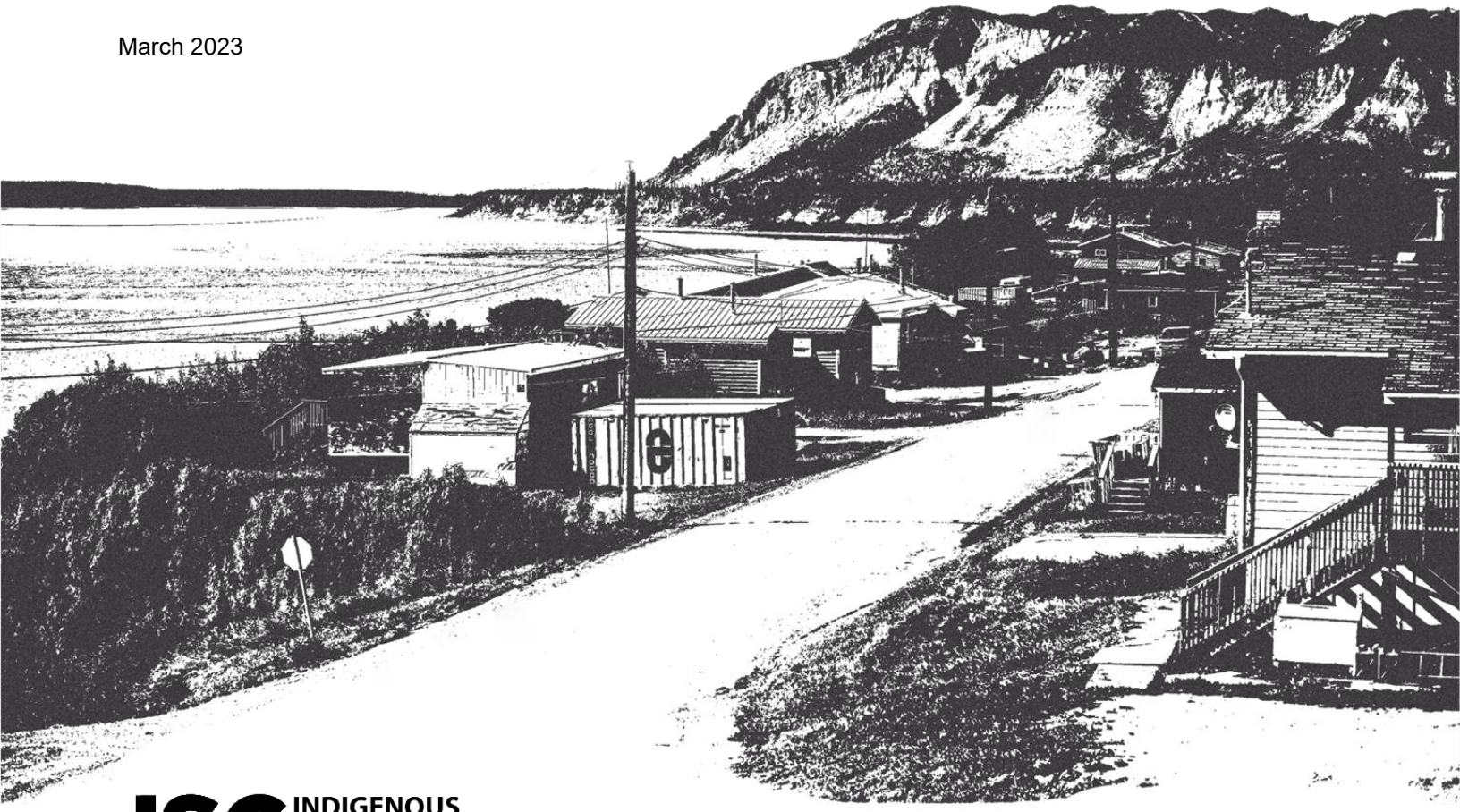
Closing the Infrastructure Gap by 2030

A Collaborative and Comprehensive Cost Estimate Identifying the Infrastructure Investment Needs of First Nations in Canada

March 2023



ISC INDIGENOUS SERVICES CANADA

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, and Yalleedesigns for their contributions to the development of this proposal.

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

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

First Nations Engineering Services
Craig Baker
Sarah Pearson
Taylor Martin

BTY Group
Ben Harris
Nicholas Jackson
Neill McGowan
Rob Wilson
Michael Gabert
Travis Cheung
Saira Muzaffar
Klara Gilbert

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

Planetworks Consulting
Susanna Reardon
Melanie Reardon
Duncan Sharp

Art and Graphic Design
Darren Yallee, Yalleedesigns

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Executive Summary

The Assembly of First Nations (AFN), in partnership with Indigenous Services Canada (ISC), has co-developed a comprehensive cost report which is 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 budget request outlined in this historic First Nations-led report is a fully substantiated cost estimate based on years of AFN technical studies, First Nations engagements, and decades of ISC records. The AFN, as directed by the First Nations-In-Assembly, has engaged industry experts to use this research to estimate the national infrastructure need and sustain it for future generations of First Nations.

These critical investments are fiduciary reparations needed for over a century of underfunded programs to First Nations and will improve their self-determination and socioeconomic outcomes, as well as minimize the disparity between First Nations and Canadians access to essential community infrastructure services and housing.

Closing the Infrastructure Gap 2030
An Infrastructure Needs Report to Build Towards Reconciliation, Resilience, Achieving Net-Zero Goals, Connectivity, and Unlocking First Nation Economic Capacity.

Participation from 401 First Nations communities

Creates economic opportunities for First Nations and non-Indigenous workers and businesses

Promotes a self-governed asset management approach by First Nations to Close the Infrastructure Gap by 2030.

The investment need to Close the Infrastructure Gap is $349.2 billion which is a result of decades of underfunding, failed fiduciary duties, and unfair distribution of Canada's wealth as a country *(see p. 25 and Annex 1 – Cost Report).*

Advances First Nations socioeconomic outcomes by fulfilling the Government of Canada's existing fiduciary, legal, and public commitments to First Nations

Proposal Description

INTRODUCTION

The Assembly of First Nations and Indigenous Services Canada co-developed this 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 inequality, especially when 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 that were years in the making and national in scope, these include:

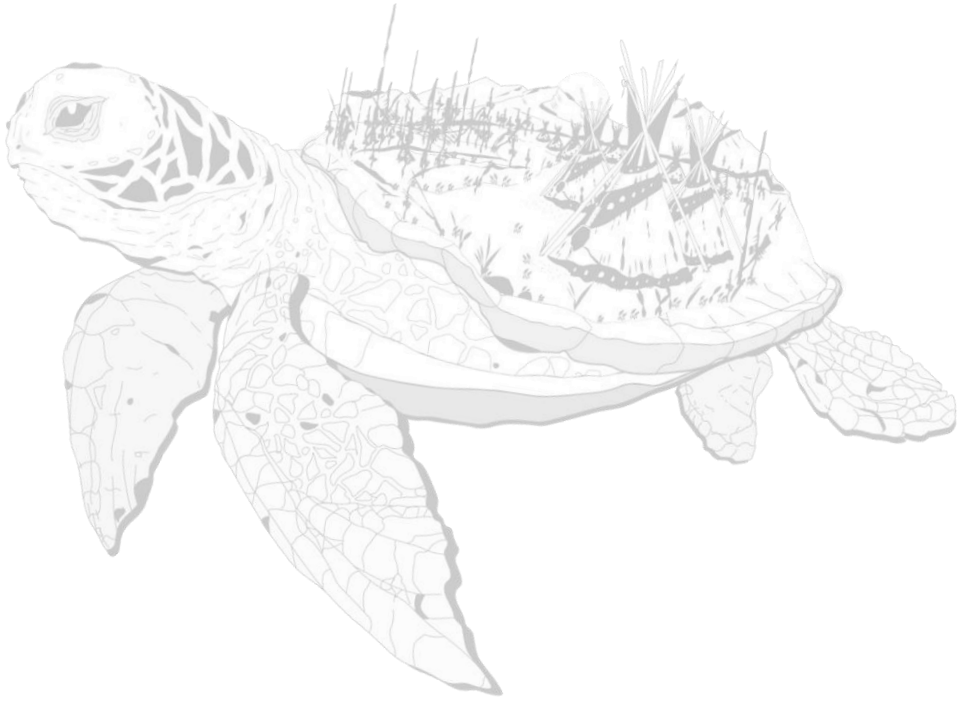
- AFN Report: Cost Analysis of Current Housing Gaps and Future Housing Needs in First Nations
- AFN National First Nations Assets Needs Study
- AFN First Nations Education Infrastructure Capital Needs Assessment
- AFN First Nations Education Infrastructure Operation and Maintenance Needs Assessment

The AFN have led a team of industry experts to utilize this research and expand upon it to calculate the federal investments needed to Close the Infrastructure Gap by 2030.

Monetary investments alone cannot fully heal the intergenerational traumas caused by the residential school system and failed colonial policies.

This proposal focuses on creating access to sustainable and reliable funding for First Nations that will improve access to essential infrastructure by 2030 and beyond.

A robust framework for the implementation of national infrastructure projects has also been developed. Careful consideration to how and when projects will be planned and delivered will acknowledge and facilitate First Nation’s self-determination to start on their own “Healing Path Forward” as they strengthen their communities through the development of essential infrastructure and housing.



This proposal is a comprehensive approach to funding that will help the Federal government deliver on many of the commitments made publicly to First Nations on behalf of Canada and to fulfill its fiduciary responsibilities to its First Peoples. It will replace existing emergency-based reactionary responses with a stable and comprehensive community infrastructure planning system, led and managed by First Nations.

This framework also incorporates sustainable practices, climate resiliency, and preparation for Canada's Net-Zero commitments as part of its service delivery model. It also balances the goals of economic development with the Gender-based Analysis Plus (GBA Plus) framework and the Minister of Finance's 2021 mandate from the Prime Minister to apply quality of life indicators in decision-making. The plan will provide a significant boost to Canada's economic performance – benefits of this infrastructure will be felt by First Nations and non-First Nations peoples alike.

By integrating First Nation investment, infrastructure development, and economic growth, this proposal will elevate Canada's status as a global leader in realizing truth and reconciliation. This will improve current public opinion on Canada's treatment of its First Nations.

PAST AND PRESENT COMMITMENTS TO FIRST NATIONS

The Government of Canada has made extensive commitments to First Nations communities to provide funding for critical infrastructure to improve living conditions. The most recent commitments are included in the Prime Minister's Mandate Letter to Indigenous Services Minister Patty Hajdu. This letter notes the specific action ***"…to continue to make immediate and long-term investments to support ongoing work to close the infrastructure gap by 2030…".***[1]

The last major infrastructure investment to First Nations was in the 1990s, over 25 years ago.

Despite this, a significant "Gap" remains between infrastructure in First Nations communities and the rest of Canada. **This takes form in persistent issues such as long-term drinking water advisories and overcrowded housing units.** These are a clear injustice to First Nations and a visible blemish on Canada's reputation as a G7 country.

The following examples are **commitments made by the Government of Canada** that highlight the long-standing gap between the quantity and quality of First Nations infrastructure compared to the rest of Canada:

The Speech from the Throne in November 2021 stressed the need for immediate action. *"**This is the moment to move faster on the path to reconciliation** … Reconciliation requires a whole-of-government approach, breaking down barriers, and rethinking how to accelerate our work. Whether it is eliminating all remaining long-term drinking water advisories or implementing the United Nations Declaration on the Rights of Indigenous Peoples, **the Government is committed to closing the gaps that far too many First Nations, Inuit and Métis communities still face today**."* [2]

[1] https://pm.gc.ca/en/mandate-letters/2021/12/16/minister-intergovernmental-affairs-infrastructure-and-communities
[2] https://www.canada.ca/en/privy-council/campaigns/speech-throne/2021/building-resilient-economy.html#reconciliation

In June 2021, the Federal Government released its National Action Plan in response to the 231 calls for justice contained in **"Reclaiming Power and Place: The Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls"** issued in 2019. Call to Justice 4.1 specifically calls upon all governments to *"to recognize Indigenous Peoples' right to self-determination in the pursuit of economic social development … with long-term, sustainable funding designed to meet the needs and objectives as defined by Indigenous Peoples and communities."*

In 2016, the Government of Canada officially endorsed, without qualification, the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). This proposal outlines an Indigenous-led approach to remedy the infrastructure gap; a key component of meeting all the objectives in the United Nations' declaration, specifically to the fundamental basic right to freely pursue their economic, social, and cultural development as an Indigenous Peoples without discrimination.

The federal government is accountable for 76 of the 94 Truth and Reconciliation Commission of Canada: Calls to Action document published in 2015. The Calls to Action specifically reference the need for sufficient, adequate, and sustainable funding in 25 separate instances and details commitments that will improve education, justice, healthcare, and other social infrastructure for the First Nations Peoples of Canada. For example, Call to Action No. 8 states: *"We call upon the federal government to eliminate the discrepancy in federal education funding for First Nations children being educated on reserves and those First Nations children being educated off reserves."*. Call to Action No. 21 states: *"We call upon the federal government to provide sustainable funding for existing and new Aboriginal healing centres to address the physical, mental, emotional, and spiritual harms caused by residential schools, and to ensure that the funding of healing centres in Nunavut and the Northwest Territories is a priority."*

In November 2015, the Government of Canada committed to ending all long-term drinking water advisories affecting approximately 800 federally funded public water systems on reserves. This is also aligned with the 2019 to 2022 Federal Sustainable Development Strategy which supports the target objective of providing all Canadians with access to safe drinking water.

In 2007, the House of Commons passed Jordan's Principle, a legal requirement resulting from the Orders of the Canadian Human Rights Tribunal (CHRT). Jordan's Principle aims to eliminate service inequities and delays for First Nations children. It states that any public service ordinarily available to all other children must be made available to First Nations children without delay or denial.[3]

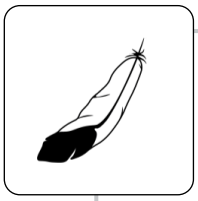
The findings of this proposal and supplementary reports indicate that increased investment and further actions are needed for 2023 and beyond for Canada to begin meeting its commitments to First Nations. Otherwise, according to the House of Commons Committee on Indigenous and Northern Affairs, current projections indicate that Canada will miss its 2030 target to close the infrastructure gap[4] – a key component of Indigenous Services Minister Patty Hajdu's mandate letter.

The numerous commitments above underscore the dire need for improved direction and First Nations-led initiatives to improve the self-government of First Nations. This proposal incorporates measures to achieve permanent and sustainable First Nation self-governance, as well as provide Canada with the opportunity to demonstrate its leadership in truth and reconciliation with its First Peoples.

[3] https://www.afn.ca/policy-sectors/social-secretariat/jordans-principle/
[4] https://www.aptnnews.ca/national-news/feds-on-track-to-miss-indigenous-housing-targets/

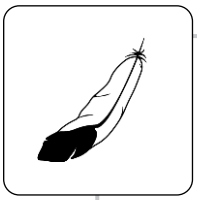
ASSESSING THE INFRASTRUCTURE GAP

Current well-documented challenges in First Nations communities — including insufficient access to healthcare and barriers to education — are results of longstanding infrastructure gaps compared to the rest of Canada. Several critical basic needs have yet to be remedied, including such issues as:



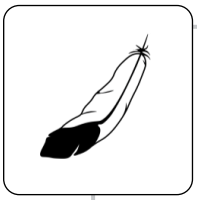
Of an estimated 85,700 existing housing units, 34% require minor repairs and 31% require major repairs. An additional 108,803 housing units are needed to address overcrowding, replacement, and population growth. (*AFN Housing Study, 2021).*

The last major federal infrastructure investment for buildings and utilities took place in the period of 1994-1996 — and 1980 for transportation-related infrastructure. There is currently $4.8 billion worth of federally funded assets on-reserve that are rated as in "poor condition" and are a federal liability in need of either immediate repair or replacement *(AFN Assets Needs, 2022).*



As of July 25, 2022, there were still 31 long-term and 14 short-term drinking water advisories in effect on 43 on-reserve communities across Canada, down from 105 in November 2015.

202 First Nations schools are overcrowded and require additions; 56 First Nations schools require immediate replacement based on reported poor conditions. Estimates indicate that First Nations are only being funded 23% of their educational capital needs when compared to the Government of Canada's budget 2021 commitments.



From 2020 to 2030, First Nations' on-reserve population is expected to grow at an average rate of 1.7% per year compared with only 1.0% for the rest of Canada. Most building, utility, transportation, and housing infrastructure cannot accommodate such growth and requires immediate upgrading and long-term planning to ensure the continued functionality of on-reserve community infrastructure for First Nations.

First Nations people accounted for 28% of the homeless population in the 44 communities that reported on the number of First Nations people experiencing homelessness, whereas they represent only 2.0% of the population in these communities. First Nations are also over-represented in the shelter system, especially in the Prairies, where 68% of shelter users are identified as Indigenous.

FIRST NATIONS LED INITIATIVE

A shortage of operations and maintenance funding has led to the severe deterioration of First Nations infrastructure assets. The year-to-year, and project-by-project, "firefighting" approach to addressing infrastructure demands is an inefficient use of federal investments to First Nations and decreases the longevity of community infrastructure assets.

This proposal aims to remedy this governmental inefficiency by establishing operational structures that enable First Nations to self-manage their assets and make long-term forecasts to strategically plan their own community infrastructure needs. This approach will give more control to First Nations over their own infrastructure and housing needs, while enabling them to also predict the necessary resourcing requirements when implementing their short- and long-term community plans.

The key component of this proposal is a comprehensive cost report, co-developed by AFN and ISC, which builds on several recently completed technical reviews. The cost report, which is the first attempt at a First Nations-led comprehensive and quantitative evaluation of the national infrastructure gap, will be updated on a yearly basis as First Nations begin to better forecast their own infrastructure and housing needs through new reliable and sustainable funding programs. The information from this report will assist First Nations with the optimization of federal investment for new builds, renovations and retrofits, sustainable operations and maintenance, and lifecycle-custodial costs to care for their buildings and facilities.

This proposal is also supported by a First Nations Asset Management Framework-derived National Implementation Plan that outlines a strategy for prioritizing investments as they are distributed regionally. This plan will define key phasing of investment categories, highlight short and long-term timelines for infrastructure developments, and identify critical operations and maintenance needs. The structure provided by this framework will enable First Nations to self-govern their community development as they work collaboratively with the Government of Canada to achieve the shared objectives of CTIG 2030.

STRENGTHENING CANADA THROUGH FIRST NATIONS ECONOMIC LEADERSHIP

CTIG 2030 will boost both First Nations economic conditions and overall Canadian prosperity. Infrastructure investment dollars will grow Canada's long-term gross-domestic-product (GDP) by increasing the productivity of the Canadian economy. Improvements to the built environment spurs substantial job creation and generates further federal income via taxation and border levies from internationally transported goods destined for First Nation infrastructure and housing projects.

The Centre for Spatial Economics (C4SE) has surmised that 9.4 jobs are generated for every million dollars spent on infrastructure – and the value of GDP generated per dollar of public infrastructure spending lies between $2.46 and $3.83.[5] Many of the jobs generated by Closing the Gap will be in rural and remote areas and will create economic opportunities for both First Nations and non-First Nations people alike.

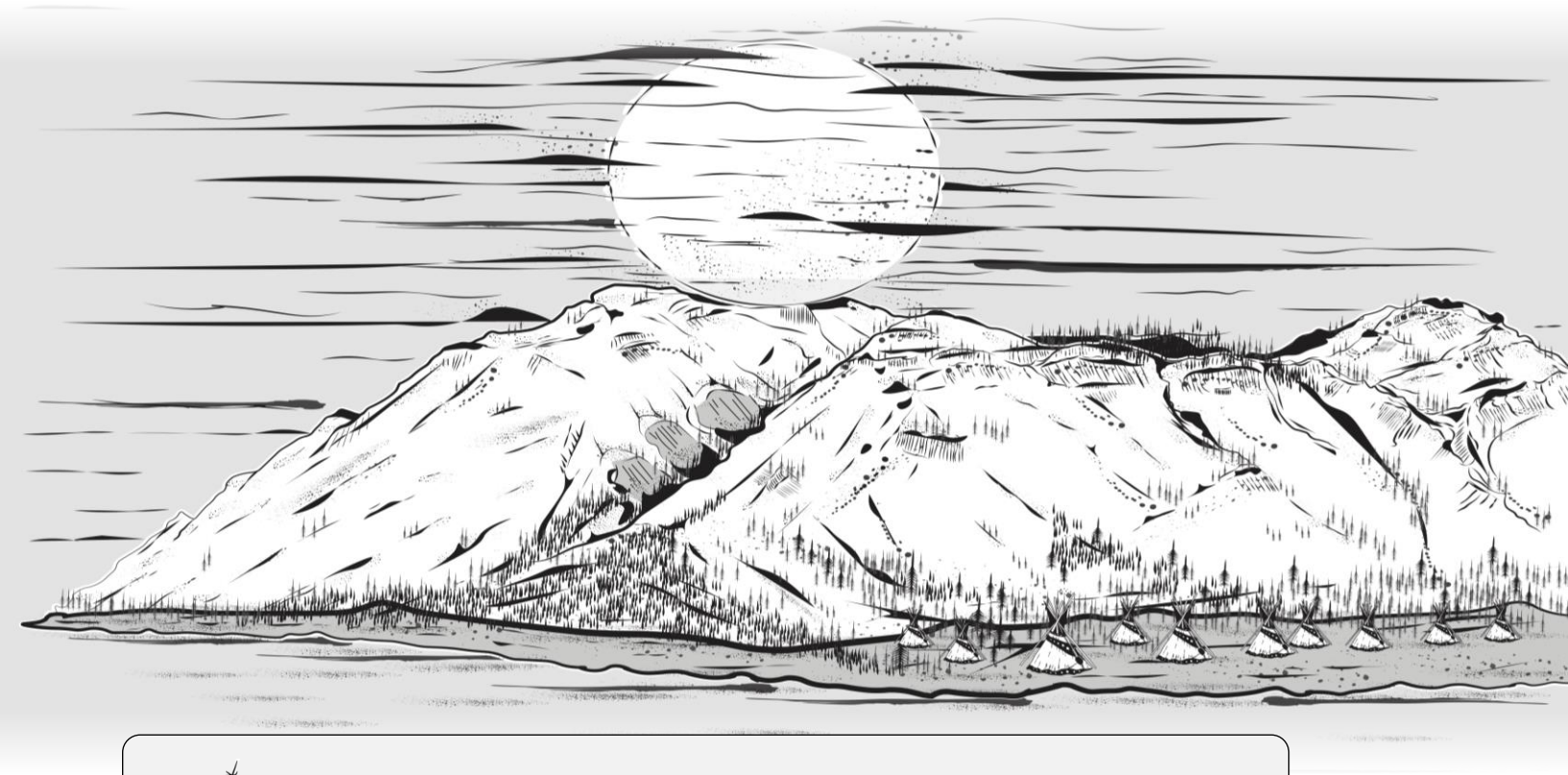
This proposal has the potential to create more than 3.2 million jobs as well as increase Canada's GDP by more than $1 trillion dollars.[5]

[5] Estimated potential value of GDP and number of jobs created based on the report "The Economic Benefits of Public Infrastructure Spending in Canada" by The Centre for Spatial Economics, September 2015.
https://www.iuoelocal793.org/wp-content/uploads/2015/09/Broadbent-Study.pdf

Public sector infrastructure investment unlocks capacity and boosts business opportunities for both First Nations and Canadians as a whole. The impact of infrastructure stimulus into the country's most underinvested and underdeveloped communities will ripple across a broad range of sectors – and radically change the Canadian economy from coast to coast.[6] By connecting First Nations to the rest of Canada via essential infrastructure development, new trade corridors and commerce centres will form that were previously non-existent.

Interlinking First Nations investment, infrastructure development, climate resilience, and net-zero transitioning will make Canada a global leader in post-pandemic recovery — all while bringing essential services to its most disadvantaged segment of the population.

The outcome of Closing the Infrastructure Gap will enable the Government of Canada to achieve its objectives set out by various mandates and declarations related to its fiduciary and legal obligations to First Nations peoples. Sustainable infrastructure supports in First Nations communities also reinforces Canada's commitments on the global stage to meet its targets established in the UNDRIP and the Paris Climate Agreement.



Did you know: Canada's natural resource exports were valued at $319 billion in 2021 alone, comprising 51% of the value of Canada's total merchandise exports (NRCan). The vast commodities on First Nations Traditional Territories has allowed Canada to prosper as a country, it's time to fairly distribute that wealth.

[6] https://www.conference-board.org/topics/recession/securing-growth-through-infrastructure

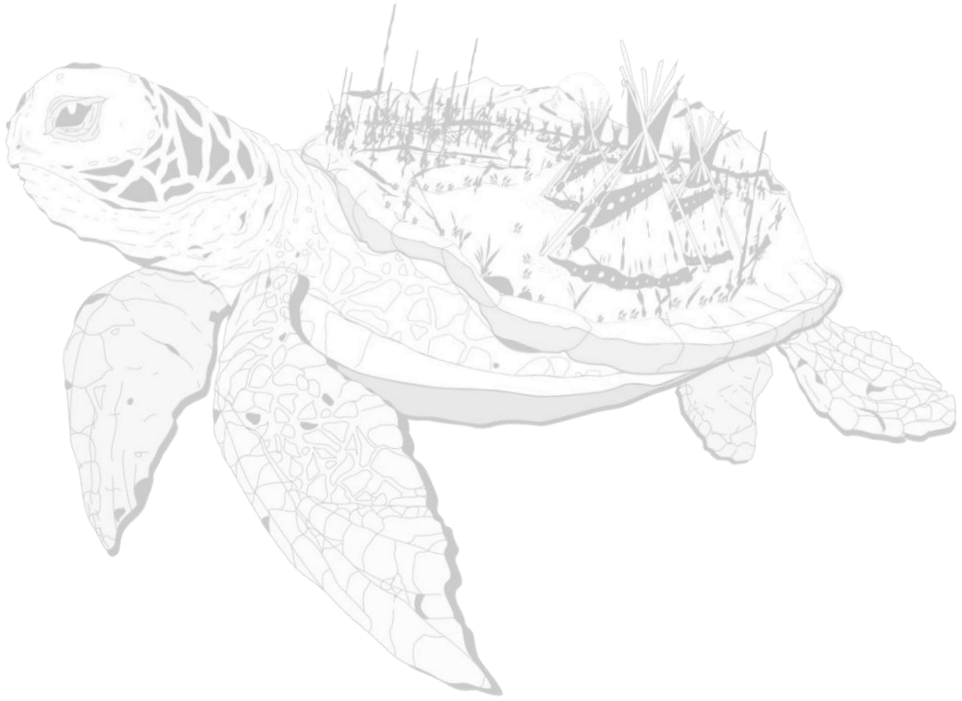
Background and Program Interactions

Presently, year-to-year infrastructure planning between ISC and First Nations via the First Nations Infrastructure Investment Plan(s) has led to the wide infrastructure gap due to a lack of strategic long-term community planning. Sustainable operations and maintenance funding is also absent, which has resulted in an inability for First Nations to implement a First Nations-led asset management framework. Although more than half of First Nations communities across Canada have completed a comprehensive community plan, most First Nations have no asset management systems in place to better plan for their short- and long-term infrastructure needs. These factors have caused the true capital and operations costs of existing and needed infrastructure assets to be unknown to both First Nations and ISC.

EVOLUTION OF FIRST NATIONS INFRASTRUCTURE DEVELOPMENT

CTIG 2030 represents a major program shift in how First Nations infrastructure is planned, delivered, and managed. A First Nations-led approach is needed to accelerate the Closing of the Infrastructure Gap which will require a joint effort between First Nations and the Government of Canada. This includes:

- Move away from a federal year-to-year, pay-as-you-go, approach to First Nations infrastructure funding programs. Infrastructure projects are complex and require significant capital investments with rolling budgets to drive progress through multi-year planning, design, and construction phases. Reliable funding is also needed by First Nations to keep the administrative momentum moving forward and sustain the project from feasibility study to final completion.
- Co-development between ISC and AFN to improve funding access to First Nations via a self-governed First Nation Infrastructure Bank. Policy reform at the Canadian Infrastructure Bank to better meet the unique investment needs of First Nations.
- Having the Government of Canada renew funding supports to expiring and exhausted programs so First Nations can complete comprehensive community plans and establish a First Nations Asset Management Framework in their communities.



- Reform ISC federal tendering policies to remove the administrative burden of federal procurement processes, especially for those First Nations in rural and remote areas where there are limited bondable contractors and who must regularly compete with more lucrative public and private sector projects.

- AFN and ISC to host Closing the Infrastructure Gap by 2030 engagement forums in 2023 at the national and regional level to continue the collaborative work started by the Assembly of First Nations, Indigenous Services Canada, and First Nations to address the Infrastructure Gap.

- Make improvements to already-in-place financial supports such as Ministerial Loan Guarantees, so First Nations can build their own on-reserve housing and tackle First Nations homelessness without being impeded by their inability to provide typical fee-simple land collateral to traditional lenders.

- AFN and ISC to co-develop new funding strategies for First Nations to improve access to capital while protecting federal investments: such as monetizing transfers for short-term projects with lump-sum awarded contracts.

- The Government of Canada must properly engage and consult First Nations to ensure they are at the decision-making table as Canada develops its post-pandemic recovery plan strategies. The COVID-19 pandemic has severely impacted the construction industry by rapidly increasing costs to the international manufacturing, supply chain, and labour markets. As a result, First Nations infrastructure and housing projects have been hindered — or halted — due to high construction costs.

- AFN and ISC plan to co-develop new funding strategies to streamline access to funds announced in federal budgets so First Nations can more efficiently develop their planned infrastructure projects.

TRANSITION TO FIRST NATIONS CONTROL OF INFRASTRUCTURE

The AFN and ISC will co-develop a road map for the research, design, and implementation of new comprehensive infrastructure systems that will lead to a complete federal government withdrawal and a full transfer of service authority from the federal government to First Nations for the self-governed care, control and management of their own housing and infrastructure (Department of Indigenous Services Act, S.C. 2019, c. 29, s. 336).

The transition process from federal infrastructure programming to First Nations care, control and management of infrastructure requires dedicated financial resources that include designing, developing and implementing regional and local strategies and plans. The transition process will rely on continued federal engagement with First Nations and their leadership. During the transition period, negotiations between First Nations and the federal government will respect a government-to-government relationship.

The process of transitioning care, control and management to First Nations will not be a “devolution” of existing government programs and services. It will result in the creation of new systems, new infrastructure institutions, and new ways to deliver infrastructure services to First Nations people. It will include the coordination of housing governance delivery systems across all jurisdictions to better serve First Nations members living away from their communities in urban, rural, and remote areas who wish to return home.

Rationale

CTIG 2030 includes integrating and coordinating initiatives that improve housing, education, and other core infrastructure, enabling First Nations communities to become sustainable long-term environments that provide educational and economic opportunities and foster harmony and safety for all. First Nations and the Government of Canada can cultivate untapped human capital by investing in the built environment to support healthy communities.

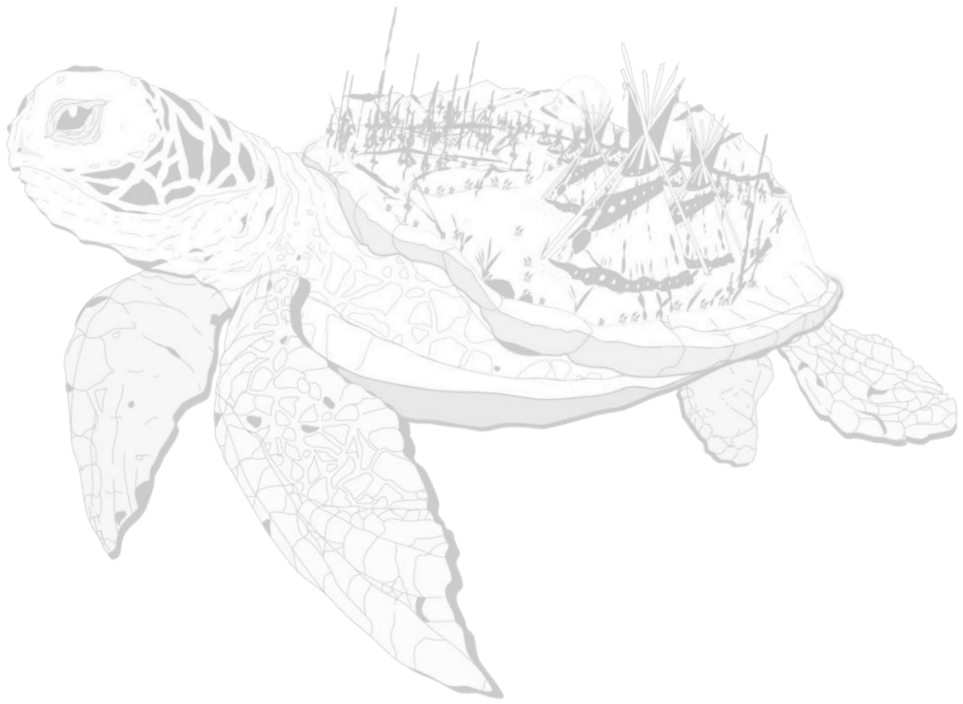
Housing is essential to improving First Nations' economic conditions through their self-determined priorities. Housing is a vital social, cultural, and economic asset that affects ones standing in the community and enables access to employment, wealth, and positive physical and mental health. At present, the housing challenges First Nations communities face are significant. Issues such as overcrowding compound risks for family violence, intimate partner violence, and education, growth, and development challenges for children. Deteriorating housing infrastructure also causes significant health risks to occupants, such as mold and other potentially hazardous materials.

Education is likewise critical to community well-being. Ensuring schools and teacherages are safe and reach their maximum lifecycle potential is critical for providing healthy learning environments and living standards to staff and students. Schools and teacherages need to be designed to be culturally appropriate to First Nations communities, as well as be sustainable for long-term use.

Health issues, such as the transmission of communicable diseases, are exacerbated by the aging healthcare infrastructure in First Nations communities. The impact that COVID-19 has had on First Nations communities has made it clear that critical infrastructure improvements are needed.

These improvements must also incorporate modern technology collaboratively alongside First Nations healing traditions and techniques. Fostering this approach will enable long-term sustainability when managing the health of First Nations peoples.

Lastly, closing the transportation and utilities infrastructure gap is a critical component of improving accessibility for First Nations. The remote location of many First Nations communities underscores the need for robust transportation infrastructure to increase connectivity with the rest of Canada.



HOW THIS PROPOSAL RESPONDS TO CLEAR PUBLIC POLICY CHALLENGE

Infrastructure for First Nations communities has historically been underfunded. The existing project-by-project funding approach that responds to needs only as they arise, rather than planning for long-term investment and prosperity is a more costly and inefficient use of federal investment. Numerous public commitments to First Nations have not yet been satisfied and change is clearly needed to close this gap.

Part of this proposal is building planning and management capacity and operational structures that enable First Nations communities to both plan and self-manage their assets and become leaders in closing the infrastructure gap. This includes the development of the First Nations Asset Management Framework and incorporates industry-supported best practices for infrastructure asset development and management. This approach will enable the federal government to deliver on the commitments noted above while also providing First Nations communities autonomy and self-governance to administer and manage a comprehensive and valuable infrastructure asset portfolio.

