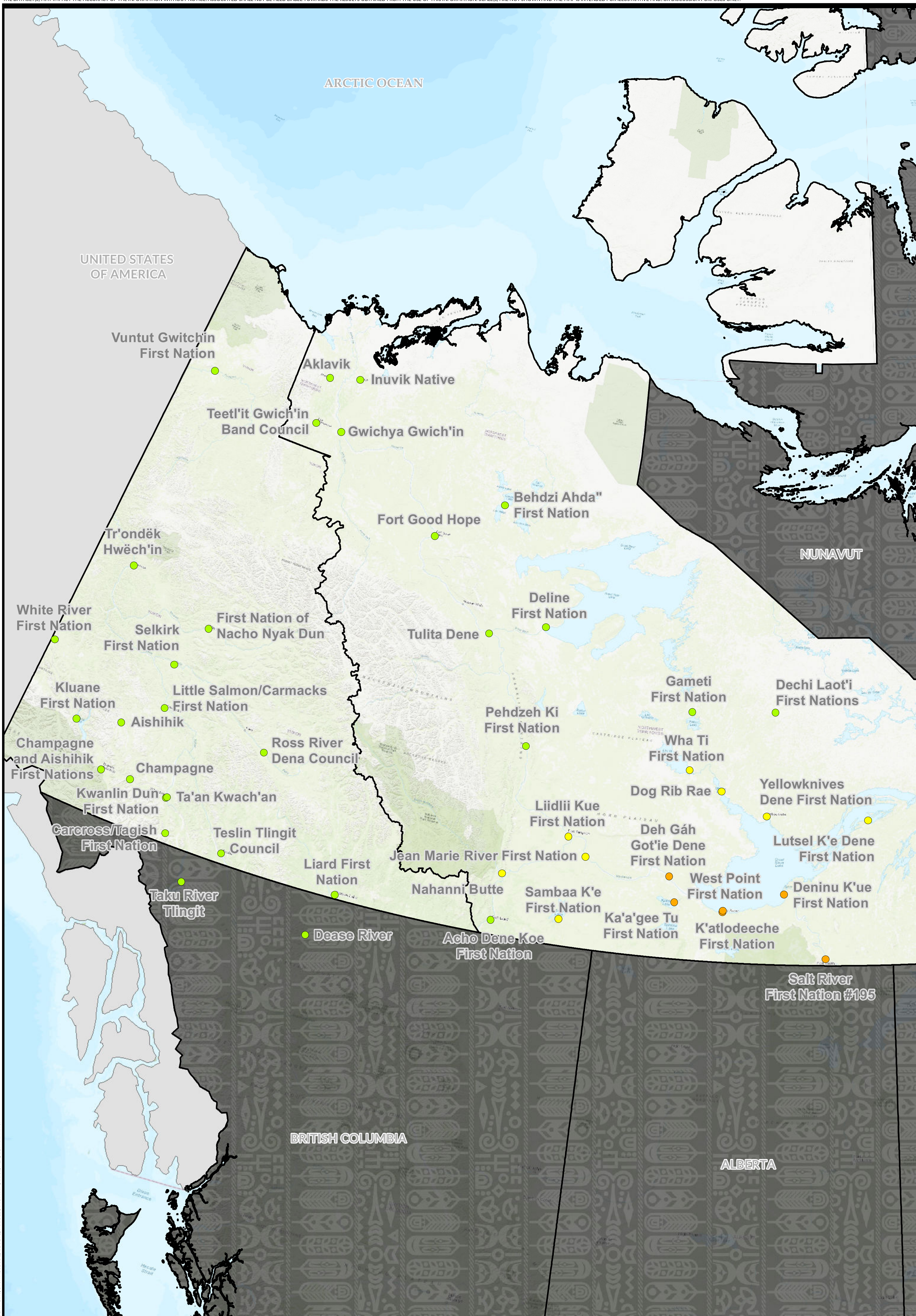
- High (+200% Or More Average Area Burned)
- Medium (+100% To +200% More Average Area Burned)
- Low (+0% To +100% More Average Area Burned)

FIGURE 3-1
WILDFIRES
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Associated Engineering

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\3_WILDFIRE\AE20223439_FIG3-1_BC_WF_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\2_DROUGHT\AE20223439_FIG2-8_NWT_YT_DROUGHT_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AI REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 2-8
DROUGHT
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Drought

Change In Standardized Precipitation-Evapotranspiration Index (SPEI)*

- Medium (-0.25 To -0.5 Change In SPEI)
- Low (0 To -0.25 Change In SPEI)
- No Increase Or Decreasing (+0 Or Greater Change In SPEI)

*Between The Period 1950-2005 And 2050 (Lower Is Dryer)

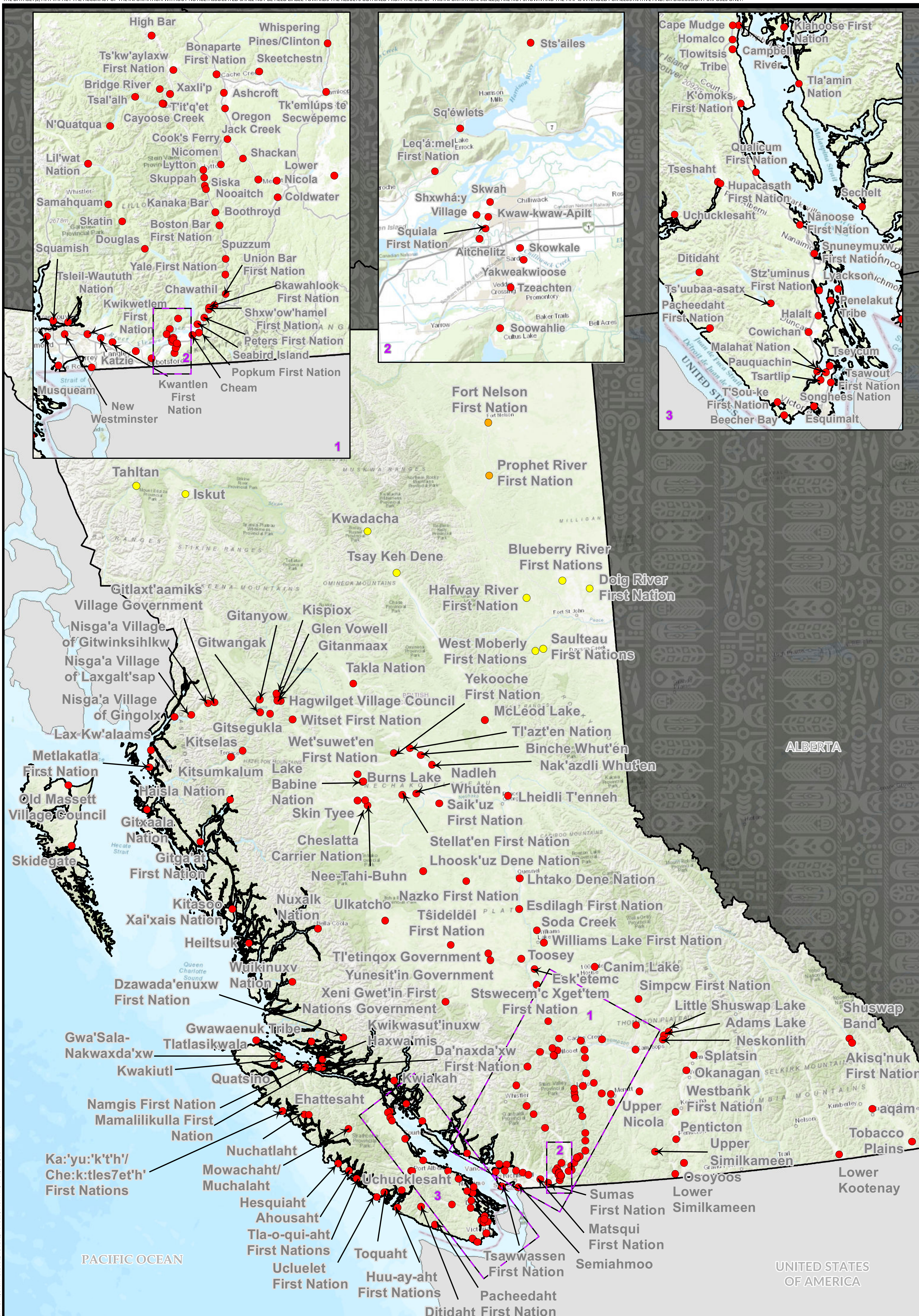


FIGURE 3-1
WILDFIRES
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Wildfires

Change In Average Area Burned In A Region Between 2023 And 2050)

- High (+200% Or More Average Area Burned)
- Medium (+100% To +200% More Average Area Burned)
- Low (+0% To +100% More Average Area Burned)

Associated Engineering

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\3_WILDFIRE\AE20223439_FIG3-2_AB_WF_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Wildfires

Change In Average Area Burned In A Region Between 2023 And 2050)

- High (+200% Or More Average Area Burned)
- Medium (+100% To +200% More Average Area Burned)
- Low (+0% To +100% More Average Area Burned)
- Not Applicable (Outside Of A Wildfire Risk Eco-zone)

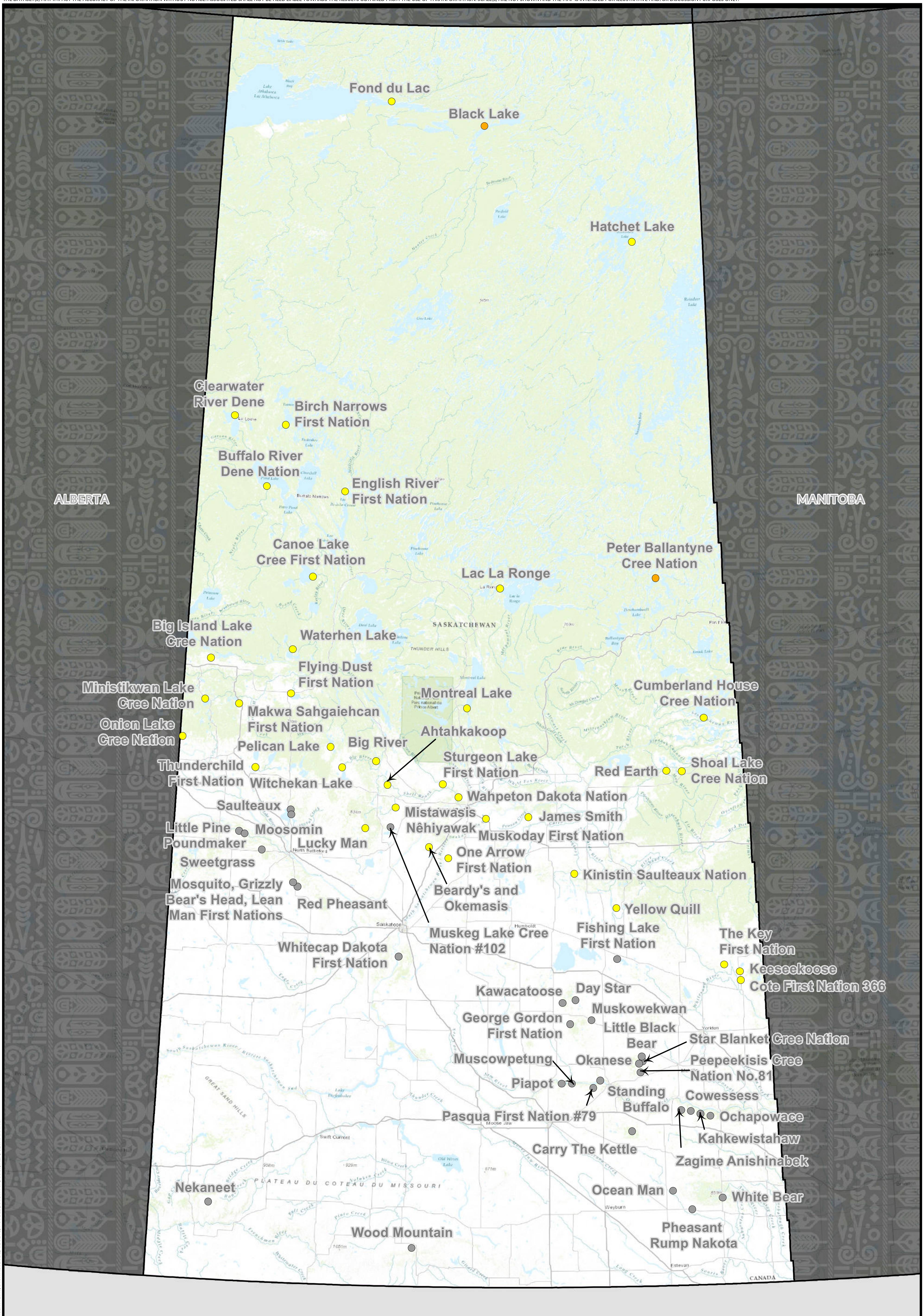
N

FIGURE 3-2
WILDFIRES
ALBERTA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering



Wildfires

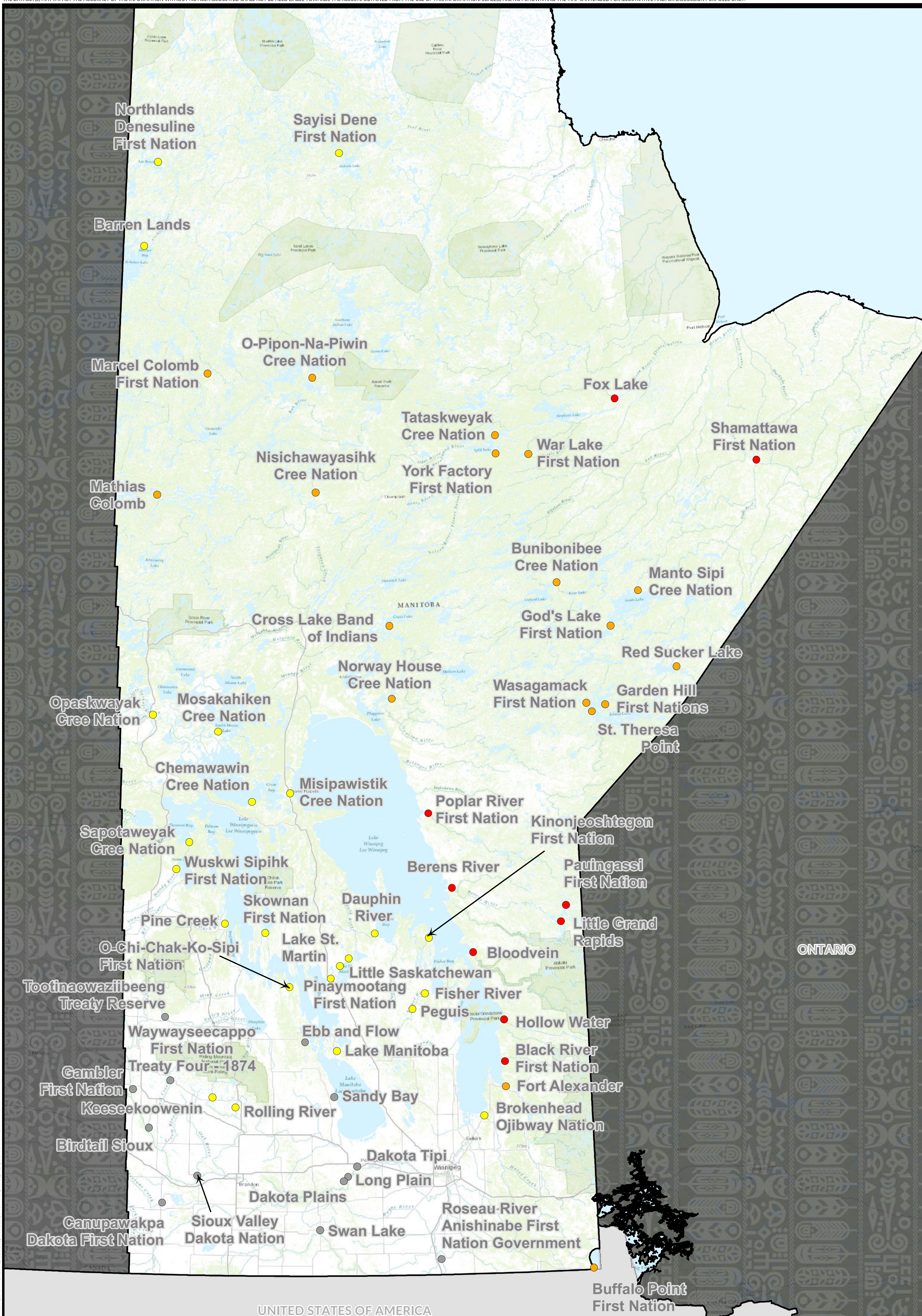
Change In Average Area Burned In A Region Between 2023 And 2050)

- Medium (+100% To +200% More Average Area Burned)
- Low (+0% To +100% More Average Area Burned)
- Not Applicable (Outside Of A Wildfire Risk Eco-zone)

FIGURE 3-3
WILDFIRES
SASKATCHEWAN

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\3_WILDFIRE\AE20223439_FIG3-4_MB_WF_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AI REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 3-4
WILDFIRES
MANITOBA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Wildfires

Change In Average Area Burned In A Region Between 2023 And 2050)

- High (+200% Or More Average Area Burned)
- Medium (+100% To +200% More Average Area Burned)
- Low (+0% To +100% More Average Area Burned)
- Not Applicable (Outside Of A Wildfire Risk Eco-zone)

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\3_WILDFIRE\AE20223439_FIG3-5_ON_WF_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Wildfires

Change In Average Area Burned In A Region Between 2023 And 2050)

- High (+200% Or More Average Area Burned)
- Medium (+100% To +200% More Average Area Burned)
- Not Applicable (Outside Of A Wildfire Risk Eco-zone)

N

FIGURE 3-5
WILDFIRES
ONTARIO

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering

Wildfires

Change In Average Area Burned In A Region Between 2023 And 2050)

- Red: High (+200% Or More Average Area Burned)
- Orange: Medium (+100% To +200% More Average Area Burned)
- Grey: Not Applicable (Outside Of A Wildfire Risk Eco-zone)

N

FIGURE 3-6
WILDFIRES
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\3_WILDFIRE\AE20223439_FIG3-6_QC_WF_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Wildfires

Change In Average Area Burned In A Region Between 2023 And 2050)

- High (+200% Or More Average Area Burned)
- Medium (+100% To +200% More Average Area Burned)
- Not Applicable (Outside Of A Wildfire Risk Eco-zone)

FIGURE 3-7
WILDFIRES
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\3_WILDFIRE\AE20223439_FIG3-7_ATL_WF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