WHY NEW FUNDING IS NECESSARY

New funding – rather than internal reallocation or cost recovery -- is needed. Current funds are insufficient to meet not only the immediate needs of all communities, but also short- and long-term requirements. Historical underfunding of assets for operation and maintenance has resulted in greater capital needs as assets do not meet their intended design life.

In addition, the method and timelines in which funding is distributed is not aligned with the needs of the First Nations communities. Reliable and predictable Capital and Operations & Maintenance funding structures are required for long-term sustainability.

Funding is needed to enable First Nations communities to bridge the infrastructure gap and obtain access to the same level of amenities that most non-Indigenous individuals have. This includes improved infrastructure for utilities, housing, education, transportation, recreation, and healthcare – unlocking growth in key areas such as geographic accessibility and digital connectivity for members of the community.

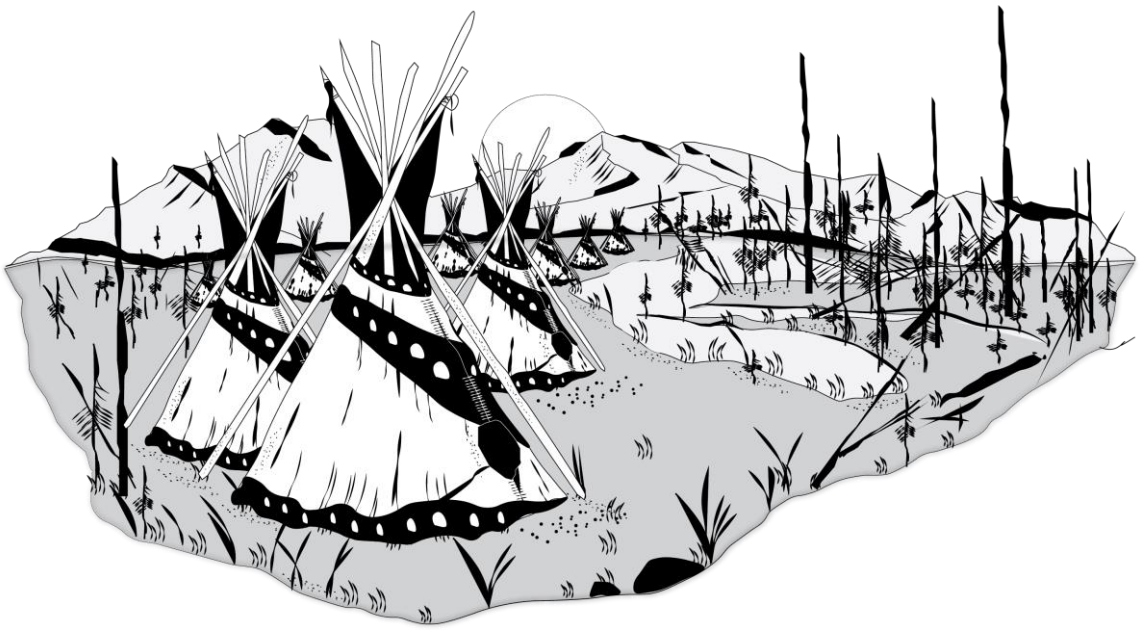
WHY GOVERNMENT INTERVENTION IS CRITICAL

All levels of Government in Canada have been and remain the primary providers of infrastructure that is critical to their societies' economic and social well-being. The gravity and scale of First Nations infrastructure deficits are enormous and geographically diverse, spanning a wide range of asset classes for 634 First Nations communities across the country. Despite sharing overlapping responsibilities with provinces (e.g., child welfare, education, and policing), Canada's federal government has fiduciary responsibility under nation-to-nation relationships with First Nations peoples.

Furthermore, it has the capacity to fund and support the delivery of the comprehensive infrastructure needed. As the federal government has already demonstrated through investments in non-Indigenous municipalities, regions, and publicly owned assets across Canada, investing in infrastructure spurs immediate economic growth and builds long-term capacity to increase productivity and support innovation.

Finally, the federal government has a crucial role in enabling First Nations self-governance and self-determination in accord with the calls to actions and recommendations made. Infrastructure deficits (e.g., overcrowded housing, underperforming utilities, inadequate healthcare) made COVID-19's impact far more severe on First Nations communities. Moreover, the pandemic reduced economic opportunity and pushed critical healthcare infrastructure beyond its limits. Despite this, First Nations peoples received a small share of Canada's COVID-19 economic response plan.

This proposal therefore is a key element in delivering a post-pandemic recovery plan tailored to the needs of the First Nations community as a whole.[7]



[7] Gillies, P. (2020). Industry Perspectives Op-Ed: Post COVID-19 and the case for infrastructure investment. Daily Commercial News. Retrieved from https://canada.constructconnect.com/dcn/news/government/2020/06/industry-perspectives-op-ed-post-covid-19-and-the-case-for-infrastructure-investment

Expected Impacts

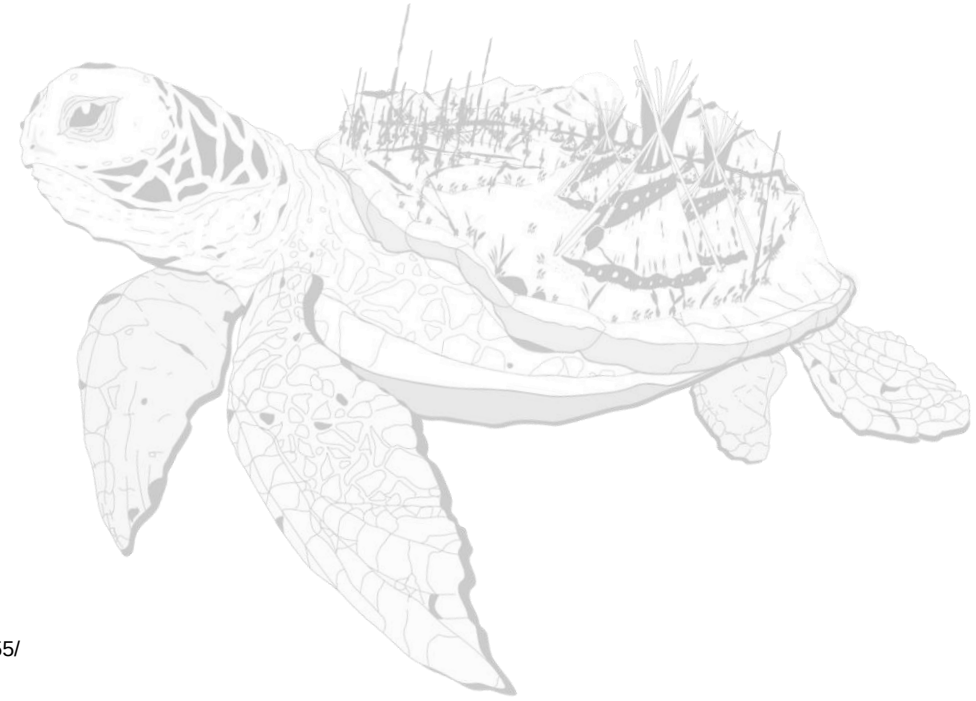
The socioeconomic benefits of access to essential infrastructure services and properly maintained community infrastructure facilities are well documented.[8] Benefits range from employment created by construction and maintenance to improving the quality of life for citizens, supporting local businesses, and connecting local economic activities to other regions and markets.

Numerous First Nations communities face connectivity challenges as many are in rural areas with seasonal roads or a complete lack of road infrastructure. Improved connectivity and trade corridors will enable First Nations to participate in the larger Canadian economy and build long-term economic growth coast to coast. Digital connectivity is also a key infrastructure need to address; technology such as virtual schooling, online business, and digitally connected healthcare services rely on physical telecommunications infrastructure to function.

Well-implemented infrastructure assets can help conserve natural resources and mitigate the impacts of climate change. For example, replacing existing diesel power facilities, many of which are still used in First Nations communities, with clean energy generation infrastructure will reduce GHG emissions and stimulate the adoption of renewable energy technology.

Affordable, plentiful and climate resilient housing; access to clean drinking water; improved educational facilities; connected digital and transportation networks; and sustainable energy sources; all work together to improve community well-being. Sustainable infrastructure also enables further preservation of First Nation traditions and cultures which strengthens families.

As part of CTIG 2030, the Assembly of First Nations and Indigenous Services Canada will co-develop annual reports to monitor the improvements to those social indicators and socio-economic outcomes noted above.



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

Domain	Indicator	Rationale	Who is impacted
Prosperity	Acceptable housing	Housing was selected as an indicator due to the proposal and cost report including costs for new housing, on-reserve migration, and to renovate deteriorating housing stock to reduce First Nations overcrowding and resolve homelessness issues	On and off reserve First Nations / Homeless and Shelter Reliant First Nations
	Employment	Employment was selected as an indicator due to large amount of job opportunities that would be created both on and off reserve to Close the Infrastructure Gap by 2030 as defined in this report	First Nations and non-Indigenous persons and businesses
	Access to broadband	The digital infrastructure gap is estimated at $3.3 billion and of the 748 First Nations communities studied in this report, 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.	First Nations in rural and remote areas. Students, Medical Staff, First Nations Emergency Responders
	Financial well-being	The year-to-year lack of sustainable and adequate investment in First Nation communities has caused intergenerational disadvantages for Canada's First Peoples and widened both the infrastructure and socioeconomic gap between First Nations and the rest of Canada. This proposal supports the co-development of innovative fundings streams so First Nations can have more efficient access to funds announced in annual federal budgets.	First Nations Governments

Domain	Indicator	Rationale	Who is impacted
Health	Unmet health care needs	First Nations peoples often find it difficult to access appropriate mainstream primary health care services. The infrastructure and digital connectivity investments identified in this report allow First Nations to build critical medical facilities and support their proper operation on dependent internet-based medical software.	Persons with Disabilities, Elders, and Senior Citizens, Vulnerable Persons
	Children vulnerable in early development	Inadequate housing, lack of community infrastructure, and diminished educational and economic opportunities in First Nations communities, especially on-reserve, are systemic Canadian social issues contributing to the over-representation of Indigenous children in public care. This proposal seeks solutions and investments in essential community services like daycares, teacherages, and schools on reserve.	First Nation Youth
	Home care needs met	Addressing the gaps and eliminating these issues will enable First Nations to accommodate projected population growth, as well as prepare for on-reserve migrations for First Nations who wish to return home after years of separation from their community and culture. Many First Nation senior citizens are forced to move away from their community to seek adequate elder or palliative care.	First Nations Elders, Senior Citizens

Domain	Indicator	Rationale	Who is impacted
Environment	Clean drinking water	Drinking water supplies face a variety of pressures ranging from aging and deteriorating infrastructure and equipment in networked or decentralized systems, deterioration of source waters from natural events or other water users and interested parties, or growth and drought related pressures on water supplies. This report looks at long-term and short-term drinking water advisories that currently persist in First Nation communities.	First Nations lacking Safe Drinking Water
	Climate change adaptation	Climate change adaptation is integral to the management of First Nation assets and constitutes an important element of strategically Closing the Infrastructure Gap by 2030 while protecting federal investments. First Nation infrastructure is currently exposed to environmental hazards, and this exposure will increase over the coming decade, and likely escalate rapidly thereafter.	First Nations in Wildland Urban Interface, First Nations situated on Permafrost, First Nations near water bodies, First Nations in vulnerable locations due to Climate Change
	Greenhouse gas emissions	The need to reduce the carbon emitted by existing federally funded infrastructure and prepare new facilities on First Nation lands for net-zero capacity is an immediate starting point to deliver on the Canadian Net-Zero Emissions Accountability Act. This report looks at the critical steps to be taken so First Nations can embark on Canada's net-zero future.	First Nations
	Waste management	Many community wastewater treatment systems in First Nation communities are coming to the end-of-life operating conditions and are in need of immediate replacement. This report looks at the replacement, upgrading, and new build costs for new wastewater systems.	First Nations

Domain	Indicator	Rationale	Who is impacted
Good Governance[9]	Indigenous self-determination	Transfer of Service: The transition process from federal infrastructure and housing programming to First Nations care, control and management of infrastructure requires dedicated financial resources that include designing, developing and implementing regional and local strategies and plans.	First Nation Governments
	Discrimination and unfair treatment	First Nations currently face endemic levels of discrimination in Canada's healthcare system. This report looks to provide funds for on-reserve medical clinics and broadband to connect them for proper functionality to medical software systems.	Vulnerable Persons, First Nations in need of palliative care
	Confidence in public institutions	Trust between First Nations, federal, provincial, and territorial governments can create space for good faith negotiations, cooperation, innovation, and shared achievements. With decades of unfulfilled fiduciary obligations and legal requirements, First Nations still await the Government of Canada to fulfill its publicly made commitments to remedy years of under-invested First Nation infrastructure.	First Nations
	Representation in corrections and custodial population	The incarceration numbers for Indigenous people are worsening year by year. Indigenous inmates in federal institutions rose from 20 per cent of the total inmate population in 2008-2009 to 28 per cent in 2017-2018, even though Indigenous people represented only 4.1 per cent of the overall Canadian population (Department of Justice Canada, 2018).	Indigenous youth, specifically female youth (12 to 17 years)

[9] Impacts that accrue outside of Canada should be reflected in this domain under the Canada's place in the world indicator, unless they will contribute to quality of life outcomes in Canada, as measured by framework indicators

Domain	Indicator	Rationale	Who is impacted
Society	Participation in cultural or religious practices, recreation or sport	Many First Nations, especially youth, lack adequate access to recreational facilities – this proposal identified needs for infrastructure assets related to: arenas, recreation/cultural centres, and youth centres.	First Nations Youth (1-19) and Young Adults
	Sense of belonging to local community	The majority of First Nations move away from their home communities to live in nearby municipalities due to better social amenity spaces, better job opportunities, and economic development. This proposal seeks to develop these essential capabilities with First Nations communities for long-term and sustainable socioeconomic prosperity.	First Nations
	Indigenous languages	This proposal identifies the investment needs for First Nations teacherages and schools which will allow First Nations to preserve and teach their languages in their own educational facilities.	Students
	Accessible environments	A 2014 report entitled Expanding the Circle: Aboriginal People with Disabilities Know their Rights states that, “Due to the intersectional impact of aboriginal status and disability status, this disproportionately large population of aboriginal Canadians with disabilities faces massive barriers and challenges in accessing appropriate educational opportunities, accessible transportation, housing, support services, employment, recreation, and cultural opportunities.”	Persons with Disabilities, Senior Citizens

Expected Sustainability Impacts

New and revitalized infrastructure offers an opportunity to improve sustainability across Canada and efficiencies between asset renewal, mitigation, and accessibility should be applied to the development of First Nations communities.

Achieving net-zero carbon emissions is a critical aspect of this sustainable future. Improved mechanical and electrical systems will reduce energy consumption in First Nations community infrastructure; extend the lifespan of assets; and reduce carbon emissions from the use of fossil fuels for electricity generation and heat. Reliable and sustainable funding, coupled with infrastructure development and operations planning for multiple classes of infrastructure will increase employment, while decreasing custodial and life-cycle costs. Improvements to deteriorating water and wastewater systems will provide an immediate benefit to First Nations community health. The application of accessible design principles will assist those who have disabilities to remain on-reserve rather than having to move away from their community.

Closing the Infrastructure Gap is an effective demonstration of Canada's leadership to the global community by integrating First Nations investment, infrastructure development, and sustainability.
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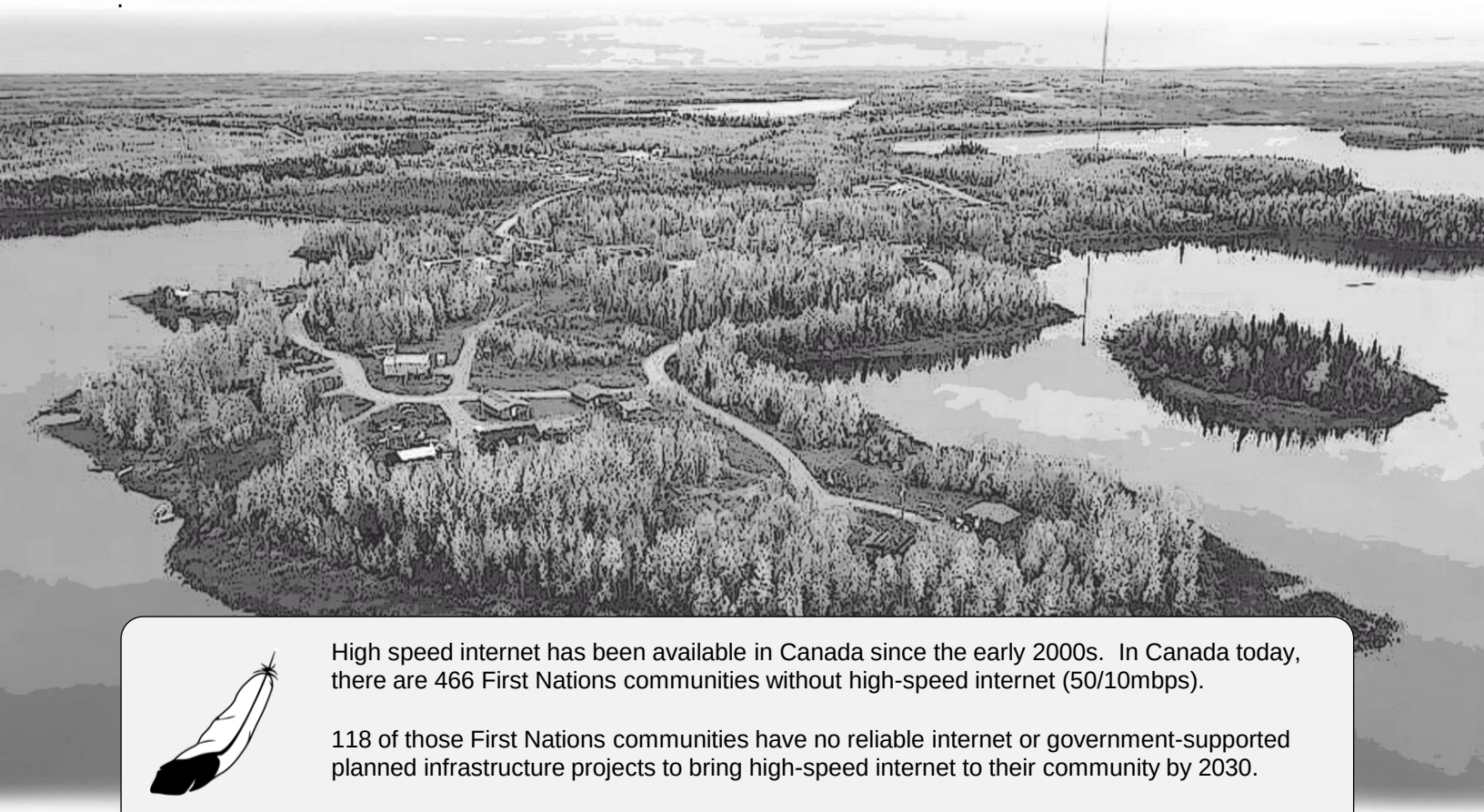


High speed internet has been available in Canada since the early 2000s. In Canada today, there are 466 First Nations communities without high-speed internet (50/10mbps).

118 of those First Nations communities have no reliable internet or government-supported planned infrastructure projects to bring high-speed internet to their community by 2030.

That means no virtual schooling, no virtual businesses, poorly functioning health facilities, and a loss of First Nation participation in the digital world and economy.

Expected Resiliency Impacts

The changing climate has, and will continue to have, a major impact on First Nations assets. Flooding, fire, drought, and severe weather collectively present a significant threat to the resilience of First Nation communities. This threat exists now, and will increase over time, resulting in an escalating potential for the displacement of citizens and disruption to their lives.

Reliable and sustainable funding will enable First Nations to plan, retrofit, and design new assets to adapt to a changing climate. Adaptation will bring increased costs to build and maintain resiliency across all categories of assets. Costs to First Nations with infrastructure in more vulnerable and remote locations are likely to be higher due to construction and shipping premiums in these regions.

In addition to protecting communities, investment in First Nations climate resiliency will promote the reduction of carbon emissions while boosting economic growth. CTIG 2030 will elevate Canada's global profile for leadership in integrating First Nations investment, infrastructure development, climate resilience and economic growth.

The 2021 Census counted 1,048,405 First Nations people living in Canada. Among status First Nations people, only 40.6% lived on reserve in 2021 (StatsCan). Elders in rural and remote communities typically must move hundreds of kilometers away from their First Nation and family to find suitable long-term care homes. There is an urgent need for essential community infrastructure services, so First Nations can remain or migrate back to their home communities.

Expected Regional and Sectoral Impacts

The scale of this proposal has impacts for First Nations across Canada and all provincial economies. CTIG 2030 involves detailed planning to deliver infrastructure projects where they are needed, in a sustainable and reliable manner, within a realistic and appropriate timeframe.

Across Canada, provinces have unique local construction economies that are driven by labour, access to supply chains, regulatory compliance requirements, and many other factors. Understanding these markets and their capacity for new investment is crucial to planning new projects that can be readily delivered by the local construction market.

The diagram on the following page outlines proposed CTIG 2030 investment by Canadian regions. The allocation includes investment needs for developing Infrastructure, Housing, Education facilities, Direct Asks to ISC from First Nations, addressing Drinking Water Advisories, providing All-Season Roads Access, Climate Change Adaptation, Net Zero Measures, Broadband Connectivity, and Accessibility needs.

The figures for the regional breakdown are preliminary and based on several factors. For Housing, the largest asset class, the distribution is based on the need identified in the study performed for the AFN. This study accounts for upgrades for population growth and migration between on- and off-reserve communities under the responsibility of ISC. The representation of Yukon and NWT First Nations is considered to be limited in the ISC data used in the Asset Needs Study. However, the CTIG 2030 analysis has made allowances for investment in infrastructure for First Nations in these territories. For the other asset categories, First Nations population in each region is the main variable used to distribute the investment. The number of communities is also used to balance the population data allowing for additional funding for regions with smaller communities. Lastly, a factor for Northern regions has been included as these areas are subject to more challenging climatic conditions.

Closing the Infrastructure Gap is a monumental undertaking that incorporates a wealth of inputs from a wide range of stakeholders. In addition to the various factors we have applied, it is important to note that this proposed distribution may change over time as new data and more detailed information become available. Improvements to data could come from increased survey participation, a better understanding of infrastructure need, and more detailed asset management plans becoming available. These improvements could then be used to refine this distribution model and ensure an equitable and collaborative approach is taken to Closing the Infrastructure Gap.

The regional distribution of CTIG investment is outlined on the following page. Please note that we have referenced the following sources of information in the development of this diagram:

- Statistics Canada. Table 17-10-0144-01 Projected population by Indigenous identity, age group, sex, area of residence, provinces and territories, and projection scenario, Canada (x 1,000)
- First Nation Profiles. https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Index

For additional information, please refer to Annex 1: Cost Report.

Closing the Infrastructure Gap: Estimated Regional Distribution

Northwest Territories
CTIG Capital Investment: **$14.7 billion**
CTIG O&M Investment: **$3.1 billion**
First Nations Communities: **26**

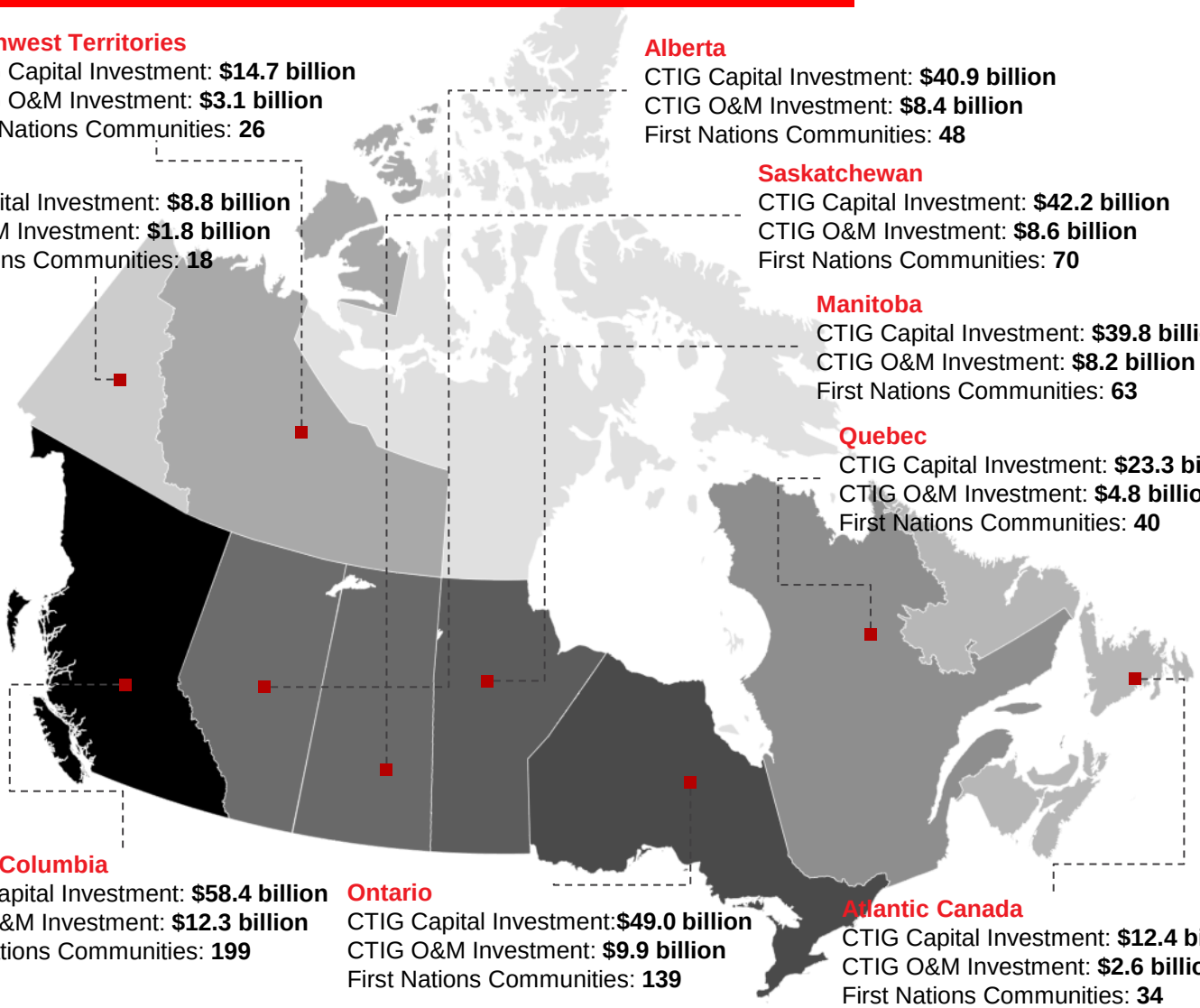
Alberta
CTIG Capital Investment: **$40.9 billion**
CTIG O&M Investment: **$8.4 billion**
First Nations Communities: **48**

Yukon
CTIG Capital Investment: **$8.8 billion**
CTIG O&M Investment: **$1.8 billion**
First Nations Communities: **18**

Saskatchewan
CTIG Capital Investment: **$42.2 billion**
CTIG O&M Investment: **$8.6 billion**
First Nations Communities: **70**

Manitoba
CTIG Capital Investment: **$39.8 billion**
CTIG O&M Investment: **$8.2 billion**
First Nations Communities: **63**

Quebec
CTIG Capital Investment: **$23.3 billion**
CTIG O&M Investment: **$4.8 billion**
First Nations Communities: **40**



British Columbia
CTIG Capital Investment: **$58.4 billion**
CTIG O&M Investment: **$12.3 billion**
First Nations Communities: **199**

Ontario
CTIG Capital Investment:**$49.0 billion**
CTIG O&M Investment: **$9.9 billion**
First Nations Communities: **139**

Atlantic Canada
CTIG Capital Investment: **$12.4 billion**
CTIG O&M Investment: **$2.6 billion**
First Nations Communities: **34**

Region	First Nations Population On-Reserve	Zone 1 Communities	Zone 2 Communities	Zone 3 Communities	Zone 4 Communities	Subtotals
Atlantic	21,625	22	11	0	1	34
Quebec	42,755	17	11	6	6	40
Ontario	59,390	45	60	1	33	139
Manitoba	65,030	5	39	0	19	63
Saskatchewan	56,525	10	55	2	3	70
Alberta	59,437	22	23	0	3	48
BC	87,500	79	78	11	31	199
Yukon	3,300	2	9	6	1	18
NWT	9,300	6	6	1	13	26
Totals	**404,862**	**208**	**292**	**27**	**110**	**637**

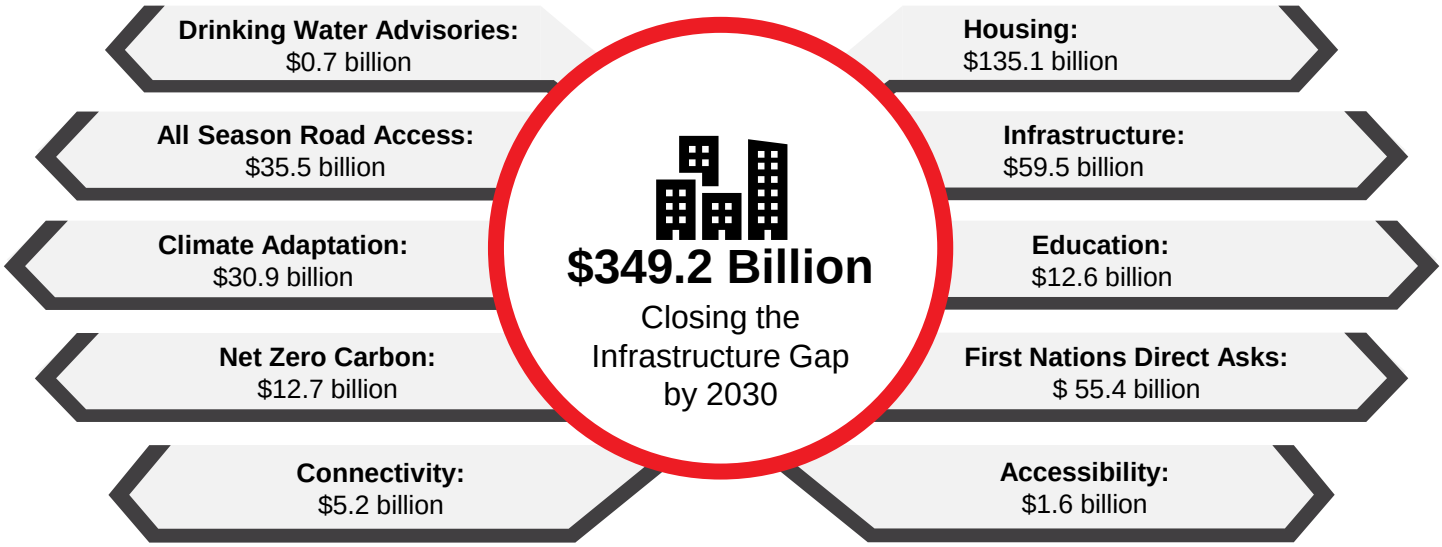
Costing

The federal government investments called for in this proposal are supported by a fully substantiated cost report which draws from a significant pool of data from AFN technical studies, First Nations engagement reports, and decades worth of archived information from ISC. Several of these studies include:

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

The AFN, as directed by the First Nations-In-Assembly, engaged industry experts to utilize this research to estimate the infrastructure needs and sustain it for future generations of First Nations. The full costing report is included as part of **Annex 1: Proposal Costing**.

The following chart and table provide a summary of the funding requirements for the fiscal years 2023-2024 to 2029-2030 to satisfy the time requirements of the Closing the Infrastructure Gap mandate.



SUMMARY OF FUNDING REQUIREMENTS

The following table provides a summary of the funding requirements for the fiscal years 2023-2024 to 2029-2030 to help satisfy the requirements of the Closing the Infrastructure Gap program and includes the need from 2023-2030.

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Housing								
Total Capital Cost	$8,096	$12,749	$17,680	$18,210	$18,756	$19,319	$19,899	$114,709
Total O&M	$1,890	$ 2,448	$ 3,028	$ 3,118	$ 3,211	$ 3,308	$ 3,407	$ 20,410
Housing Subtotal	**$9,986**	**$15,197**	**$20,708**	**$21,328**	**$21,967**	**$22,627**	**$23,306**	**$135,119**
Education								
Total Capital Cost	$ 564	$ 888	$ 1,231	$ 1,268	$ 1,306	$ 1,346	$ 1,386	$ 7,989
Total O&M	$ 325	$ 513	$ 711	$ 733	$ 755	$ 778	$ 801	$ 4,616
Education Subtotal	**$ 889**	**$ 1,401**	**$ 1,942**	**$ 2,001**	**$ 2,061**	**$ 2,124**	**$ 2,187**	**$ 12,605**
Infrastructure								
Total Capital Cost	$2,678	$ 4,219	$ 5,850	$ 6,026	$ 6,207	$ 6,393	$ 6,585	$ 37,958
Total O&M	$1,521	$ 2,395	$ 3,321	$ 3,421	$ 3,523	$ 3,629	$ 3,738	$ 21,548
Infrastructure Subtotal	**$4,199**	**$ 6,614**	**$ 9,171**	**$ 9,447**	**$ 9,730**	**$10,022**	**$10,323**	**$ 59,506**
SUB-TOTAL	**$15,074**	**$23,212**	**$31,821**	**$32,776**	**$33,758**	**$34,773**	**$35,816**	**$207,230**
Connectivity								
Total Capital Cost	$ 367	$ 579	$ 802	$ 826	$ 850	$ 876	$ 902	$ 5,202
Connectivity Subtotal	**$ 367**	**$ 579**	**$ 802**	**$ 826**	**$ 850**	**$ 876**	**$ 902**	**$ 5,202**
All-Season Road Access								
Total Capital Cost	$ 2,056	$ 3,238	$ 4,489	$ 4,624	$ 4,763	$ 4,906	$ 5,053	$ 29,128
Total O&M	$ 449	$ 708	$ 981	$ 1,011	$ 1,041	$ 1,073	$ 1,105	$ 6,368
All-Season Roads Total	**$ 2,505**	**$ 3,946**	**$ 5,470**	**$ 5,635**	**$ 5,804**	**$ 5,979**	**$ 6,158**	**$ 35,496**
Climate Adaptation								
Total Capital Cost	$ 1,726	$ 2,718	$ 3,769	$ 3,882	$ 3,998	$ 4,118	$ 4,242	$ 24,452
Total O&M	$ 458	$ 720	$ 999	$ 1,029	$ 1,060	$ 1,092	$ 1,124	$ 6,482
Climate Adaptation Subtotal	**$ 2,184**	**$ 3,438**	**$ 4,768**	**$ 4,911**	**$ 5,058**	**$ 5,210**	**$ 5,366**	**$ 30,934**

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Net Zero								
Total Capital Cost	$ 897	$ 1,413	$ 1,959	$ 2,018	$ 2,079	$ 2,141	$ 2,205	$ 12,712
Net Zero Subtotal	**$ 897**	**$ 1,413**	**$ 1,959**	**$ 2,018**	**$ 2,079**	**$ 2,141**	**$ 2,205**	**$ 12,712**
Drinking Water Advisory								
Total Capital Cost	$ 19	$ 30	$ 42	$ 43	$ 45	$ 46	$ 47	$ 272
Total O&M	$ 28	$ 45	$ 62	$ 64	$ 66	$ 68	$ 70	$ 403
Drinking Water Advisory Subtotal	**$ 47**	**$ 75**	**$ 104**	**$ 107**	**$ 111**	**$ 114**	**$ 117**	**$ 675**
Accessibility								
Total Capital Cost	$ 112	$ 177	$ 245	$ 252	$ 260	$ 268	$ 276	$ 1,590
Accessibility Subtotal	**$ 112**	**$ 177**	**$ 245**	**$ 252**	**$ 260**	**$ 268**	**$ 276**	**$ 1,590**
First Nations Direct Asks								
Total Capital Cost	$ 3,907	$ 6,154	$ 8,534	$ 8,790	$ 9,053	$ 9,325	$ 9,605	$ 55,368
First Nations Direct Ask Subtotal	**$ 3,907**	**$ 6,154**	**$ 8,534**	**$ 8,790**	**$ 9,053**	**$ 9,325**	**$ 9,605**	**$ 55,368**
TOTAL FUNDING	**$25,093**	**$38,993**	**$53,703**	**$55,315**	**$56,973**	**$58,685**	**$60,444**	**$349,206**

SEE ANNEX 1 – COST REPORT FOR FURTHER DETAILS

In addition to conducting a costing review of the information provided from previous technical studies, First Nations community requests and ISC data records, the costing report methodology also took the following considerations into account:

- **Regional Factors:** Construction costs in Canada vary by region, it is necessary to aggregate data by region to understand the context in which the work will be done. Despite the vastness of Canada, the degree of variation among regions is relatively modest, but still warrants cost adjustments.

- **Zonal Factors:** The zones are based on Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC) geographical zone classifications for community remoteness. These include G1 Urban Area, G2 Rural Area, G3 Remote Area, G4 Special Access Area.

- **Contingency Amounts:** Based on current best practice, the costing report calculated the three standard types of contingencies Design Contingency, Construction Contingency and Escalation Contingency.

Scalability / Alternative Options / Reallocation

The Federal Government has a fiduciary responsibility for funding agreements with First Nations. Its primary responsibility is to make investments that will enable greater First Nations access to affordable housing, healthcare, education, transportation, telecommunications, water and wastewater, and recreational infrastructure.

The scalability of this proposal spans 634 First Nations communities in various geographic regions across Canada. It is a comprehensive approach that has accounted for the needs of 570 First Nations as demand on existing inadequate infrastructure grows..

Through First Nations-led engagement, funding will be scaled according to the size and urgency of the need. For example, much of the existing First Nations infrastructure is in dire need of maintenance and repair. A portion of the funding request in this proposal will be scaled to meet that specific need as it is an immediate priority to maintain current service levels.

There will be a significant impact on expected outcomes if the proposal is funded at an amount lower than requested. Without these funds, infrastructure that First Nation communities across the country depend on will continue to deteriorate at an alarming pace. Without this investment, the health, safety, and community infrastructure of First Nations will be in worse condition with each passing year. And the costs to bring these essential services to First Nations will only increase.

As part of CTIG 2030, alternative delivery options include:

- An immediate funding package to address maintenance and improvements to existing First Nations infrastructure assets. This plan would include an evaluation of all critical infrastructure that could be remediated, with appropriate funding, in the next 1 – 3 years;
- Approval of funding to create an annual infrastructure management plan. This plan, created in collaboration industry experts, will identify the annual funding needs to Close the Infrastructure Gaps and provide insight into assets that are needed, locations that have the capacity to deliver these projects, and outline the distribution between new buildings and renovation of existing facilities.

There are multiple potential avenues for raising funds such as natural resource sharing, resource exports taxation and/or levies, the Clean Water and Wastewater Fund, the Disaster Mitigation and Adaptation Fund, the Gas Tax Fund, and the Canada Infrastructure Bank. *(Overview of Canada's Long-term Infrastructure Plan, Background Paper, Library of Parliament)*

INVESTMENT NOW WILL GENERATE LONG-TERM BENEFITS

Improved socioeconomic outcomes are expected from appropriate and sustained investment in First Nations infrastructure have multiple beneficial impacts. These include increased capacity for infrastructure to serve the unique needs of First Nations and granting wider access to healthcare, housing, justice, and other social assistance services. Such positive societal outcomes will serve to promote better educational and employment opportunities for First Nations – leading to a boost to First Nation economic growth. The majority of First Nations throughout Canada still have an insufficient water supply which impedes their economic development capacity as they are unable to build the most basic multi-residential or commercial developments since they lack the appropriate infrastructure to provide the facility's fire sprinkler system, electricity, or proper sanitary waste management.

In 2011, 44% of foster care children in Canada were Indigenous. The recent 2021 census data indicates that this number has grown to 53.8%. Inadequate housing, lack of community infrastructure, and diminished educational and economic opportunities in First Nations communities, especially on-reserve, are systemic Canadian social issues contributing to the over-representation of Indigenous children in public care

Implementation

CTIG 2030's implementation will generate opportunities for local First Nations communities, local businesses, and the wider construction industry sector from coast to coast. It will also drive Canadian innovation in developing one of the country's largest infrastructure asset management initiatives, incorporating and actualizing First Nations capacity building and economic development policy imperatives, and implementing a comprehensive viable shared path to meeting Net-Zero commitments in asset delivery and operations.

The current "firefighting" and "patchwork" approach of approving funding on a project-by-project basis must be replaced with a sustainable program perspective supported through long-term community planning with reliable funding commitments. The First Nations Asset Management Framework is structured around a First Nations-led approach that encompasses a holistic view of infrastructure asset delivery and management.

IMPLEMENTATION OBJECTIVES

Enable First Nations to Develop and Administer Community Asset Management Plans

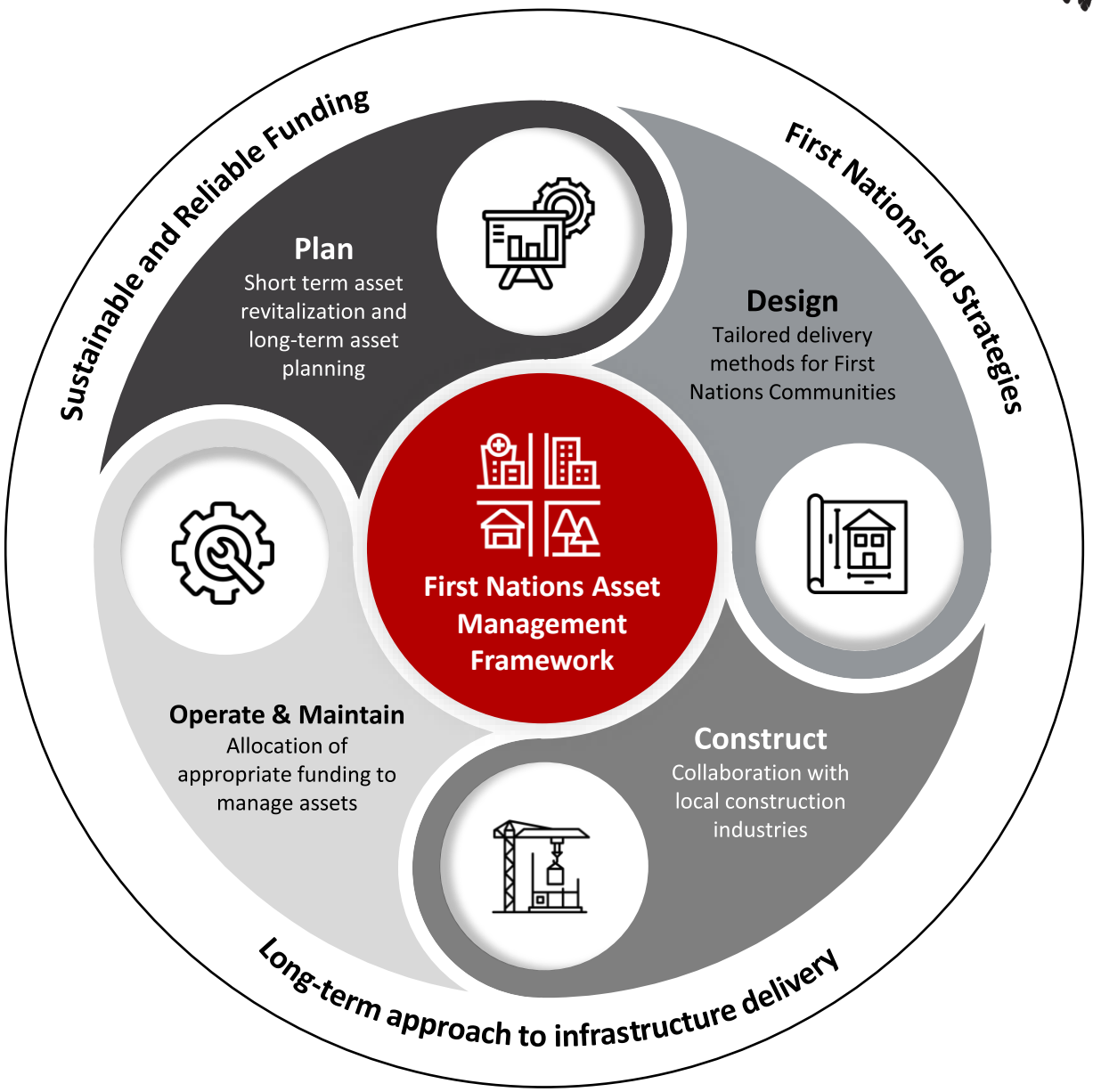
The implementation of CTIG 2030 funding must support asset management and long-term community planning at the local First Nations level. This objective is critical for:

- Ensuring the unique needs and priorities of all First Nations are adequately addressed.
- Securing the best value-for-money by ensuring appropriate operation and maintenance funding allocations are given to First Nations and enable First Nations community assets to reach their full-service life.
- Implementing effective program delivery and risk management mechanisms for the maintenance of aging or deteriorating assets over time, and seamless upgrades or replacement of infrastructure.
- Requiring infrastructure deficiencies be addressed in a holistic and multi-sector approach which will inform First Nations planning decisions (e.g., ensuring adequate utilities infrastructure is in place before new housing is constructed).

- Changing the course of First Nations infrastructure management from stop-gap projects to a planning system which is responsive to sustainable infrastructure management requirements, specifically incorporating operating and capital decisions in support of long-term financial planning.

- Empowering First Nations to establish their own levels of service and selecting the solution that best meets their objectives.

- Enabling First Nations to pursue training and capacity development, including utilizing asset management hubs.



The inadequate current approach to approving funding on a project-by-project basis is not designed to develop and support healthy, sustainable communities. This approach diminishes the potential to realize socioeconomic benefits, the real return on funding, by incentivizing short-term and *ineffective resolutions* rather than long-term, reliable cross-sector *effective solutions*. Without providing operations and maintenance funding, this approach also fails to help First Nations maximize their asset's full lifecycle, further eroding Canada's "return on investment" in infrastructure. This must be replaced with a sustainable program perspective and should be supported through long-term community planning with reliable funding.

CTIG 2030 will ensure First Nations have the agency, resources, and tools to undertake capital planning, prioritize each First Nations unique needs, understand their community's constraints, build capacity within First Nations, and identify the most effective approach to addressing deficiencies and implementing climate adaptations through their First Nations Asset Management Plan.

Reliable and Sustainable Funding Plan

The development of a reliable funding plan is a key component of CTIG 2030. This will enable First Nations as well as industry participants to better plan for short, medium and long-term social, environmental, and economic objectives and align these actions with the infrastructure needs of First Nations. Without reliable funding, it will be challenging to create a consistent infrastructure development and management strategy that First Nations and industry partners can confidently commit to and support.

Invest in First Nations Capacity and Human Capital Development

First Nations-led planning is core to Canada's responsibilities under the TRCC Report's Calls to Action. CTIG 2030 will invest in providing First Nations knowledge, training, and tools to develop and administer long-term community land-use planning, determine prioritization for addressing infrastructure needs, and how to effectively operate and maintain infrastructure assets over their maximum lifecycle. This training will enable First Nations to effectively plan and manage their infrastructure assets, including housing.

Including First Nations' economic development provisions in program delivery will enable new and expanded productivity gains. This will directly improve the socioeconomic outcomes of CTIG 2030 and unlock additional economic growth for local businesses which drive Canada's GDP.

Address Deficiencies Backlog & Fast-Track Shovel Ready Projects

As detailed in the enclosed costing report, CTIG 2030 has identified an infrastructure deficiencies backlog in housing, education, healthcare, transportation, connectivity, utilities, and emergency services totaling $246 billion, substantiated by industry consultants, numerous AFN technical studies and decades of ISC data records. Many projects are shovel-ready and can be fast-tracked once funding is approved. Delaying reliable funding will result in increased future costs which have the potential to be much greater than the costs that have been identified in this proposal.

Improve Competitiveness of Procuring and Delivering First Nations Infrastructure

At present, projects for First Nations communities face greater procurement challenges than non-Indigenous communities which results in a lack of engagement with industry. This is due to the remote nature of many communities as well as higher bonding and other procurement restrictions on First Nations projects. Enabling First Nations to create innovative procurement strategies will increase engagement; expedite approvals; foster private sector competition; and remove barriers such as bid bonds, performance bonds, minimum number of tenders, etc., enabling critical projects to be delivered quickly and at a more competitive cost.

CTIG 2030 will optimize the planning and procurement process for delivering construction works in First Nations communities by improving competitiveness, identifying opportunities to expedite approvals, and revamping tendering policies.

Convene Communities of Practice with First Nations, Industry & Public Sector

Bringing together First Nations, industry and government in Communities of Practice (or other similar formats, such as Knowledge Networks) will enable shared approaches to CTIG 2030. Communities of Practice comprise people and organizations who have distinct backgrounds and capabilities but share common concerns or challenges that require collaboration. This format of convening enables the development of best practices and creates new shared knowledge.

CTIG 2030 Communities of Practice will provide ongoing standardization, derived from capable First Nations authorities. This will create lessons learned and delivery improvements, while also providing opportunities to develop models for community benefit agreements, provisions for local economic development and jobs creation, innovations in asset funding and revenue generation, and more.

Help Canada Achieve its Net-Zero Commitments Through First Nations-led Initiatives

All paths to a Net-Zero future for Canada go through the traditional lands and territories of First Nations peoples, from coast to coast. To meet Net-Zero commitments by 2050, Canada needs to ensure First Nation infrastructure is efficient and green, in keeping with the transformation of non-Indigenous infrastructure elsewhere. CTIG 2030 will ensure First Nation assets provide the foundation necessary to reduce carbon emissions produced by their operation thereby ensuring First Nations people can make a meaningful contribution to the fight against climate change in keeping with their values.

CTIG 2030 is the cornerstone of Canada's ambitions for a sustainable, low-carbon, and resilient future. A shared viable path to a prosperous Net-Zero Canada relies on Closing the Infrastructure Gap and investing in maintaining resilient infrastructure in Fist Nations communities.

IMPLEMENTATION OBJECTIVES

Given the wide range of size, complexity, and asset types that CTIG 2030 encompasses, the program needs to utilize best practices for construction procurement in Canada while taking into account the unique needs and priorities of First Nations. In addition to understanding project specifications and costs, CTIG 2030 will need to match projects to procurement methods best suited to achieve budget, schedule, and risk management objectives. This table summarizes the main procurement methods that could be used to deliver projects as part of CTIG 2030, as well as their corresponding benefits and use considerations. These will be further refined as part of the First Nations Asset Management Framework.

Procurement Method: General Contractor/Design-Bid-Build

Features

- A Prime Consultant is appointed to manage the design according to the Owner's required scope of work
- Standard contracts are administered by the Canadian Construction Documents Committee CCDC

Benefits

- Cost reporting; simplified to one lump sum price
- Design is totally complete before bidding
- Owner perceives competitive bid process achieves lowest price
- Design team stays on to serve as construction administrator

Use Considerations

- High risk of legal claims and change orders
- Owner does not receive all savings that result during the project
- Detailed plans must be complete prior to bidding
- Lump sum bids can come in high because of incomplete design
- Delivery method is typically longest in duration and not suited to fast-track scheduling
- Required changes are not competitively priced and all changes may impact schedule

Procurement Method: Design-Build

Features

- Contract between the Owner and the Design-Builder where the Design-Builder provides the Design Services and performs the Work under one agreement, for a single, pre-determined stipulated or fixed price
- Standard contracts are administered by the Canadian Construction Documents Committee CCDC

Benefits

- Single point of accountability between design and construction
- Design and construction aligned with the Owners goals
- Method proven to work for both simple and complex projects
- Owners removed from potential conflicts between designer and builder
- Design-Builder is responsible for design mistakes (omissions)
- Facilitates fast track project delivery
- Fewer change orders due to integrated project delivery
- Early GMP facilitates alternative financing methods
- GMP guarantees Owner budget
- Less risk to Owner
- Functional Guarantee

Use Considerations

- Owner gives up some control over the project
- Owner does not have direct control of Design Team
- Owner needs to clearly define the project purpose and goals through performance-based criteria during procurement (RFP)
- Selecting appropriate design-build partner is critical

Procurement Method: Construction Manager at Risk

Features

- Construction Manager (CM) is engaged early on during design
- Standard contracts administered by the Canadian Construction Documents Committee CCDC

Benefits

- CM provides early input on estimating, scheduling, constructability, value planning and logistics
- CM procures long lead items during design to maintain or compress schedule
- Facilitates fast-track project delivery
- Produces less change orders and schedule delays than Design-Bid-Build
- Early resource identification and designation to enhance quality, maintain schedule
- Guaranteed Maximum Price (GMP) option guarantees Owner budget
- CM procures subcontractor/manages all risk
- Single source of accountability throughout construction

Use Considerations

- Adds another coordination point during design
- Potential for adversarial relationships
- GMP is still based on the plans and specifications at the time of the conversion
- Owner remains financially liable for exclusions and inconsistencies
- Timing of conversion impacts achieving best value and risk transfer

Procurement Method: Public-Private Partnerships (PPPs)

Features

- The Authority or Owner determines the scope and budget of the project and runs a competitive process to engage an integrated consortium referred to as “Project Co” under one fixed-price contract
- Contracts can be Build-Finance, Design-Build-Finance, Design-Build-Finance-Maintain, and Design-Build-Finance-Maintain-Operate
- Depending on project scope, Project Co may include architects, contractors, lenders and financial institutions, and maintenance and operation providers

Benefits

- Used to deliver large, complex infrastructure or to deliver multiple infrastructure facilities and services across a region
- Project Co. finances the upfront cost of design and completion of construction
- Authority or Owner will pay only after substantial completion, or if the project has an operations component, then owner will make availability payments based on the contract term
- Risk allocated to party best suited to manage it
- Construction schedule and cost overruns are the responsibility of Project Co.

Use Considerations

- Instead of specifying exactly what must be built, a government will provide the outputs it is looking for from the asset, encouraging private-sector innovation to provide the best solutions
- Risks and parties responsible for risks must be clearly defined
- Characteristics of project size, contract term, new-build vs. refurbishment, degree of risk transfer and market capacity all play a part in viability of PPPs

Procurement Method: Alliance Model

Features

- Collaborative approach to infrastructure development with a multi-stage request for qualifications (RFQ) process
- Behavioural evaluation of proponents to determine entities with the “best fit” for the Owner
- Successful and unsuccessful proponents receive partial compensation
- Multi-party contract with very limited avenues for legal action between party members
- Pain-share/gain-share provisions to incentivize on-time and on-budget project delivery

Benefits

- Risk is structured to be shared amongst the party members
- Incentivizes collaboration and efficiency through gain sharing structure
- Participants waive rights to legal action against other party members, eliminating the need for costly claims

Use Considerations

- Best suited for complex projects where the scope is difficult to define, risks cannot be adequately defined or measured, or the cost of transferring risk to the contractor is too high
- Limited industry knowledge and expertise in Canada for this model

Procurement Method: Alternative Asset Partnerships

Features

- Asset partnerships are geared toward municipalities needing new infrastructure while maintaining ownership and control of revenue and rates over the long-term
- 50/50 partnership joint venture between municipality and private sector team to develop, capitalize and deliver the project

Benefits

- Suitable for rate-based infrastructure such as utilities, water and waste management facilities
- Can utilize Green Bonds for sustainable financing
- Can be combined with additional Federal and Provincial funding

Use Considerations

- New model with limited knowledge in the industry
- Framework jointly developed with municipality and private sector team, requiring capacity development and knowledge sharing

IMPLEMENTATION FRAMEWORK

The chart below provides a high-level summary of major initiatives in the implementation of CTIG 2030, from capacity building and knowledge sharing to construction works.

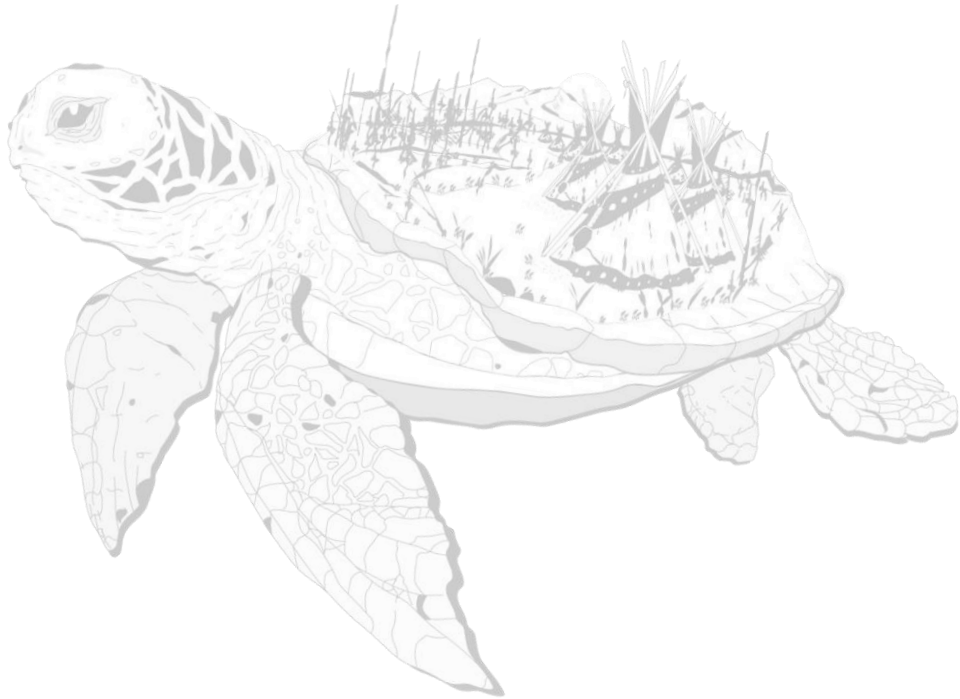
FIRST NATIONS ASSET MANAGEMENT FRAMEWORK	2023	2024	2025	2026	2027	2028	2029	+2030
1. CTIG 2030 Funding Requirement (Million $)	$25,093	$38,993	$53,703	$55,315	$56,973	$58,685	$60,444	Total $349,206
2. Enable First Nations to Develop and Administer Community Asset Management Plans								
3. Invest in First Nations Capacity and Human Capital Development in Construction, Community Planning and Asset Management								
4. Improve Competitiveness of Procuring First Nations Infrastructure Works								
5. Convene Communities of Practice with First Nations, Industry and Public Sector								
6. Address Infrastructure Deficiencies Backlog								
• Minor Renovation & Rehabilitation Projects								
• Major Retrofit and Expansion Projects								
• Minor New-Build Projects								
• Major New-Build Projects								
7. Ongoing Operations & Maintenance								

Legislative / Regulatory Changes

This proposal encompasses numerous Federal Government commitments, legislative promises, and other regulatory changes that have attempted to improve the lives of First Nations across Canada. CTIG 2030 represents a fundamental shift towards creating an environment and framework where First Nations are empowered to take initiative and ownership of their needs and priorities now and into the future. This includes providing reliable and sustainable funding mechanisms that enable the effective planning and execution of infrastructure project delivery in a manner appropriate to the diverse and complex needs of First Nations across Canada. As part of the proposal, we recommend that the Government of Canada adopt Asset Management Planning (AMP) for the funding of First Nations' assets. The Government of Canada has already identified the benefits of asset management planning, as they have already required the provinces and other government branches to adopt it in 2012 in order to receive funding. Transitioning to an asset management planning approach, from the current formula-based funding regime, will empower First Nations in achieving greater self-determination, provided it is implemented appropriately, and with First Nations' consultation. The following recommendations were included as part of the Draft AMP Policy submitted to ISC for feedback and should be included in the finalized version.

First Nations should set their own levels of service based on community consultation. ISC should not be involved in the day-to-day operation of a First Nation. That is the responsibility of Chief and Council. The funding levels provided by ISC should be capable of meeting equivalent provincial and/or federal levels of service, whichever is higher, where the First Nation is located.

First Nations deal with their infrastructure daily and should be allowed to conduct their own Asset Condition Reporting System (ACRS) inspections. Technical and financial support should be provided in order to ensure that First Nations have the capability to manage their own infrastructure. The support should extend to First Nations being able to carry out their own project management.



British Columbia developed and implemented an enhanced version of ACRS (E-ACRS) that is currently being piloted in Ontario. E-ACRS shall be adopted for conducting condition assessments as the detail in the reports is greatly increased and the financial information provided is more reliable.

Asset Management Planning places significant importance on Risk Management. Risks to service should be identified and the financial impact of the risks evaluated so that a reserve fund can be created to deal with these unexpected events. Funding of the reserve fund should be included in the funding from ISC.

The transition to Asset Management to be rolled out over 5 years upon adoption of the new AMP policy – This timeline may need to be adjusted based on individual First Nations' ability to implement asset management.

Stakeholder and Communications Considerations

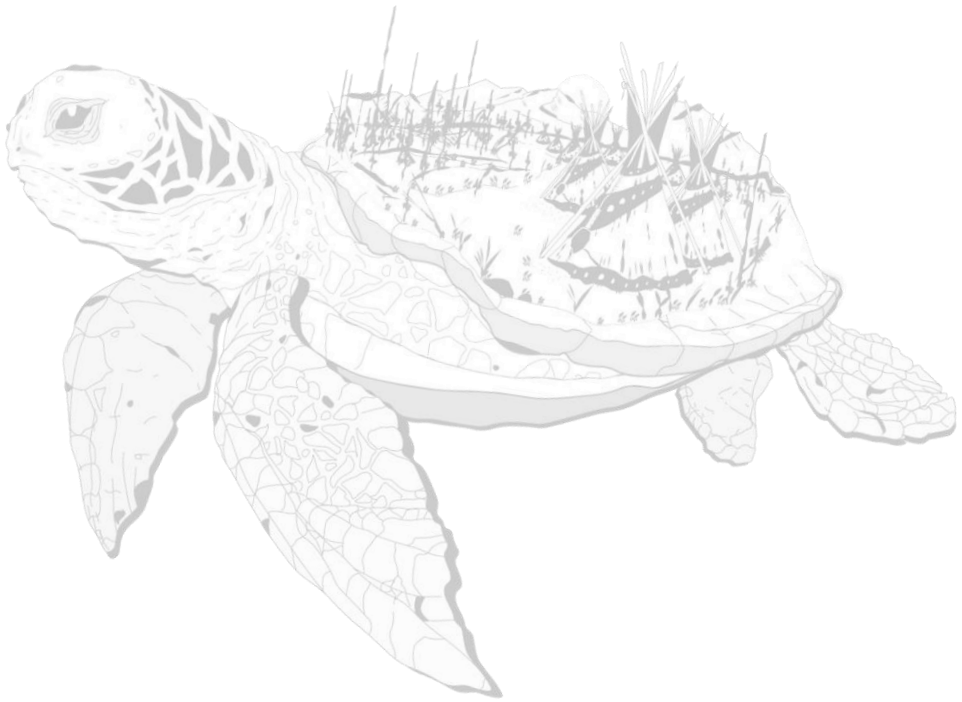
The Closing the Infrastructure Gap by 2030 report has a multifaceted and equally important stakeholder group, without which, a comprehensive gap assessment would not have been attainable.
The key stakeholders and their respective data which formed this cost report analysis include: the Assembly of First Nations, Indigenous Services Canada, and community-specific information from 399 First Nations throughout Canada.

It is vital that the infrastructure needs and monetary findings of this cost report, which are intended to inform and direct federal investment into deficient First Nations infrastructure, are re-evaluated on a year-to-year basis. As funding is implemented, methods to measure progress made, or yet to be made, on Closing the Infrastructure Gap will need to be co-developed by the Assembly of First Nations and Indigenous Services Canada to track Canada's progress to bring critically needed infrastructure services to its First Peoples.

Apart from urgently needed federal investments, focused engagement from the private sector industry, specifically those in the construction and infrastructure industries, will have a pivotal role in assisting the Government of Canada in meeting its commitments to Close the First Nation Infrastructure Gap. Publicly funded projects which will eventually serve federal, provincial, and municipal sectors will compete against the private sectors resources needed to build projects tendered for First Nations communities on-reserve. This counteractive demand on private sector resources can only be resolved by building capacity at the operations level by improving administrative resources within the largest stakeholder involved in the Closing the Infrastructure Gap — the First Nations of Canada.

A National Forum on Closing the Infrastructure Gap with First Nations will be planned in follow-up to this study to further engage and obtain input from the most critical stakeholders of this report, especially those First Nations which were unable to participate in the data collection process due to time or resource constraints.

Given the public relevance and importance of this report's findings, there will need to be a joint effort by the Assembly of First Nations and Office of the Minister of Indigenous Services Canada for all public communications and media statements as private and public sector interest in the cost report's estimates begins once communicated to the First Nations-in-Assembly and the Government of Canada.



Proposed Public Description of Proposal

For over a century, First Nations throughout Canada have experienced inferior access to essential community infrastructure services and inadequate on-reserve housing to support its members.

The year-to-year lack of sustainable and adequate investment in First Nation communities has caused intergenerational disadvantages for Canada's First Peoples and widened both the infrastructure and socioeconomic gap between First Nations and the rest of Canada.

The funding investment needs identified in the "Closing the Infrastructure Gap by 2030: A Collaborative and Comprehensive Cost Report for Budget 2023" calls upon the Government of Canada to use this document to inform its investments into critical First Nations infrastructure and housing and begin fulfilling its fiduciary and legal obligations to its First Peoples.

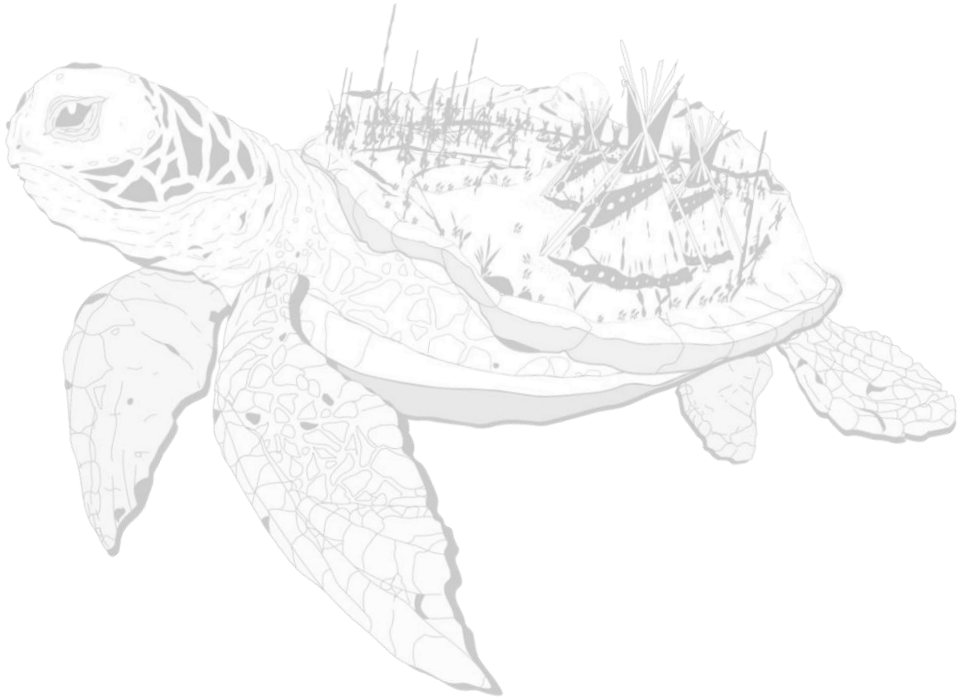
Key sections of the report address:

- Immediate First Nations infrastructure and housing investment needs to Close the Gap
- First Nations role in Canada's net-zero future
- Climate change adaptation
- Accessibility needs for First Nation persons with disabilities
- Bringing safe drinking water to all First Nations
- Co-development between the Assembly of First Nations and the Government of Canada on a new and innovative funding strategy for 2023+
- Digital Connectivity Needs
- Emergency preparedness
- First Nations role in economic growth and the Canadian gross domestic product (GDP)
- The importance of short- and long-term infrastructure planning

The impact of addressing infrastructure funding needs identified in the report will benefit First Nations communities across Canada in the form of new utilities, grounds, transportation, community buildings, housing, and healthcare infrastructure assets.

These informed investments by the Government of Canada will result in a significant improvement to the quality of life for First Nations.

It will also provide economic opportunities for First Nation and non-First Nations individuals and businesses as they economically recover together in a post-pandemic marketplace.