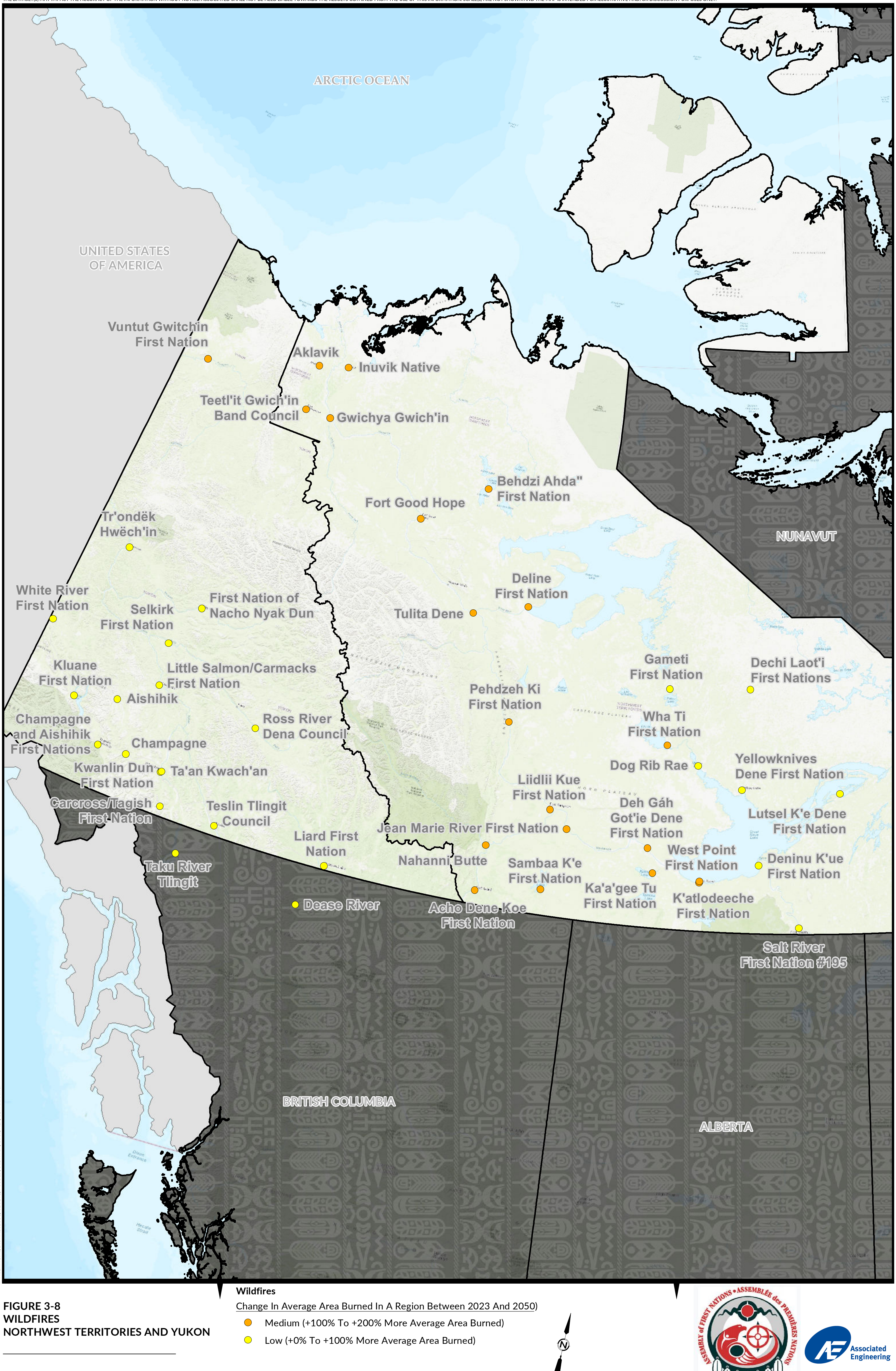
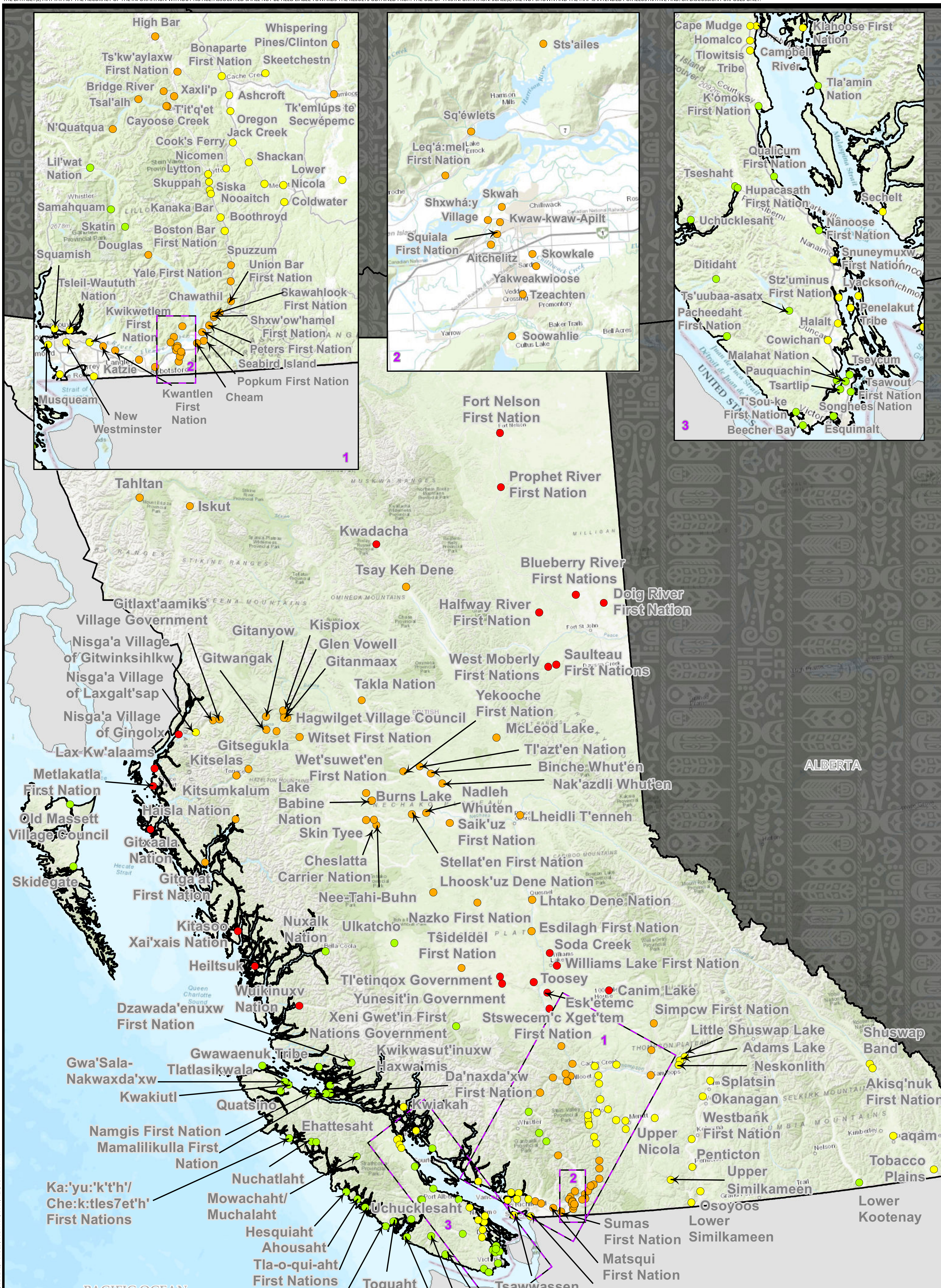


FIGURE 3-8
WILDFIRES
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP4_FREEZING_RAIN\AE20223439_FIG4-1_BC_FR_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00. IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Freezing Rain

Change In Ice Accumulation From Freezing Rain Between 2023 And 2050

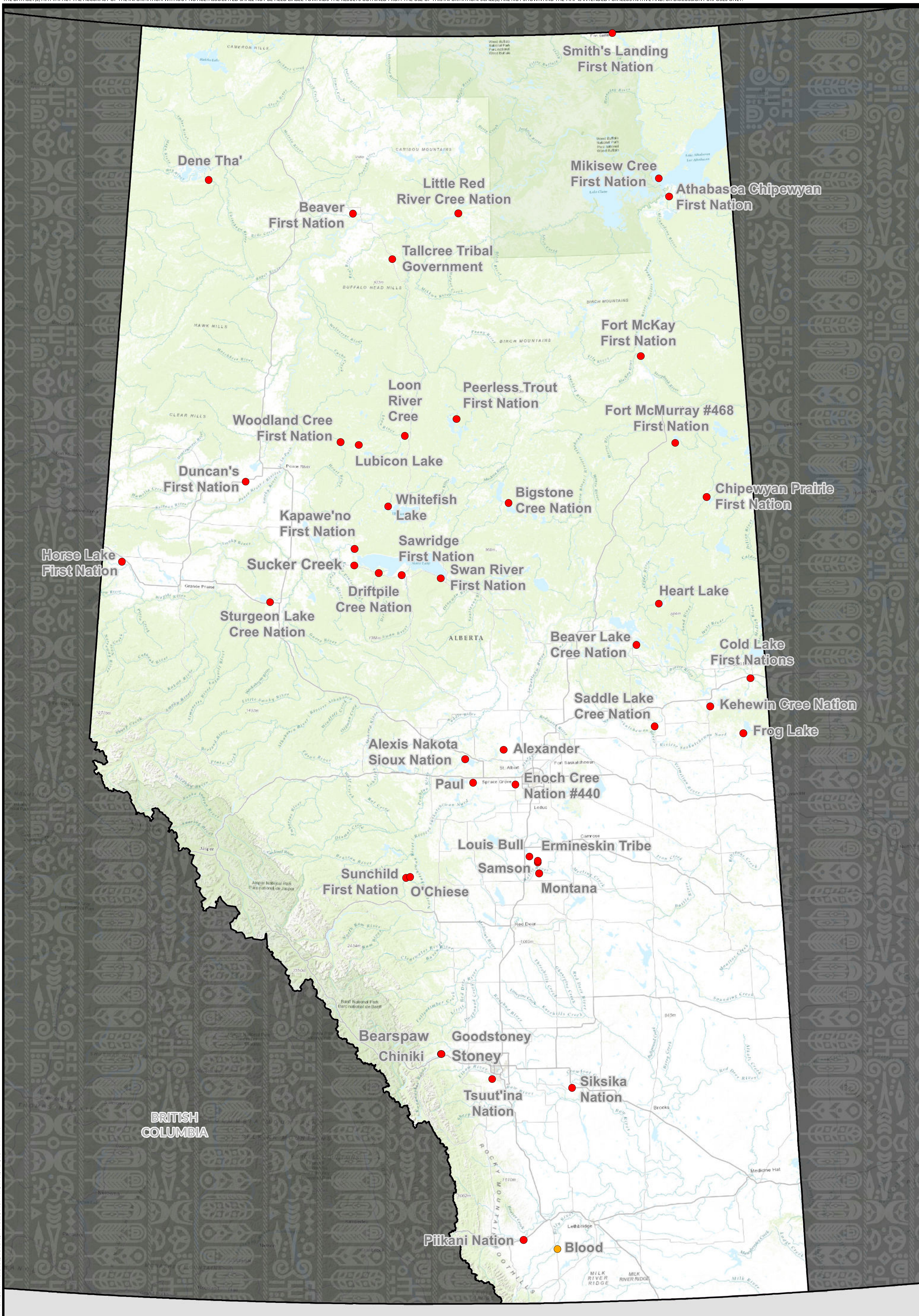
- High (+15% Or More Ice Accumulation)
- Medium (+7.5% To +15% More Ice Accumulation)
- Low (+0% To +7.5% More Ice Accumulation)
- No Increase Or Decreasing (0% Or Less Ice Accumulation)

N

FIGURE 4-1
FREEZING RAIN
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP4_FREEZING_RAIN\AE20223439_FIG4-2_AB_FR_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 4-2
FREEZING RAIN
ALBERTA

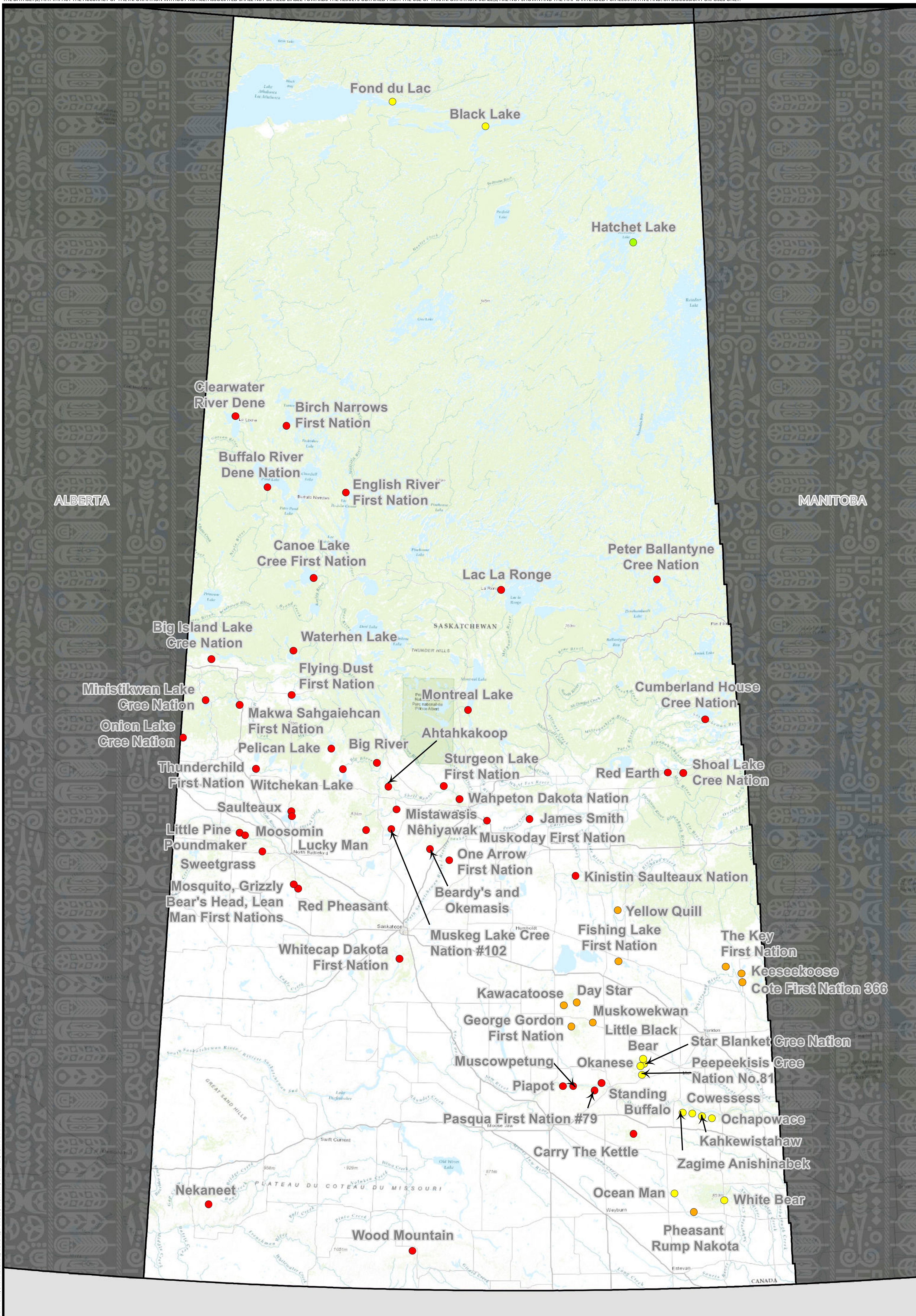
ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Freezing Rain
Change In Ice Accumulation From Freezing Rain Between 2023 And 2050
- High (+15% Or More Ice Accumulation)
- Medium (+7.5% To +15% More Ice Accumulation)

N

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering



Freezing Rain

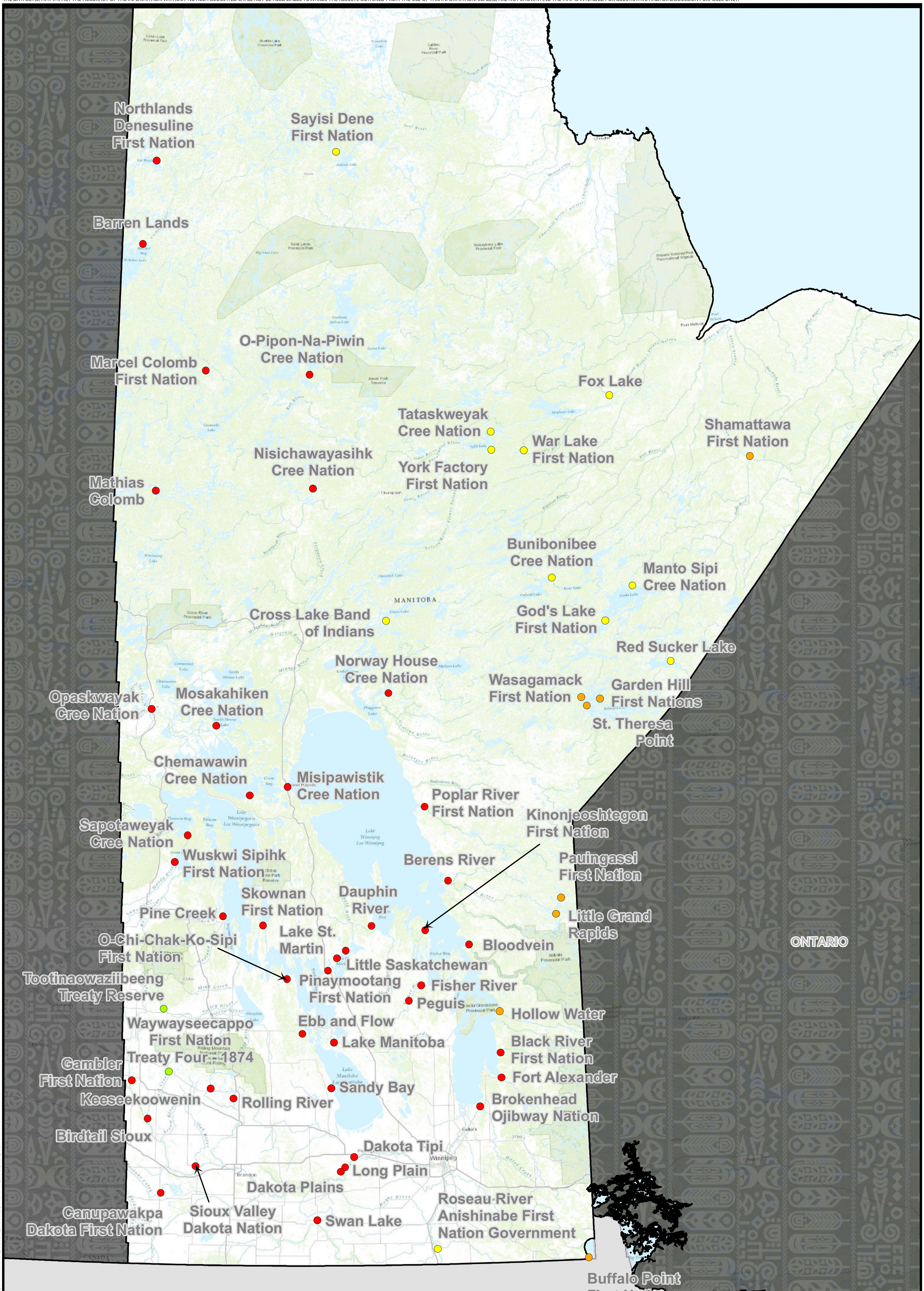
Change In Ice Accumulation From Freezing Rain Between 2023 And 2050

- High (+10% Or More Ice Accumulation)
- Medium (+5% to +10% More Ice Accumulation)
- Low (+0% to +5% More Ice Accumulation)
- No Increase Or Decreasing (0% Or Less Ice Accumulation)

FIGURE 4-3
FREEZING RAIN
SASKATCHEWAN

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



Freezing Rain

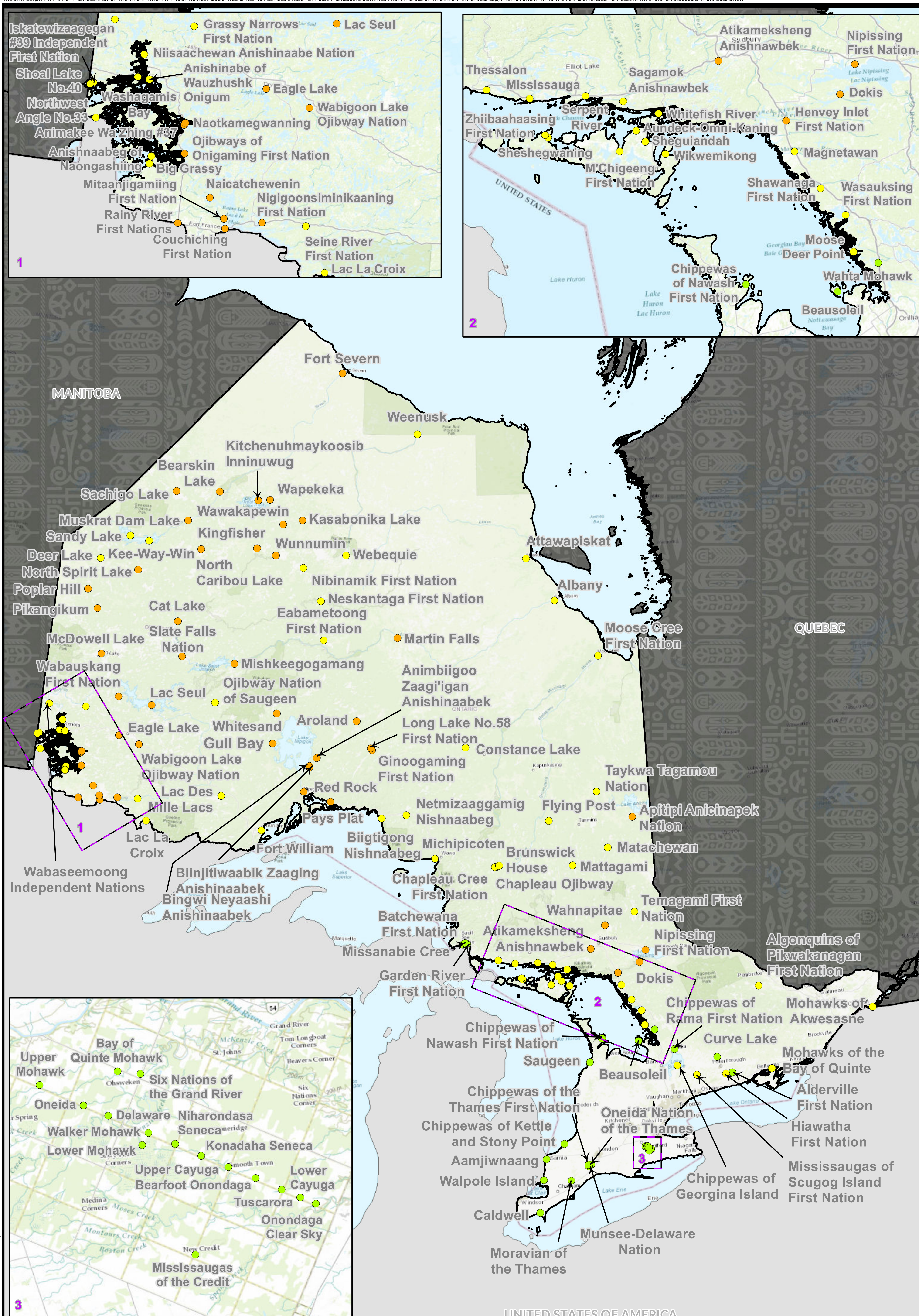
Change In Ice Accumulation From Freezing Rain Between 2023 And 2050

- High (+10% Or More Ice Accumulation)
- Medium (+5% to +10% More Ice Accumulation)
- Low (+0% to +5% More Ice Accumulation)
- No Increase Or Decreasing (0% Or Less Ice Accumulation)

FIGURE 4-4
FREEZING RAIN
MANITOBA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP4_FREEZING_RAIN\AE20223439_FIG4-4_MB_FR_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\4_FREEZING_RAIN\AE20223439_FIG4-5_ON_FR_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 4-5
FREEZING RAIN
ONTARIO

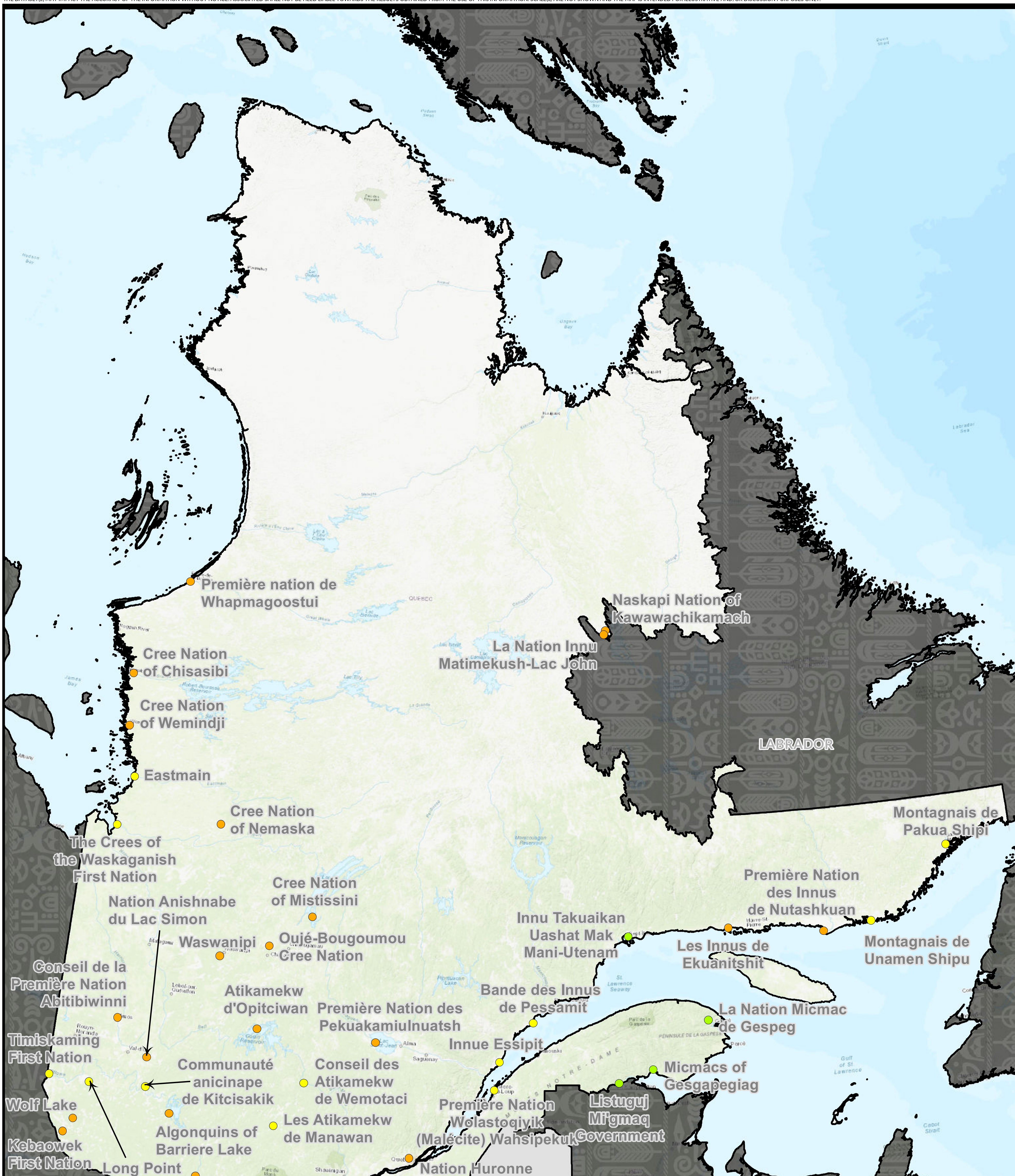
ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Freezing Rain
Change In Ice Accumulation From Freezing Rain Between 2023 And 2050
- Medium (+7.5% To +15% More Ice Accumulation)
- Low (+0% To +7.5% More Ice Accumulation)
- No Increase Or Decreasing (0% Or Less Ice Accumulation)

N

ASSEMBLY OF FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering



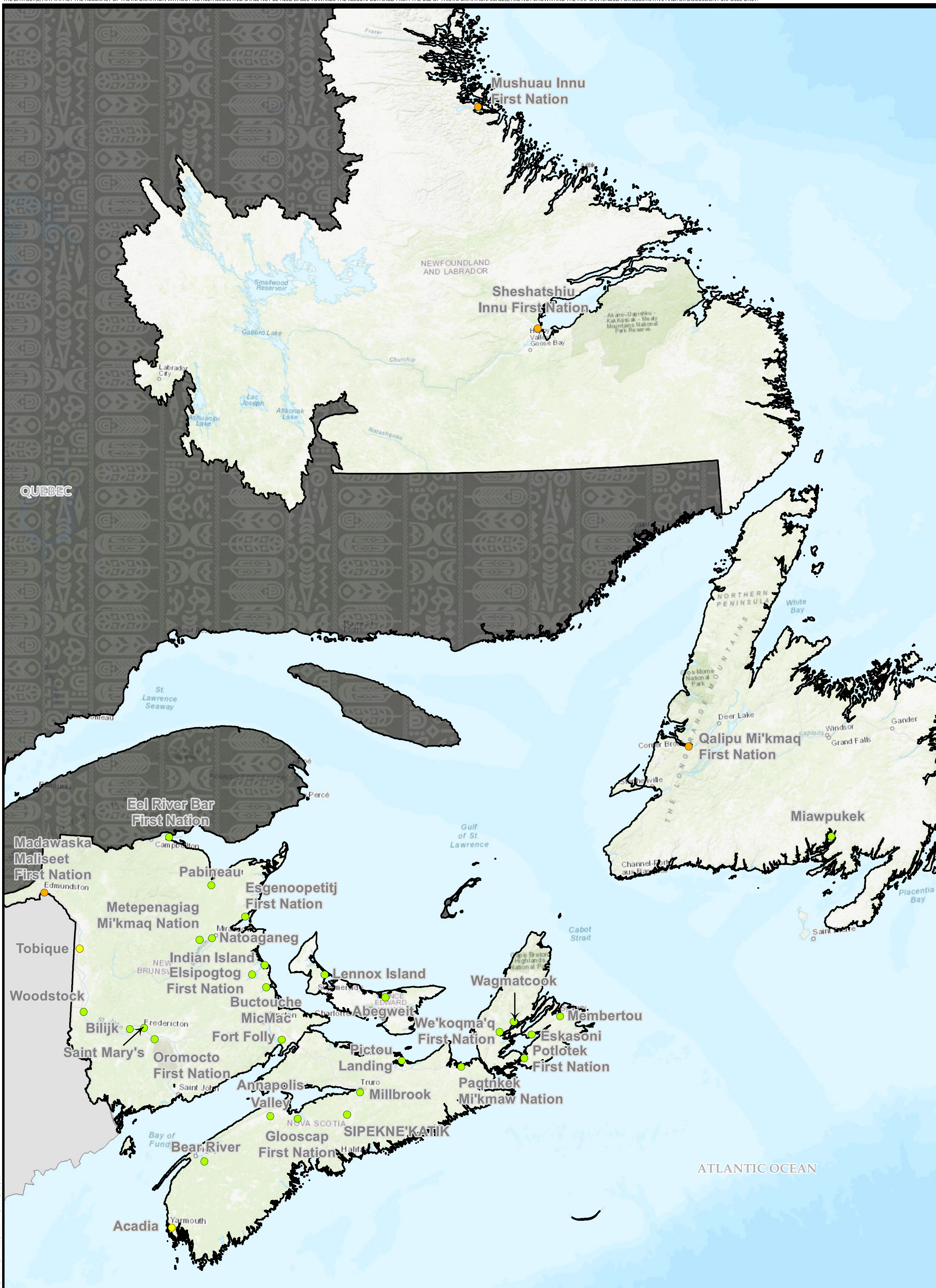
Freezing Rain

Change In Ice Accumulation From Freezing Rain Between 2023 And 2050

- Medium (+7.5% To +15% More Ice Accumulation)
- Low (+0% To +7.5% More Ice Accumulation)
- No Increase Or Decreasing (0% Or Less Ice Accumulation)

FIGURE 4-6
FREEZING RAIN
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\4_FREEZING_RAIN\AE20223439_FIG4-7_ATL_FR_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Freezing Rain

Change In Ice Accumulation From Freezing Rain Between 2023 And 2050

- Medium (+7.5% To +15% More Ice Accumulation)
- Low (+0% To +7.5% More Ice Accumulation)
- No Increase Or Decreasing (0% Or Less Ice Accumulation)

N

FIGURE 4-7
FREEZING RAIN
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\4_FREEZING_RAIN\AE20223439_FIG4-8_NWT_YT_FR_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

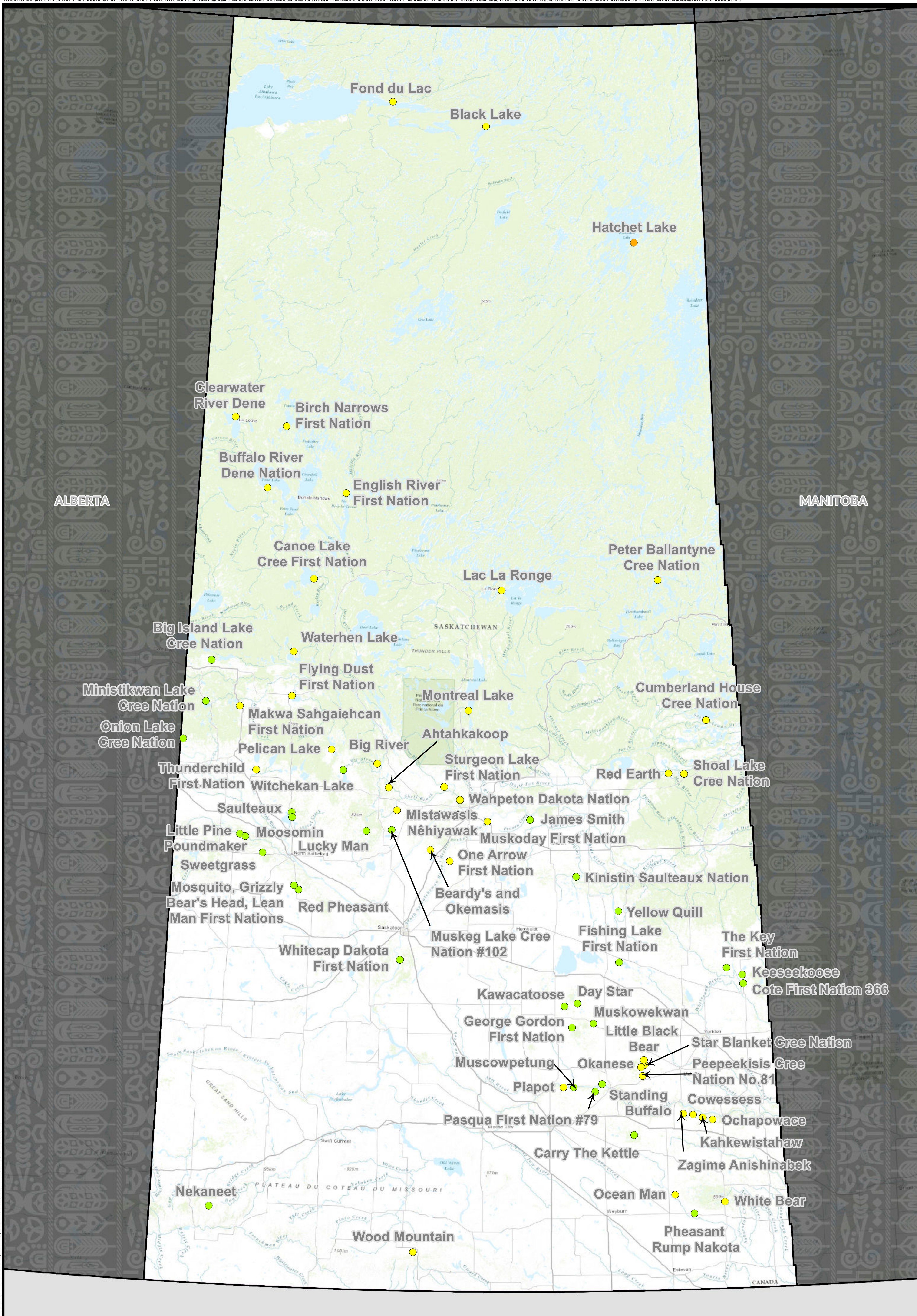
Freezing Rain

Change In Ice Accumulation From Freezing Rain Between 2023 And 2050

- High (+15% Or More Ice Accumulation)
- Medium (+7.5% To +15% More Ice Accumulation)
- Low (+0% To +7.5% More Ice Accumulation)
- No Increase Or Decreasing (0% Or Less Ice Accumulation)

FIGURE 4-8
FREEZING RAIN
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



High Winds

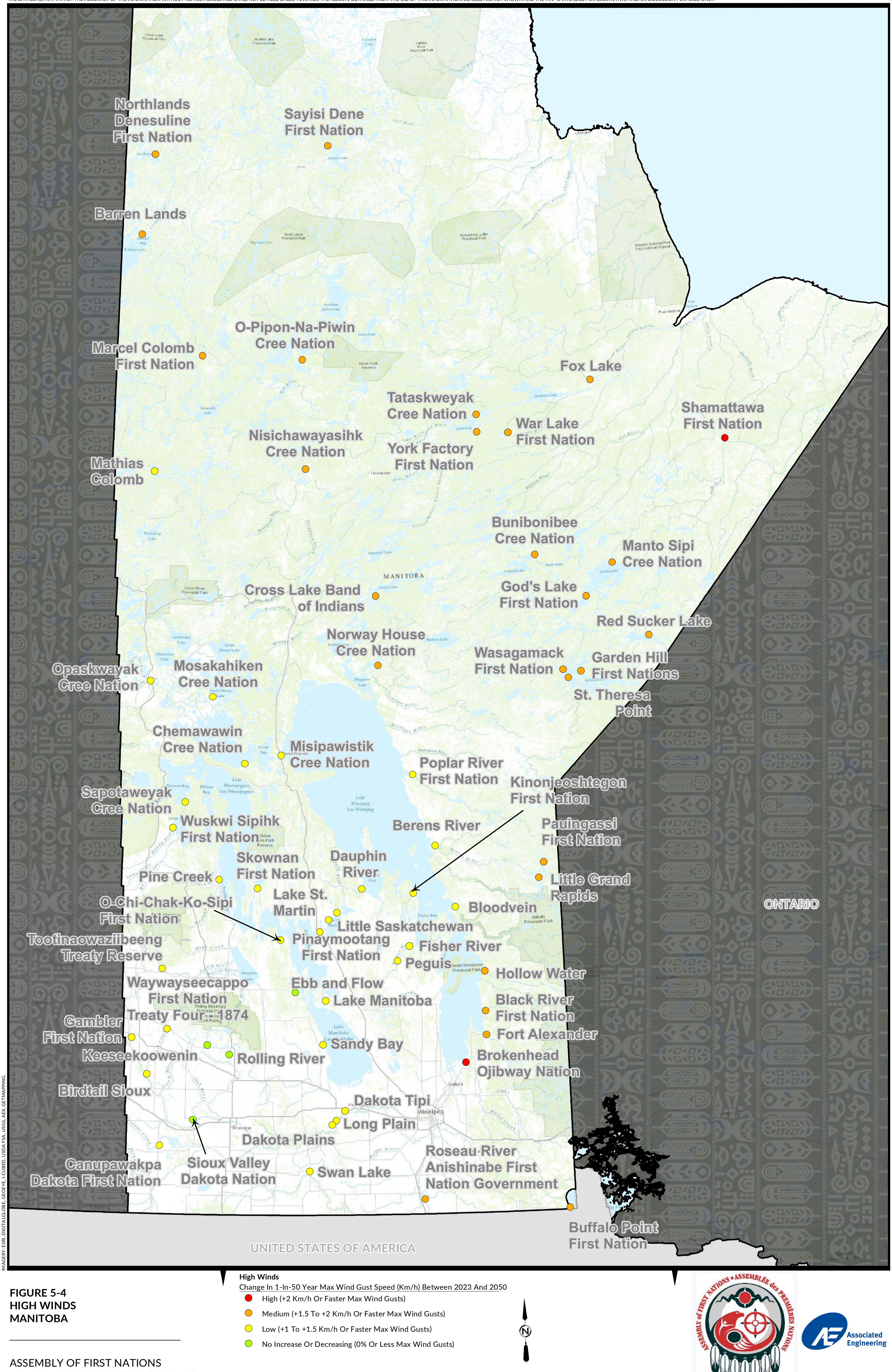
Change In 1-In-50 Year Max Wind Gust Speed (Km/h) Between 2023 And 2050

- Medium (+1.5 To +2 Km/h Or Faster Max Wind Gusts)
- Low (+1 To +1.5 Km/h Or Faster Max Wind Gusts)
- No Increase Or Decreasing (0% Or Less Max Wind Gusts)