Contact

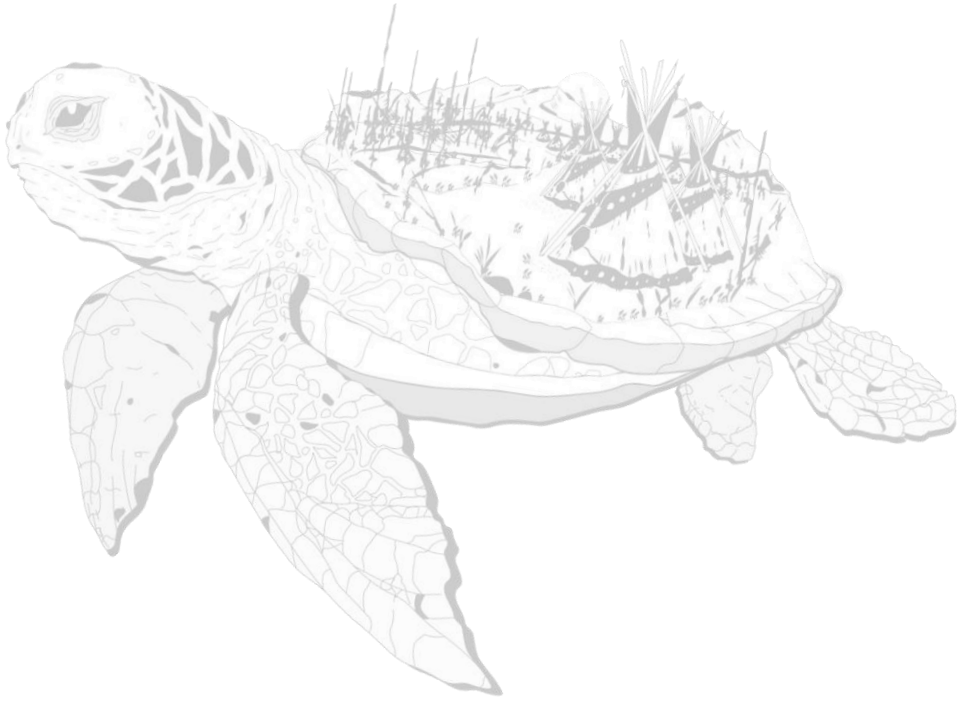
Assembly of First Nations

Irving Leblanc, Director — Infrastructure
ileblanc@afn.ca

Grace Martineau, Director — Housing and Homelessness
gmartineau@afn.ca

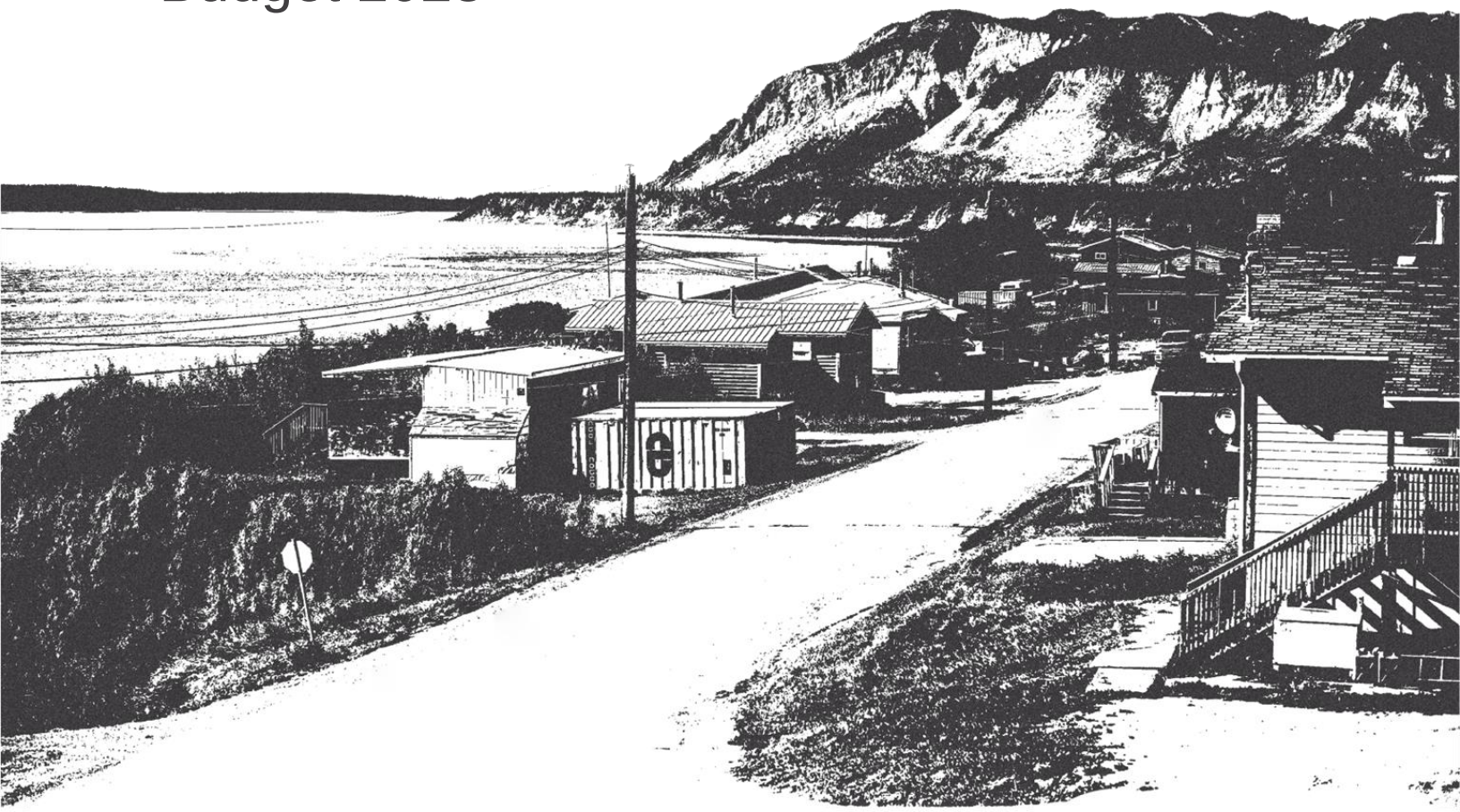
Matthew George, Senior Policy Analyst – Infrastructure
mgeorge@afn.ca

Dan Gaspé, Senior Policy Advisor — Housing and Homelessness
dgaspe@afn.ca



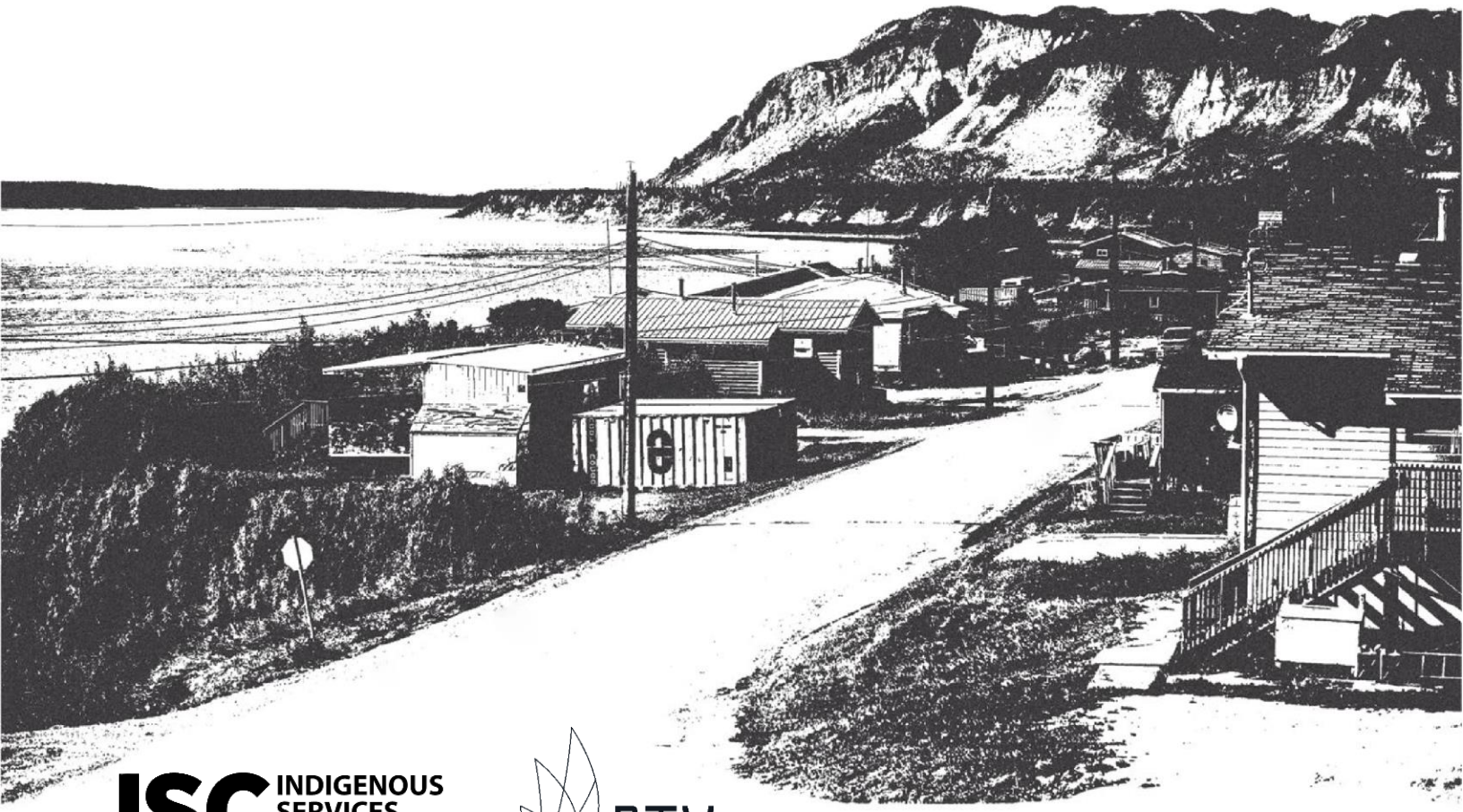
Closing the Infrastructure Gap 2030

Annex 1: Cost Report for Budget 2023



Closing the Infrastructure Gap by 2030

COST REPORT FOR BUDGET 2023



ISC INDIGENOUS SERVICES CANADA

BTY

Contents

Tables, Figures, and Appendices

1.0 Executive Summary

1.1 Context / Report Purpose

This report aims to provide up-to-date construction industry intelligence to support the first federal budget request for “Closing the Infrastructure Gap by 2030” for First Nations. Federal funding is essential for First Nations to plan and implement asset improvements and raise their standard of living to that of the general population of Canada. This report outlines the capital and operations and maintenance (O&M) costs associated with taking major steps to create, repair and improve First Nations infrastructure and to ensure that it is properly maintained. It not only outlines the cost of remedying current shortfalls but looks to a future of population growth and an end to overcrowding and sub-standard living conditions.

This report could not have been prepared without its basis in the previous reports commissioned by AFN on housing, schools and infrastructure, the latter covering a broad range of facilities, such as wastewater, site servicing and emergency services. BTY Group is indebted to the authors of these reports for their participation in this study and to AFN and ISC for their invaluable input and guidance.

While a great deal of effort has been expended in deriving the proposed budgets presented below, it should be recognized that the issues facing First Nations on reserve are complex and many-faceted. Every effort has been made to use the best information available, but future updates will be required as further research and study reveal in greater detail the emerging needs of First Nations people across Canada.

1.2 Project Background and Description

Addressing the infrastructure, housing and educational disparity between First Nations communities and the rest of Canada is an essential milestone in the Federal Government's commitment to Truth and Reconciliation. Adequate funding is crucial for First Nations communities to achieve socioeconomic prosperity in Canada and the Government of Canada, through ISC, is seeking guidance on the needs of First Nations, Metis, and Inuit peoples. This report addresses the First Nations part of this need for a timeframe commencing in the fiscal year 2023-2024 and ending in 2030.

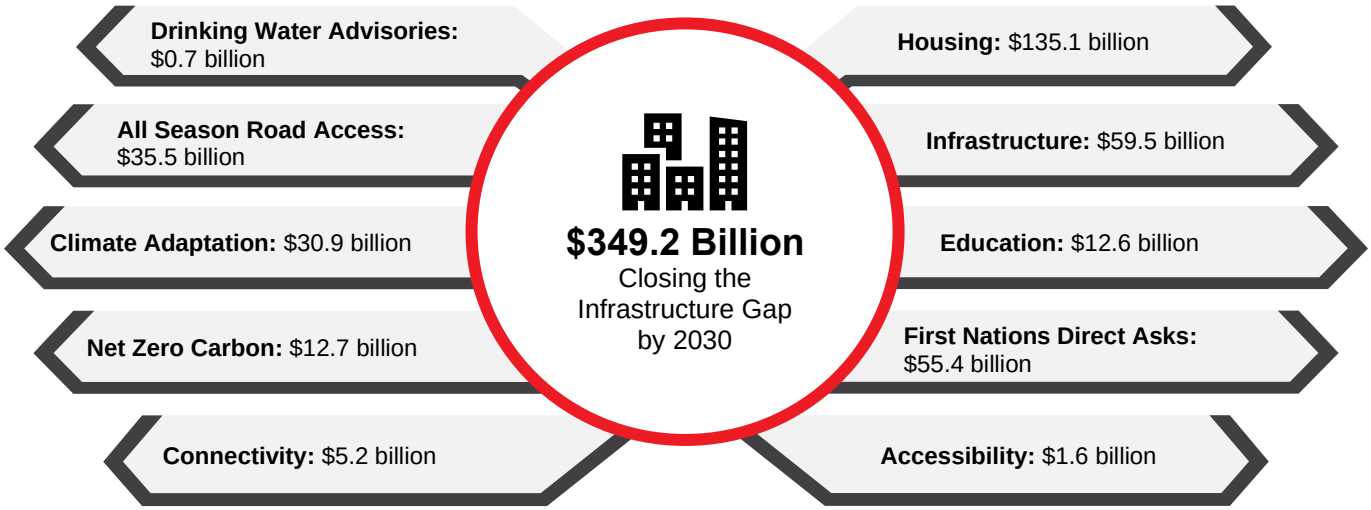
This report provides a review of existing cost estimates and asset budgets used to inform the funding request by First Nations across Canada that will help Close the Infrastructure Gap by 2030 and advance Canada's goal of reconciliation. This cost report is supported by multiple Assembly of First Nations (AFN) studies on infrastructure needs in housing, education, water, transportation, and other asset categories that detail both immediate and long-term needs. A costing methodology was formed by BTY in consultation with Associated Engineering (AE) and First Nations Engineering Services Ltd (FNESL).

In preparing this report, a review and commentary on the existing reports was undertaken, encompassing the proposed budgets for several asset types, regional and zonal factors were developed and applied to the budgets to account for varying economic, geographic and access issues and a review of impacts of cost escalation – in particular, the current record high inflation and fastest incremental increases in Government of Canada interest rates in Canadian history, and other issues related to the recent pandemic and global uncertainty and resilience over time of the asset costing.

In preparing this report, a review and commentary on the existing reports was undertaken, encompassing the proposed budgets for several asset types, regional and zonal factors were developed and applied to the budgets to account for varying economic, geographic and access issues and a review of impacts of cost escalation – in particular, the current record high inflation and rate of increases in Bank of Canada interest rates in Canadian history, and other issues related to the recent pandemic and global uncertainty and resilience over time of the asset costing.

Where further detailed information was available, BTY undertook a more detailed review of assets to ensure budget adequacy. AE developed further estimates of funding related to elimination of drinking water advisories, year-round access roads, climate adaptation, the path to net-zero carbon and incorporation of accessibility in facilities across Canada. A further study was undertaken by Planetworks Consulting of connectivity needs for high-speed internet on reserves. Finally, the results of a survey of First Nations undertaken by ISC and reflecting the direct requests of First Nations were incorporated in the results. An overall summary of the funding requirement is presented in Figure 1.

Figure 1: Closing the Infrastructure Gap Cost Summary



1.3 Expected Impacts

Essential infrastructure services and adequately maintained community facilities are key factors that improve the socioeconomic circumstances of a community. The evidence of these benefits can be divided into five domains: prosperity, health, environment, good governance, and society. Indicators of success in each of these domains align well with some credible institutions' Human Resources documents and academic research on economic uplift and health outcomes. The Assembly of First Nations and Indigenous Services Canada will co-develop a follow-up study to monitor the improvements to the social indicators and socioeconomic outcomes noted above.

Source: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5479555/

1.4 Summary of Funding Requirements

The following table provides a summary of the funding requirements for the fiscal years 2023-2024 to 2029-2030 to help satisfy the requirements of the Closing the Infrastructure Gap program and includes the need from 2023-2030.

Table 1: Yearly Cost Data by Infrastructure Type to Close the Infrastructure Gap

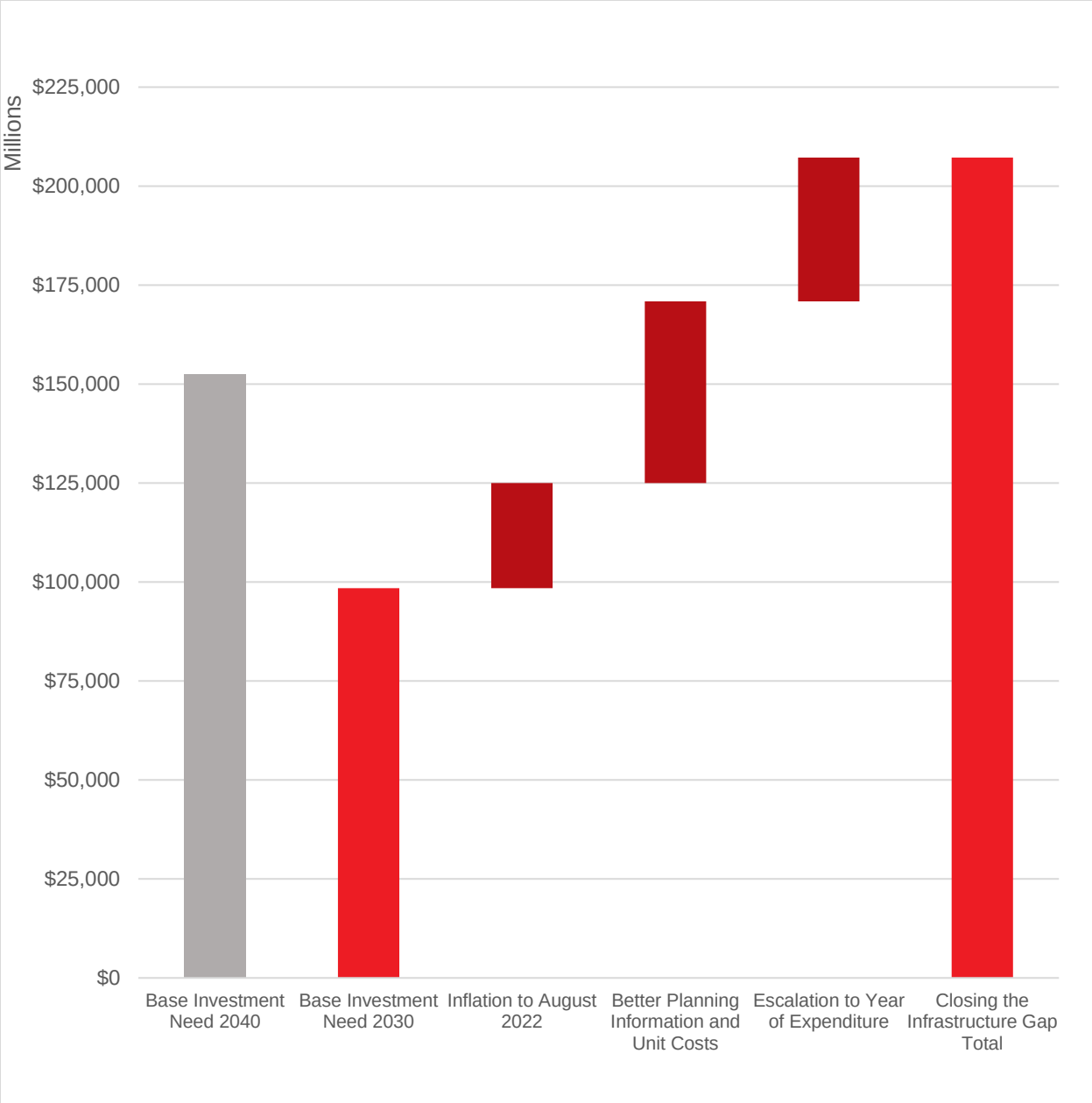
Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Housing								
Total Capital Cost	$8,096	$12,749	$17,680	$18,210	$18,756	$19,319	$19,899	$114,709
Total O&M	$1,890	$ 2,448	$ 3,028	$ 3,118	$ 3,211	$ 3,308	$ 3,407	$ 20,410
Housing Subtotal	**$9,986**	**$15,197**	**$20,708**	**$21,328**	**$21,967**	**$22,627**	**$23,306**	**$135,119**
Education								
Total Capital Cost	$ 564	$ 888	$ 1,231	$ 1,268	$ 1,306	$ 1,346	$ 1,386	$ 7,989
Total O&M	$ 325	$ 513	$ 711	$ 733	$ 755	$ 778	$ 801	$ 4,616
Education Subtotal	**$ 889**	**$ 1,401**	**$ 1,942**	**$ 2,001**	**$ 2,061**	**$ 2,124**	**$ 2,187**	**$ 12,605**
Infrastructure								
Total Capital Cost	$2,678	$ 4,219	$ 5,850	$ 6,026	$ 6,207	$ 6,393	$ 6,585	$ 37,958
Total O&M	$1,521	$ 2,395	$ 3,321	$ 3,421	$ 3,523	$ 3,629	$ 3,738	$ 21,548
Infrastructure Subtotal	**$4,199**	**$ 6,614**	**$ 9,171**	**$ 9,447**	**$ 9,730**	**$10,022**	**$10,323**	**$ 59,506**
SUB-TOTAL	**$15,074**	**$23,212**	**$31,821**	**$32,776**	**$33,758**	**$34,773**	**$35,816**	**$207,230**
Connectivity								
Total Capital Cost	$ 367	$ 579	$ 802	$ 826	$ 850	$ 876	$ 902	$ 5,202
Connectivity Subtotal	**$ 367**	**$ 579**	**$ 802**	**$ 826**	**$ 850**	**$ 876**	**$ 902**	**$ 5,202**
All-Season Road Access								
Total Capital Cost	$ 2,056	$ 3,238	$ 4,489	$ 4,624	$ 4,763	$ 4,906	$ 5,053	$ 29,128
Total O&M	$ 449	$ 708	$ 981	$ 1,011	$ 1,041	$ 1,073	$ 1,105	$ 6,368
All-Season Roads Total	**$ 2,505**	**$ 3,946**	**$ 5,470**	**$ 5,635**	**$ 5,804**	**$ 5,979**	**$ 6,158**	**$ 35,496**
Climate Adaptation								
Total Capital Cost	$ 1,726	$ 2,718	$ 3,769	$ 3,882	$ 3,998	$ 4,118	$ 4,242	$ 24,452
Total O&M	$ 458	$ 720	$ 999	$ 1,029	$ 1,060	$ 1,092	$ 1,124	$ 6,482
Climate Adaptation Subtotal	**$ 2,184**	**$ 3,438**	**$ 4,768**	**$ 4,911**	**$ 5,058**	**$ 5,210**	**$ 5,366**	**$ 30,934**

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Net Zero								
Total Capital Cost	$ 897	$ 1,413	$ 1,959	$ 2,018	$ 2,079	$ 2,141	$ 2,205	$ 12,712
Net Zero Subtotal	**$ 897**	**$ 1,413**	**$ 1,959**	**$ 2,018**	**$ 2,079**	**$ 2,141**	**$ 2,205**	**$ 12,712**
Drinking Water Advisory								
Total Capital Cost	$ 19	$ 30	$ 42	$ 43	$ 45	$ 46	$ 47	$ 272
Total O&M	$ 28	$ 45	$ 62	$ 64	$ 66	$ 68	$ 70	$ 403
Drinking Water Advisory Subtotal	**$ 47**	**$ 75**	**$ 104**	**$ 107**	**$ 111**	**$ 114**	**$ 117**	**$ 675**
Accessibility								
Total Capital Cost	$ 112	$ 177	$ 245	$ 252	$ 260	$ 268	$ 276	$ 1,590
Accessibility Subtotal	**$ 112**	**$ 177**	**$ 245**	**$ 252**	**$ 260**	**$ 268**	**$ 276**	**$ 1,590**
First Nations Direct Asks								
Total Capital Cost	$ 3,907	$ 6,154	$ 8,534	$ 8,790	$ 9,053	$ 9,325	$ 9,605	$ 55,368
First Nations Direct Ask Subtotal	**$ 3,907**	**$ 6,154**	**$ 8,534**	**$ 8,790**	**$ 9,053**	**$ 9,325**	**$ 9,605**	**$ 55,368**
TOTAL FUNDING	**$25,093**	**$38,993**	**$53,703**	**$55,315**	**$56,973**	**$58,685**	**$60,444**	**$349,206**

The Housing, Education and Infrastructure amounts have been derived from previous studies undertaken by Assembly of First Nations (AFN) consultants. BTY Group has reviewed these studies and, in some instances, modified the funding requirements in the studies' conclusions. The budgets for the remaining asset categories, focussing on such issues as climate adaptation, eliminating drinking water advisories, Connectivity, Net-Zero Carbon, Year-round access, and providing accessibility, have been developed as part of the current budgeting exercise. In all cases, the budgets for each fiscal year have been escalated to the year in which they are planned to be required. Further details of the approach to this issue and others are described in the body of this report. Further exploration of an appropriate delivery mechanism and schedule are required and will be part of future studies.

The table below summarises the journey from the funding totals in previous studies to the funding recommendations contained within this report, specific to Infrastructure, Education and Housing.

Figure 2: Closing the Infrastructure Gap



We note that previously, the Base Investment Need captured a funding period up to 2040 for Housing, Education, and Infrastructure. For comparative purposes the above represents the Need up to 2030 for Housing, Education, and Infrastructure only.

2.0 Introduction

BTY has prepared the following report to support the Closing the Infrastructure Gap by 2030: Proposal for Budget 2023, co-developed by the Assembly of First Nations ("AFN") and Indigenous Services Canada ("ISC").

2.1 Report Objective/Instructions Received

The analysis within this report identifies, defines, and quantifies the costs associated with Closing the Infrastructure Gap by 2030. The associated costs include but are not limited to new investment in a wide range of capital and O&M investment needs.

Realizing the objectives of the report would bring us closer to achieving First Nations resiliency and sustainability and providing First Nations peoples improved access to essential community infrastructure and services which are more easily accessible to non-First Nation Canadian citizens. It also discusses the impact of implementing this program within the context of the Canadian economy and the capacity of the construction industry.

To accomplish this, the report highlights:

1. The existing infrastructure gap with First Nations communities and the need for comprehensive community infrastructure planning.
2. BTY's approach and methodology for reviewing previous reports, costing community requests, and defining the industry terminology that informs this report.
3. Key socio-economic factors that are taken into consideration for cost reporting.
4. A review of previous cost reports for AFN, including any observations and limitations.
5. A discussion paper on the status of drinking water advisories (by AE).
6. A strategy for achieving Net-zero carbon by 2050 (by AE).
7. A discussion paper on Climate adaptation and reducing climate risk (by AE).
8. A discussion paper for improving accessibility to First Nations facilities.
9. A discussion paper on Digital Connectivity.
10. A discussion paper on year-round road access for First Nations.
11. A discussion paper on Climate Adaptation for First Nations facilities.
12. Inclusion of community requests submitted to ISC.

2.2 Project Team

In addition to BTY Group, the following team members have participated in or provided key information in the development of this report:

- Assembly of First Nations ("AFN)"
- Indigenous Services Canada ("ISC")
- Associated Engineering ("AE")
- First Nations Engineering Services Ltd. ("FNESL")
- Institute of Fiscal Studies and Democracy ("IFSD")
- Planetworks ("Planetworks")

3.0 Methodology

3.1 General Approach

3.1.1 Review of Previous Reports

BTY has been provided with the following reports previously prepared for AFN by its consultants:

- AFN – Cost Analysis of Current Housing Gaps and Future Housing Needs in First Nations, 2021, IFSD
- AFN – First Nations Education Infrastructure Capital Needs Assessment 2021, FNESL
- AFN – First Nations Education Infrastructure Operations and Maintenance Needs Assessment, 2022, FNESL
- AFN – National First Nations Asset Needs Study, 2022, AE
- AFN – First Nations On-Reserve Housing and Related Infrastructure Needs, July 2020, FNIGC (reference only).

This review, in the first instance, aims to provide an estimate of the Capital and Operations and Maintenance costs prepared by other team members. The estimated costs and scope of work inherent in them for Asset replacement, sustainment, growth, and upgrades across Canada have formed the basis of this analysis and verification.

Where possible, the unit rates have been assessed/verified using BTY's Internal Cost Database, with the base unit rate being set for an urban centre in Metro Vancouver, British Columbia. Regional and Zonal factors have then been applied to the base unit rate to reflect the expected cost specific to the geographical location and remoteness of the asset. Refer to Section 3.2.1 and 3.2.2 of this report.

In the instances where granular data were unavailable to allow a comprehensive analysis, appropriate uplifts have been applied to existing summary cost tables (provided to BTY) to ensure they include contingencies and soft costs and reflect changes in the market since the time of pricing by others and cost increases forecast to occur in future years. We note that numbers in the tables throughout this report may not sum to the total due to rounding.

3.1.2 Discussion Papers

For this report, a series of discussion papers were prepared to address funding needs for climate adaptation and digital connectivity, among other issues. The results of these discussion papers were treated similarly to the other asset classes to ensure that complete project costs with soft costs and appropriate escalation allowances were included in the funding requests.

3.1.3 First Nations Direct Asks

ISC has provided BTY with rationalized data collected in its survey of First Nations Communities. The data have been filtered to eliminate overlaps between the survey requests from First Nations and the asset classes covered in the other studies and discussion papers. For the remaining First Nations Direct Asks derived from the ISC survey, it was unclear how comprehensive the budget figures in the requests were, so assumptions had to be made as to what level of uplift was required.

3.1.4 Limitations

- IFSD, FNESL and AE have provided verification and made conservative assumptions based on the scope of their studies. Please refer to the source reports for more detailed information.
- While O&M costs have been included for most asset classes, establishing O&M estimates for some of the asset classes newly studied in this report will require further research.
- The First Nations Direct Ask amounts are derived from requests submitted by the 402 First Nations that responded to the ISC survey. These figures have not been extrapolated to the non-responding First Nations.
- Due to the short timeframe within which this report was prepared and the risks inherent in cost forecasting, comprehensive updates will need to be prepared annually.

3.2 Definitions

Asset

An asset is an item or thing of value (ISO 55000). In this study, asset refers to physical assets such as buildings, ports and wharves, treatment equipment, pipes, civil structures, and vehicles.

Asset Age

An asset's age (in Years) is based on the number of years since the construction (or in-service date) for each asset to the current year (i.e., 2022).

Asset Category

Highest level of categorization of assets in the Integrated Capital Management System (ICMS). All assets fit into one of the five Categories (i.e., Buildings, Grounds, Transportation, Utility and Vehicles).

Asset Code

The three-digit code describes a unique asset type in the ICMS, incorporating the Category, Class, and Sub-Class (e.g., A5A).

Asset Class

The middle level of categorization of assets in the ICMS further refines the asset category (e.g., Roads, Recreational Buildings, Water Supply).

Asset Inventory

The data extracted from the ICMS containing all assets included in the study.

Asset Sub-Class

The bottom level of categorization of assets in the ICMS further refines the Class of the asset. (e.g., Gravel Roads, Libraries, Water Mains, Other).

Asset Type

Refers in general terms to different kinds of assets, not strictly following the ICMS classification system.

Capital Cost

Fixed one-time expenses incurred on the construction enhancement, purchase of land or equipment related to the project.

Capacity Utilization Rate

The ratio of an industry's actual output to potential output.

Current Replacement Value (CRV)

The total cost in 2022 $CAD to replace the particular asset and make it functional, including purchase, construction, installation etc. This may be derived from either historical costs or current capital costs.

Contingencies

As defined in Section 3.2.3 of this report.

Expected Service Life (ESL)

The asset's expected life before it will no longer meet its functional need(s). This may vary significantly from a short-lived asset, such as computers/vehicles (e.g., five years), to a long-lived asset, such as a building foundation (e.g., 60 years).

Growth

The term growth generally means an increasing number of people, i.e., population increases. Growth as an investment driver is the investment required to accommodate the needs of a growing population. This study comprises making assets bigger (upsizing) and adding new assets to service the population.

Operations and Maintenance (O&M)

Investments in operations and maintenance ensure that an asset achieves its planned service life. These include immediate repairs and periodic replacement of components.

Remaining Service Life (RSL)

The number of years remaining from the asset's current age to the end of its ESL.

Regional Factors

As defined in Section 3.2.1 of this report.

Service Centre

Defined by ISC as a community where suppliers, materials, and equipment, as well as skilled and semi-skilled labour, are available and where at least one financial institution and minimum provincial and federal services are available.

Sustainment

Sustainment refers to the investment required to maintain current levels of service. It includes renewing assets at end of life and refurbishing/rehabilitation of assets.

School

A building designed to provide instruction inclusive of learning spaces and environments.

Teacherage

A building that provides both a school and or a residence for teachers.

Upgrades

Upgrade refers to the improvement of an asset through either upsizing or modification (e.g., retrofits) to meet changing regulatory requirements.

Zone

Degree of remoteness regarding proximity to a service centre. Each First Nation is assigned a Zone (i.e., score of 1-4, with four being the most remote), and all assets within that Nation are in the same Zone.

Zonal Factors

Adjustment factors to reflect the impact of remoteness on construction costs.

3.3 Key Concepts

3.3.1 Regional Factors

Construction costs in Canada vary by region and it is also useful to aggregate data by region to understand the context in which the work will be done. Despite the vastness of Canada, the degree of variation among regions in the South is relatively modest, but still warrants cost adjustment. Larger adjustments are required for work to be done in the North. For the Education and Infrastructure studies, regional cost adjustments are inherent in the construction costs calculated by the authors. For the Housing study, BTY has used a set of regional adjustment factors to derive regional costs from a base cost established for Greater Vancouver.

3.3.2 Zonal Factors

The zonal factors are based on Crown-Indigenous Relations and Northern Affairs Canada's (CIRNAC's) geographical zone classifications for community remoteness, which is part of CIRNAC's classification system that stratifies communities as follows:

- **Region:** Province or Territory.
- **Sub-region:** For example, ease of access to service centres is based on geographical remoteness.

- **Size:** Community size can be a determinant of project size and cost but is not a part of the zonal classification.

Within the sub-region classification, the zone of each First Nation is defined as follows:

- **G1 – Urban Area:** First Nation community is located within 50 Km of the nearest service centre to which it has year-round road access.
- **G2 – Rural Area:** First Nation community is located between 50 and 350 Km from the nearest service centre to which it has year-round road access.
- **G3 – Remote Area:** First Nation community is located over 350 Km from the nearest service centre to which it has year-round road access.
- **G4 – Special Access Area:** First Nation has no year-round road access to a service centre and, as a result, experiences a higher cost of transportation.

Although most First Nations are in Zones G1 and G2, additional costs associated with providing facilities and services in Zones G3 and G4 are significant.

In the reports on Infrastructure, Housing and Education needs done previously, the authors have adopted a variety of adjustment factors to reflect the additional costs associated with projects undertaken in Zones G2, G3, and G4, using G1 costs as a base. Each of the consultants for the Education and Infrastructure reports used their own set of adjustment factors for capital and O&M costs. The zonal factors employed by BTY in its review of Housing costs are described in Sections 4.2.2 and 4.2.3.

3.3.3 Regional Allocations

The figures for the regional allocation of funding are preliminary and based on several factors. For Housing, the largest asset class, the distribution is based on the need identified in the study performed for the AFN. For the other asset categories, First Nations population in each region is the main variable used to distribute the investment. The number of communities is also used to balance the population data allowing for additional funding for regions with smaller communities. Lastly, a factor for Northern regions has been included as these areas are subject to more challenging climatic conditions.

3.3.4 Contingencies

Current good practice for budgeting construction projects dictates that four 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, the estimates in this report are programmatic, in the sense that the estimated budgets proposed are for completed projects, i.e., the contingencies have already been expended. Accordingly, a small design contingency of 2% 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. A rate of 5% across the board has been applied to capital projects in this review.

Escalation Contingency: This is to allow for risks associated with increases in costs that may accrue after the date of an estimate. It involves forecasting escalation percentages that take account of macro-economic trends and local market conditions and applying the cumulative rates to the estimated costs in the planned year of expenditure. The following escalation rates have been applied to both capital and O&M costs and reflect interest-rate measures being taken by the Bank of Canada resulting in a return to more familiar inflation rates.

Table 2: Canadian Escalation Forecast

Fiscal Year	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026	2026-2027+
Actual & Forecast Escalation	16.6%	13.9%	7%	5%	4%	3%	3%

These rates are considered to span between mid-fiscal years, i.e., from and to the end of October.

The rate for 2020-2021 is an average of 4th quarter 2020 to 4th quarter 2021 residential and non-residential rates published by Statistics Canada and is included to provide context for the forecast rates. The rate for 2021-2022 is a similar blend of residential and non-residential rates and is a partial forecast as, at time of writing, historical rates have only been published to the 2nd quarter of 2022. The forecast rate for 2023-2024 is for the period August 2022 to the end of October 2023. It should be noted that the escalation rate applied to any specific year is cumulative from the base year of 2022 to the year in which the expenditure is expected to occur.

Further discussion on these escalation rates can be found throughout Section 5.1 of this report. The above escalation rates have been incorporated into all Capital and O&M costs to reflect the likely cost of delivery, based on their anticipated year of expenditure.

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.

3.3.5 Soft Costs

Soft, or non-construction costs, have been adjusted or added to the construction costs in each of the asset categories to give a more complete project cost. The soft-cost allowance is considered to include the following:

- Professional Consulting Fees.
- Project Management (non-general contractor)/Owner's Administration Cost/ Project Insurance/ Project Commissioning (3rd party).
- Furnishings, Fittings and Equipment (FF&E).

The following costs, though often part of project budgets, have not been included:

- Land purchase.
- Interest and other financing costs.
- Marketing.
- Municipal permit fees and DCCs.

The method to determine an appropriate Soft Cost allowance for the full portfolio of works captured in this study was based on a blended Building and Civil approach. The outcome of this analysis defined the soft cost allowance as 20% of construction costs, which has been used for all asset classes referenced in this report.

4.0 Review of Previous Studies

4.1 Infrastructure Report & BTY Findings

4.1.1 Approach and Assumptions

The current study relies heavily on the First Nations Asset Needs Study undertaken by Associated Engineering (AE) published in March 2022. The intent of the AE study was to "provide a holistic review of asset needs to support the ongoing safe and sustainable provision of services to 634 First Nation populations over the next 20 years." The report defined the capital and O&M investment required for on-reserve assets for renewal, upgrades, and population growth over a 20-year timeframe to 2040.

The First Nations Asset Needs Study built on the previous studies: the Education Infrastructure Capital Needs Assessment (2022) and Housing Needs Study (2021), but covered a broad scope of work including:

- Buildings.
- Ports and wharfs.
- Transportation infrastructure, including roads, bridges, and dykes.
- Utility Infrastructure, including water, wastewater, and solid waste management.
- Vehicles used in the provision of services, such as firetrucks and liquid- and solid-waste trucks.

The key investment drivers determining the funding need were identified as:

Sustainment: required ongoing investment in renewal and refurbishment;

Growth: driven by future, on-reserve population increases;

Upgrades: to meet evolving building code and energy and safety standards; and

Operations & Maintenance: O&M investment for continuous operation.

The study notes as an exclusion bridging the need for substantive equality which would require changes to the asset base.

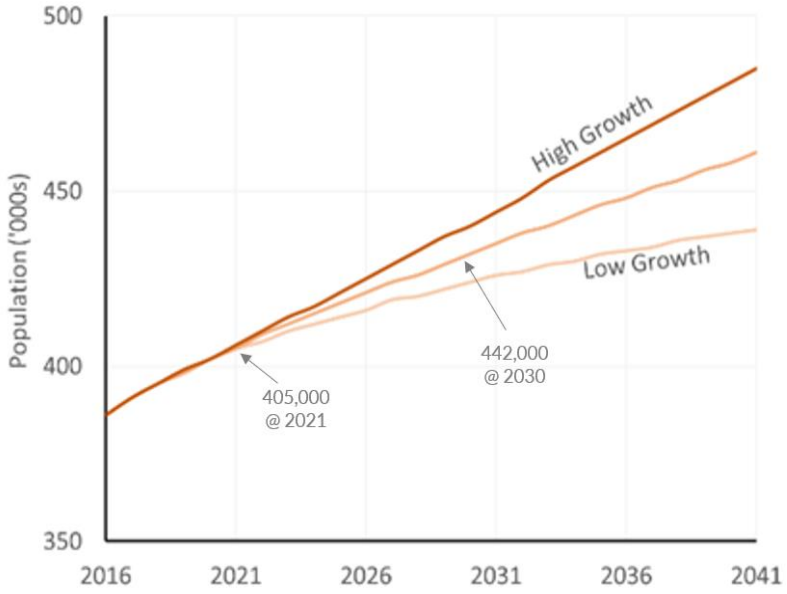
The primary source of information for the study was data compiled by ISC, including the numbers of facilities across Canada in its system and its Asset Condition Reporting System (ACRS) defining the age and condition of the facilities. AE's defined paradigms, including sizes, for each type of facility and made use of construction unit rates to develop Capital Replacement Values (CRVs) for each type of facility to arrive at budgeted amounts. These budgets were then adjusted by zone to reflect local market conditions. O&M costs were estimated based on standard periodic replacement intervals and percentages of CRVs. This report was a major undertaking that culminated in the identification of a 20-year investment need of $73 billion in 2021 dollars. Readers are encouraged to acquaint themselves with the details of AE's report to gain a greater understanding of its scope and methodology.

BTY Group reviewed AE's base unit rates for the broad scope of work under consideration and derived a CRV (capital replacement value) total for all the assets using AE's quantities. The total value of the portfolio was within 10% of AE's value, well within an acceptable range given the high-level analysis undertaken. BTY did not replicate AE's modelling of the funding needs beyond this unit rate review. The funding needs developed by AE were marked up to allow for escalation since the date of pricing in 2021, escalation to the year in which costs will be incurred, contingencies and soft costs to provide a more comprehensive view of the funding requirement.

AE's review was for a 20-year timeframe, so the resulting costs were then adapted to the 2030 timeline of this report, including preparing an annual cash flow. This includes the need from 2019-2030, with expenditure being forecast between 2023 and 2030.

The Closing the Infrastructure Gap Report uses the latest 2021 population growth rates from Statistics Canada. Statistics Canada estimates that population growth rates will be higher for First Nations people living off reserve compared to those living on reserve, so the on-reserve growth rate is lower than the overall First Nations growth rate (0.8% to 1.8% in the "Low Growth" and "High Growth" scenarios for peoples living on reserve compared to 1.2% to 2.1% for First Nations overall). While Statistics Canada projections account for some level of migration from people choosing to move to reserves, having access to better infrastructure and services on reserves would potentially lead to increased, on-reserve population growth rates. While this change is important, in the short-to-medium term, investment needs are driven almost entirely by sustaining and maintaining existing infrastructure, and population growth rates have only a small effect on total investment needs. 2030 on-reserve population projections range from 434,000 (low - 0.8%), to 442,000 (medium - 1.1%), to 450,000 (high - 1.8%). The medium growth scenario of 1.1% has been utilized for developing investment needs in this report.

Figure 3: Population Growth Scenarios



4.1.2 Capital Budget

Based on the above approach, our findings are as follows:

Table 3: Infrastructure – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Infrastructure								
Capital Cost	$2,678	$4,219	$5,850	$6,026	$6,207	$6,393	$6,585	$37,958
TOTAL COST	**$2,678**	**$4,219**	**$5,850**	**$6,026**	**$6,207**	**$6,393**	**$6,585**	**$37,958**

Table 4: Infrastructure – Capital Cost Analysis by Zone

Provinces	Zone 1	Zone 2	Zone 3	Zone 4	Total (millions)
Alberta	$ 2,707	$ 1,664	-	$ 270	$ 4,641
British Columbia	$ 5,366	$ 1,938	$ 224	$1,037	$ 8,564
Manitoba	$ 442	$ 3,180	-	$1,597	$ 5,219
North (Yukon/NWT)	$ 447	$ 1,702	$ 537	$ 915	$ 3,602
Atlantic Canada	$ 868	$ 961	-	$ 83	$ 1,912
Ontario	$ 1,903	$ 1,955	$ 9	$2,000	$ 5,866
Quebec	$ 1,270	$ 834	$ 858	$ 451	$ 3,412
Saskatchewan	$ 501	$ 3,823	$ 112	$ 306	$ 4,742
TOTAL	**$13,503**	**$16,056**	**$1,741**	**$6,658**	**$37,958**

4.1.3 O&M Budget

Table 5: Infrastructure – Operation and Maintenance Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Infrastructure								
O&M Cost	$1,521	$2,395	$3,321	$3,421	$3,523	$3,629	$3,738	$21,548
TOTAL COST	**$1,521**	**$2,395**	**$3,321**	**$3,421**	**$3,523**	**$3,629**	**$3,738**	**$21,548**

Table 6: Infrastructure – Operation and Maintenance Cost Analysis by Zone

Provinces	Zone 1	Zone 2	Zone 3	Zone 4	Total (millions)
Alberta	$1,537	$ 945	-	$ 153	$ 2,634
British Columbia	$3,046	$ 1,100	$127	$ 588	$ 4,862
Manitoba	$ 251	$ 1,805	-	$ 907	$ 2,963
North (Yukon/NWT)	$ 254	$ 968	$305	$ 520	$ 2,046
Atlantic Canada	$ 493	$ 546	-	$ 47	$ 1,085
Ontario	$1,080	$ 1,110	$ 5	$1,135	$ 3,330
Quebec	$ 721	$ 473	$487	$ 256	$ 1,937
Saskatchewan	$ 285	$ 2,170	$ 64	$ 174	$ 2,692
TOTAL	**$7,665**	**$91,146**	**$988**	**$3,779**	**$21,548**

4.2 Housing Report & BTY Findings

4.2.1 Approach and Assumptions

The review of the Housing report prepared by the Institute of Fiscal Studies and Democracy (IFSD) in 2021 aimed to provide the Assembly of First Nations (AFN) with up-to-date housing costs for On-Reserve Housing and Related Infrastructure.

A report prepared by the First Nations Information Governance Centre and titled “First Nations On-Reserve Housing and Related Infrastructure Needs” was issued in July 2020 and formed an important basis for the IFSD Report “Cost analysis of current housing gaps and future housing needs in First Nations”, the final report of which was issued on October 18, 2021.

The results of the FNIGC report were based on a questionnaire distributed to First Nations requesting information on the existing housing stock, housing subsidy and ownership, housing major and minor repair needs, system capacity and current and future needs. The questionnaire also asked about the types of housing data that First Nation communities record with respect to housing and infrastructure.

The survey sample represented 478 out of 498 First Nations communities in the regions that participated in the survey. This was 97.7% representative by population. In total, seven regions, Yukon, British Columbia, Saskatchewan, Ontario, Quebec, New Brunswick, Atlantic (including Nova Scotia; Prince Edward Island; and Newfoundland and Labrador) were included in the results. Insufficient data were received from Manitoba, Alberta and NWT and they were later added to the total requirement by extrapolation from the other jurisdictions.

85,738 housing units were reported by respondents across the participating regions, mostly single-family homes (91%). The total apartment housing units reported was 1,386. Emphasis was also given to the availability and need for serviced lots. A serviced lot refers to a parcel of land that has the required utilities for a housing unit (water, wastewater, sewer, power), but not to the off-parcel requirements to bring the services to the lot boundary.

IFSD’s report “Cost analysis of current housing gaps and future housing needs in First Nations” was issued on July 30, 2021, under a mandate from AFN. IFSD took a three-part approach:

1) Ten First Nations collaborated with IFSD to build in-depth case studies and analysis on housing needs, costs, opportunities, and challenges.

2) Cost estimation of current and future needs using data from FNIGC’s survey for AFN with consideration of growth factors such as population, migration, and inflation.

3) Performance measurement for well-being: A future-focused framework was developed by leveraging best practices from other jurisdictions, a holistic wellbeing understanding of housing, with consideration of First Nations care and control of delivery.

The focus here is on Item 2, the cost estimation of current and future needs. In 2021 prices, the total capital cost for existing and future needs was estimated to be $59.4 billion. The existing housing needs, totalling $43.7 billion, were categorised according to the issue they dealt with: overcrowding, on-reserve migration, replacement of existing units, servicing new lots, major and minor repairs, and population growth. The remainder was to satisfy future needs, from 2022-2040. These figures include an extrapolation of the survey data for Manitoba, Alberta, and NWT.

BTY has reviewed the unit costing for all housing needs, and adjusted it based on current rates as of August 2022, considering current market conditions. Assumptions made during BTY's evaluation of the Housing report are as follows:

New Units

- Assumes there was or is an existing structure that was or will be removed, and therefore the lot has already been serviced and a new unit is needed on that lot
- Assumes that all residential units are 1,500 sf single-family homes
- Assumes site serviced lots already exist to accommodate new units
- Assumed 20% for soft costs

Service New Lots

- Assumes major infrastructure cost is part of the asset replacement need, and local tie-in to services is only required. Streetlighting, roads and mains is included in the infrastructure asset budget.
- Assume 5,000 sf lots.
- Assume 10% of all lots serviced will require rock blasting.
- Driveway assumed to be included in house construction cost.
- Assume 10% of Service Lots in Zones 3 and 4 will have decentralised water and wastewater systems.
- Assume all service connections are within 50m of house.
- Assume all services are within 5m of the property line
- Assume 20% for soft costs

Minor Renovations

- Replacement of windows and doors, roof covering and the exterior cladding and various interior works.
- Assume 10% of overall construction cost.

Major Renovations

- Replacement of many components of a dwelling (for example, windows and doors, roof, floor covering, exterior cladding, plumbing, electricity, heating, insulation, etc.).
- Assume 1,500 sf single-family homes
- Assume major renovations to be 30% of overall construction cost.

- Existing FN Housing Operation and Maintenance
- Based on 85,738 existing housing units across all regions (as per 21-06-16 National FNs Housing Survey Results Final Report).
- Based on 1.95% of construction cost per annum.
- This calculation is based on a % of the construction cost. Due to the unknown quantities in each Zone/region, we have used the average unit cost across Canada.
- O&M excludes electricity, water, property tax, insurance, internet, and TV.

New Housing Operation and Maintenance

- This calculation is based on a percentage of the construction cost and considers the cost of construction for all regions and zones.
- Based on 1.95% of construction cost per annum.
- Applies to all new housing units.

Refer to Appendix 2 for the quantification of Housing Needs, as agreed with the Project Team.

4.2.2 Regional Factors

BTY's approach to pricing for the Housing asset category has been to develop unit rates for a base location of Greater Vancouver and then adjust them first by region and then by sub-region or zone. The regional factors are based on review of a variety of sources, including:

- RS Means Construction Cost Data 2022, which proposes cost adjustment factors for residential and commercial construction. The residential factors were referenced in this review.
- BTY's annual construction cost survey for various asset types included in the annual Market Intelligence Report, the most recent of which was published in January 2022.
- BTY's review of variations in housing costs for both major centres in the South and for communities in the North with varying levels of remoteness, including those with ice-road and fly-in access. This study was undertaken by RDH and BTY for CMHC in 2017.

BTY is called upon as part of its day-to-day cost management activities to make recommendations on cost variations across regions of Canada. The above data sources were provided to senior consultants within BTY, and an internal consensus was reached on appropriate, broad adjustment factors for Zone 1 residential construction.

The regional factors derived from this exercise are as follows:

Table 7: Regional Factors

Region	Factor
British Columbia	1.00
Alberta	0.95
Saskatchewan	0.93
Manitoba	0.90
Ontario	1.05
Quebec	0.98
Atlantic Canada	0.93
The North (Yukon & NWT)	1.22

The granularity of the regional breakdown has been developed in consultation with the project team to respect ISC's confidentiality requirements. The regions are each province, except for the Maritimes and Newfoundland and Labrador which are grouped as 'Atlantic Canada' due to the paucity of First Nations in that region. Nunavut is excluded from this review because it is being reviewed separately. Yukon and NWT have been amalgamated into a single region. These factors have been used to make regional adjustments to both capital and O&M costs.

4.2.3 Zonal Factors

The zonal factors adopted for the Housing review by BTY are as follows:

Table 8: Adjustment Factors by Zone

Zone	Capital Factor	O&M Factor
G1	1.00	1.00
G2	1.20	1.00
G3	1.60	1.60
G4	2.00	2.75

These zonal factors take account of the following:

- In a busy construction market, a lack of competitive bidders for projects in rural and remote areas;
- Transportation and other out-of-town costs for construction personnel;
- Shipping costs for materials in a narrow construction window in the northern climate.

These zonal factors were applied to the base Zone G1 cost for each region to arrive at local costs for each zone.

4.2.4 Housing Capital Budget

The following table summarises the cash flow requirement for the Housing capital program to 2030.

Table 9: Housing – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Housing								
Capital Cost	$8,096	$12,749	$17,680	$18,210	$18,756	$19,319	$19,899	$114,709
TOTAL CAPITAL COST	**$8,096**	**$12,749**	**$17,680**	**$18,210**	**$18,756**	**$19,319**	**$19,899**	**$114,709**

The following table summarises the capital cost of the proposed Housing program to 2030 by region and zone in escalated dollars.

Table 10: Housing – Capital Cost Analysis by Zone

Provinces	Zone 1	Zone 2	Zone 3	Zone 4	Total (millions)
Alberta	$ 5,716	$ 8,265	$1,760	$ 3,805	$ 19,545
British Columbia	$ 7,339	$ 6,328	$2,288	$ 3,020	$ 18,975
Manitoba	$ 4,545	$ 6,571	$1,457	$ 3,204	$ 15,778
North (Yukon/NWT)	$ 1,532	$ 2,395	$1,597	$ 1,303	$ 6,828
Atlantic Canada	$ 1,516	$ 1,876	-	$ 236	$ 3,627
Ontario	$ 6,528	$ 7,517	$ 183	$ 7,707	$ 21,935
Quebec	$ 2,440	$ 1,843	$1,833	$ 1,490	$ 7,606
Saskatchewan	$ 3,270	$15,545	$ 766	$ 833	$ 20,413
TOTAL	**$32,886**	**$50,340**	**$9,885**	**$21,598**	**$114,709**

4.2.5 Housing O&M

The following table summarises the Housing O&M funding cash flow requirement.

Table 11: Housing – Operations and Maintenance Cost Analysis

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Housing								
O&M for new housing	$ 883	$1,391	$1,928	$1,986	$2,045	$2,107	$2,170	$12,510
O&M for existing housing	$1,007	$1,057	$1,100	$1,132	$1,166	$1,201	$1,237	$ 7,900
TOTAL O&M COST	**$1,890**	**$2,448**	**$3,028**	**$3,118**	**$3,211**	**$3,308**	**$3,407**	**$20,410**

The Operation and Maintenance Cost (August 2022 dollars) for all existing housing is $941 million per year, based on a total of 85,738 units. The quantity of existing housing units was provided in the IFSD Housing report.

The following table summarises the New Housing O&M funding requirement by region and zone:

Table 12: New Housing – Operations and Maintenance Cost Analysis Zone

Provinces	Zone 1	Zone 2	Zone 3	Zone 4	Total (millions)
Alberta	$ 624	$ 907	$ 204	$ 446	$ 2,180
British Columbia	$ 812	$ 693	$ 260	$ 329	$ 2,094
Manitoba	$ 491	$ 713	$ 160	$ 350	$ 1,715
North (Yukon/NWT)	$ 167	$ 265	$ 186	$ 146	$ 765
Atlantic Canada	$ 160	$ 193	-	$ 25	$ 378
Ontario	$ 690	$ 828	$ 21	$ 823	$ 2,362
Quebec	$ 264	$ 186	$ 174	$ 145	$ 769
Saskatchewan	$ 372	$1,698	$ 89	$ 89	$ 2,247
TOTAL	**$3,579**	**$5,484**	**$1,094**	**$2,353**	**$12,510**

*Quantification of existing housing by region and zone is not available, therefore O&M by region and zone is not presented in this report.

The limitations of this are that O&M expenditure will likely be significantly less than that presented in the table above for new units due to major system replacement costs, typically starting several years after construction. This table assumes O&M expenditure commences from Year 1. Nevertheless, the overall budget is valid as the life-cycle costs are prorated to a per annum amount for the purpose of calculation.

4.3 Education Report

4.3.1 Approach and Assumptions

BTY were provided with the AFN First Nations Education Infrastructure Capital Needs Assessment, issued by First Nations Engineering Services Ltd (FNESL) in August 2021 and the AFN First Nations Education Infrastructure Operation and Maintenance Needs Assessment also issued by FNESL in January 2022.

First Nations Engineering Services Ltd. was retained to complete a National First Nations Education Infrastructure Capital Needs Assessment over a 20-year planning period. Its capital needs assessment report was issued in August 2021 and was followed by an assessment of O&M requirements in January 2022. The studies focused on two main asset types: schools, including provision for outdoor learning, and teacherages, to provide on-reserve accommodation for teaching staff.

The funding requirements were divided into three categories:

Additions: Additional facilities in existing schools so they would comply with the 2021 School Space Accommodation Standards (SSAS);

New Construction: To replace existing schools that had passed their useful life and accommodate future population growth;

Planning and Design: 15% allowances for the soft costs associated with the above construction projects.

An assumption in the study is that schools will offer the same grades as are currently offered. 391 existing schools and 1,026 teacherages were analysed in the study, all part of the data provided by ISC. This represents 74% of the total number of schools on reserve in Canada.

The funding data are organized in tranches: Immediate Needs - schools and teacherages that have already exceeded their service life - and then funding requirements in successive 5-year periods: years 1-5, 6-10, 11-15 and 16-20. Cost escalation/ additional soft cost allowance/ contingencies and zonal factors were applied to the capital and O&M needs identified. Overall, the 20-year capital funding requirements for schools and teacherages were found to be approximately $12.8 billion and O&M requirements $443 million.

These costs had been escalated to the year of their anticipated expenditure, but for this current study FNESL stripped out the escalation and provided the costs in August 2021 dollars. FNESL provided an appropriate break-out of the funding requirement to 2030, which included those costs it had identified as Immediate Needs. The immediate needs arose from FNESL's analysis of ISC's data that indicated that several schools and teacherages exceeded their useful life and needed replacement.

BTY made the following adjustments to FNESL's estimates to derive an appropriate total project budget:

- Included 20% soft costs for Capital Cost only, having backed out FNESL's 15% allowance.
- Included 2% Design Contingency and 5% Construction Contingency.
- Escalated costs from 2021 to 2022 and then to the year of planned expenditure.

4.3.2 Education Capital Budget

The following table summarises the capital funding requirement for education assets to 2030.

Table 13: Education – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Education								
Capital Cost Schools	$443	$698	$ 967	$ 996	$1,026	$1,057	$1,089	$6,276
Capital Cost Teacherage	$121	$190	$ 264	$ 272	$ 280	$ 289	$ 297	$1,713
TOTAL CAPITAL COST	**$564**	**$888**	**$1,231**	**$1,268**	**$1,306**	**$1,346**	**$1,386**	**$7,989**

The following table provides the capital funding requirements to 2030 by region and zone for Schools and Teacherages.

Table 14: Education – Capital Cost Analysis by Zone

Provinces	Zone 1	Zone 2	Zone 3	Zone 4	Total (millions)
Alberta	$ 567	$ 352	-	$ 59	$ 977
British Columbia	$1,118	$ 415	$ 54	$ 216	$1,803
Manitoba	$ 88	$ 670	-	$ 341	$1,098
North (Yukon/NWT)	$ 92	$ 359	$114	$ 192	$ 758
Atlantic Canada	$ 181	$ 201	-	$ 20	$ 402
Ontario	$ 395	$ 420	-	$ 420	$1,235
Quebec	$ 266	$ 180	$180	$ 93	$ 718
Saskatchewan	$ 110	$ 808	$ 20	$ 60	$ 998
TOTAL	**$2,816**	**$3,405**	**$368**	**$1,400**	**$7,989**

4.3.3 Education O&M

The following table summarises the annual Education O&M funding requirement.

Table 15: Education – Operations and Maintenance Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Education								
O&M Schools	$274	$431	$598	$616	$635	$654	$673	$3,881
O&M Teacherages	$ 51	$ 82	$113	$117	$120	$124	$128	$ 735
TOTAL O&M COST	**$325**	**$513**	**$711**	**$733**	**$755**	**$778**	**$801**	**$4,616**

The following table summarises the Education O&M funding requirement by region and zone:

Table 16: Education – Operations and Maintenance Cost Analysis by Zone

Provinces	Zone 1	Zone 2	Zone 3	Zone 4	Total (millions)
Alberta	$ 327	$ 203	-	$ 34	$ 564
British Columbia	$ 646	$ 240	$ 31	$ 125	$1,042
Manitoba	$ 51	$ 387	-	$ 197	$ 635
North (Yukon/NWT)	$ 53	$ 208	$ 66	$ 111	$ 438
Atlantic Canada	$ 105	$ 116	-	$ 12	$ 232
Ontario	$ 228	$ 243	-	$ 243	$ 713
Quebec	$ 154	$ 104	$104	$ 54	$ 415
Saskatchewan	$ 63	$ 467	$ 12	$ 35	$ 577
TOTAL	**$1,627**	**$1,967**	**$213**	**$ 809**	**$4,616**

4.4 Drinking Water Advisory

4.4.1 Approach and Assumptions

BTY were provided with the Associated Engineering memo, which identifies the infrastructure investment required to address ongoing water quality issues on First Nations reserves and specifically to end long-term drinking water advisories (DWAs). Refer to Appendix 4.

Ending long-term drinking water advisories is a complex process and requires collaboration between First Nations communities, the Government of Canada, and a range of other key interested parties for each specific site, which may include provincial and local governments, landowners, municipalities, and industry. It is not all about water treatment. The supply chain for clean drinking water involves source waters (surface water, groundwater), abstraction (groundwater wells and surface water intakes), treatment, storage (tanks, reservoirs, and cisterns), transmission, and distribution (both piped systems and trucked water). The development of sustainable, practical best-practice solutions typically encompasses:

- Comprehensive feasibility studies – to identify a range of site-specific solutions and allow the optimum solution to be selected for the situation.
- Project development – taking account of labour, material, and equipment availability for both construction and ongoing operations and maintenance of any developed or upgraded infrastructure.
- Construction of new infrastructure and maintenance of existing infrastructure.
- Training and support of operations and maintenance staff.
- Ongoing operations and maintenance of the facilities – including monitoring and testing.

The funding requirements were divided into two categories:

Capital: Required investment to eliminate the 31 remaining Long Term Drinking Water Advisories.

Operation and Maintenance Budget: Ongoing operations and maintenance of the facilities – including monitoring and testing.

BTY made the following adjustments to derive an appropriate total project budget:

- Included 2% Design Contingency, and 5% Construction Contingency
- Escalated cost from 2015 to 2022 for Capital cost only.

This cost distribution was completed and BTY applied cumulative escalation rates to the capital and O&M costs based on their anticipated year of expenditure.

4.4.2 Capital and O&M Budget

The following table summarises the Capital and O&M funding requirement to address the 31 currently remaining Long Term Drinking Water Advisories by 2030.

Table 17: Drinking Water Advisory – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Drinking Water Advisory								
Capital Cost Drinking Water Advisory	$19	$30	$ 42	$ 43	$ 45	$ 46	$ 47	$272
O&M Drinking Water Advisory	$28	$45	$ 62	$ 64	$ 66	$ 68	$ 70	$403
TOTAL CAPITAL COST	**$47**	**$75**	**$104**	**$107**	**$111**	**$114**	**$117**	**$675**

4.5 All-season Access Roads

4.5.1 Approach and Assumptions

BTY were provided with the Associated Engineering memo, which identifies the cost of replacing winter roads with all-season roads across Canada.

The estimate is based on the definition of winter road network developed by the FPT sub-working group on Northern Transportation in 2015. Establishment of this definition excluded approximately 2,000 km of winter road from the existing network and, consequently, some uncertainty does exist regarding the actual extent of Canada's winter road network. For simplicity, this discussion paper uses an estimate of 8,000 km to describe the road network serving First Nations communities to conform with current research on the subject area. The winter road network in Manitoba is 2,119 km and serves 19 First Nations, while the Ontario network is 3,160km and serves 31 First Nations. The remaining 2,721 km of winter road network provides services to 17 First Nation and/or remote communities and industry across Saskatchewan, Alberta, and the North.

BTY made the following adjustments to derive an appropriate total project budget:

- Included 2% Design Contingency, and 5% Construction Contingency

This cost distribution was completed and BTY applied cumulative escalation rates to the capital and O&M costs based on their anticipated year of expenditure.

4.5.2 Approach and Assumptions

The following table summarises the Capital funding requirement for replacing Canada's winter road network with an all-season alternative built to a gravel road standard.

Table 18: All-season Access Roads – Capital and O&M Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Year-Round Access								
Capital cost All-season access roads	$2,056	$3,238	$4,489	$4,624	$4,763	$4,906	$5,053	$29,128
O&M cost All-season access roads	$ 449	$ 708	$ 981	$1,011	$1,041	$1,073	$1,105	$ 6,368
TOTAL CAPITAL COST	**$2,505**	**$3,946**	**$5,470**	**$5,635**	**$5,804**	**$5,979**	**$6,158**	**$35,496**

4.6 Climate Adaptation

4.6.1 Approach and Assumptions

BTY were provided with the Associated Engineering memo which identifies the additional financial investment necessary to manage the risk of climate change to First Nations infrastructure by 2030. Risk is defined here as the combined impact of:

- The likelihood of the event based on available climate projection data and specific to the region in which the asset is situated.
- The exposure of the asset to climate hazards, which is specific to its location.
- The consequence of the climate event, expressed in terms of the asset type, its size, and its value. Consequence was appraised in terms of potential damage to the asset resulting from chronic issues, such as declining road surface conditions resulting from more frequent extreme heat events or more acute events such as severe storms.

The funding requirements were divided in to five categories: Buildings, Housing, Transportation, Utility and Emergency Preparedness. In addition, the preservation and enhancement of natural assets such as firebreaks will be necessary to mitigate the threat created by climate change.

The cumulative Capital and O&M budget is presented in this report. Refer to Appendix 6 for further details.

BTY made the following adjustments to derive an appropriate total project budget:

- Included 20% soft cost for Capital Cost only
- Included 2% Design Contingency and 5% Construction Contingency

This cost distribution was completed and BTY applied cumulative escalation rates to the capital and O&M costs based on their anticipated year of expenditure.

4.6.2 Capital and O&M Budget

The following table summarises the Capital and O&M funding requirement to manage the one-hundred and ninety-seven (197) potential adaptations proposed to manage the risk of climate change to First Nations assets based on assessed risks.

Table 19: Climate Adaptation – Capital and O&M Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Climate Adaptation								
Capital and O&M Cost Climate Adaptation	$1,726	$2,718	$3,769	$3,882	$3,998	$4,118	$4,242	$24,452
O&M Climate Adaptation	$ 458	$ 720	$ 999	$1,029	$1,060	$1,092	$1,124	$ 6,482
TOTAL CAPITAL COST	**$2,184**	**$3,438**	**$4,768**	**$4,911**	**$5,058**	**$5,210**	**$5,366**	**$30,934**

4.7 Net Zero Carbon

4.7.1 Approach and Assumptions

BTY were provided with the Associated Engineering memo identifies the additional financial investment necessary to put First Nations on the path to Net-Zero Carbon by 2050.

An important part of achieving Canada's net-zero future starts by Closing the Infrastructure Gap by 2030 for First Nations. The need to reduce the carbon emitted by existing federally funded infrastructure and prepare new facilities on First Nation lands for net-zero capacity is an immediate starting point to deliver on the Canadian Net-Zero Emissions Accountability Act and carbon emissions reduction target. The scope and costs evaluated in this report constitute Tier 2 in the energy hierarchy. The first two tiers of the energy hierarchy are also intended to manage Scope 1 emissions, defined by the international Greenhouse Gas Protocol as those directly resulting from an organization's facilities and vehicles, which are the primary form of emissions by First Nations. Refer to Appendix 7. Therefore, the focus is on the following:

- Improving the Energy Efficiency of First Nations Residential and Non-Residential Buildings
- Improving the energy efficiency of First Nations Vehicles and Fleet Infrastructure
- Improving the energy efficiency of First Nation Utilities Systems, Building Utility Scale Renewable Systems

Given that operations and maintenance costs will increase for aging assets, at the same time, they potentially will be reduced by energy efficiency and renewable energy upgrades. It is therefore assumed that they will offset-each other in the short-term. This assumption will vary from asset to asset, however, no net increase in O&M costs is an appropriate assumption for this portfolio-wide assessment.

BTY made the following adjustments to derive an appropriate total project budget:

- Included 2% Design Contingency and 5% Construction Contingency

This cost distribution was completed and BTY applied cumulative escalation rates to the Capital costs based on their anticipated year of expenditure.

4.7.2 Capital Budget

The following table summarises the Capital funding requirement to improve the energy efficiency of First Nations Housing, Vehicles and Fleet Infrastructure and Light-Duty Vehicles, by 2030.

Table 20: Net Zero Carbon – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Net Zero								
Capital Cost Net Zero Carbon	$897	$1,413	$1,959	$2,018	$2,079	$2,141	$2,205	$12,712
TOTAL CAPITAL COST	**$897**	**$1,413**	**$1,959**	**$2,018**	**$2,079**	**$2,141**	**$2,205**	**$12,712**

4.8 Connectivity

4.8.1 Approach and Assumptions

BTY were provided with the memo prepared by Planetworks Consulting, its sub-consultant, which identifies the extent of the wired and mobility wireless infrastructure gaps in First Nation communities and provides capital budgets to resolve the gaps and ensure every First Nation community has:

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

The infrastructure gap is estimated at $3.3 billion and of the 748 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 them in place. The remaining 728 communities need one or more of the three infrastructure elements. Refer to Appendix 8.

BTY made the following adjustments to derive an appropriate total project budget.

- Included 20% Design Contingency and 10% Construction Contingency

This cost distribution was completed and BTY applied cumulative escalation rates to the Capital costs based on their anticipated year of expenditure.

4.8.2 Capital 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. At this stage Operation and Maintenance is excluded and will be included in future studies.

Table 21: Connectivity – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Connectivity								
Capital Cost Connectivity	$367	$ 579	$ 802	$ 826	$ 850	$ 876	$ 902	$ 5,202
TOTAL CAPITAL COST	**$367**	**$ 579**	**$ 802**	**$ 826**	**$ 850**	**$ 876**	**$ 902**	**$ 5,202**

4.9 Accessibility

4.9.1 Approach and Assumptions

BTY were provided with the Associated Engineering memo, which identifies the cost of retrofitting First Nation building assets across all categories to meet the requirements of the Accessible Canada Act (ACA), exclusively to buildings. It does not include other important accessibility measures related to communications, technology, and of a more universal organizational or attitudinal nature. Three major categories of measures emerged for residential and non-residential construction and were applied against all assets listed in the registry either as:

- Category 1: a bundle of minor measures such as grab bars in bathrooms or washrooms.
- Category 2: a bundle of more extensive measures such as widening corridors and entries, replacing change rooms in recreation centres with fully accessible design, or changing vanity and kitchen counter heights to accommodate wheelchair users.
- Category 3: a bundle of measures including elevators or stair lifts, ceiling rails to enable transport of a bed-bound person to a bath, exterior ramps, and secondary fire exits. Note that secondary fire exits are now mandatory under Canadian fire codes.