FIGURE 5-3
HIGH WINDS
SASKATCHEWAN

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

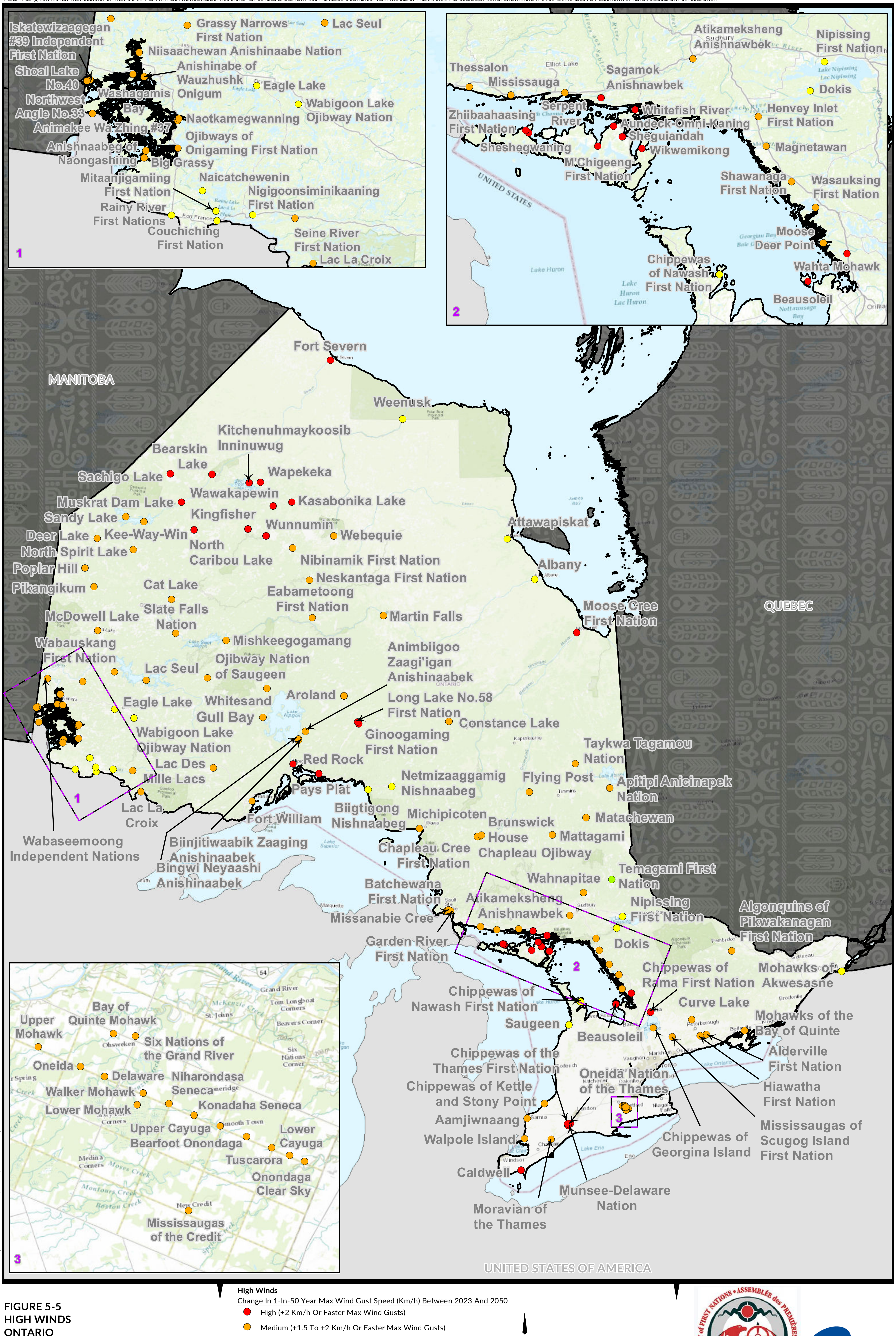
C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-3_SK_HW_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-4_MB_HW_230314.MXD DRAWN BY: WL CHECKED BY: CM/AI REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 5-4
HIGH WINDS
MANITOBA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-5_ON_HW_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

High Winds
Change In 1-In-50 Year Max Wind Gust Speed (Km/h) Between 2023 And 2050
- High (+2 Km/h Or Faster Max Wind Gusts)
- Medium (+1.5 To +2 Km/h Or Faster Max Wind Gusts)
- Low (+1 To +1.5 Km/h Or Faster Max Wind Gusts)
- No Increase Or Decreasing (0% Or Less Max Wind Gusts)

FIGURE 5-5
HIGH WINDS
ONTARIO

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

High Winds
Change In 1-In-50 Year Max Wind Gust Speed (Km/h) Between 2023 And 2050
- High (+2 Km/h Or Faster Max Wind Gusts)
- Medium (+1.5 To +2 Km/h Or Faster Max Wind Gusts)
- Low (+1 To +1.5 Km/h Or Faster Max Wind Gusts)

N

FIGURE 5-6
HIGH WINDS
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-6_QC_HW_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering

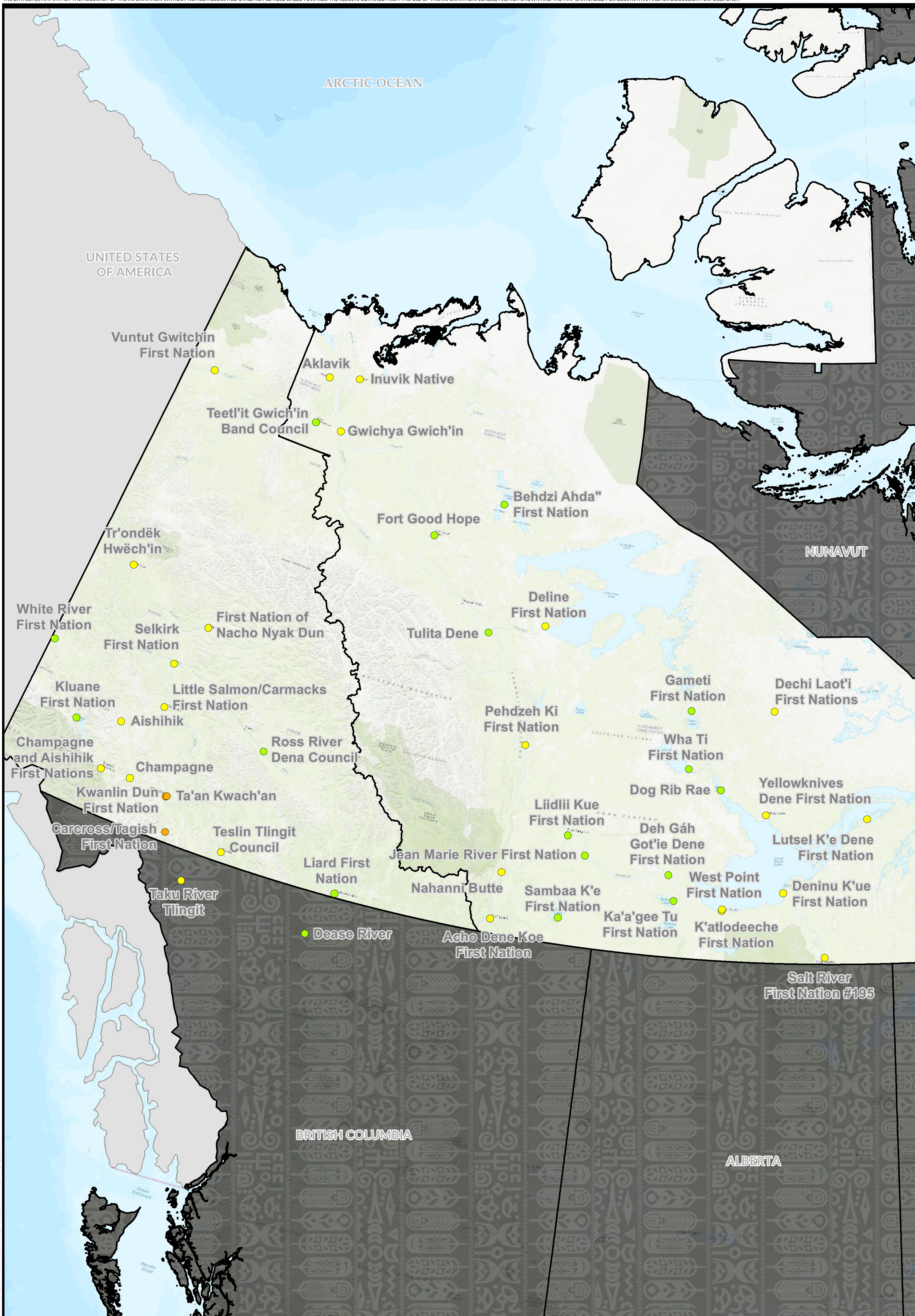
C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-7_ATL_HW_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AJ. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

High Winds
Change In 1-In-50 Year Max Wind Gust Speed (Km/h) Between 2023 And 2050
- High (+2 Km/h Or Faster Max Wind Gusts)
- Medium (+1.5 To +2 Km/h Or Faster Max Wind Gusts)
- Low (+1 To +1.5 Km/h Or Faster Max Wind Gusts)
- No Increase Or Decreasing (0% Or Less Max Wind Gusts)

FIGURE 5-7
HIGH WINDS
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



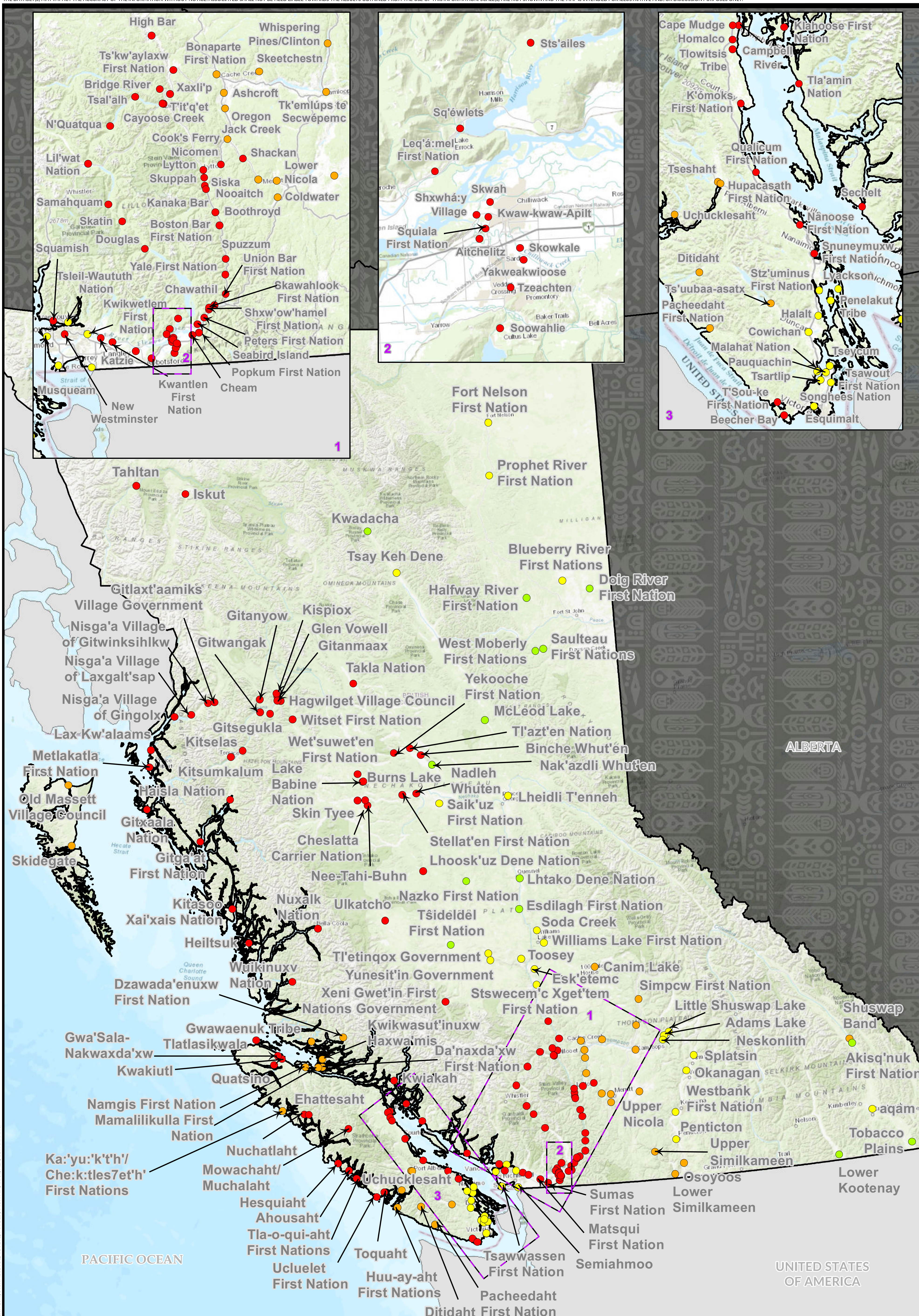
C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-8_NWT_YT_HW_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AI REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

High Winds
Change In 1-In-50 Year Max Wind Gust Speed (Km/h) Between 2023 And 2050
- Medium (+1.5 To +2 Km/h Or Faster Max Wind Gusts)
- Low (+1 To +1.5 Km/h Or Faster Max Wind Gusts)
- No Increase Or Decreasing (0% Or Less Max Wind Gusts)

FIGURE 5-8
HIGH WINDS
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-1_BC_HW_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AJ. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

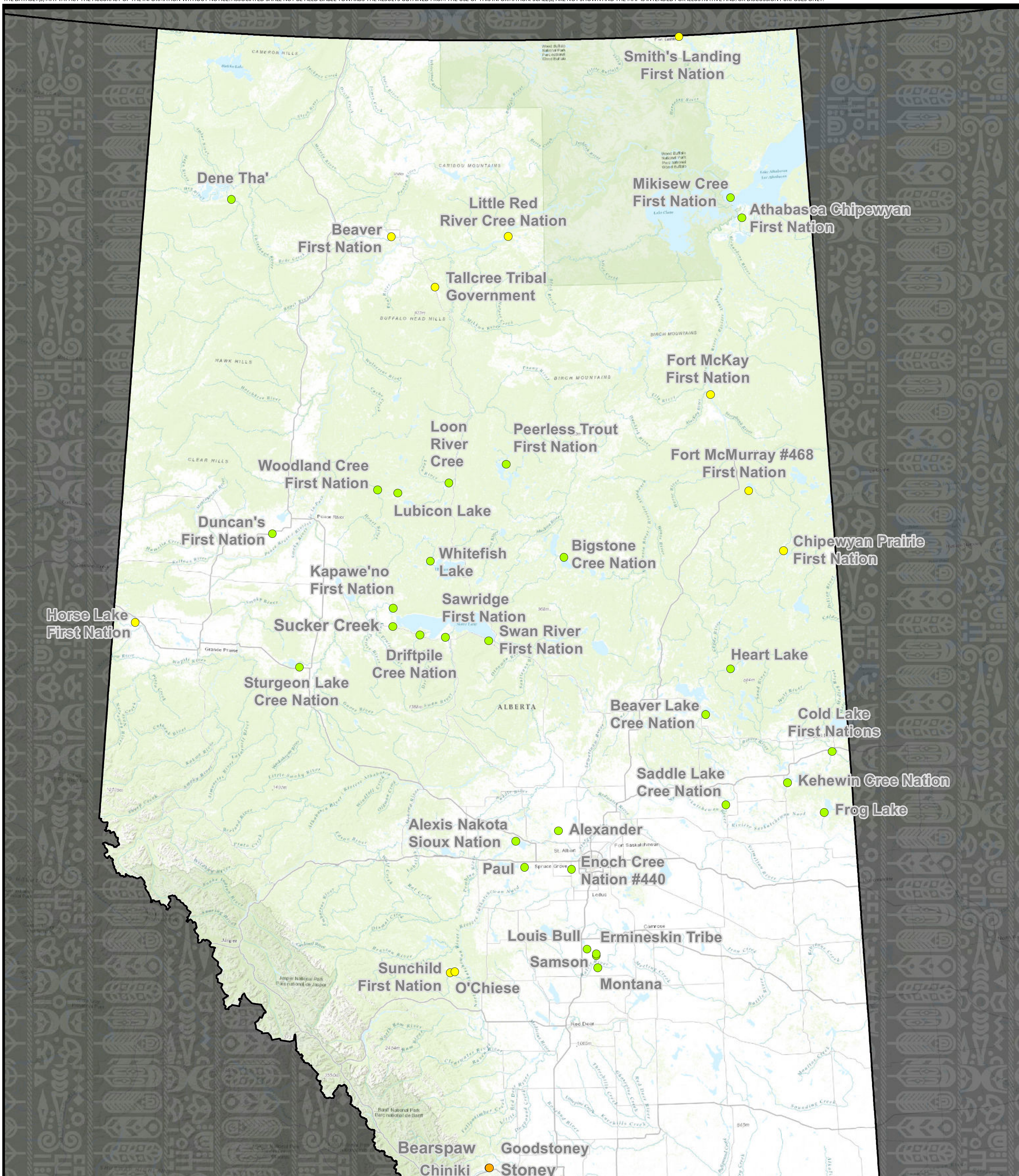
High Winds
Change In 1-In-50 Year Max Wind Gust Speed (Km/h) Between 2023 And 2050
- High (+2 Km/h Or Faster Max Wind Gusts)
- Medium (+1.5 To +2 Km/h Or Faster Max Wind Gusts)
- Low (+1 To +1.5 Km/h Or Faster Max Wind Gusts)
- No Increase Or Decreasing (0% Or Less Max Wind Gusts)

N

FIGURE 5-1
HIGH WINDS
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Associated Engineering



High Winds

Change In 1-In-50 Year Max Wind Gust Speed (Km/h) Between 2023 And 2050

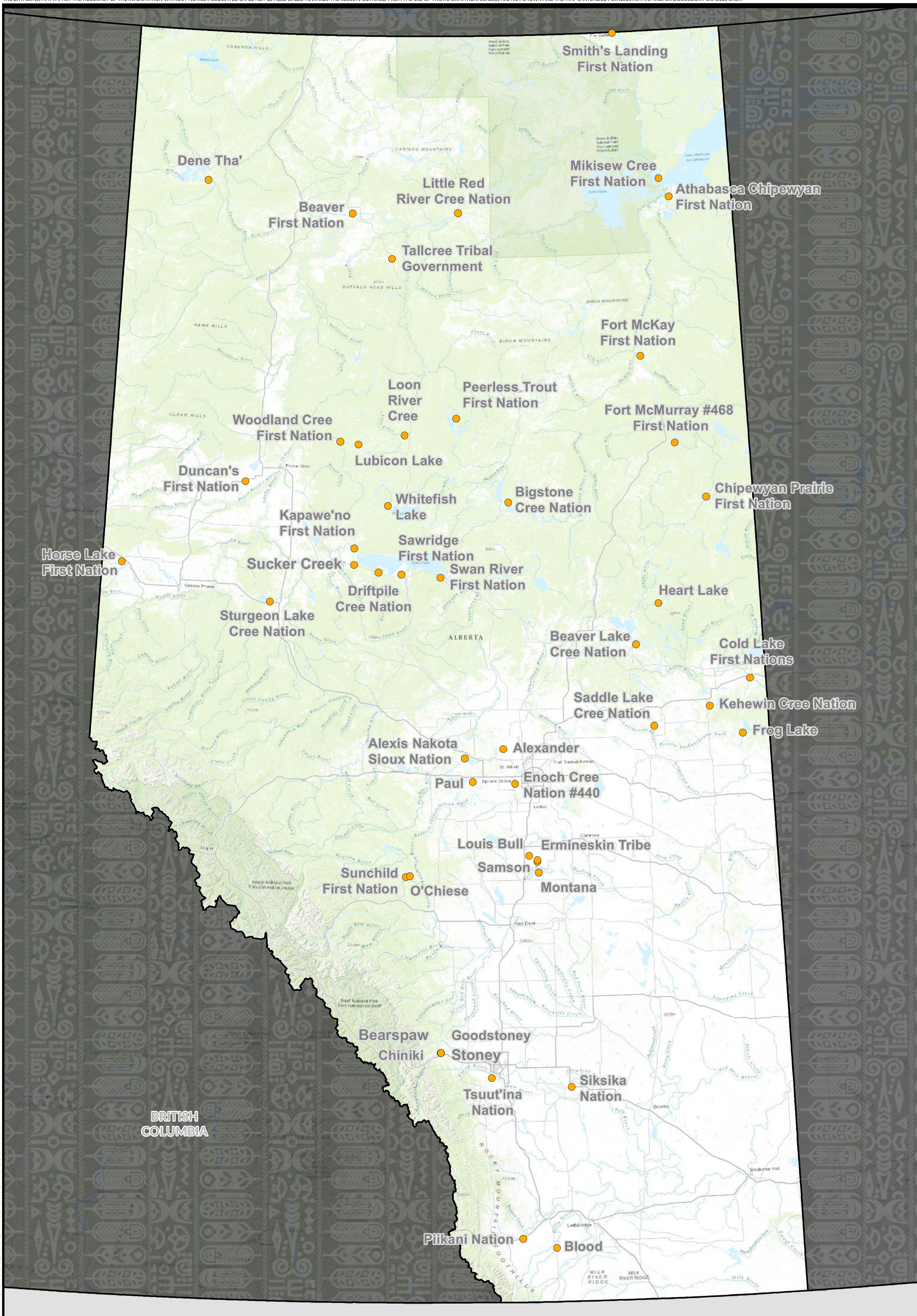
- Medium (+1.5 To +2 Km/h Or Faster Max Wind Gusts)
- Low (+1 To +1.5 Km/h Or Faster Max Wind Gusts)
- No Increase Or Decreasing (0% Or Less Max Wind Gusts)

N

FIGURE 5-2
HIGH WINDS
ALBERTA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\5_HIGH_WIND\AE20223439_FIG5-2_AB_HW_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.



Localized Flooding

Change In 10 Minute 1-In-20 Year Rainfall Event Between 2023 And 2050

- Medium (+7.5% To +10% Increase In Rainfall)

FIGURE 6-2
LOCALIZED FLOODING
ALBERTA

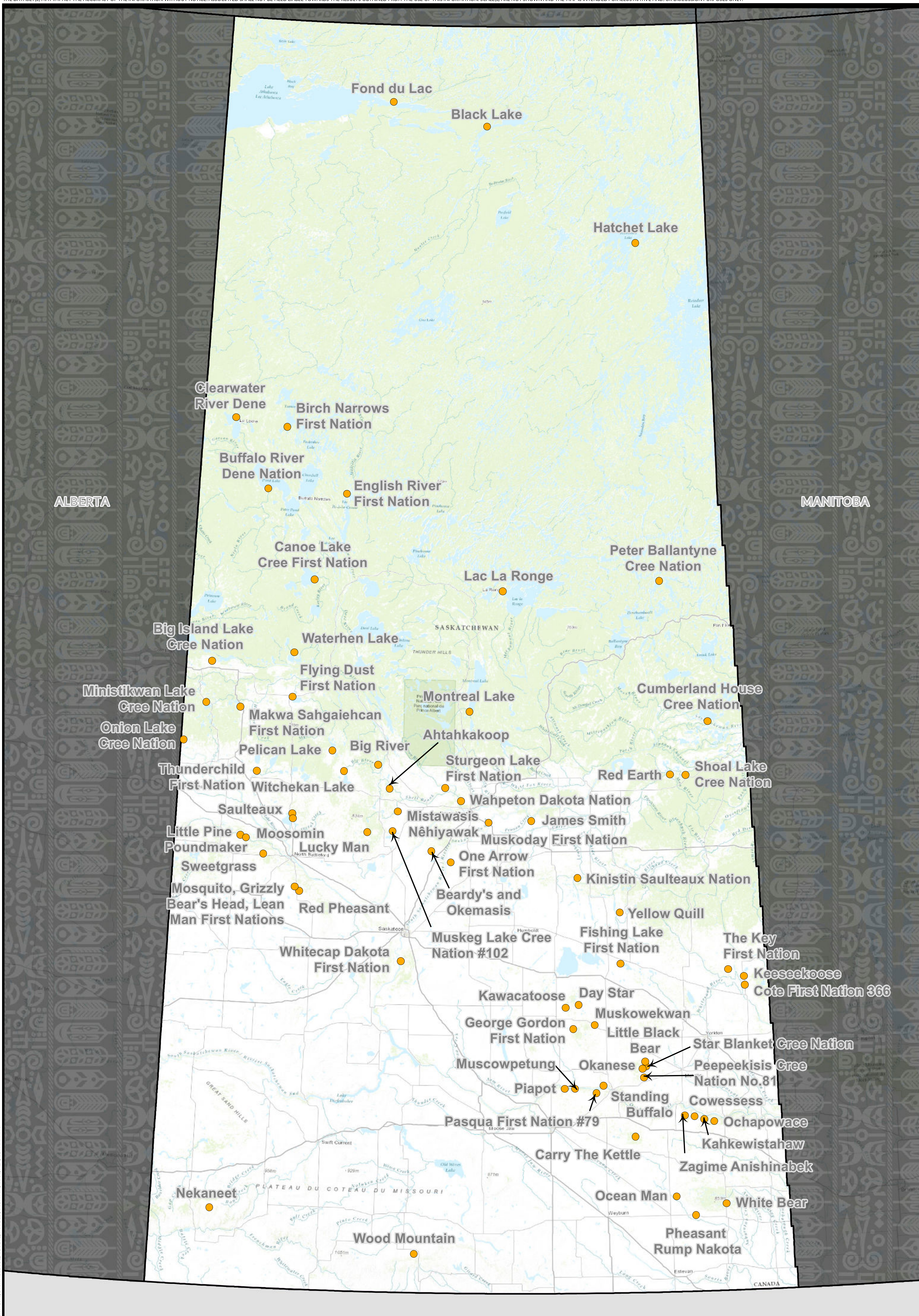
ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ASSEMBLY of FIRST NATIONS • ASSEMBLÉE des PREMIÈRES NATIONS

Associated Engineering

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\6_LOCALIZED_FLOOD\AE20223439_FIG6-2_AB_LF_230314.MXD, DRAWN BY: WL CHECKED BY: CM/AI REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.

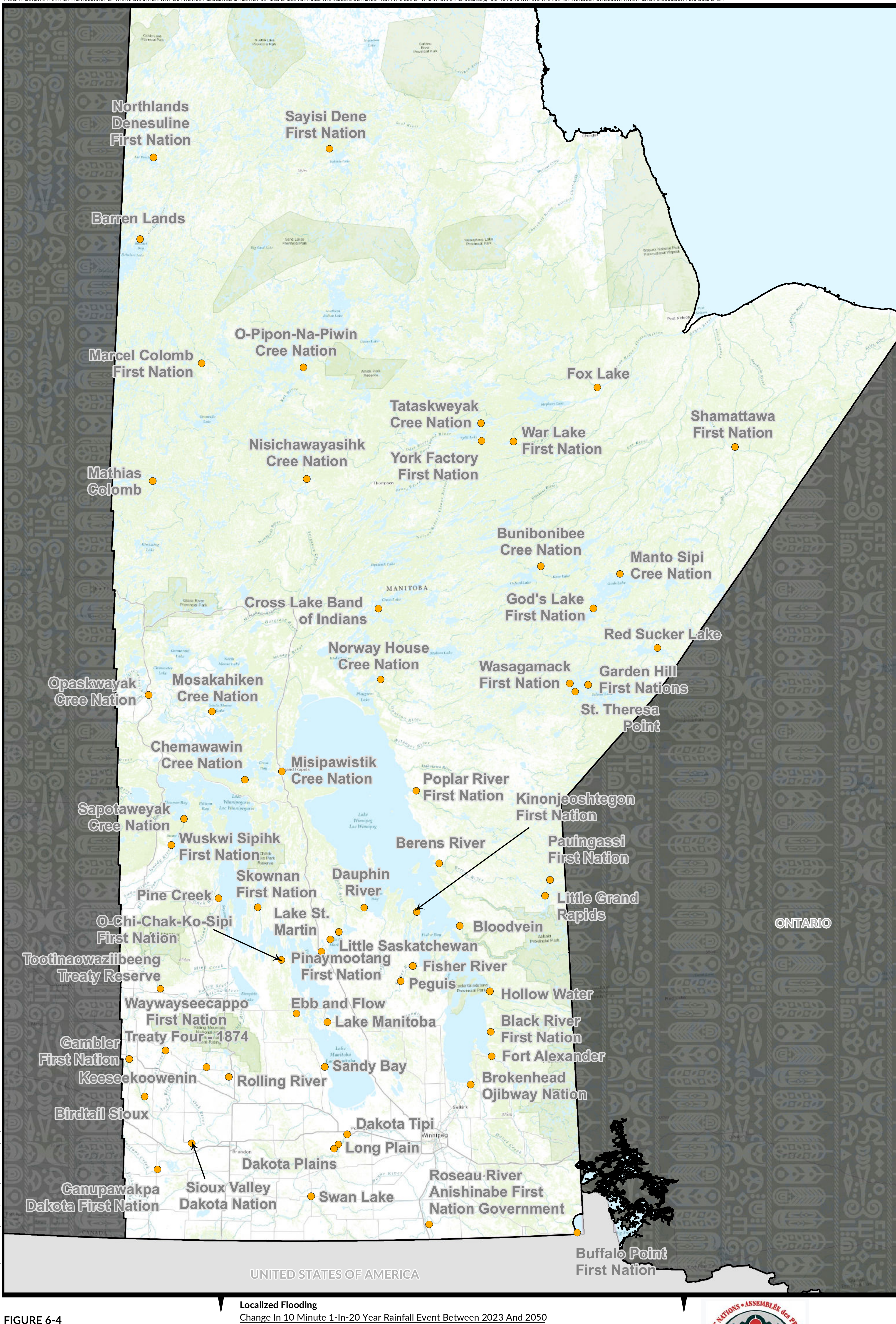


C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\6_LOCALIZED_FLOOD\AE20223439_FIG6-3_SK_LF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 6-3
LOCALIZED FLOODING
SASKATCHEWAN

Localized Flooding
Change In 10 Minute 1-In-20 Year Rainfall Event Between 2023 And 2050
Medium (+7.5% To +10% Increase In Rainfall)

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP6_LOCALIZED_FLOOD\AE20223439_FIG6-4_MB_LF_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 6-4
LOCALIZED FLOODING
MANITOBA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\6_LOCALIZED_FLOOD\AE20223439_FIG6-5_ON_LF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Localized Flooding

Change In 10 Minute 1-In-20 Year Rainfall Event Between 2023 And 2050

- High (+10% Or Greater Increase In Rainfall)
- Medium (+7.5% To +10% Increase In Rainfall)

FIGURE 6-5
LOCALIZED FLOODING
ONTARIO

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\6_LOCALIZED_FLOOD\AE20223439_FIG6-6_QC_LF_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AI. REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Localized Flooding

Change In 10 Minute 1-In-20 Year Rainfall Event Between 2023 And 2050

- High (+10% Or Greater Increase In Rainfall)
- Medium (+7.5% To +10% Increase In Rainfall)

FIGURE 6-6
LOCALIZED FLOODING
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

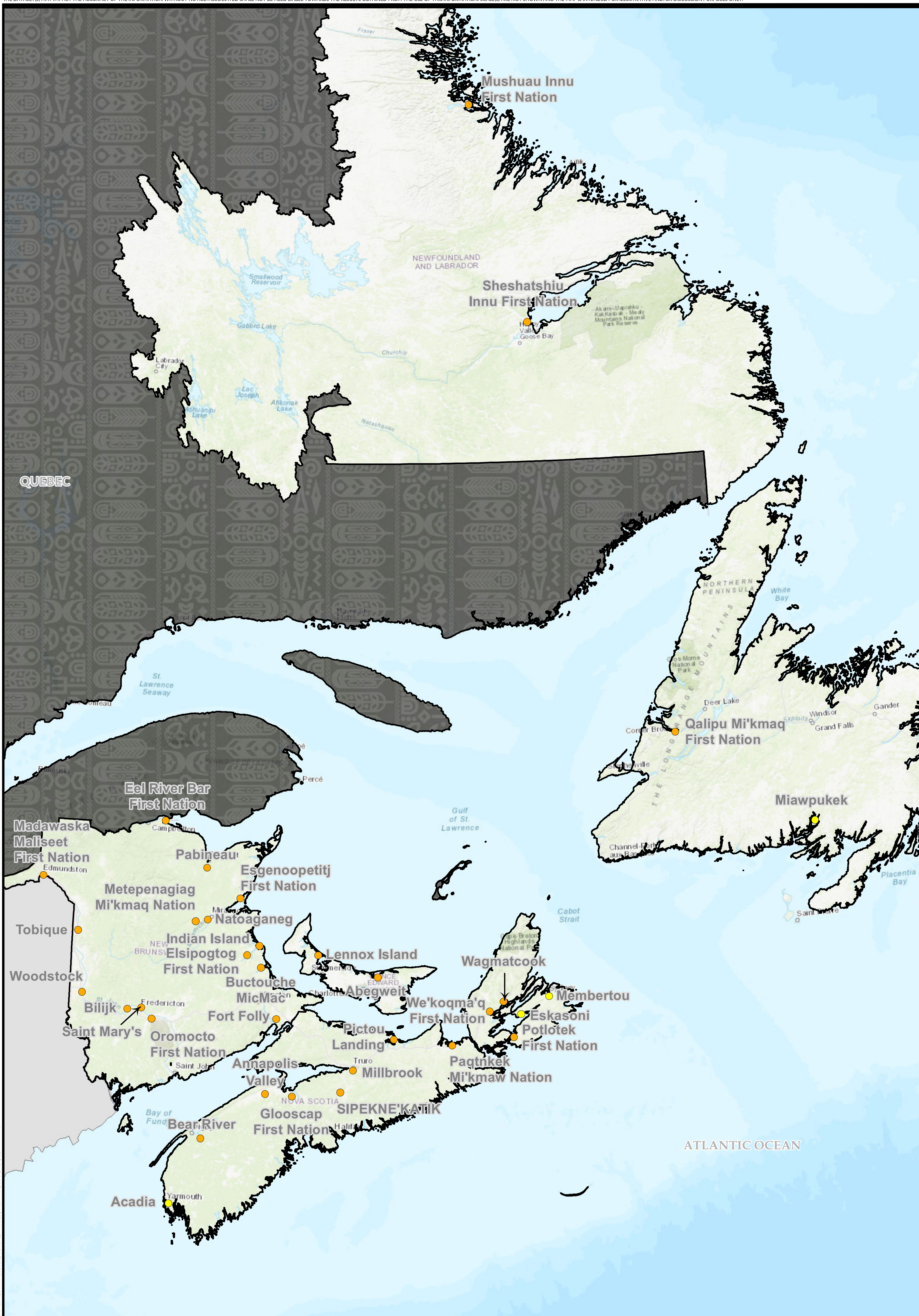


FIGURE 6-7
LOCALIZED FLOODING
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Localized Flooding
Change In 10 Minute 1-In-20 Year Rainfall Event Between 2023 And 2050
- Medium (+7.5% To +10% Increase In Rainfall)
- Low (+5% Increase In Rainfall)

Associated Engineering

C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\6_LOCALIZED_FLOOD\AE20223439_FIG6-7_ATL_LF_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AJ REV 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

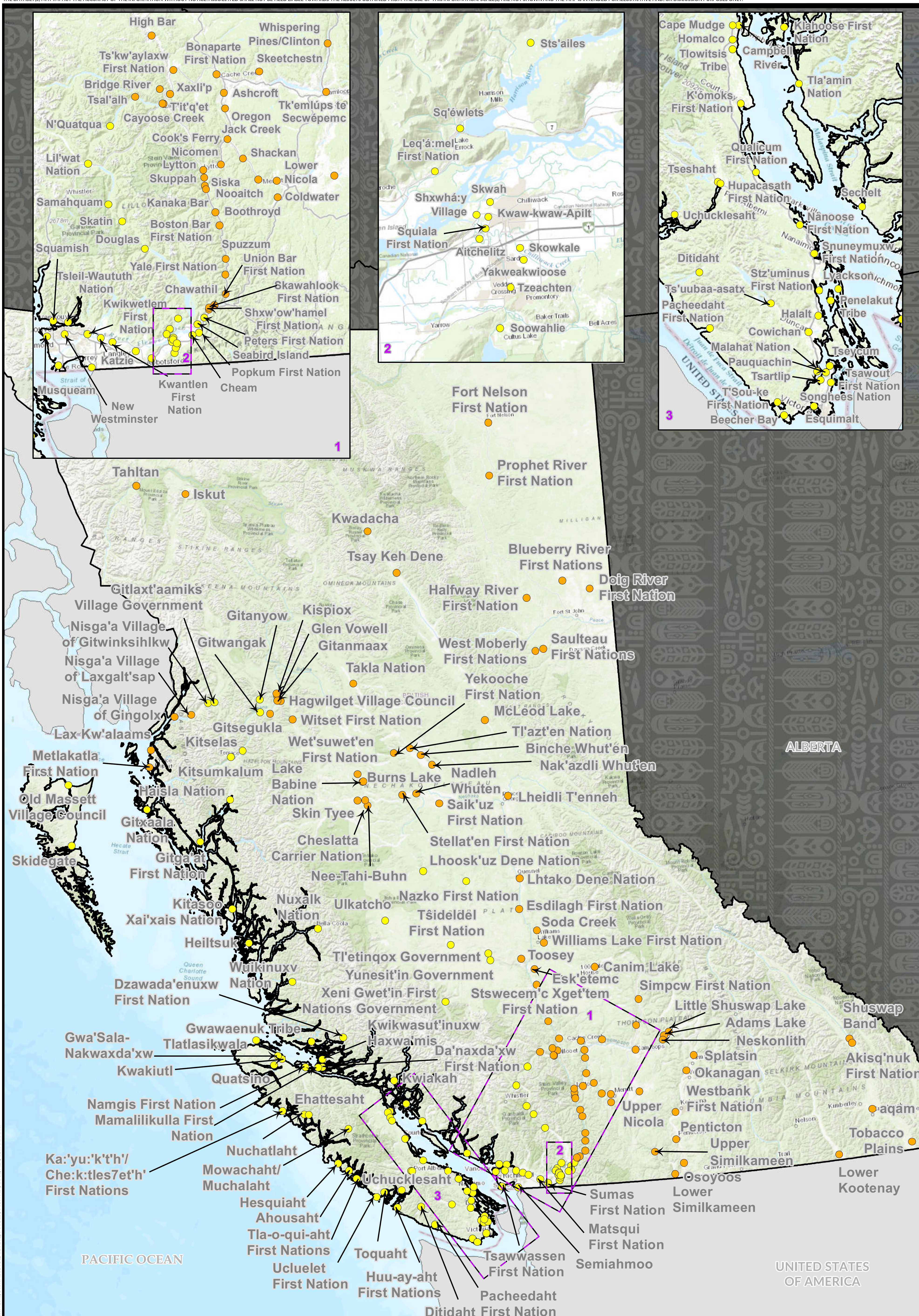
Localized Flooding

Change In 10 Minute 1-In-20 Year Rainfall Event Between 2023 And 2050

- High (+10% Or Greater Increase In Rainfall)
- Medium (+7.5% To +10% Increase In Rainfall)

FIGURE 6-8
LOCALIZED FLOODING
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\6_LOCALIZED_FLOOD\AE20223439_FIG6-1_BC_LF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Localized Flooding

Change In 10 Minute 1-In-20 Year Rainfall Event Between 2023 And 2050

- Medium (+7.5% To +10% Increase In Rainfall)
- Low (+5% Increase In Rainfall)

FIGURE 6-1
LOCALIZED FLOODING
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

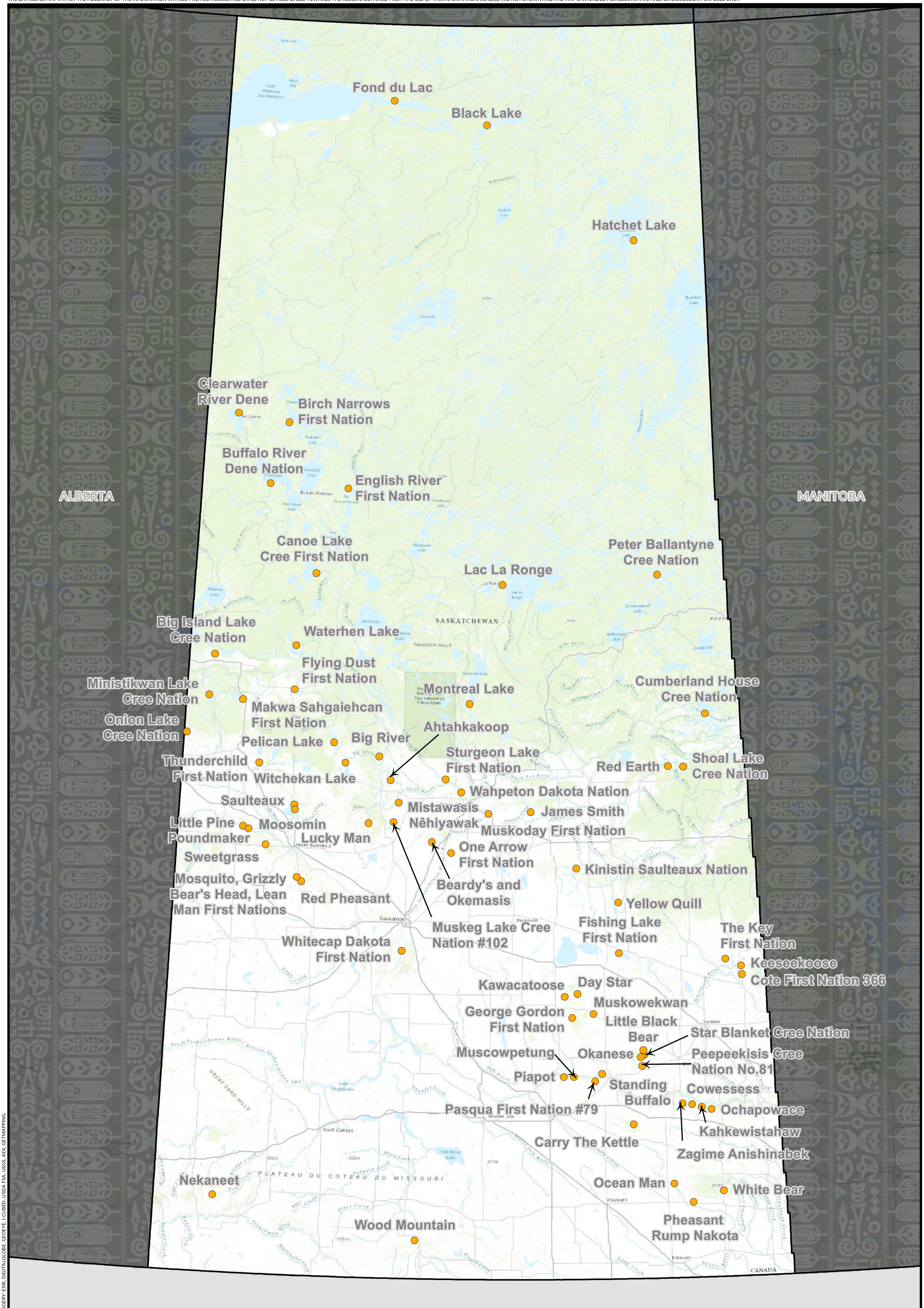


FIGURE 7-3
RIVER/CREEK/LAKE FLOODING
SASKATCHEWAN

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

River/Creek/Lake Flooding
Change In 1 Hour 1-In-100 Year Rainfall Event Between 2023 And 2050
● Medium (+7.5% To +10% Increase In Rainfall)