For a list of measures necessary to improve the accessibility of First Nation residential and commercial assets, refer to Appendix 9. BTY provided AE with conceptual costs for its use in preparing the discussion paper. O&M costs are included in the Infrastructure O&M budget, as all accessibility improvements are specific to the assets included in Infrastructure study. The following adjustments were made to AE's estimates to derive an appropriate total project budget:

- Included 20% soft costs for Capital Costs only
- Included 2% Design Contingency, and 5% Construction Contingency

This cost distribution was completed and BTY applied cumulative escalation rates to the Capital costs based on their anticipated year of expenditure.

4.9.2 Capital Budget

The following table summarises the Capital Cost funding requirement to retrofit First Nations building assets for accessibility.

Table 22: Accessibility – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
Accessibility								
Capital Cost Accessibility	$112	$ 177	$ 245	$ 252	$ 260	$ 268	$ 276	$ 1,590
TOTAL CAPITAL COST	**$112**	**$ 177**	**$ 245**	**$ 252**	**$ 260**	**$ 268**	**$ 276**	**$ 1,590**

4.10 First Nations Direct Ask

4.10.1 Approach and Assumptions

In the Fall Economic Statement of 2020, the Government of Canada announced it will accelerate its commitment to close the infrastructure gap in Indigenous communities by 2030, by "supporting the co-development of infrastructure plans with Indigenous partners, which will help pave the way to address critical needs in First Nations, Inuit and Métis Nation communities."[1] Since then, Indigenous Services Canada has worked with the Assembly of First Nations, in part, to quantify the infrastructure needs of First Nations communities.

The ISC-led engagements took place with individual First Nations throughout the spring and summer of 2022. ISC provided First Nations across Canada with a letter requesting communities submit a list of their infrastructure asset needs, ordered in terms of paramount of need. No restrictions were placed on the type, quantity, or cost of assets for communities to identify what is required to close their infrastructure gaps.

Responses were received throughout the summer and early fall; by October 24th, 2022, 70% of First Nations communities had submitted infrastructure lists, as summarized in Table 24.

Asset lists were examined by Indigenous Services Canada, and the costing of assets, if provided by communities, was evaluated against previously completed projects and industry information. Costing figures originated from communities, and unless costing was outside of normal ranges for similar projects, the values were included as-is.

The First Nation Direct-Asks that were received as a part of the cost report exercise were than compared against the AFN National First Nation Assets Needs Study to ensure no overlap of infrastructure costs occurred and that a comprehensive and complete number was compiled into the final cost report. Any excluded information in this exercise has been further qualified in the cost reports subsections and appendices.

Based on assumptions regarding the scope of the estimates submitted by First Nations, BTY made the following adjustments to derive appropriate total project budgets:

- Included 5% soft costs for Capital Costs
- Included 2% Design Contingency and 5% Construction Contingency

This cost distribution was completed and BTY applied cumulative escalation rates to the Capital costs based on their anticipated year of expenditure.

The following Infrastructure Asset Categories have been included in the First Nations Direct Ask, as defined by ISC.

(CA) Community Accessibility Assets - Includes 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.

[1] Fall Economic Statement 2022, Chapter 3, 3.3.3.1 Supporting Infrastructure in Indigenous Communities: https://publications.gc.ca/collections/collection_2020/fin/F1-52-2020-eng.pdf

(TR) Transportation Infrastructure – Includes Roads, Bridges, Waterways, Airports and Tunnels within the community.

(WW) Water, Wastewater and Utilities - Includes water treatment plants, lift stations, water and wastewater pipes, lagoons, in-city hydro, and connections.

(SW) Solid Waste and Recycling - Includes waste processing areas, landfills, garbage trucks.

(ET) Education and Training - Includes schools, vocational training, Indigenous language training.

(ES) Emergency Services - Includes fire, ambulance, police.

(HS) Health - Includes all Health-related Assets, nursing stations, clinics, long term care homes.

(SP) Social Programs - Includes Social Work, Child Care, Men's, and Women's Shelters. Includes Elders Complexes not identified as Long-Term Care homes.

(CU) Cultural Assets - Includes cultural centres, ceremonial grounds, powwow grounds, museums.

(CO) Community Assets - Includes community centres, community costs and studies, libraries, community workshops and storage areas, ATR additions to reserve, administrative buildings. Includes all vehicles for the community.

(RA) Recreation Assets - Includes trails, arenas, baseball diamonds.

(ED) Economic Development - Includes gas stations, hotels, storefronts.

4.10.2 Capital Budget

The following table summarises the Capital Cost funding requirement defined by the output of the ISC Survey:

Table 23: First Nations Direct Ask – Capital Cost Data

Closing the Infrastructure Gap 2030 (millions)	2023 to 2024	2024 to 2025	2025 to 2026	2026 to 2027	2027 to 2028	2028 to 2029	2029 to 2030	Total (millions)
First Nations Direct Ask								
Capital Cost First Nations Direct Ask	$3,907	$6,154	$8,534	$8,790	$9,053	$9,325	$9,605	$55,367
TOTAL CAPITAL COST	**$3,907**	**$6,154**	**$8,534**	**$8,790**	**$9,053**	**$9,325**	**$9,605**	**$55,367**

The following table quantifies the community response:

Table 24: First Nation Direct Ask – Community Response Summary

Regions	Number of Communities	Number of Infrastructure Plans Received	Regional Participation
British Columbia	189	91	48%
Alberta	45	45	100%
Saskatchewan	70	42	60%
Manitoba	63	61	97%
Ontario	126	96	76%
Quebec	37	26	70%
Atlantic Region	32	32	100%
Yukon Territory	6	6	100%
NWT	2	2	100%
TOTAL	**570**	**401**	**70%**

The following table summarises the First Nation Direct Ask funding requirement by asset and zone:

Table 25: First Nation Direct Ask – Asset and zone

Asset Categories	Zone 1	Zone 2	Zone 3	Zone 4	Total (millions)	Exclusions vs. Asset Needs
Community Accessibility Assets (CA)	-	-	-	$ 8,549	$ 8,549	-
Community Assets (CO)	$ 3,155	$ 7,567	$ 873	$ 1,782	$13,376	-
Cultural Assets (CU)	$ 262	$ 370	$ 22	$ 129	$ 783	$ 67
Economic Development (ED)	$ 520	$ 582	$ 39	$ 292	$ 1,432	-
Education and Training (ET)	$ 1,116	$ 2,472	$ 411	$ 413	$ 4,412	$ 1,829
Electronic Connectivity (EC)	-	-	-	-	-	-
Emergency Services (ES)	$ 415	$ 996	$ 87	$ 285	$ 1,784	$ 421
Health (HS)	$ 2,623	$ 1,710	$ 113	$ 555	$ 5,001	-
Housing (HO)	-	-	-	-	-	-
Recreation Assets (RA)	$ 288	$ 552	$ 35	$ 282	$ 1,157	-
Social Programs (SP)	$ 1,047	$ 1,548	$ 158	$ 412	$ 3,165	-
Solid Waste and Recycling (SW)	$ 255	$ 309	$ 33	$ 149	$ 747	$ 254
Transportation Infrastructure (TR)	$ 750	$ 1,617	$ 53	$ 1,679	$ 4,099	$ 3,883
Water, Wastewater and Utilities (WW)	$ 1,968	$ 3,356	$ 397	$ 1,161	$ 6,881	$ 4,305
TOTAL	**$12,399**	**$21,078**	**$2,222**	**$15,688**	**$51,387**	**$10,758**

Therefore, the total AFN Direct Ask is $40,628,755, considering the AFN exclusions for assets overlapping with allowances made in the National First Nations Assets Needs Study (2022). The next study should ensure participation from the remaining 169 First Nations who did not engage in evaluating either their short or long-term community infrastructure needs. Nonetheless, allowances were made for basic infrastructure needs and growth as part of the AFN National Assets Needs Study which contributes its findings to this report and its total calculations.

5.0 Short-term Pressures and Construction Industry Trends

There are several socio-economic pressures that the construction industry currently faces that are having significant impacts on the delivery of new-build and renovation works across Canada. This section reviews some of these challenges and the impact they may have on achieving the goals of this project.

5.1 Inflation and Cost Escalation

Global economies are presently experiencing record-levels of inflation in local markets. This is in stark contrast to the previous years of relatively stable inflation. It is important to define the relationship between Inflation and Cost Escalation in the Construction Industry.

Construction Escalation outlines the change in costs for a basket of goods and services in the construction industry (i.e., material prices, labour costs, etc.).

Inflation in Canada is defined by the change in costs for a basket of goods and services (i.e., the Consumer Price Index) in Canada. Note that inflation is one of the key factors used when evaluating escalation.

Although inflation has a significant impact on rising costs in the construction industry, there are localized and global factors that also play an important role in driving costs. Construction escalation drivers include Canada's core inflation rate comprising the CPI basket of goods and services, Canada's monetary policy and Bank of Canada's (BoC's) overnight rate, labour pricing and availability, supply chain performance, the public health environment, and significant global geopolitical forces impacting Canada's trading activities.

Canada has experienced unprecedented increases in construction costs since the beginning of 2021. The latest figures from Statistics Canada to the second quarter of 2022 report Canada-wide average rates of 20% for residential and 12.8% for non-residential construction. This is against a backdrop of inflation in the economy in general running at an annual rate of 7.6% according to the most recent figures. Increases in construction prices offered by contractors have, therefore, been running well ahead of those in the general economy.

The Bank of Canada's response to this has been a series of increases in interest rates, the most recent by 75 basis points. These increases have been reflected in higher mortgage rates and a resulting reduction in housing demand as mortgage payments become less affordable. The Bank of Canada's senior deputy governor has cautioned that "getting inflation down to 2% will take some time" and cited a probable timeframe of 2 years. (2% is the Bank of Canada's inflation target).

The recent strength in inflation is being driven by energy prices, rebounding demand for more recently reopened services, supply chain problems, container shortages and labour shortages. For construction, supply-chain problems and labour shortages have been especially acute, while high energy prices work their way through every facet of the industry.

There are signs that supply chain problems are easing in the form of shorter shipping times from Asia, but ongoing Covid lockdowns in China are still affecting the availability of construction materials. Labour shortages may be alleviated by reduced demand, but this is a long-term problem in the industry for which there is no quick fix. Coupled with that, current federal government policy has immigration pegged at 400,000 per annum, so there is a built-in demand for housing in Canada that will persist.

BTY's suggested escalation rates should be considered a contingency against the risk of price increases in the construction sector that could affect funding requirements between now and the end of the decade. In doing so, account has been taken of the high degree of uncertainty surrounding future construction price increases. It is widely accepted that the BoC does not know how high rates will have to go until inflation is reined in and there is serious concern that a "hard landing" will result. There is also a risk that rising interest rates will not be sufficient to stifle price increases due to pressure in the labour market to play wage catch-up and that price increases are due to factors beyond the control of the BoC's dampening of demand.

The prices in our review have been re-based to August 2022, so the first uplift in the rate is to take prices from then until October-November 2023, the average period for price levels in fiscal year 2023-2024. After that, we anticipate a gradual drop-off in inflation and construction escalation levels, with the ultimate assumption being that increases will return to close to the BoC's target rate. Our rate of 3% for later in the decade includes a hedge against any margin between the general inflation rate and price increases in construction.

5.2 Bank of Canada Monetary Policy

The Bank of Canada has an ongoing mandate to maintain an inflation rate of roughly 2%. An essential instrument for this purpose is the Policy Interest Rate, or Overnight Rate, which is the short-term interest rate provided by the Bank of Canada and informs financial institutions of the target interest rate for overnight loans. The Bank of Canada reviews and amends the Overnight Rate eight times per calendar year as part of their monetary policy.

Key economic indicators have shown that additional rate increases are likely to be implemented; one of these primary indicators is the United States Federal Reserve's Interest Rate. As Canada and the United States economies are closely interlinked, there are typically consistent trends between the two when adjusting interest rates. On June 15, 2022, the United States Federal Reserve approved a rate increase of 0.75%, the most significant interest rate increase since 1994. As a result, on July 13, 2022, the Bank of Canada announced that the Overnight Rate would increase by 1.0% the most significant increase since 1998. This was followed by a further increase of 0.75% on September 7, 2022.

The net result of increasing the Overnight Rate is that the cost of lending increases. This typically results in reduced demand for borrowing and slows the injection of new capital into local markets, cooling economic growth. Increasing the Overnight Rate (which in turn increases the Bank Rate and the Deposit Rate) is part of the Bank of Canada's Quantitative Tightening approach, which aims to reduce money supply in the economy to combat rising inflation.

5.3 Energy Prices

Energy costs influence all aspects of a project; from the cost of raw materials going into the project to the transportation costs of raw materials and operating buildings, fluctuations in energy pricing can have immediate and volatile effects. Between 2015 and 2021, the average increase in retail gas prices has been 3% across Canada, with significant cost changes that fluctuated according to demand, supply, refining capacity, and crude oil pricing. It is also important to note that fuel pricing can vary dramatically based on location. For example, in British Columbia, retail gas prices are unique; there are numerous taxes implemented by the provincial government that increases the cost to consumers. In addition, there is a shortage of crude oil refining facilities in British Columbia, which gives more control of retail pricing to refinery operators. The lack of local refining capacity also means that a large portion of the crude oil processed is typically shipped to the state of Washington to be refined before it is purchased back as gasoline to be sold locally. This is done at significant cost, which is again borne by the consumer. Other factors, such as the conflict between Ukraine and Russia, have reduced the global supply of crude oil. This again has a ripple effect which impacts Canada's energy prices.

As such, it is important to consider these factors when evaluating present and future infrastructure costs. As energy is needed to create and transport building materials, as well as operate buildings and equipment, the day-to-day pricing volatility of energy makes it a challenging cost to control.

5.4 Labour Wages

A key result of the COVID-19 pandemic has been its impact in workforce logistics and how business and employees operate on a day-to-day basis. Current trends show that companies have had trouble attracting and retaining talent, especially with the advent of remote work which can potentially broaden labour pools and increase competition.

One approach to evaluating worker wages is understanding how union vs non-union labour is employed. For example, construction labour in British Columbia is predominantly non-union, with labour rates that will fluctuate according to prevailing market conditions. Conversely, union labour wages are set through collective bargaining agreements and are therefore more stable and predictable.

Currently, labour shortages continue to be a challenge for Owners and Developers as skilled trades continue to be in high demand for the foreseeable future. There have also been a higher number of new jobs created and unfilled vacancies across all industries in Canada. Labour wages may potentially see significant short-term increases, increasing project costs; however, wages have historically been aligned with the rate of inflation and trends are relatively predictable over a longer timeframe.

5.5 Supply Chain Logistics

Global supply chains continue to adapt to challenges and market volatility. With COVID-19's impact on how goods are manufactured and transported, agility and flexibility is needed to remain resilient to changing market demands as well as trend shifts.

The construction industry in Canada is especially vulnerable to Supply Chain constraints; many construction goods are imported from countries overseas as local manufacturing capacity is severely limited. In addition, the logistics and transportation industry face worker shortages which reduces the flow of needed resources. Rising energy prices makes goods more expensive to transport, and rising commodity prices hamper the ability to manage cost on a project. With respect to implantation of this funding program as well as for long term sustainability of supply chain routes it may be prudent to explore multiple options to increase the resiliency of the local supply chain. This may include a focus on investment in appropriately sized airports for rural and remote First Nations to ship materials or an increased focus on commercial driver training for First Nations to address driver shortages and simultaneously increase employment opportunities.

6.0 Impact on Construction Industry in Canada

The ability of the construction industry to absorb the investment required to Close the Infrastructure Gap will be a key determining factor in the success of this program. We have highlighted below several metrics used to measure investment and capacity in the construction industry such as historical and current industry investment, availability of labour, and industry output. These metrics will provide insight into the industry's ability to support the required investment and labour needs of this program.

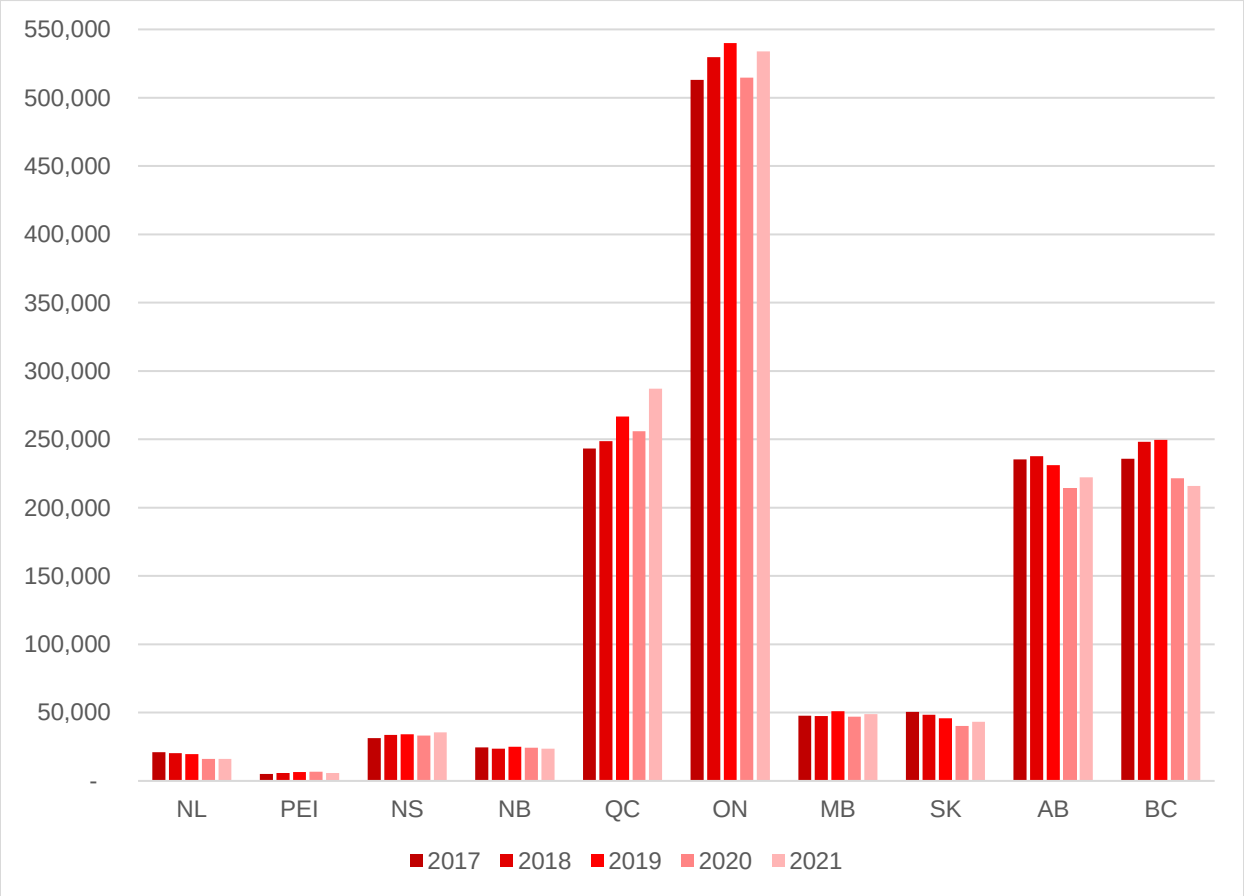
6.1 Key Findings

6.1.1 Labour Force Statistics

Source: Table 14-10-0023-01 Labour force characteristics by industry, annual (x 1,000)

Figure 4 and Table 19 shows labour force statistics in the construction industry[2] quantifying historical availability of labour by geographic location and helping to project labour force trends for the future.

Figure 4: Construction Labour Force Statistics by Province



[2] Data for the Yukon, Nunavut, and Northwest Territories was unavailable at the time of this report.

Table 25: Construction Labour Force Statistics by Province

Construction Labour Force Statistics	2017	2018	2019	2020	2021
Alberta	235,400	237,600	231,100	214,000	222,200
British Columbia	235,700	248,100	249,600	221,600	215,800
Manitoba	47,800	47,400	51,100	47,100	48,900
New Brunswick	24,600	23,500	25,000	24,200	23,500
Newfoundland and Labrador	20,900	20,200	19,500	16,000	16,200
Nova Scotia	31,400	33,700	34,200	33,300	35,600
Ontario	513,000	529,600	540,000	514,800	534,000
Prince Edward Island	5,200	5,700	6,500	6,700	5,900
Quebec	243,300	248,700	266,600	256,000	287,000
Saskatchewan	50,500	48,400	45,800	40,200	43,200
Total	**1,407,800**	**1,442,900**	**1,469,400**	**1,373,900**	**1,432,300**

Based on this data, labour force participation increased steadily in many provinces until 2019. The trend declines in 2020 which may be due to the impact of the COVID-19 pandemic. In 2021, these figures begin rising again in most provinces.

According to BuildForce Canada[3], by 2027, the industry will need more than 15,000 additional workers as well as nearly 156,000 to offset individuals projected to retire. It is anticipated that approximately 142,000 workers will enter the market during this time, making the overall need roughly 29,000 positions in the construction industry.

In addition, Employment and Social Development Canada has stated that an estimated 700,000 skilled trades workers are expected to retire between 2019 and 2028.[4] The demand for skilled trades is already a challenge for most construction projects across Canada; it is also a major challenge for First Nation communities in remote and rural areas.

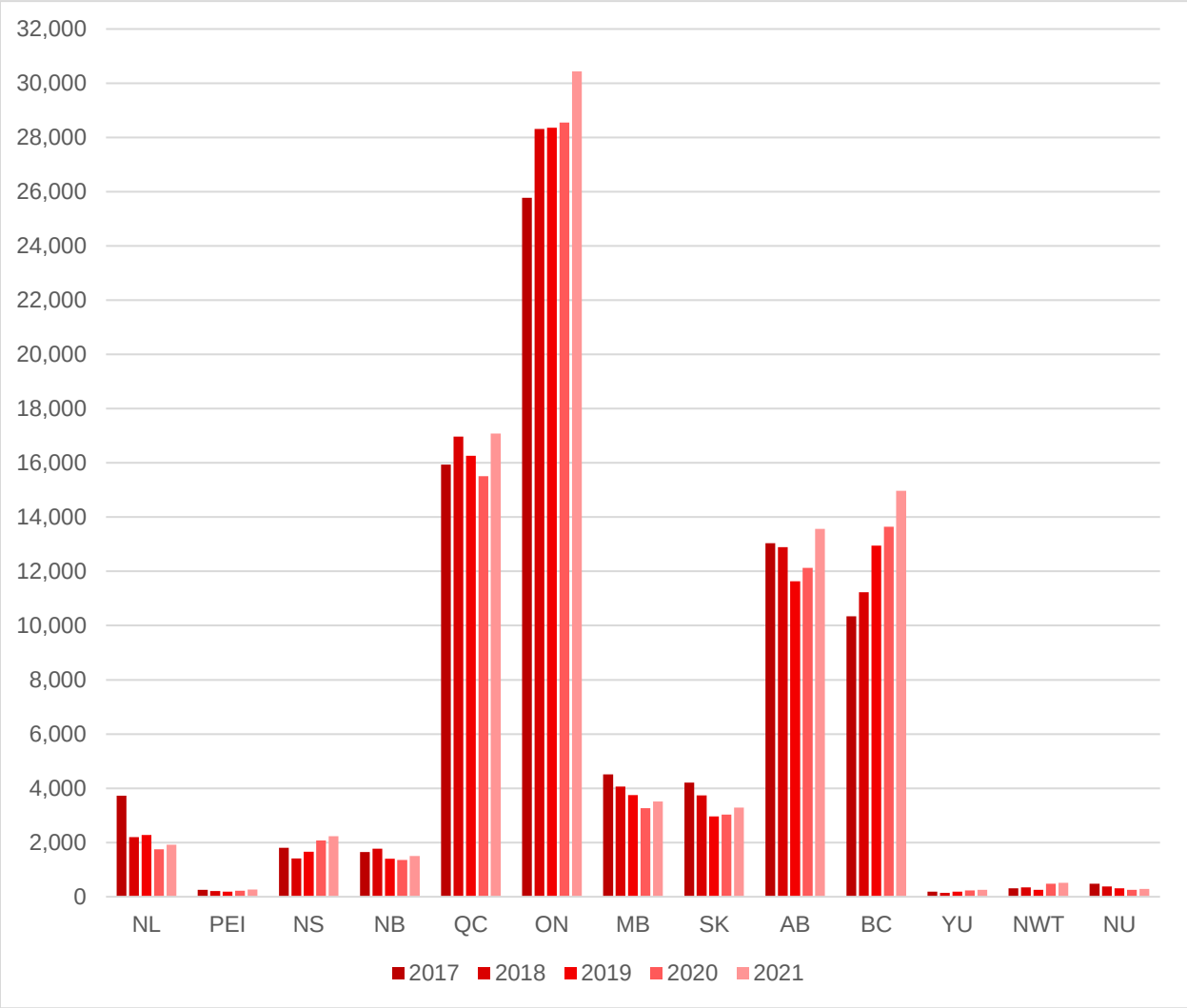
These figures account for current projections related to industry investment and overall construction activity. Should new significant investment be undertaken, the labour force will need to procure additional labour from other industries or look to immigration to maintain the resource levels to support this additional economic activity.

[3]https://www.buildforce.ca/system/files/forecast_summary_reports/2022%20National%20Summary%20Constr%20Maint%20Looking%20Forward.pdf
[4]https://www.newswire.ca/news-releases/government-of-canada-bolsters-the-skilled-trades-sector-by-investing-in-training-811505859.html

6.1.2 Industry Investment

Figure 5 highlights overall construction industry investment by province between 2017 and 2021. The data, from statistics Canada, defines investment as dollars spent by businesses or governments during a given year for the purposes of construction, equipment purchases, and improvements to existing buildings. By capturing this information, we can better understand trends related to construction investments by location and gain further insight into economic activity associated with construction.

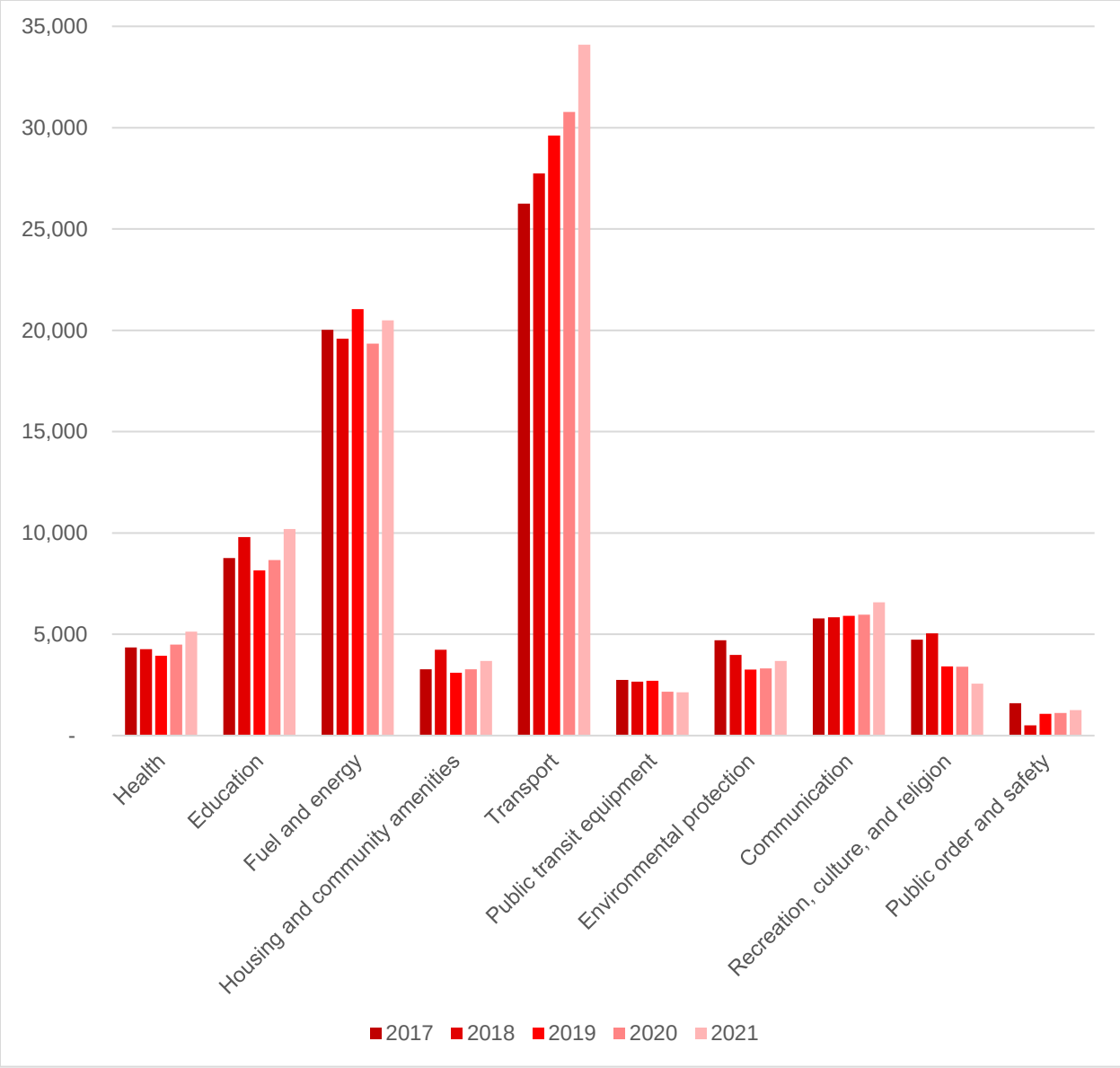
Figure 5: Construction Industry Investment by Province and Territory ($ millions)



Source: Statistics Canada. Table 36-10-0608-01 Infrastructure Economic Accounts, investment and net stock by asset, industry, and asset function (x 1,000,000)

Figure 6 further outlines construction industry investment by sectors such as healthcare and education. Evaluating these figures enables us to see how investments are distributed amongst major industry sectors during the given period.

Figure 6: Construction Industry Investment by Sector ($ millions)



From this data, we can see that primary investment areas include the transportation, energy, and education sectors. Year over year investment trends appear to vary by sector, and most sectors receive under $5 billion of funding per year. Figure 7 highlights the cumulative investment in the construction industry since 2017, while Tables 20 and 21 highlight all the information presented in this section.

Figure 7: Total Investment in the Construction Industry

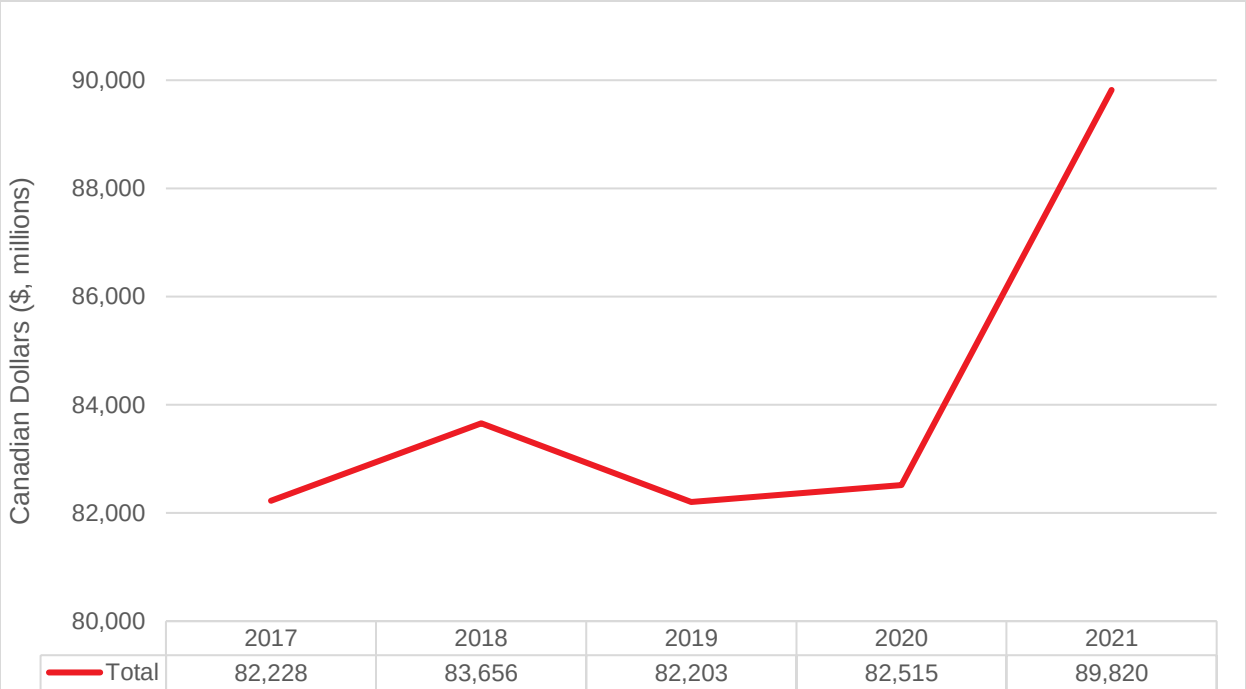


Table 26: Construction Industry Investment by Province

Construction Industry Investment by Province and Territory (millions)	2017	2018	2019	2020	2021	Average
Alberta	$13,043	$12,896	$11,636	$12,123	$13,566	$12,653
British Columbia	$10,342	$11,224	$12,946	$13,650	$14,966	$12,626
Manitoba	$ 4,510	$ 4,061	$ 3,754	$ 3,271	$ 3,513	$ 3,822
New Brunswick	$ 1,652	$ 1,776	$ 1,396	$ 1,359	$ 1,499	$ 1,536
Newfoundland and Labrador	$ 3,721	$ 2,203	$ 2,273	$ 1,748	$ 1,920	$ 2,373
Northwest Territories	$ 313	$ 342	$ 261	$ 475	$ 518	$ 382
Nova Scotia	$ 1,802	$ 1,407	$ 1,663	$ 2,071	$ 2,228	$ 1,834
Nunavut	$ 480	$ 374	$ 310	$ 261	$ 288	$ 343
Ontario	$25,780	$28,319	$28,361	$28,555	$30,435	$28,290
Prince Edward Island	$ 251	$ 208	$ 189	$ 224	$ 263	$ 227
Quebec	$15,938	$16,964	$16,258	$15,510	$17,077	$16,349
Saskatchewan	$ 4,206	$ 3,735	$ 2,968	$ 3,034	$ 3,291	$ 3,447
Yukon	$ 190	$ 147	$ 188	$ 234	$ 256	$ 203

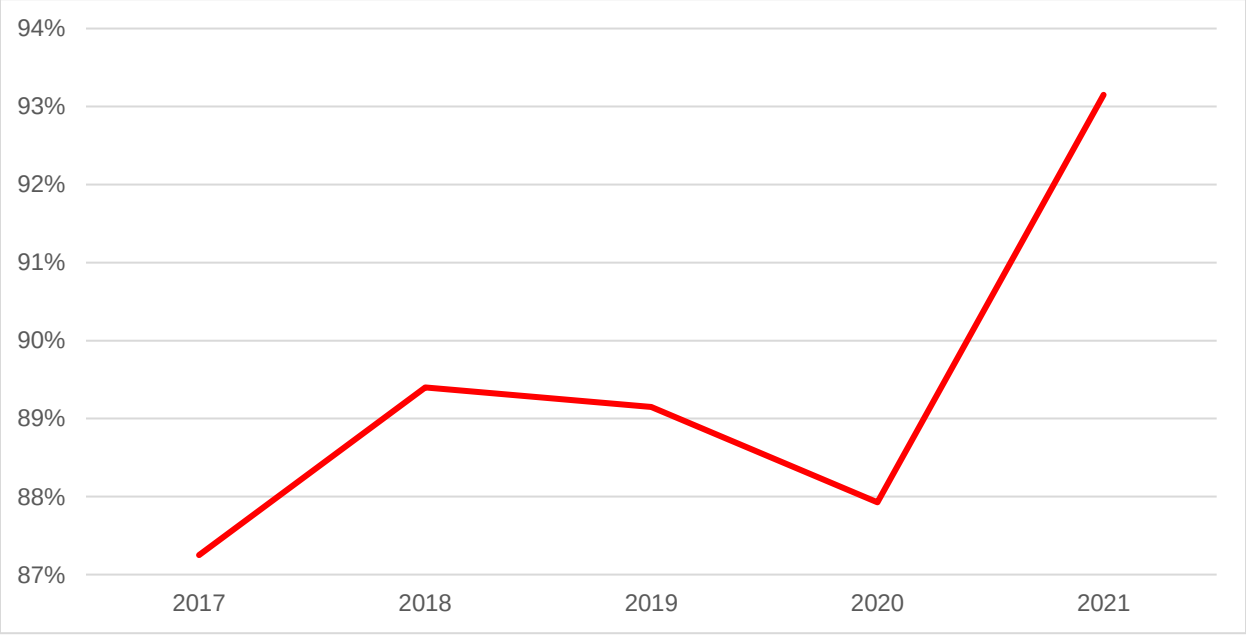
Table 27: Construction Industry Investment by Sector

Construction Industry Investment by Sector (millions)	2017	2018	2019	2020	2021	Average
Health	$ 4,351	$ 4,269	$ 3,936	$ 4,492	$ 5,127	$ 4,435
Education	$ 8,756	$ 9,791	$ 8,144	$ 8,666	$10,192	$ 9,110
Fuel and energy	$20,026	$19,587	$21,039	$19,338	$20,489	$20,096
Housing and community amenities	$ 3,276	$ 4,231	$ 3,105	$ 3,270	$ 3,686	$ 3,514
Transport	$26,246	$27,746	$29,614	$30,774	$34,092	$29,694
Public transit equipment	$ 2,749	$ 2,662	$ 2,710	$ 2,168	$ 2,141	$ 2,486
Environmental protection	$ 4,706	$ 3,974	$ 3,262	$ 3,319	$ 3,684	$ 3,789
Communication	$ 5,783	$ 5,835	$ 5,907	$ 5,960	$ 6,577	$ 6,012
Recreation, culture, and religion	$ 4,735	$ 5,050	$ 3,417	$ 3,406	$ 2,568	$ 3,835
Public order and safety	$ 1,601	$ 512	$ 1,069	$ 1,119	$ 1,264	$ 1,113

6.1.3 Capacity Utilization Rate

Figure 8 and Table 22 highlight the Capacity Utilization Rate of the Construction Industry in Canada between 2017 and 2021. Capacity utilization, per Statistics Canada's definition, is the ratio of an industry's actual output to potential output.