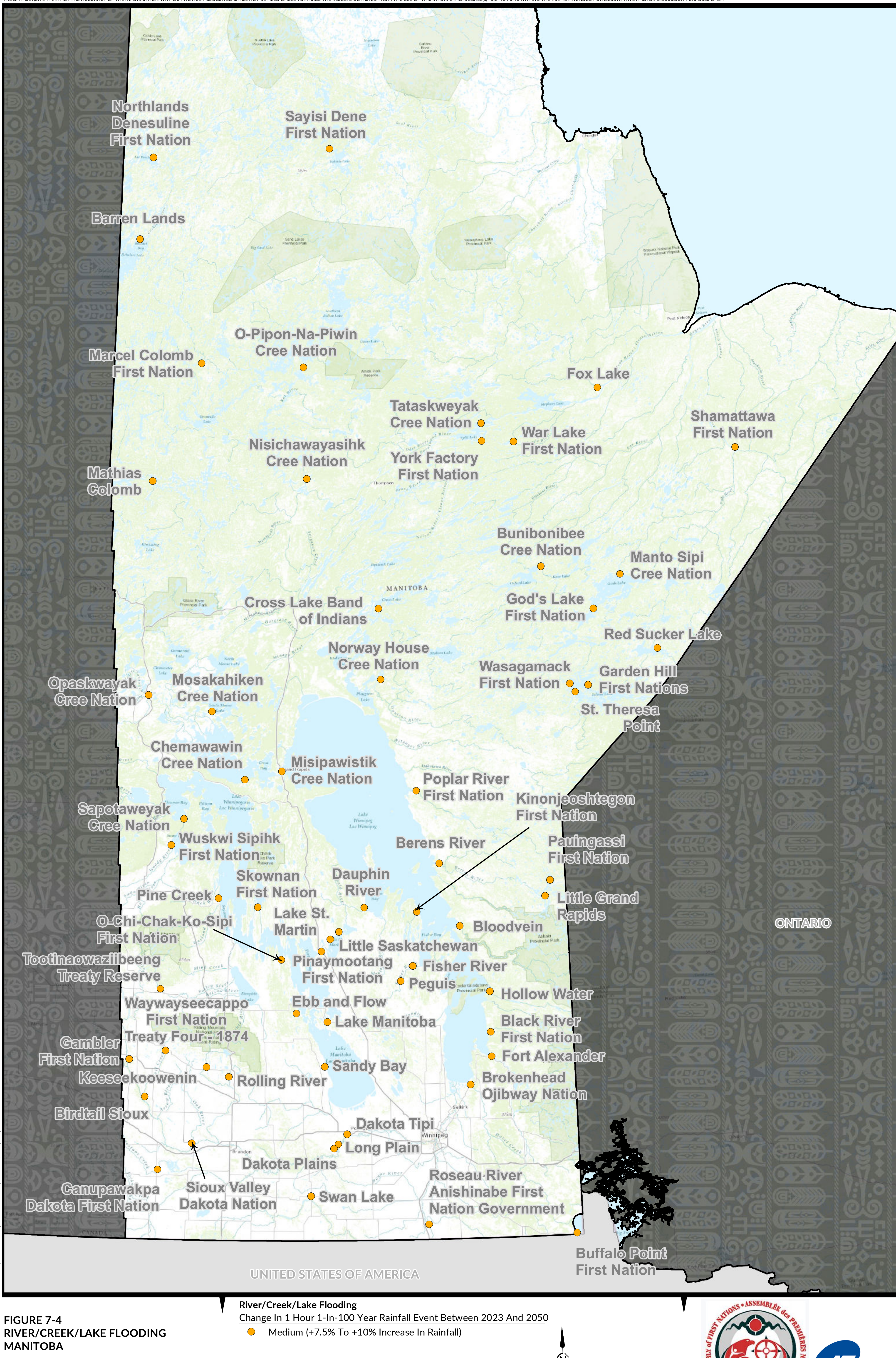
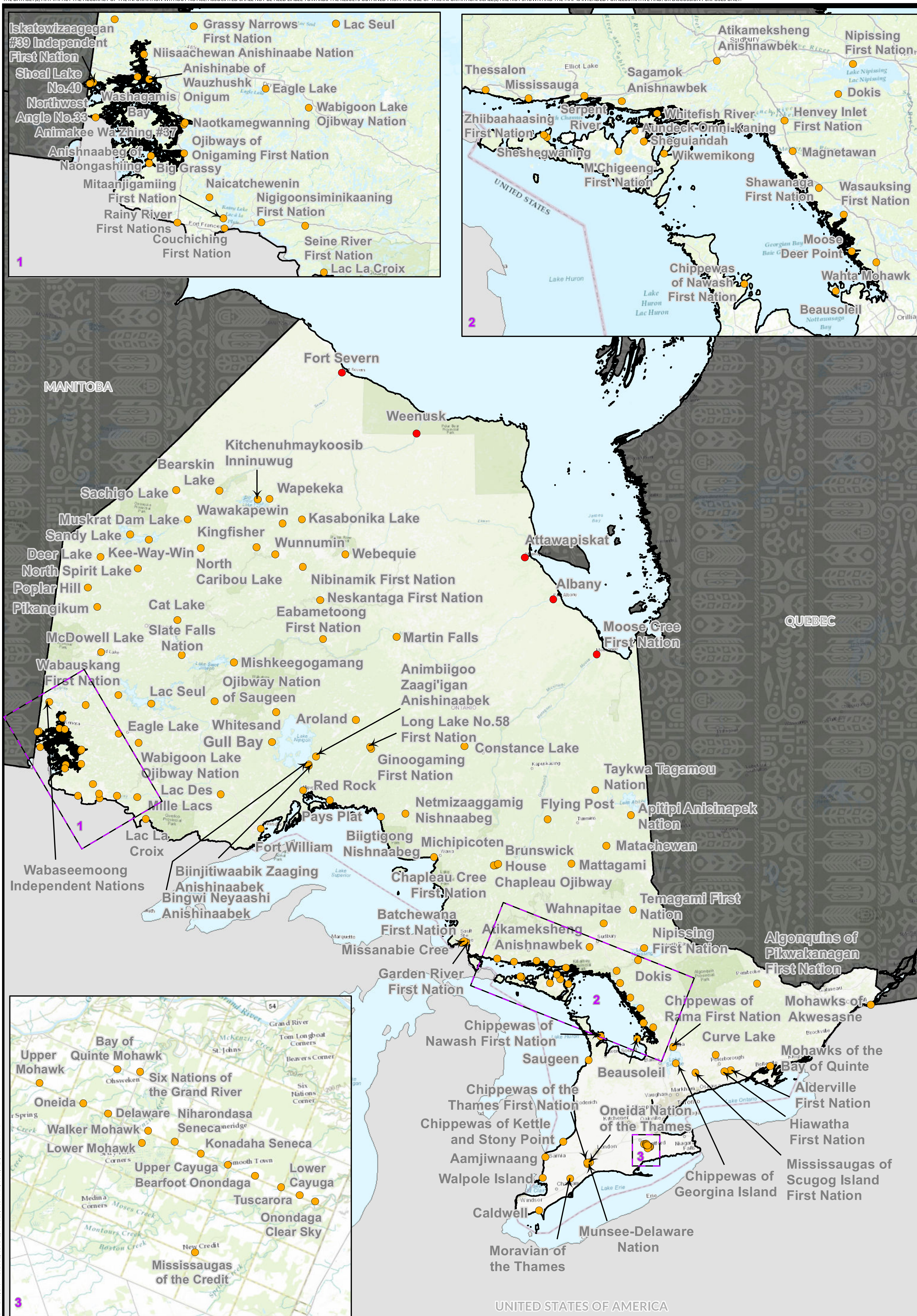


FIGURE 7-4
RIVER/CREEK/LAKE FLOODING
MANITOBA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



River/Creek/Lake Flooding
Change In 1 Hour 1-In-100 Year Rainfall Event Between 2023 And 2050
- High (+10% Or Greater Increase In Rainfall)
- Medium (+7.5% To +10% Increase In Rainfall)

FIGURE 7-5
RIVER/CREEK/LAKE FLOODING
ONTARIO

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\7_RIVER_CREEK_LAKE_FLOOD\AE20223439_FIG7-6_QC_RCLF_230314.MXD. DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 7-6
RIVER/CREEK/LAKE FLOODING
QUEBEC

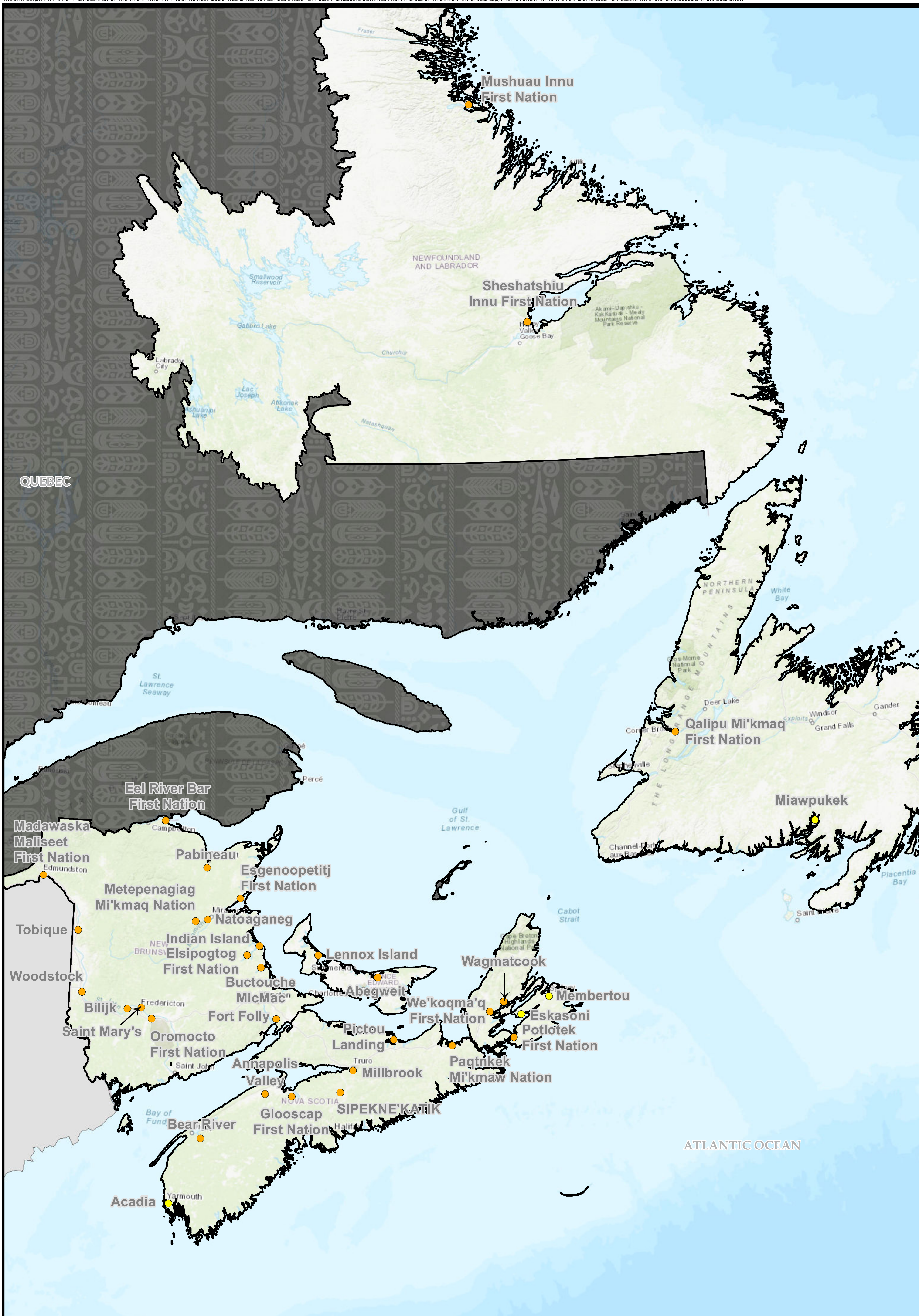
ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

River/Creek/Lake Flooding
Change In 1 Hour 1-In-100 Year Rainfall Event Between 2023 And 2050
- High (+10% Or Greater Increase In Rainfall)
- Medium (+7.5% To +10% Increase In Rainfall)

N

Associated Engineering

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\7_RIVER_CREEK_LAKE_FLOOD\AE20223439_FIG7-7_ATL_RCLF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

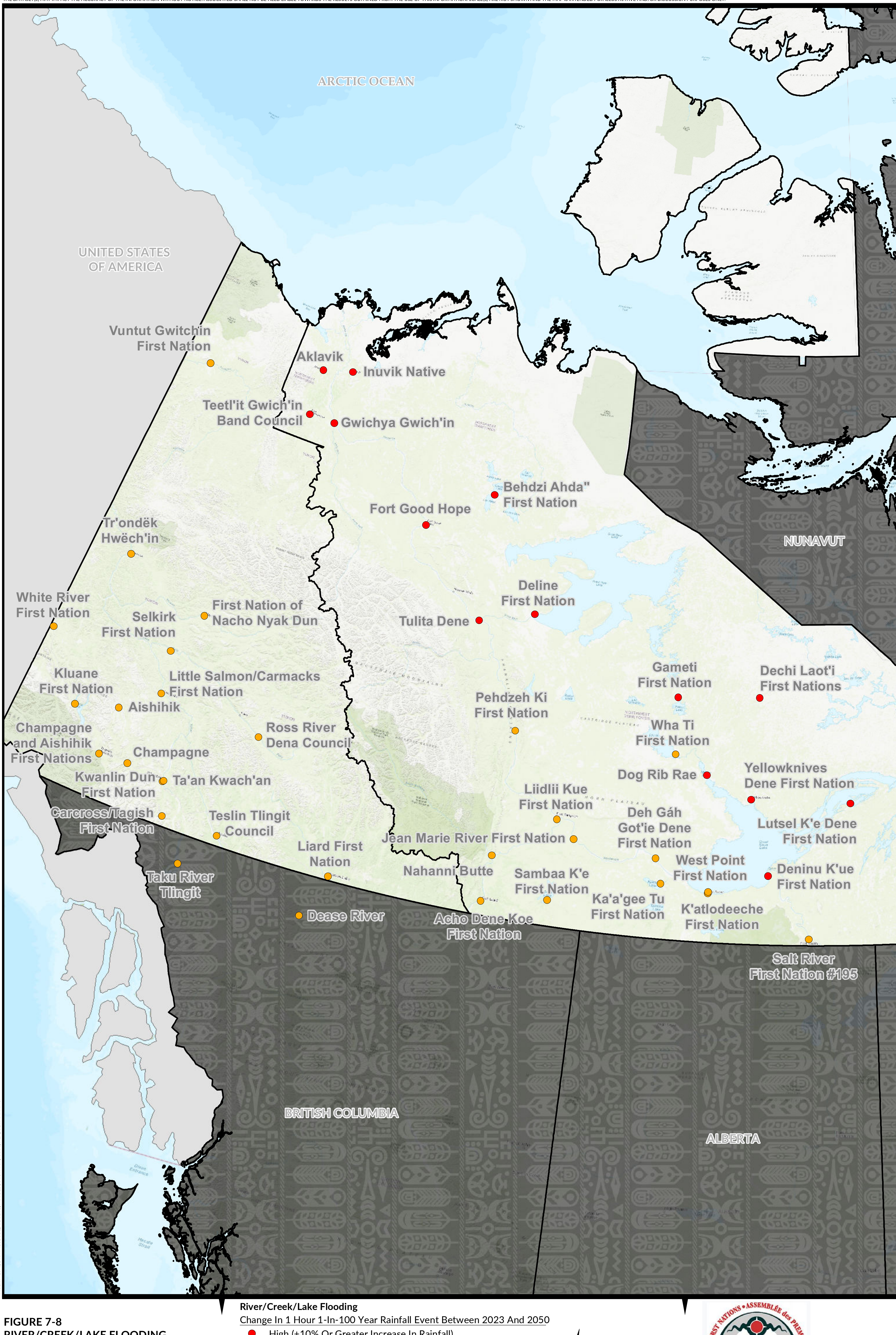
FIGURE 7-7
RIVER/CREEK/LAKE FLOODING
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

River/Creek/Lake Flooding
Change In 1 Hour 1-In-100 Year Rainfall Event Between 2023 And 2050
- Medium (+7.5% To +10% Increase In Rainfall)
- Low (+5% Increase In Rainfall)

N

Associated Engineering



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\7_RIVER_CREEK_LAKE_FLOOD\AE20223439_FIG7-8_NWT_YT_RCLF_230314.MXD. DRAWN BY: WL. CHECKED BY: CM/AL REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

FIGURE 7-8
RIVER/CREEK/LAKE FLOODING
NORTHWEST TERRITORIES AND YUKON

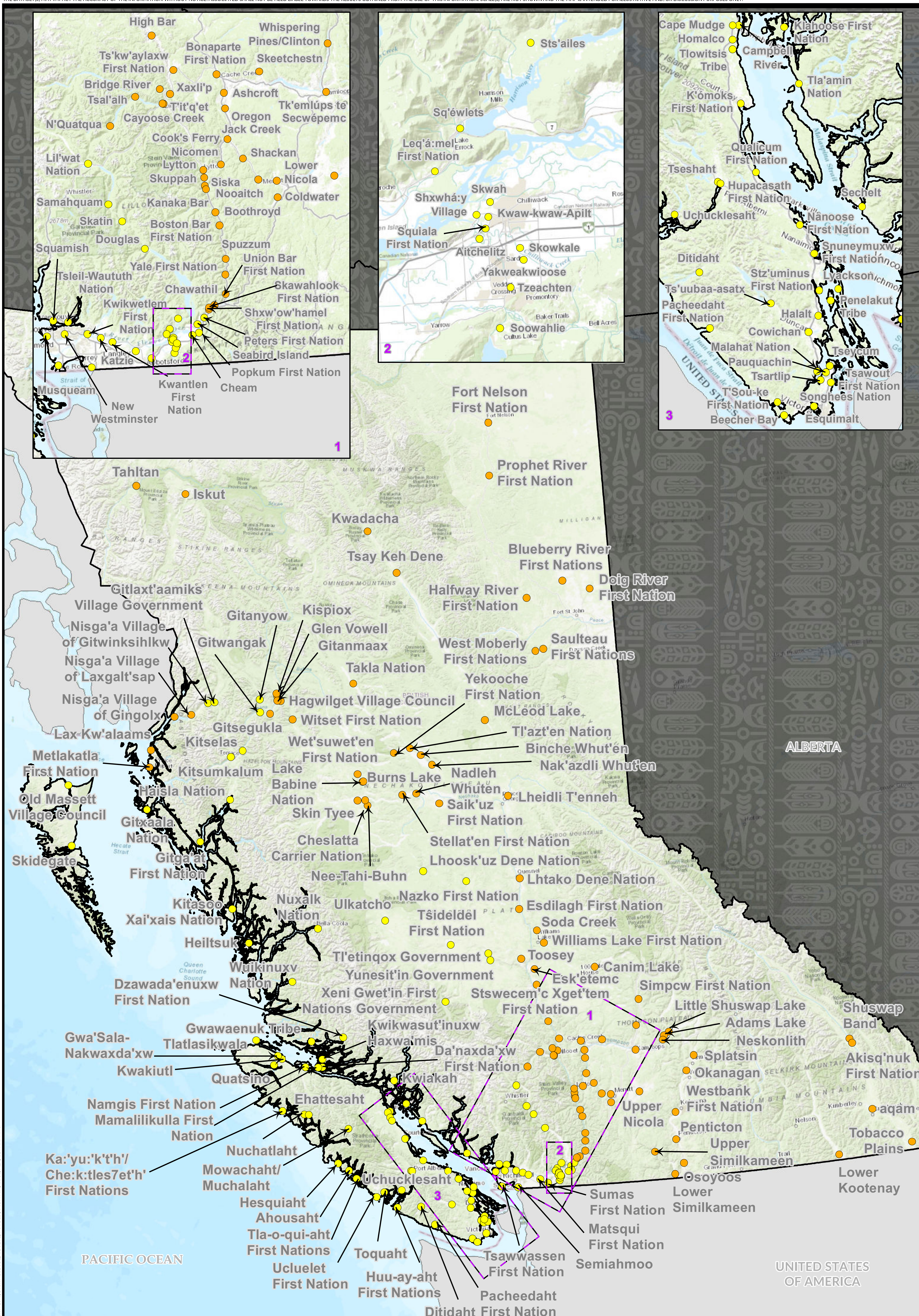
River/Creek/Lake Flooding
Change In 1 Hour 1-In-100 Year Rainfall Event Between 2023 And 2050
- High (+10% Or Greater Increase In Rainfall)
- Medium (+7.5% To +10% Increase In Rainfall)

N

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Associated Engineering

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\7_RIVER_CREEK_LAKE_FLOOD\AE20223439_FIG7-1_BC_RCLF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AI REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

River/Creek/Lake Flooding

Change In 1 Hour 1-In-100 Year Rainfall Event Between 2023 And 2050

- Medium (+7.5% To +10% Increase In Rainfall)
- Low (+5% Increase In Rainfall)

N

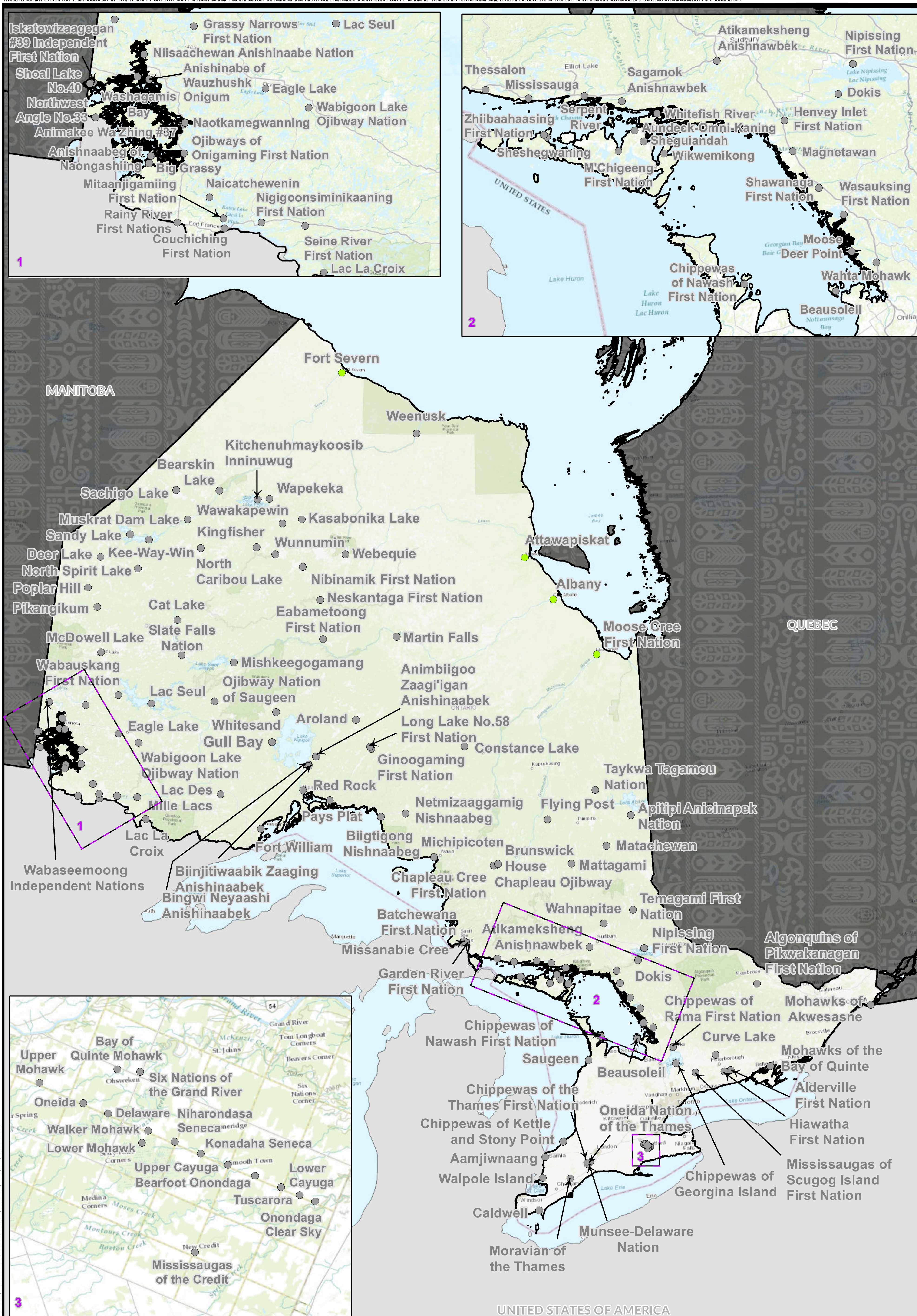
FIGURE 7-1
RIVER/CREEK/LAKE FLOODING
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

River/Creek/Lake Flooding
Change In 1 Hour 1-In-100 Year Rainfall Event Between 2023 And 2050
- Medium (+7.5% To +10% Increase In Rainfall)

FIGURE 7-2
RIVER/CREEK/LAKE FLOODING
ALBERTA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP



C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\8_COASTAL_FLOOD\AE20223439_FIG8-2_ON_CF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AJ REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Coastal Flooding
Change In Sea Level Between 2023 And 2050
- No Increase Or Decreasing (0% Or Less Change In Sea Level)
- Not Applicable Or Data Unavailable

N

**FIGURE 8-2
COASTAL FLOODING
ONTARIO**

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Associated Engineering

Coastal Flooding

Change In Sea Level Between 2023 And 2050

- Medium (+0.15 To +0.30 cm Rise In Sea Level)
- Low (+0 to +0.15 cm Rise In Sea Level)
- No Increase Or Decreasing (0% Or Less Change In Sea Level)
- Not Applicable Or Data Unavailable

N

FIGURE 8-3
COASTAL FLOODING
QUEBEC

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

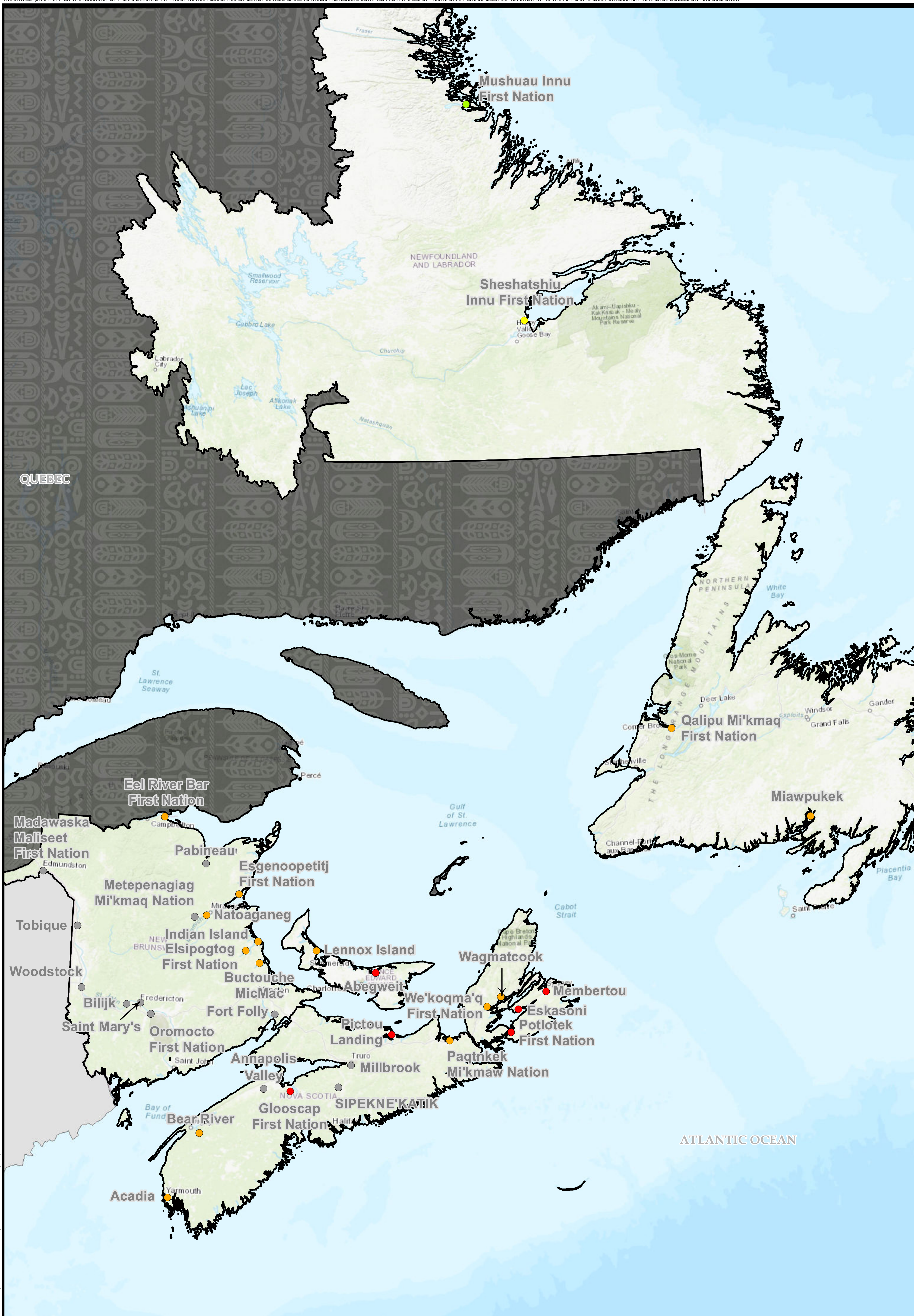


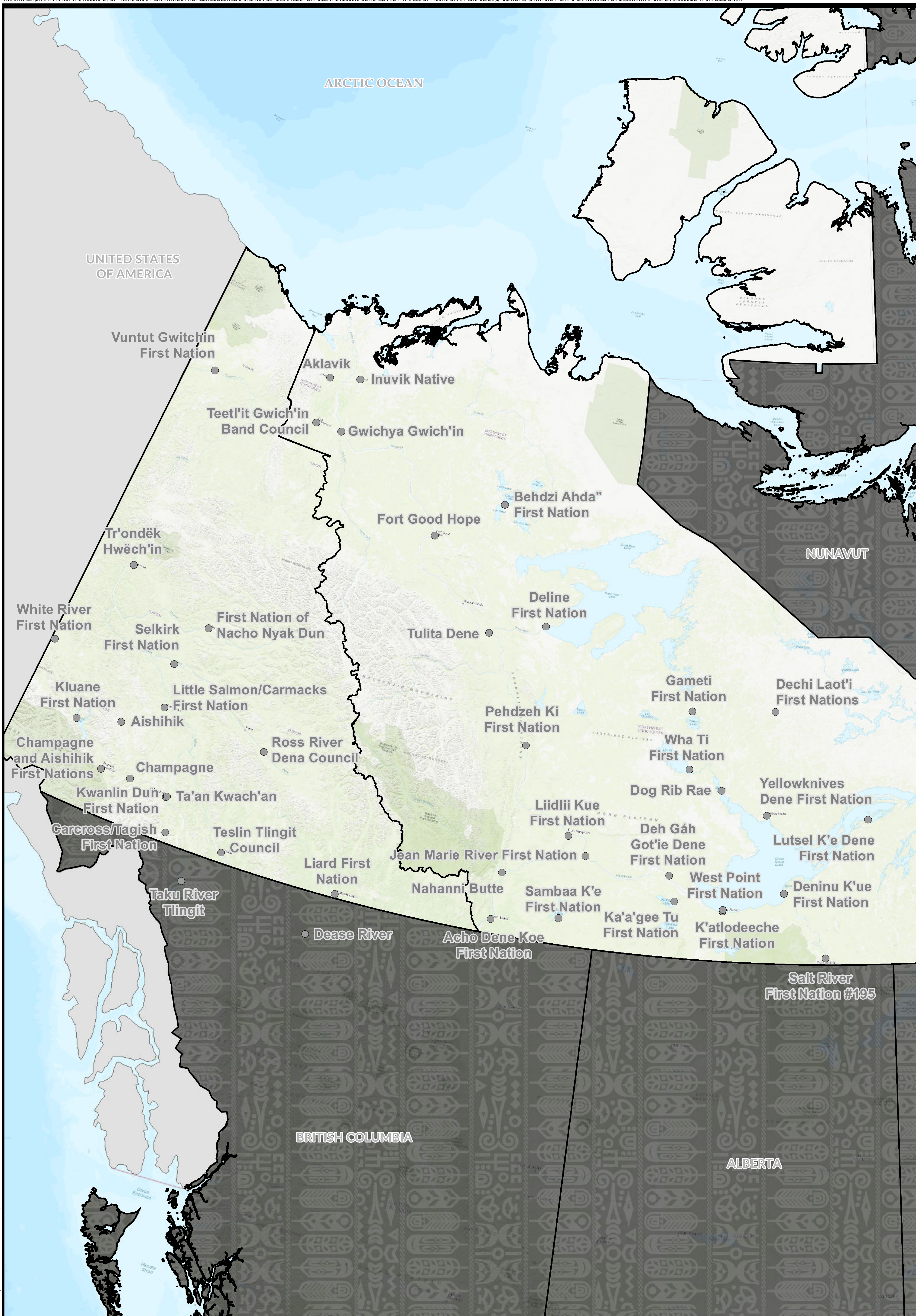
FIGURE 8-4
COASTAL FLOODING
ATLANTIC PROVINCES

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

Coastal Flooding
Change In Sea Level Between 2023 And 2050

- High (+30 cm Or Greater Rise In Sea Level)
- Medium (+0.15 To +0.30 cm Rise In Sea Level)
- Low (+0 to +0.15 cm Rise In Sea Level)
- No Increase Or Decreasing (0% Or Less Change In Sea Level)
- Not Applicable Or Data Unavailable

C:\USERS\LAW\DESKTOP\PRO\AFN\ARCMAP\8_COASTAL_FLOOD\AE20223439_FIG8-4_ATL_CF_230214.MXD DRAWN BY: WL CHECKED BY: CM/AJ REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

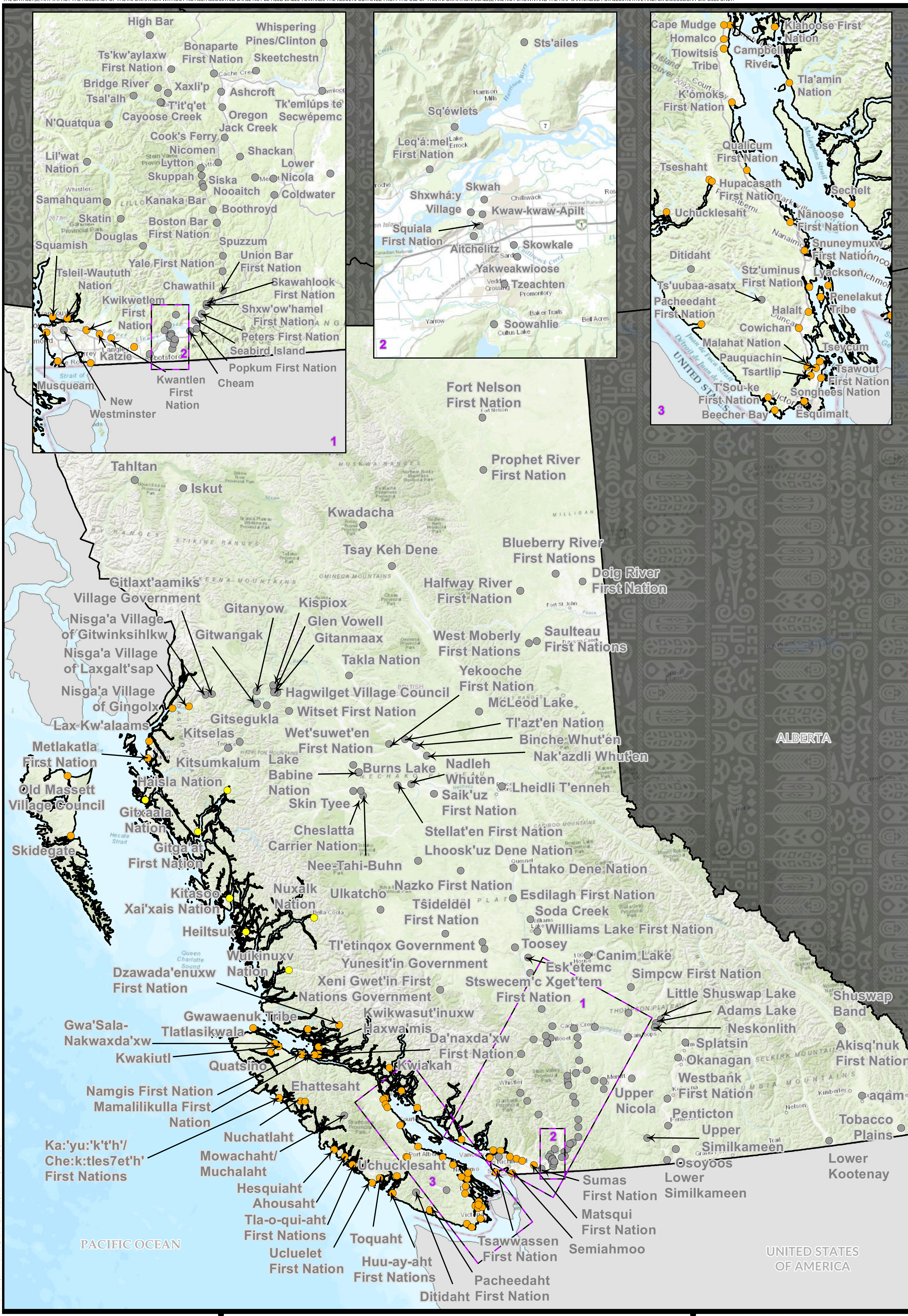


Coastal Flooding
Change In Sea Level Between 2023 And 2050
Not Applicable Or Data Unavailable

FIGURE 8-5
COASTAL FLOOD
NORTHWEST TERRITORIES AND YUKON

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

ALTHOUGH ASSOCIATED HAS TAKEN THE EFFORT AND DUE CARE TO ENSURE THE ACCURACY OF THE INFORMATION DISPLAYED AT THE DATE OF PRODUCTION, THE USER ACKNOWLEDGES THAT CHANGES OVER TIME AND THE CURRENCY OF THE DATASET(S) MAY IMPACT THE ACCURACY OF THE INFORMATION WITHOUT NOTICE. ASSOCIATED SHALL NOT BE HELD LIABLE TOWARDS THE RESULTS OBTAINED FROM THE USE OF THIS INFORMATION. SCALE(S) ARE NOT SHOWN AND THE MAP IS INTENDED FOR ILLUSTRATIVE AND/OR DISCUSSION PURPOSES ONLY.



C:\USERS\LAW\DESKTOP\PROJ\AFN\ARCMAP\8_COASTAL_FLOOD\AE2022439_FIG8-1_BC_CF_230314.MXD DRAWN BY: WL CHECKED BY: CM/AI REV: 00.
IMAGERY: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING.