Figure 8: Capacity Utilization Rate



Source: Statistics Canada. Table 16-10-0109-01 Industrial capacity utilization rates, by industry

Table 28: Capacity Utilization Rate

Capacity Utilization Rate	2017	2018	2019	2020	2021
Canadian Construction Industry	87.25%	89.40%	89.15%	87.93%	93.15%

From this information, we see that over the past five years, the construction industry's average output was close to 90% of its maximum potential. A notable dip between 2019 and 2020 occurred, likely due to the pandemic. The spike in 2021 may be attributed to construction being classified as an essential industry by the government, as well as numerous economic stimulus packages being introduced into the Canadian economy. This likely enabled construction workers to maintain and/or increase their output. This increase in the CUR was also likely driven by the high demand for construction projects across the country, further fueled by ongoing government stimulus spending.

6.2 Conclusion

The figures noted above indicate the Construction industry is currently operating at +/- 90% capacity at current labour force engagement levels and from industry investment of $89 billion for 2021. In order to close the Infrastructure Gap, an average yearly investment of approximately $50 billion will be required. For this to be achieved, the construction industry's capabilities and labour force levels will need to grow. This will require a sustained effort around creating innovative solutions for procurement, partnering, labour force engagement and training as well as construction means and methods such as off-site construction, modularization, or utilization of advanced building materials.

7.0 Closing the Infrastructure Gap Cost Comparisons

When evaluating the proposed costs for the Closing the Infrastructure Gap program (CTIG), context can be gained by comparing it to various forms of government spending as well as other economic statistics. For example, we have shown the proposed cost of the CTIG program and compared it to the historic economic output of Canada's Natural Resource exports.

The data used in the following chart was provided by the Centre for Indigenous Statistics and Partnerships.

Figure 9: Canada's Natural Resources and Downstream Exports vs. CTIG

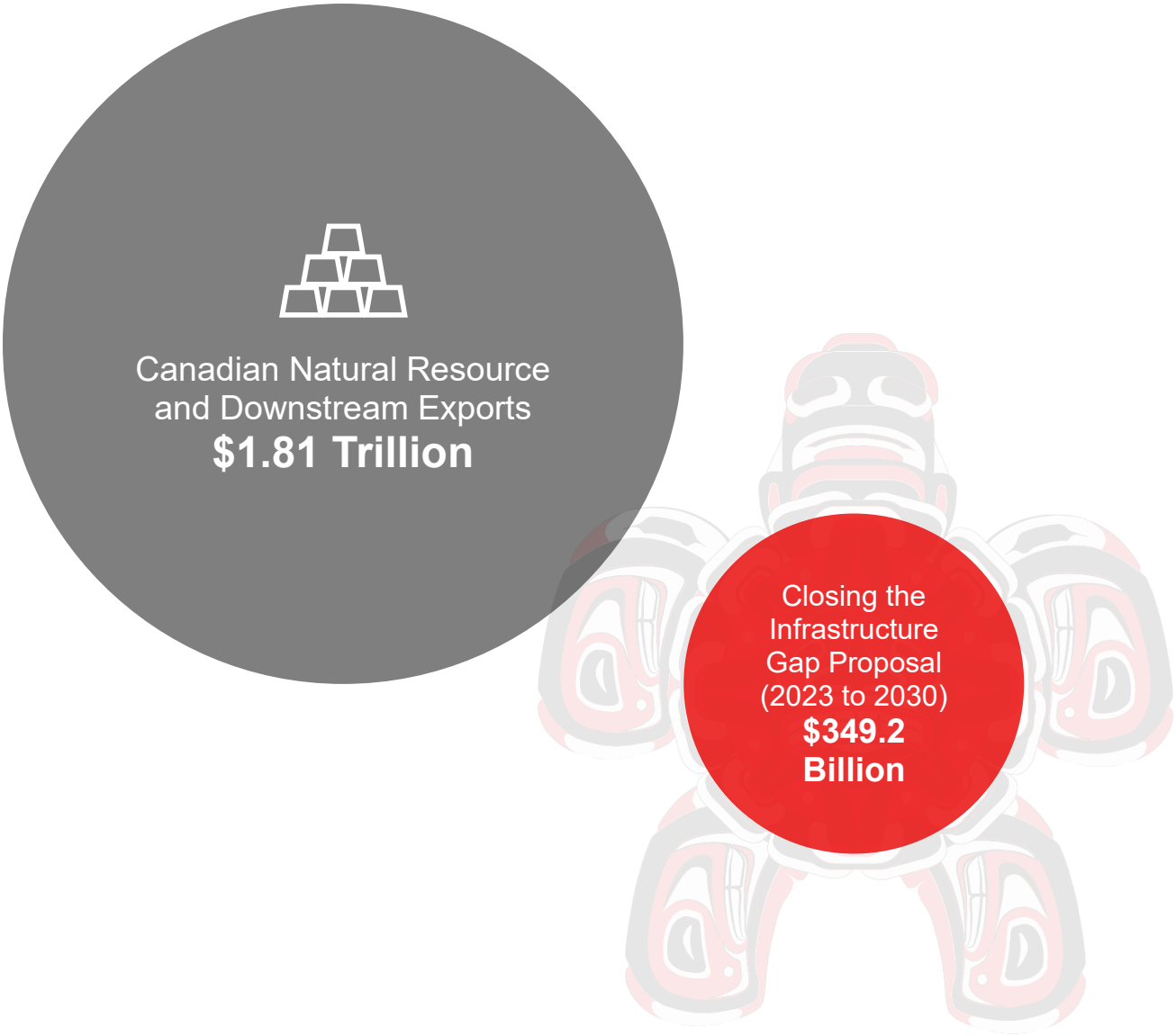
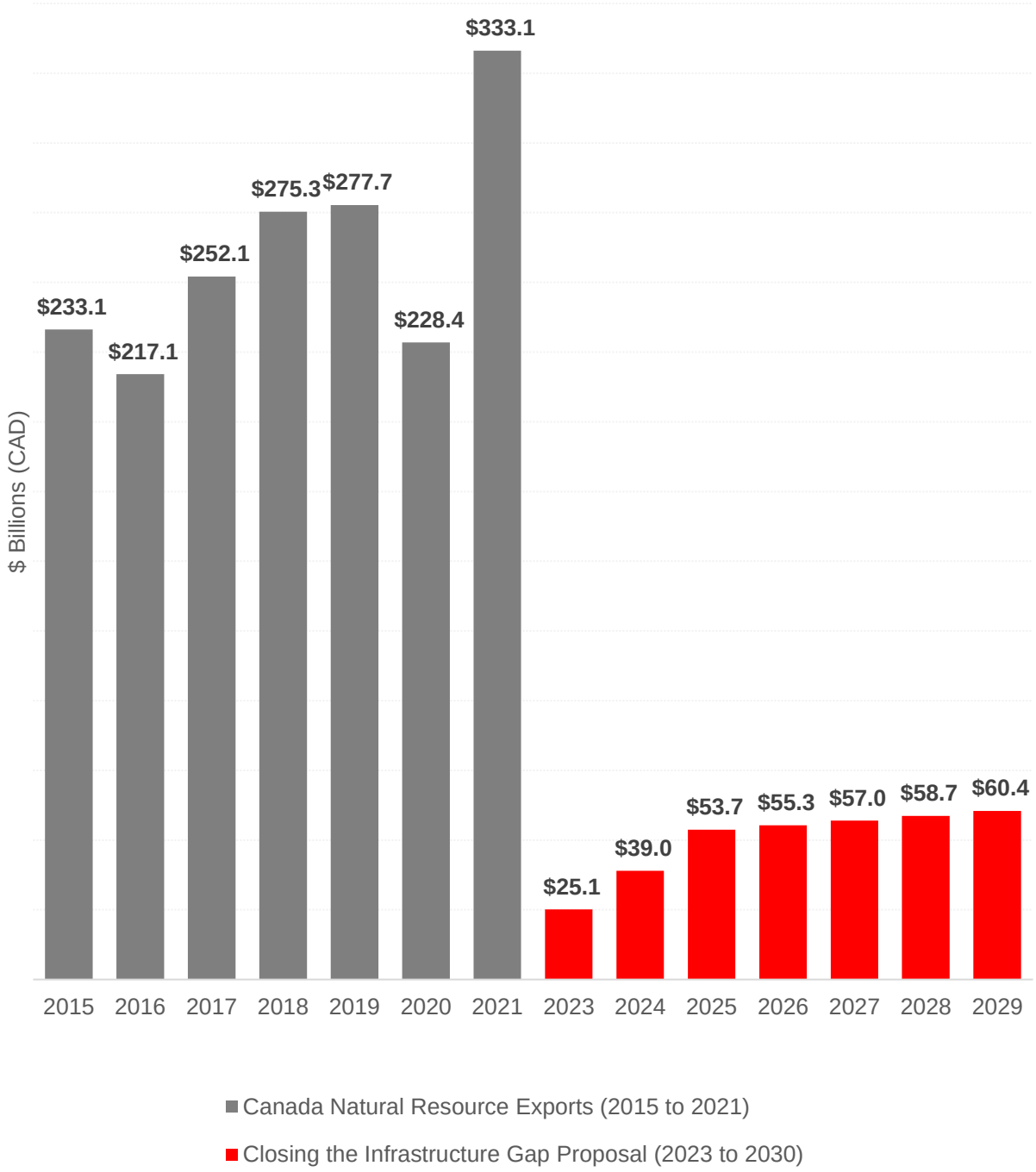
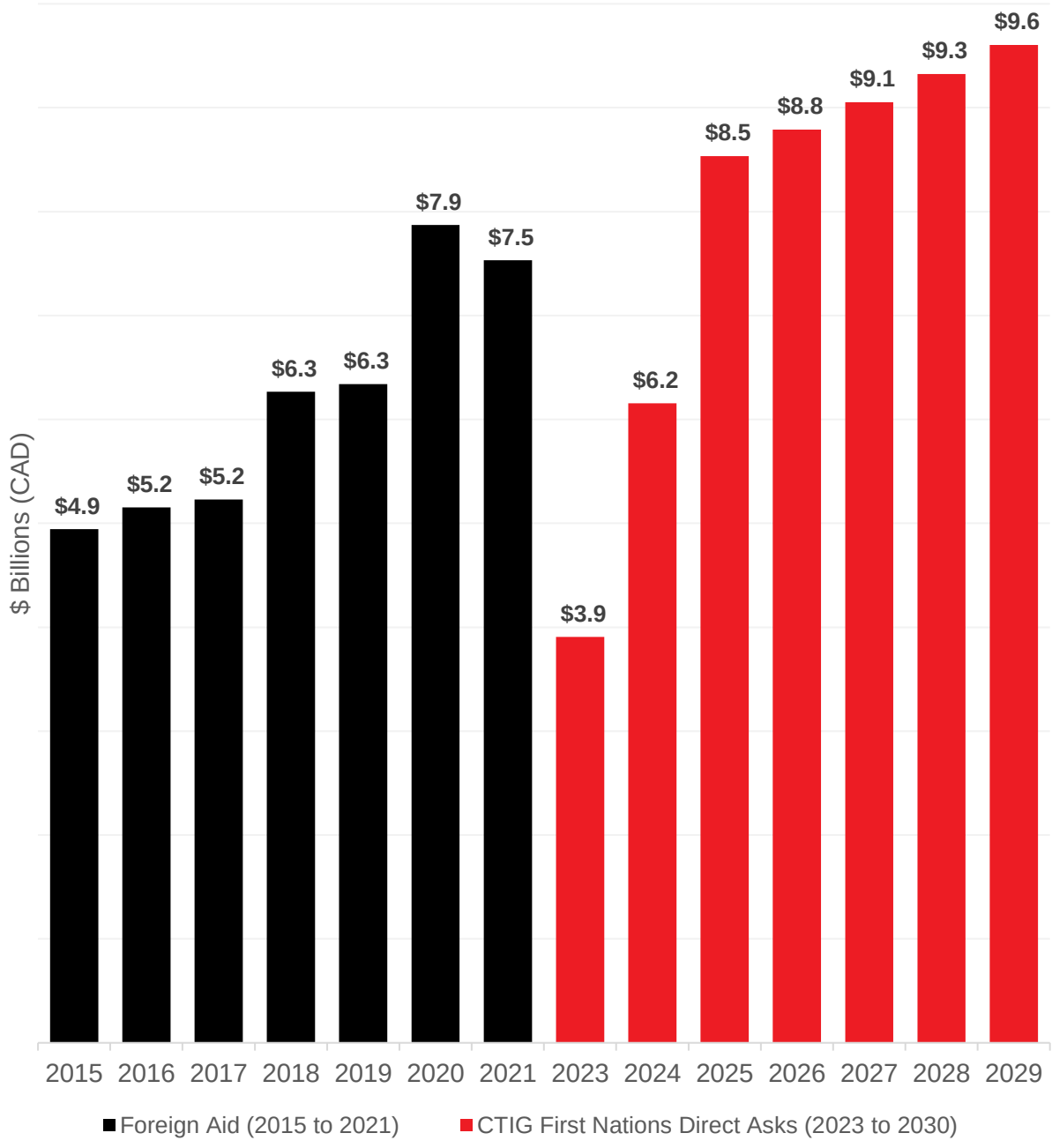


Figure 10: Canada's Natural Resources and Downstream Exports vs. CTIG Annual Breakdown



The chart in Figure 11 shows the comparison between expenditure on Foreign Aid versus the First Nations Direct Asks to Indigenous Services Canada.

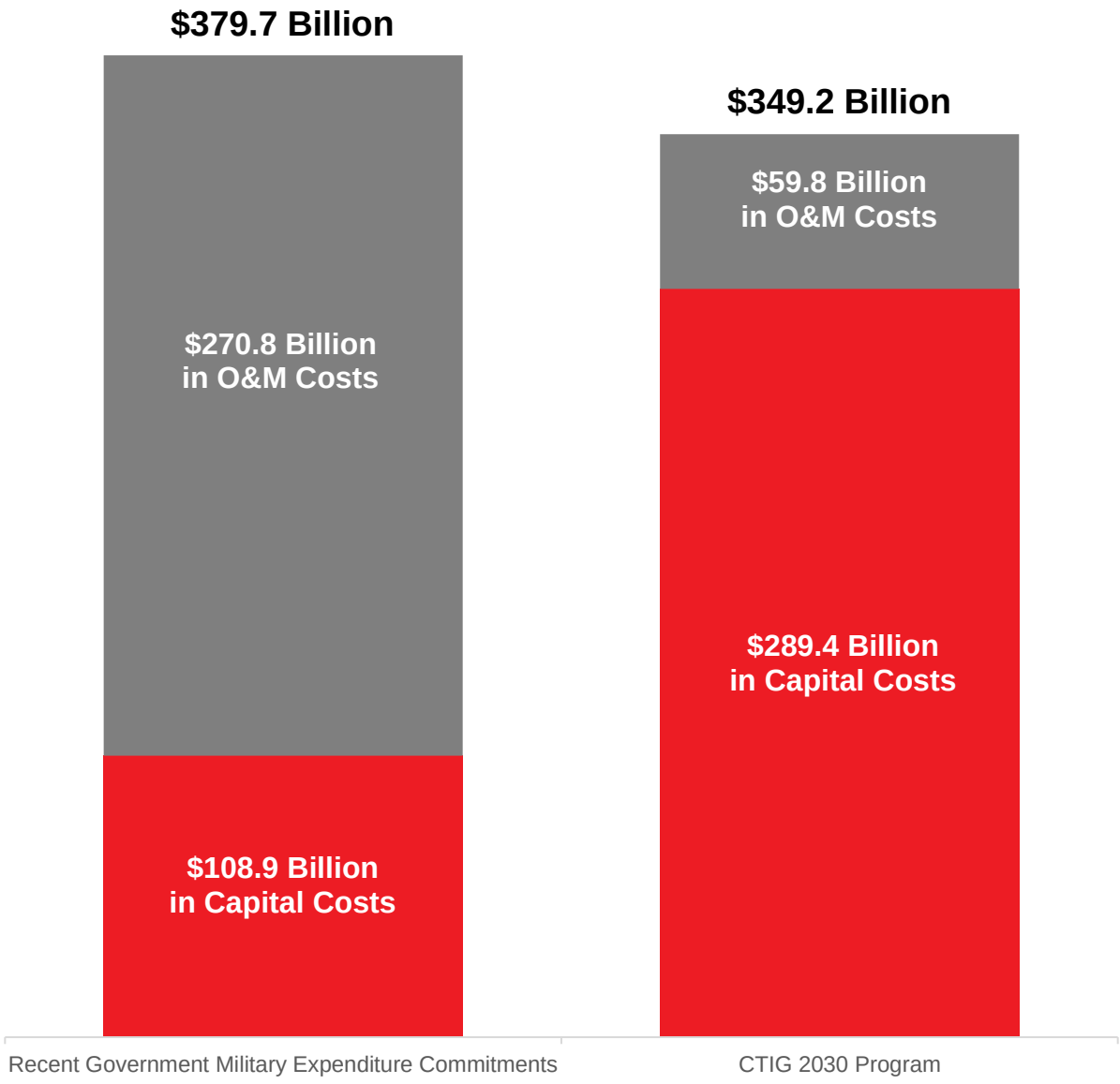
Figure 11: Government Expenditure on Foreign Aid vs. CTIG First Nations Direct Asks



Source: Statistics Canada. Table 10-10-0024-01 Canadian classification of functions of government, by general government component (x 1,000,000) , ISC Data

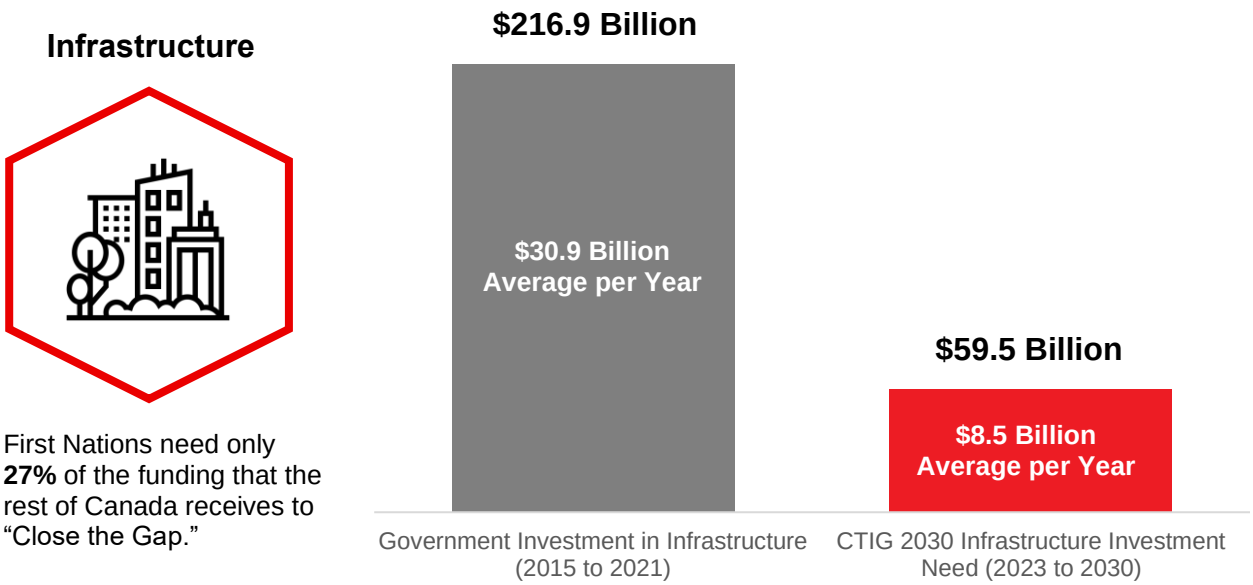
Figure 12 highlights the comparison between Canada's military spending on Capital and Operations & Maintenance expenditure versus CTIG's proposed program cost. New military spending announcements include the purchase and maintenance of 88 F-35 fighter jets, 15 frigates, and military aid to Ukraine. These commitments alone could have funded the entire Closing the Infrastructure Gap by 2030 investment needed with an excess of $30.5 billion left for further military expenditures.

Figure 12: Canada's Military Spending, Capital and O&M vs. CTIG



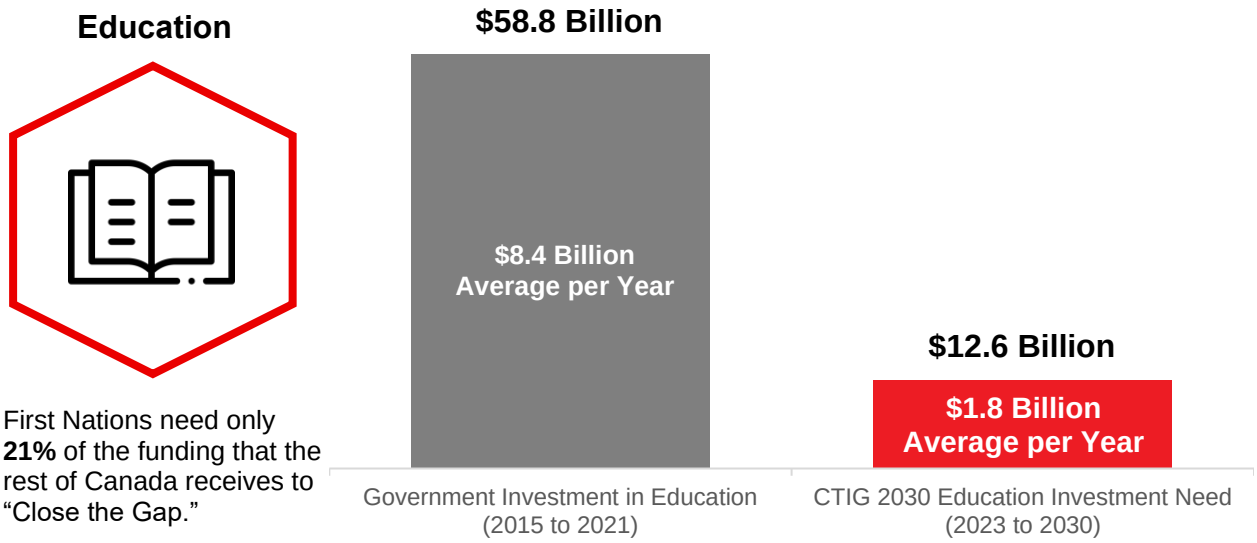
Figures 13, 14, 15, 16 and 17 highlight comparisons between historic government expenditure in the previous seven years (2015 to 2021) versus several asset categories identified in the CTIG program (2023 to 2030).

Figure 13: Government Infrastructure Expenditure vs. CTIG



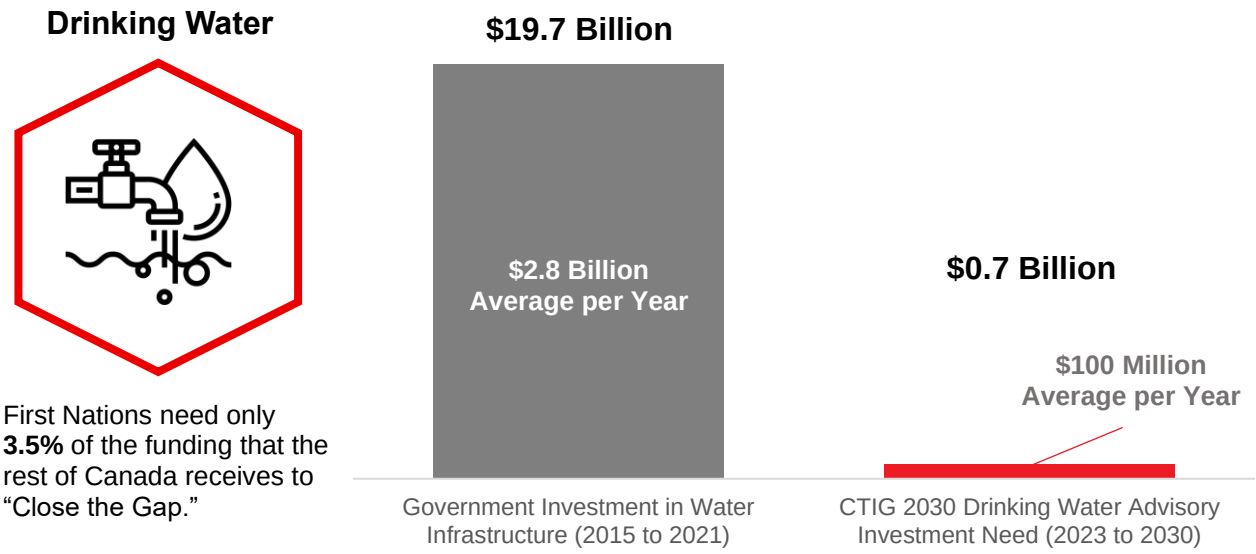
Note: Figures exclude housing and education related infrastructure assets

Figure 14: Government Expenditure on Education vs. CTIG



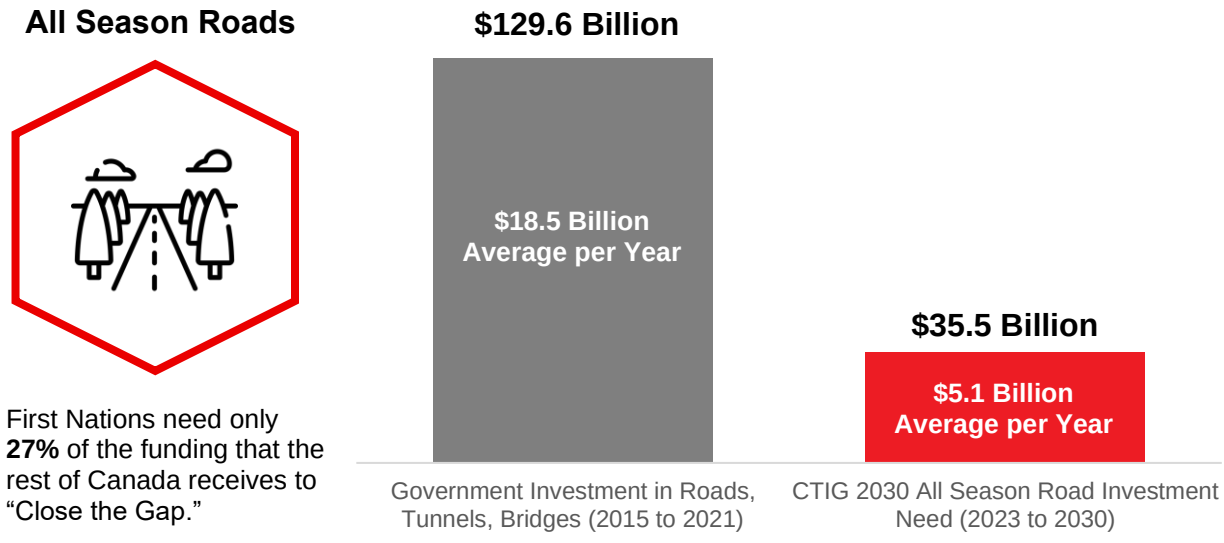
Note: Figures include schools, colleges, universities, and other educational buildings

Figure 15: Government Expenditure on Water Infrastructure



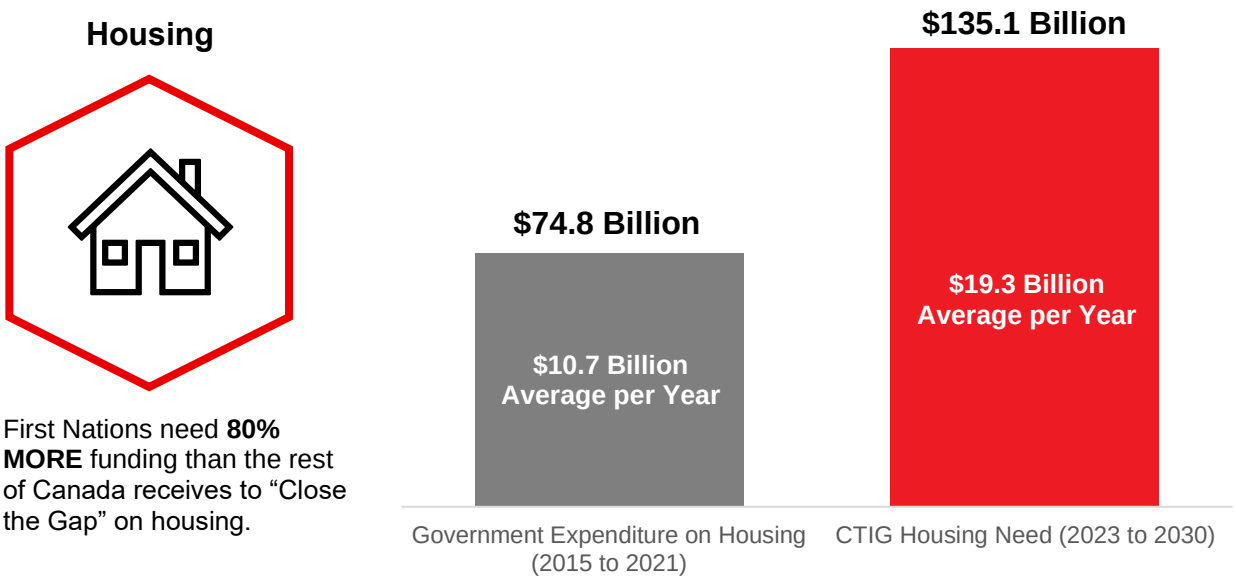
Note: Figures include water filtration plants and other water infrastructure expenditure

Figure 16: Government Expenditure on Roads, Bridges, and Tunnels



Note: Figures include highway/road structures and networks, bridges, and tunnels investment

Figure 17: Government Expenditure on Housing



Note: Figures are based on government functional expenses related to housing and community amenities

Data References

Statistics Canada. Table 36-10-0608-01 Infrastructure Economic Accounts, investment and net stock by asset, industry, and asset function (x 1,000,000)

Statistics Canada. Table 10-10-0005-01 Canadian Classification of Functions of Government (CCOFOG) by consolidated government component (x 1,000,000)

7.1 Case Study: the Marshall Plan

In addition to the comparisons above, another example that can be explored is the success of the Marshall Plan which was developed by the United States in 1948. By providing direct access to economic aid, 16 European countries were able to persevere through the aftermath of World War II and recover to pre-war levels of economic activity. This demonstrates how First Nations could similarly benefit from direct access to capital investment.

Figure 18: Marshall Plan Success and CTIG Potential

$235 Billion

(Adjusted 2023 Canadian Dollars)

The Marshall Plan provided monetary support to 16 European countries from 1948 to 1951 to enable them to recover from the aftermath of World War II. The program was a success. By 1950, these countries had returned to, or exceeded their prewar production levels.

$173 Billion

(CTIG 2023 to 2027)

This investment has the potential to dramatically improve socioeconomic outcomes for First Nations across Canada and revitalize Canada's growth as a country.