Coastal Flooding
Change In Sea Level Between 2023 And 2050
- Medium (+0.15 To +0.30 cm Rise In Sea Level)
- Low (+0 to +0.15 cm Rise In Sea Level)
- Not Applicable Or Data Unavailable

FIGURE 8-1
COASTAL FLOODING
BRITISH COLUMBIA

ASSEMBLY OF FIRST NATIONS
CLOSING THE INFRASTRUCTURE GAP

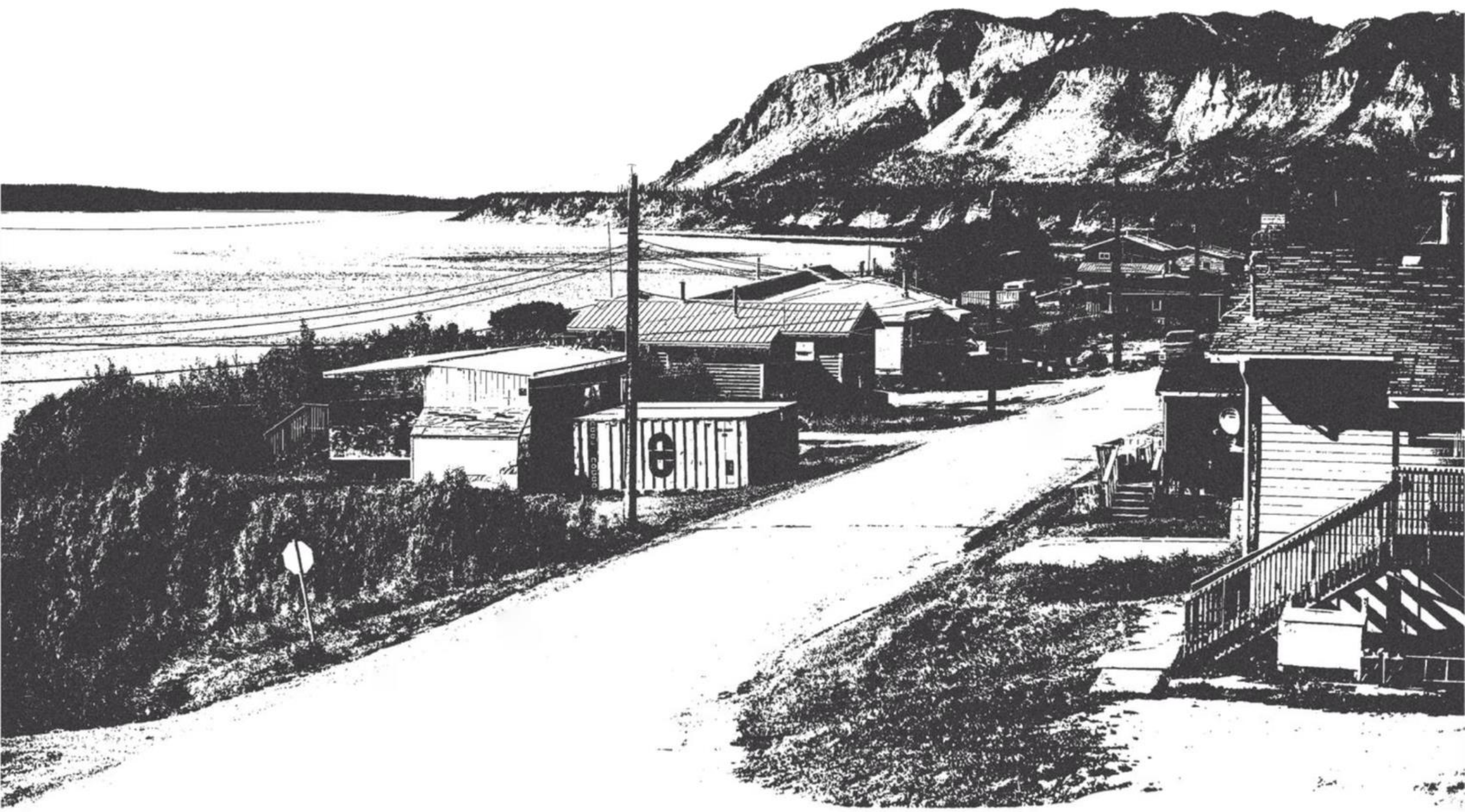
Associated Engineering

ASSEMBLY OF FIRST NATIONS • ASSEMBLÉE DES PREMIÈRES NATIONS

CLOSING THE INFRASTRUCTURE GAP
CLIMATE HAZARDS & RISKS FACING FIRST NATIONS

Appendix D

DETAILED METHODOLOGY



AE chose climate parameters using professional judgement informed by the available data that could act as an indicator of the change in a climate hazard. For example, the parameter "number of days exceeding +30°C" was chosen as an indicator for extreme heat conditions. To assess which communities are most likely to be immediately affected by climate change, the change in each climate parameter between 2023 and 2050 was calculated using data for the climate scenario RCP 8.5. An important note is that the change in these conditions provides an indicator of whether a certain climate hazard is likely to be more severe in the future; on its own, it does not account for whether a community is already vulnerable to a certain hazard. The infrastructure in a FN may have been built to manage many days above +30°C, so a similar change in the hazard may not imply as large a change in risk as it would to infrastructure in an FN that was not built to handle those conditions. The climate indicators chosen are not perfect indicators of the risk to a community – they provide a reasonable indication of a trend in the likelihood of actual climate risk a FN might experience.

To estimate the change in climate parameters for each FN, AE collected climate data for the location of each FN. The location for all FNs was taken from CIRNAC and ISC official maps to determine a point location for each FN. While not all FN infrastructure is located at the exact point location, for most hazards, climate trends will be similar across the FN (the minimum grid size for most datasets is 10x10 km, with similar trends usually seen around adjacent grids).

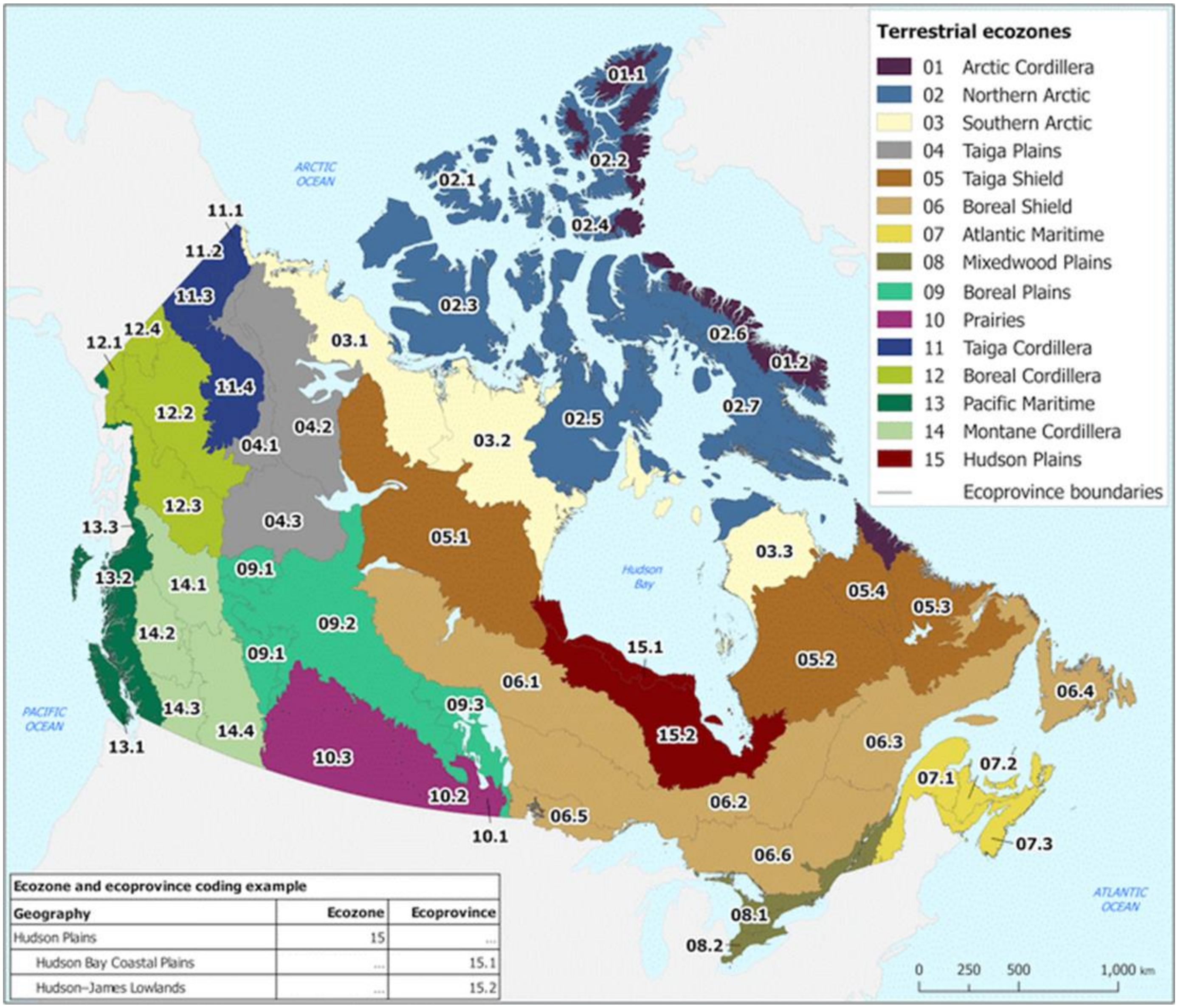
Annual average temperature data from 2014 to 2060 for the RCP 8.5 trajectory (worst case scenario) was collected through PAVICS . Point data were collected for each FN. The Climatedata.ca's CMIP5 yearly ensemble percentiles for CanDCS-U5 (BCCAQv2) was used to derive climate indicators. Averages of the parameters over a 20-year period were calculated for 2023 (2014-2034) and 2050 (2041-2060) to smooth out the variance between years.

Table C-1 at the end of this section includes the climate parameters chosen and the data sources for those parameters. In addition to the list of parameters in Table C-1, AE also assessed the number of freeze-thaw cycles per year. This climate parameter was found either decreasing or not increasing for all FNs and was excluded from the mapping or summary tables. Permafrost thaw was also considered for analysis, but the vulnerability to this hazard was deemed too local to be assessed with the data available for this scale of assessment.

AE conducted exposure mapping to determine which FNs were exposed to certain hazards. Exposure mapping was used to screen out FNs from certain risks at a very high level. Landcover maps and ecozone maps (Figure D-1) were used to determine whether an FN was in a wildfire risk zone. All ecozones except the Prairies, Mixedwood Plains (southern Ontario), and Atlantic Maritime were exposed to wildfire risk. Landcover maps were used to determine if a FN was within 1,000 m of a lightly or heavily forested area (the distance embers can spread and cause a structure to catch fire). All FNs within the wildfire risk ecozones were found to be within this distance. Watercourse and waterbody maps were deemed insufficient to act as a preliminary screening tool for flood risk. Local flood maps or elevation maps to assess exposure with a sufficient level of confidence were unavailable. Local knowledge of past flooding or historical flood maps should be used to supplement this study, and climate-projected flood maps should be used in place of this study when they are available. Elevation maps for coastal areas were used to screen for which

FNs were located at or near sea level and exposed to sea level rise. Permafrost maps were considered for exposure mapping, but ultimately were not used based on concerns about data quality at their resolution.

Figure D-1: Terrestrial Ecozones in Canada



The change for each parameter in 2023 and 2050 was calculated, and all subsequent analyses and mapping used the change in parameter. The absolute or relative change was used for each parameter based on which result would be most legible or intuitive to readers (e.g., +5 days exceeding +30°C was chosen as an indicator to be more intuitive than a 12% increase in days exceeding +30°C).

Hazards were sorted into categories (“High”, “Medium”, “Low”, “No Increase or Decreasing”) based on the change in the parameter compared across all FNs. This establishes an indicator of the relative change in risk between FNs which could be used to support the prioritization of resources for mitigation actions for a given hazard type. Hazard category boundaries loosely correspond to the percentile of FNs that fall within each third of the hazard range (e.g., if 1/3 of FNs fall within a 0% to +2% change, 0% to +2% are the bounds for the “Low” change category, likewise if the next 1/3 of FNs fall within +2% to +4%, +2% to +4% are the bounds for the “Medium” change category). The hazard category boundaries were changed to even numbers for legibility, resulting in some categories having greater or fewer than 1/3 of FNs in that category. “No Increase or Decreasing” was assigned to all hazards that decreased or stayed the same over time.

Finally, a list of the number of FNs in each region that fall into each hazard category was created. The results were compiled into summary tables and a series of maps that could be used for reference.

Note that the confidence in the data for climate parameters varies between parameters, and even within a parameter. Effort has been made to use well-established climate data sources. However, data confidence for a given hazard, like high winds, may be overall low to very low. Within a dataset, some locations may be nearer to weather stations that use historical data to inform projections (especially for wind, freezing rain, and rainfall intensity). Down-scaled climate models may not fully capture micro-climate effects , even if those models provide the best projections available. As a result, the parameters provided in this study provide an indication of the direction of the trends that will be seen in the future and are not a guarantee that the results in the future will exactly match the results projected today.

Hazard	Climate Parameter	Justification	Data Source
Extreme Heat	# of days exceeding +30°C	Environment and Climate Change Canada issues heat warnings for days when temperatures reach +30°C or higher. Heat stress on materials and infrastructure is more likely to occur above this temperature.	PAVICS – CMIP 5 Annual Data
Drought	Standardized Precipitation-Evapotranspiration Index (SPEI)	The SPEI is commonly used in North America to quantify drought. It is a relative measure of surface water surplus based on a climate water balance (precipitation minus potential evapotranspiration). The SPEI is a measure of the change from the reference period of 1950-2005.	Government of Canada – CMIP 5 Annual Data
Wildfires	Average area burned within an ecozone (FNs outside of wildfire risk ecozone are tagged "Not Applicable")	Wildfire data depends heavily on local conditions, but projections at the ecozone level can be used to provide an indication of the trends in wildfire frequency and intensity. While it is difficult to predict the likelihood that a given FN will be impacted by a wildfire in a given year, as the average area burned across a region increases, it is more likely that an FN will be affected.	Wang, Xianli, Tom Swystun, and Mike D. Flannigan. "Future wildfire extent and frequency determined by the longest fire-conducive weather spell." *Science of the total environment* 830 (2022).
High Winds	Maximum 1-in-50-year wind speeds	Maximum 1-in-50-year wind speeds are used in the National Building Code to design for wind loads on structures. The same indicator is used for high winds in this study.	ECCC's Climate-Resilient Buildings and Core Public Infrastructure – An Assessment of the Impact of Climate Change on Climatic Design Data In Canada - Annex 1.2

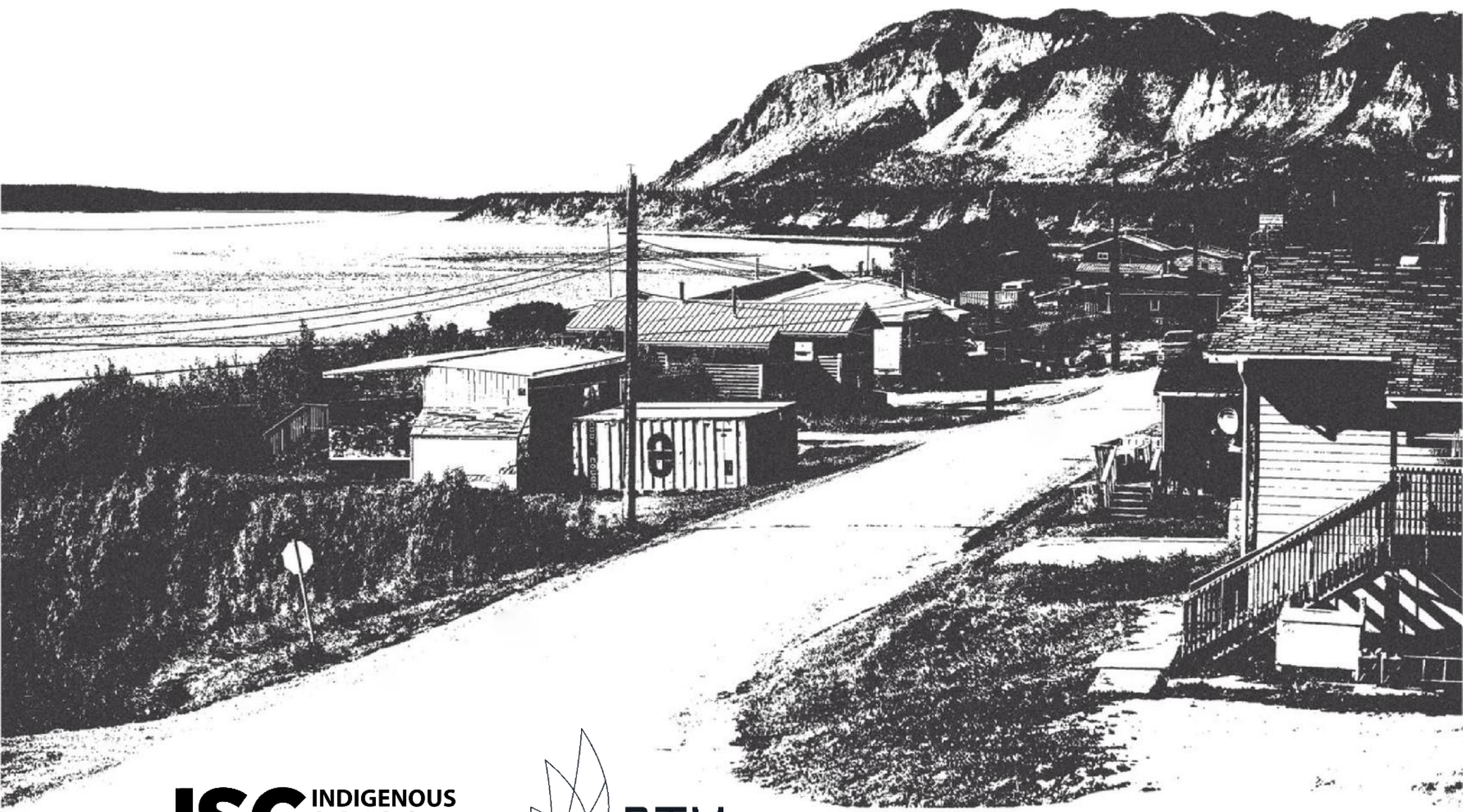
Hazard	Climate Parameter	Justification	Data Source
Freezing Rain	Change in ice accumulation	Ice accumulation is used in the National Building Code to design for wind loads on structures. The same indicator is used for high winds in this study.	ECCC's Climate-Resilient Buildings and Core Public Infrastructure - An Assessment of the Impact of Climate Change on Climatic Design Data In Canada - Annex 1.2
Localized Flooding	10-minute 1-in-25-year rainfall intensity	10-minute, 1-in-25-year rainfall intensity is used as an indicator for a storm that could cause localized flooding in an FN. Short, high-intensity rainfall can overwhelm stormwater systems and result in increased inflow and infiltration into wastewater systems.	PAVICS – CMIP 5 Annual Short-duration Rainfall IDF Data
River/ Creek/ Lake Flooding	1 hour 1-in-100-year rainfall intensity	1-hour 1-in-100-year rainfall intensity is used as an indicator for a storm that could cause a river/creek/lake to flood. This hazard is highly local, and 1-hour rainfall is only an indicator of whether a location may experience flooding. Glacial melt, soil conditions, and other characteristics of a catchment area could play a significant role in this type of flooding, and these considerations are not captured using just rainfall intensity. Flood mapping at a local level would be necessary to provide a better assessment of whether a FN is exposed to flooding. In the absence of local studies, rainfall intensity can be used as an indicator of a trend toward increased river/creek/lake flood risk.	PAVICS – CMIP 5 Annual Short-duration Rainfall IDF Data

Hazard	Climate Parameter	Justification	Data Source
Sea Level Rise	Change in sea level (with non-coastal FNs tagged “Not Applicable”)	The rise in sea level is an indicator of whether a coastal FN is at risk of damage from rising waters. Sea level rise is a predictor of erosion and loss of low-lying land. On its own, sea level rise alone is not enough to predict the intensity or frequency of future storm surges, but it can be used as an indicator of the trend toward more damaging storm surges. Data was not available for water level rise of the Great Lakes.	Church, J. A., P. Clark, A. Cazenave, J. Gregory, S. Jevrejeva, A. Levermann, M. Merrifield, G. Milne, R.S.Nerem, P. Nunn, A. Payne, W. Pfeffer, D. Stammer, and A. Unnikrishnan (2013), Sea level change, in Climate Change 2013: The Physical Science Basis, edited by T. F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P. Midgley, Cambridge University Press, Cambridge, UK and New York, NY. USA

ASSEMBLY OF FIRST NATIONS • ASSEMBLÉE DES PREMIÈRES NATIONS

"Anookeetaa! Let's get to work..."

Closing the First Nation Infrastructure Gap



ISC INDIGENOUS SERVICES CANADA

BTY