For First Nation and Canadian Economic Recovery

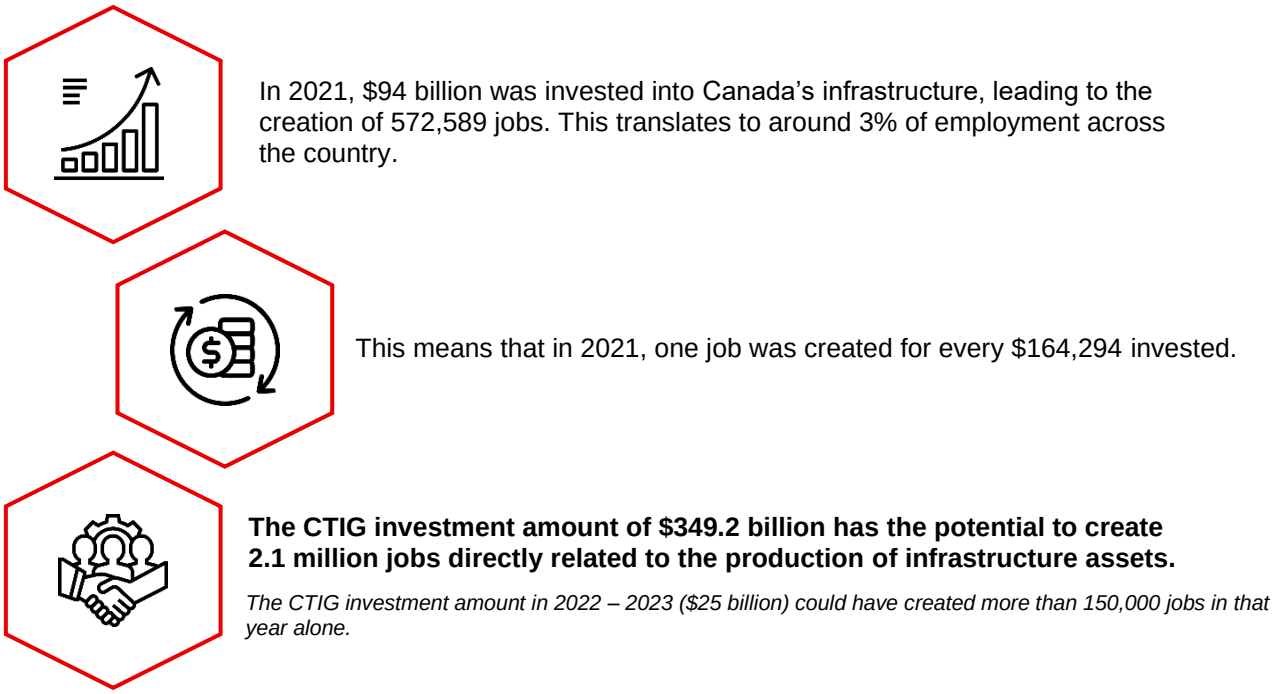
7.2 CTIG Potential for Job Creation

When comparing the CTIG program to similar functions within the various levels of Canadian Government, another consideration would be the economic impact of this investment. 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. Several 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.
- Number of jobs is the number of jobs as a result of the production of infrastructure assets.

The following diagram compares historic ISH data to CTIG's potential for job creation:

Figure 19: CTIG Job Creation



Source: Statistics Canada. Infrastructure Statistics Hub https://www150.statcan.gc.ca/n1/pub/71-607-x/2018013/ic2-eng.htm#shr-pg0

8.0 Next Steps

As noted above, the budgets provided in this report concentrate on a wide range of asset classes. AFN and ISC are fully aware that further work is required to ensure that the needs of First Nations are fully addressed during the remainder of the decade. The response to this will be an ongoing commitment to enhancing the process of gathering data from First Nations and refining the processes for determining the needs of First Nations relative to the rest of the Canadian population.

9.0 Ownership and Copyright

9.1 Report Reliance

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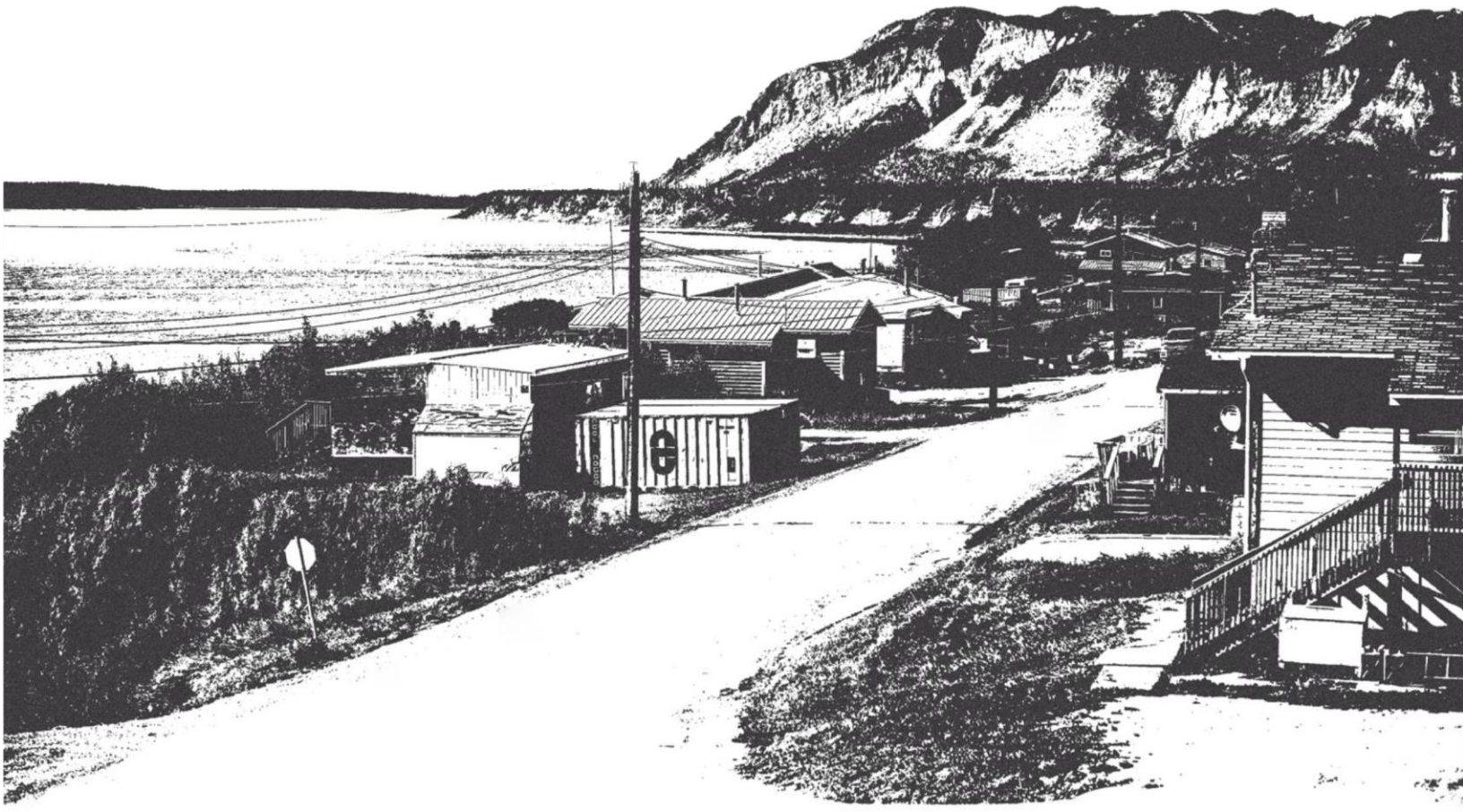
9.2 Reporting Qualifications

This Report has been prepared based on information provided to us by the Client up to the issue date of this Report. BTY Group does not accept any liability or accountability for information that has not been provided or made available to us at the time of preparing this report. Any advice, opinions, or recommendations within this report should be read and relied upon only in the report's context.

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

Appendix 1

BTY INFRASTRUCTURE COST REVIEW



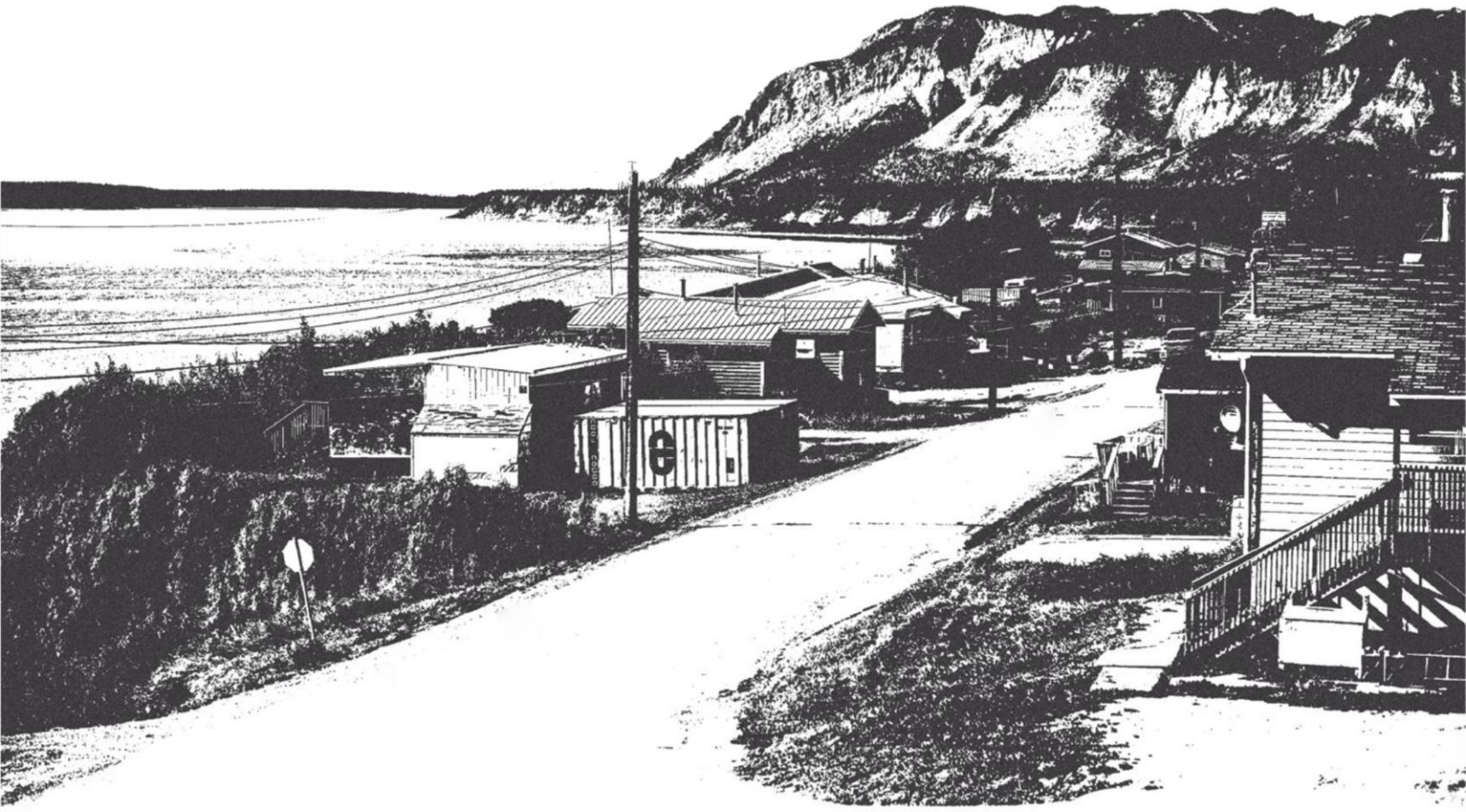
ANNEX 1 - CLOSING THE INFRASTRUCTURE GAP BY 2030:
COST REPORT FOR BUDGET 2023

REGION	Zone 1	Zone 2	Zone 3	Zone 4	Total (Millions)
Atlantic	$ 1,360	$ 1,507	$ -	$ 130	**$ 2,997**
Quebec	$ 1,990	$ 1,307	$ 1,346	$ 706	**$ 5,349**
Ontario	$ 2,983	$ 3,064	$ 14	$ 3,135	**$ 9,196**
Manitoba	$ 693	$ 4,985	$ -	$ 2,504	**$ 8,182**
Saskatchewan	$ 786	$ 5,993	$ 176	$ 479	**$ 7,434**
Alberta	$ 4,243	$ 2,608	$ -	$ 424	**$ 7,275**
BC	$ 8,411	$ 3,038	$ 351	$ 1,625	**$ 13,426**
North	$ 701	$ 2,666	$ 842	$ 1,435	**$ 5,645**
Total	**$ 21,169**	**$ 25,169**	**$ 2,729**	**$ 10,437**	**$ 59,503**

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

Appendix 2

BTY HOUSING COST REVIEW



ANNEX 1 - CLOSING THE INFRASTRUCTURE GAP BY 2030:
COST REPORT FOR BUDGET 2023

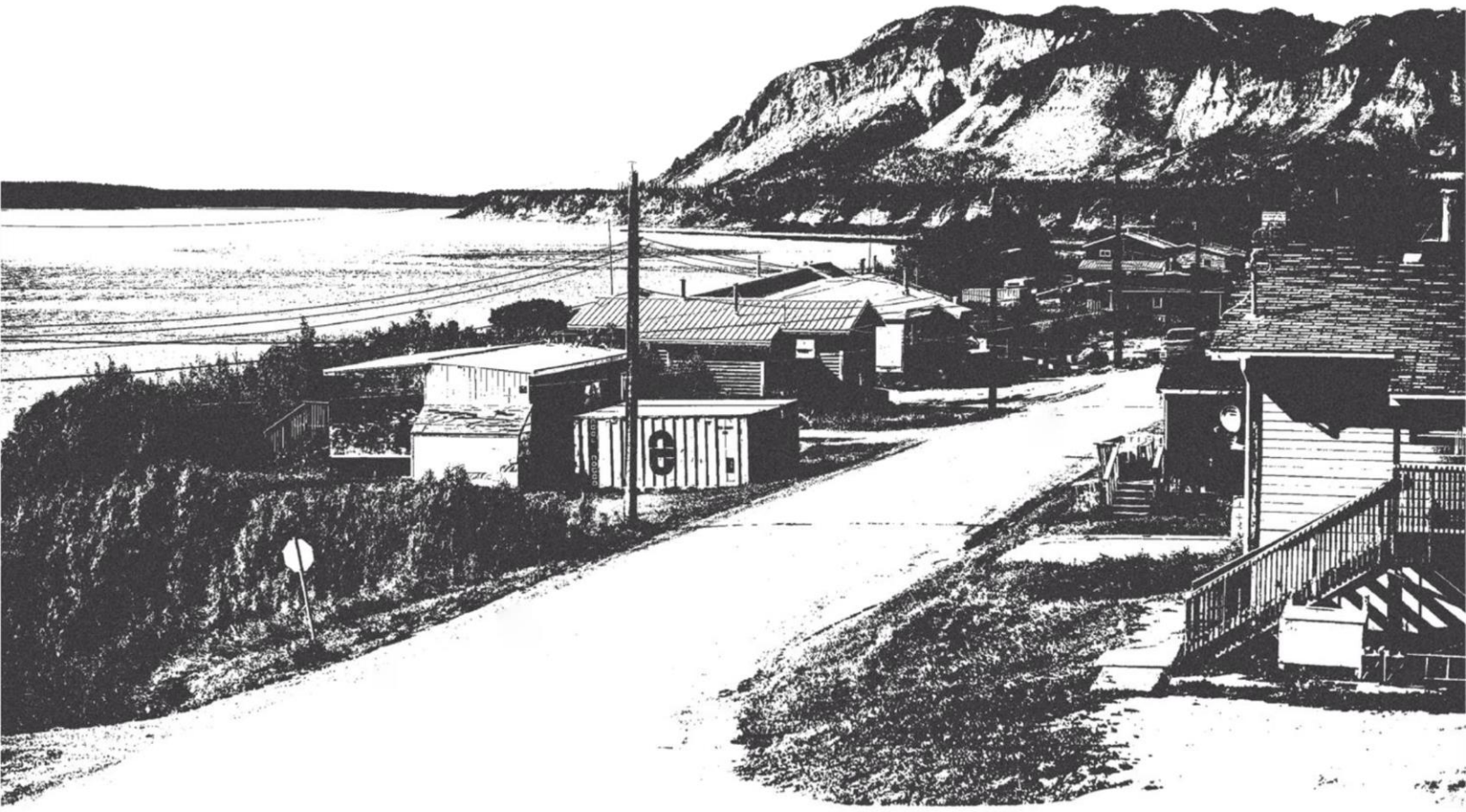
Appendix 2 – BTY Housing Cost Review

	Current Needs (2019-2030)- Housing Units										2022 Dollars (BTY)- Total Cost					
	Overcrowd	Migration	Replace outdated units	New Units (2019-2021)	New Units (2022-2040)	New Units (2022-2030)	Total New Units (2019-2030)	Service New Lots	Minor Renos	Major Renos	New Units	Service New Lots	Minor Renovations	Major Renovations	Total Capital Cost (Excluding Escalation)	O&M Cost per annum
Atlantic																
Zone 1	421	826	147	190	2343	1041	2625	2435	1935	480	$966,857,760	$158,518,500	$71,262,180	$53,032,320	$1,249,670,760	$18,853,726
Zone 2	950	310	101	227	2374	1055	2643	2559	1427	872	$1,168,085,952	$199,909,080	$63,064,267	$115,610,458	$1,546,669,757	$22,777,676
Zone 3																
Zone 4	70	23	7	23	178	79	202	197	105	64	$148,866,960	$23,478,460	$7,733,880	$14,141,952	$194,221,252	$2,902,906
Quebec																
Zone 1	1647	1163	84	201	2478	1101	4196	3940	1145	947	$1,595,278,080	$264,768,000	$43,528,320	$108,003,456	$2,011,577,856	$31,107,923
Zone 2	1387	472	62	133	924	411	2465	2271	291	1454	$1,124,361,216	$183,133,440	$13,275,187	$198,990,950	$1,519,760,794	$21,925,044
Zone 3	1184	45	38	105	805	358	1730	1617	100	1608	$1,052,147,712	$159,707,856	$6,082,560	$293,422,694	$1,511,360,822	$20,516,880
Zone 4	642	215	26	53	481	214	1150	1079	143	923	$874,199,040	$132,673,840	$10,872,576	$210,532,608	$1,228,278,064	$17,046,881
Ontario																
Zone 1	3049	3810	1624	299	3444	1531	10313	8626	2913	3984	$4,165,492,320	$615,896,400	$117,661,896	$482,765,184	$5,381,815,800	$81,227,100
Zone 2	901	7210	1013	174	2305	1024	10322	9135	2664	1941	$5,003,330,112	$782,686,800	$129,125,146	$282,243,139	$6,197,385,197	$97,564,937
Zone 3	38	150	1	1	19	8	198	198	10	5	$128,249,088	$20,753,568	$646,272	$969,408	$150,618,336	$2,500,857
Zone 4	1798	1988	1312	233	1851	823	6154	4871	2222	2342	$4,971,178,080	$635,762,920	$179,502,048	$567,588,384	$6,354,031,432	$96,937,973
Saskatchewan																
Zone 1	742	4428	153	125	1458	648	6096	5992	742	299	$2,245,034,880	$390,079,200	$27,326,376	$33,034,716	$2,695,475,172	$43,778,180
Zone 2	7366	8367	1656	1003	10819	4808	23200	21514	6240	4570	$10,253,111,616	$1,680,673,680	$275,768,064	$605,894,256	$12,815,447,616	$199,935,677
Zone 3	141	605	4	43	259	115	908	917	59	28	$535,102,656	$87,797,248	$3,476,563	$4,949,683	$631,326,150	$10,434,502
Zone 4	275	197	6	39	487	216	733	742	414	126	$540,225,840	$88,431,560	$30,493,584	$27,841,968	$686,992,952	$10,534,404
British Columbia																
Zone 1	1841	8009	961	257	2956	1314	12382	11535	1908	2223	$4,903,184,000	$807,450,000	$75,556,800	$264,092,400	$6,050,283,200	$95,612,088
Zone 2	1635	4993	886	197	2476	1100	8811	7585	2204	2018	$4,187,198,400	$637,140,000	$104,734,080	$287,686,080	$5,216,758,560	$81,650,369
Zone 3	285	1840	164	27	362	161	2477	2315	339	304	$1,569,356,800	$237,982,000	$21,479,040	$57,784,320	$1,886,602,160	$30,602,458
Zone 4	637	1242	145	73	925	411	2508	2254	532	728	$1,986,424,000	$288,512,000	$42,134,400	$172,972,800	$2,490,043,200	$38,735,268
North (Yukon/NWT)														$0		
Zone 1	367	1472	253	7	179	80	2180	1902	638	489	$1,010,035,068	$155,773,800	$29,547,624	$67,983,282	$1,263,339,775	$19,695,684
Zone 2	422	1911	398	7	320	142	2880	2356	772	592	$1,601,439,863	$231,547,680	$42,941,762	$98,800,565	$1,974,729,870	$31,228,077
Zone 3	121	1163	136	14	186	83	1517	1339	130	100	$1,124,466,442	$160,594,304	$9,656,273	$22,217,189	$1,316,934,208	$21,927,096
Zone 4	114	691	105	5	83	37	951	823	228	175	$881,515,127	$122,972,660	$21,099,563	$48,545,951	$1,074,133,300	$17,189,545
Manitoba														$0		
Zone 1	1602	4689	539	171	2962	1316	8318	7698	3122	1746	$2,964,417,649	$484,974,000	$111,283,090	$186,711,340	$3,747,386,080	$57,806,144
Zone 2	1941	5679	652	207	3587	1594	10073	8946	3782	2115	$4,308,208,256	$676,317,600	$161,728,469	$271,348,856	$5,417,603,181	$84,010,061
Zone 3	327	958	110	35	605	269	1699	1456	638	357	$968,782,682	$135,000,320	$36,367,727	$61,017,959	$1,201,168,687	$18,891,262
Zone 4	572	1674	192	61	1058	470	2970	2705	1115	623	$2,116,850,927	$312,157,000	$79,465,764	$133,328,067	$2,641,801,757	$41,278,593
Alberta														$0		
Zone 1	2052	5334	1111	271	2813	1250	10017	8859	2422	2336	$3,768,242,420	$589,123,500	$91,132,502	$263,605,272	$4,712,103,694	$73,480,727
Zone 2	2485	6460	1345	328	3406	1514	12131	10295	2934	2829	$5,476,412,241	$821,541,000	$132,443,483	$383,099,329	$6,813,496,053	$106,790,039
Zone 3	419	1089	227	55	575	255	2046	1676	495	477	$1,231,475,598	$103,660,600	$29,782,440	$86,147,181	$1,451,065,819	$24,013,774
Zone 4	733	1904	397	97	1004	446	3576	3113	865	834	$2,690,851,426	$192,539,050	$65,076,499	$188,236,993	$3,136,703,968	$52,471,603
TOTAL	**36163**	**78917**	**13855**	**4660**	**53723**	**23877**	**157473**	**140950**	**42534**	**37589**	**$75,560,382,212**	**$11,464,538,066**	**$2,034,248,435**	**$5,592,598,761**	**$94,568,785,473**	**$1,473,427,453**

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

Appendix 3

BTY EDUCATION COST REVIEW



ANNEX 1 - CLOSING THE INFRASTRUCTURE GAP BY 2030:
COST REPORT FOR BUDGET 2023

Appendix 3 – BTY Education Cost Review

CAPITAL ALLOCATION SCHOOLS					
REGION	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Total (Million $)**
Atlantic	142	158	-	16	**316**
Quebec	209	141	141	73	**564**
Ontario	310	330	-	330	**970**
Manitoba	69	526	-	268	**863**
Saskatchewan	86	635	16	47	**784**
Alberta	445	276	-	46	**767**
BC	878	326	42	170	**1,416**
Yukon	-	121	58	13	**192**
NWT	73	161	32	137	**403**
Total	**2,212**	**2,675**	**289**	**1,100**	**6,276**

CAPITAL ALLOCATION TEACHERAGES					
REGION	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Total (Million $)**
Atlantic	39	43	-	4	**86**
Quebec	57	38	38	20	**154**
Ontario	85	90	-	90	**265**
Manitoba	19	144	-	73	**236**
Saskatchewan	24	173	4	13	**214**
Alberta	121	75	-	13	**209**
BC	240	89	12	46	**387**
Yukon	-	33	16	4	**52**
NWT	20	44	9	37	**110**
Total	**604**	**730**	**79**	**300**	**1,713**

ANNEX 1 - CLOSING THE INFRASTRUCTURE GAP BY 2030:
COST REPORT FOR BUDGET 2023

Appendix 3 – BTY Education Cost Review Continued

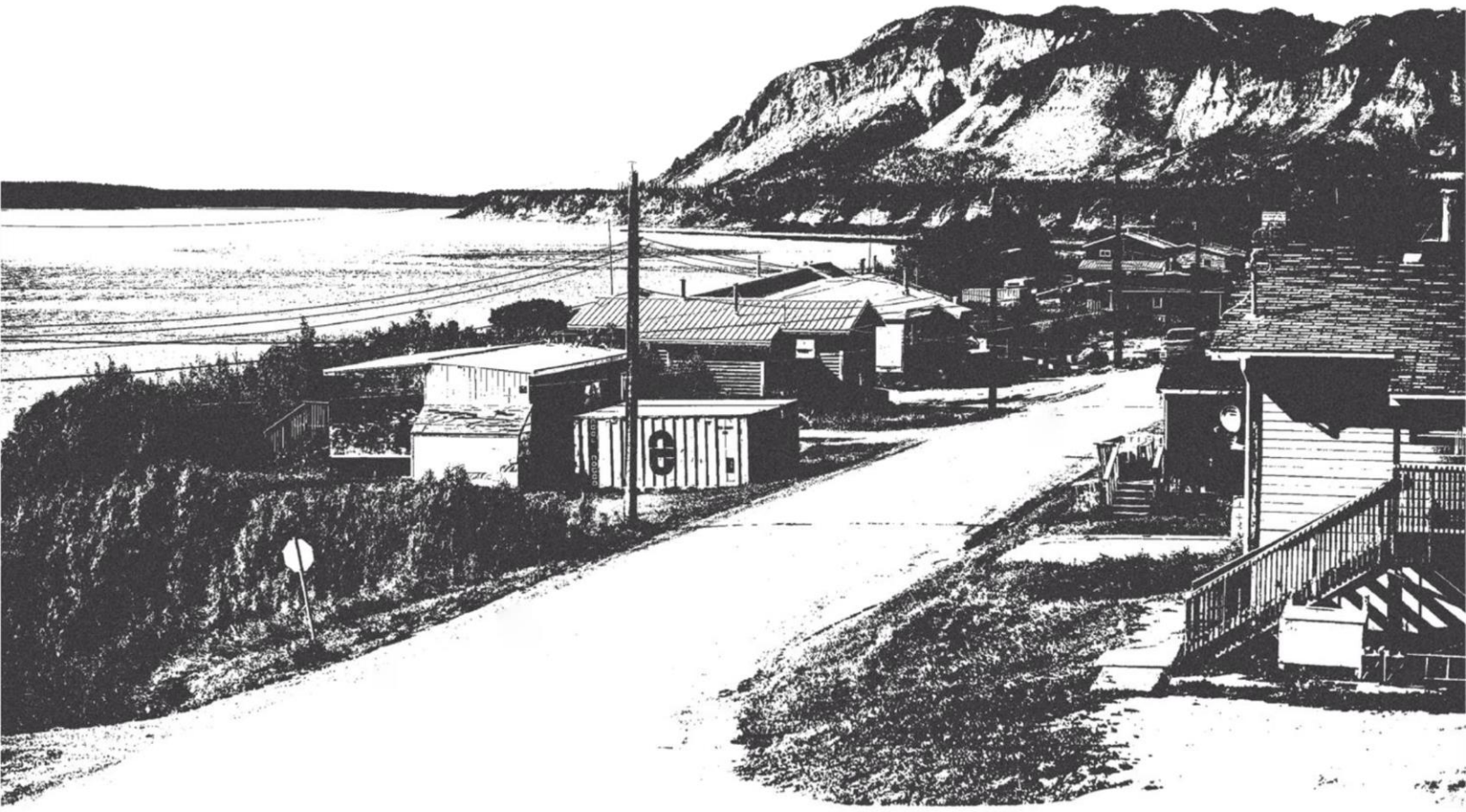
O&M ALLOCATION SCHOOLS					
REGION	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Total (Million $)**
Atlantic	88	98	-	10	**195**
Quebec	129	87	87	45	**349**
Ontario	192	204	-	204	**600**
Manitoba	43	326	-	165	**534**
Saskatchewan	53	393	10	29	**485**
Alberta	275	171	-	28	**475**
BC	543	201	26	105	**876**
Yukon	-	75	36	8	**119**
NWT	45	100	20	85	**249**
Total	**1,368**	**1,654**	**179**	**680**	**3,881**

O&M ALLOCATION TEACHERAGES					
REGION	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Total (Million $)**
Atlantic	17	19	-	2	**37**
Quebec	24	17	17	9	**66**
Ontario	36	39	-	39	**114**
Manitoba	8	62	-	31	**101**
Saskatchewan	10	74	2	6	**92**
Alberta	52	32	-	5	**90**
BC	103	38	5	20	**166**
Yukon	-	14	7	2	**22**
NWT	9	19	4	16	**47**
Total	**259**	**313**	**34**	**129**	**735**

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

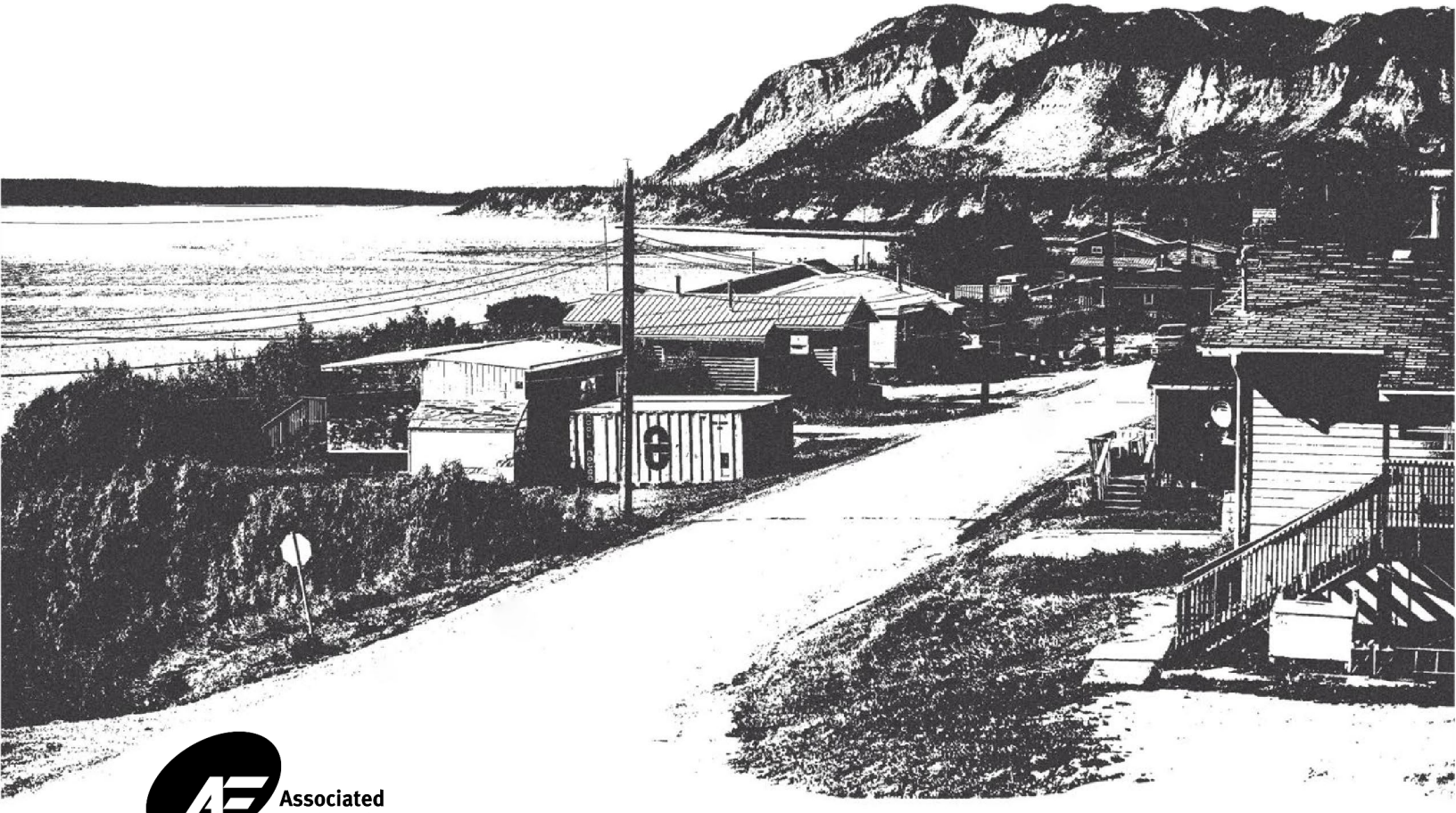
Appendix 4

AE DISCUSSION PAPER: DRINKING WATER ADVISORY



Closing the Infrastructure Gap by 2030

AE DISCUSSION PAPER: DRINKING WATER ADVISORIES ON FIRST NATIONS RESERVES



Associated Engineering

Contents

1.0 Introduction

This paper has been prepared by Associated Engineering (AE) to support the Assembly of First Nations (AFN) and Indigenous Services Canada (ISC) to identify the investment needs required by First Nations and prepare a budget submission report *Closing the Infrastructure Gap by 2030*. This Government of Canada mandated initiative is intended to bring the infrastructure and the associated levels of service provided to First Nations (and other Indigenous communities) in-line with that typically experienced within non-Indigenous communities in Canada. This paper is intended to identify the infrastructure investment required to address ongoing water quality issues on First Nations reserves and specifically to end long-term drinking water advisories (DWAs).

2.0 Background and Objectives

The reliable supply of safe drinking water is imperative in developing and maintaining public health for Canadians, including Indigenous peoples. The federal government has recognized that "Everyone in Canada should have access to safe, clean drinking water" and is committed to working with First Nations communities to achieve this objective on all reserves. Working in partnership with First Nations communities to improve on-reserve water and wastewater infrastructure and expand access to clean drinking water is a priority for Indigenous Services Canada (ISC).

Ending long-term drinking water advisories is a complex process and requires collaboration between First Nations communities and the Government of Canada, and a range of other key interested parties for each specific site, which may include provincial and local governments, landowners, municipalities, and industry. It is not all about water treatment. The supply chain for clean drinking water involves source waters (surface water, groundwater), abstraction (groundwater wells and surface water intakes), treatment, storage (tanks, reservoirs and cisterns), transmission, and distribution (both piped systems and trucked water). The development of sustainable, practical best-practice solutions typically encompasses:

- Comprehensive feasibility studies – to identify a range of site-specific solutions and allow the optimum solution to be selected for the situation.
- Project development – taking account of labour, material, and equipment availability for both construction and ongoing operations and maintenance of any developed or upgraded infrastructure.
- Construction of new infrastructure and maintenance of existing infrastructure.
- Training and support of operations and maintenance staff.
- Ongoing operations and maintenance of the facilities – including monitoring and testing.

To be sustainable, solutions need to be developed carefully in collaboration with First Nations to ensure communities contribute to and embrace constructed infrastructure solutions and have the capacity to address ongoing operational and maintenance needs. It is essential that adequate capacity building of local resources is included within the solution, together with the ability to access expert support when required.

3.0 Recent Progress and Current Status

In recent years, significant investment has been committed to deliver on the federal government's promise to end all drinking water advisories. In the eight years since 2015, 135 long-term DWAs have been ended. However, there is much work to be done by the Government of Canada to eliminate the 66 new long-term DWAs that have been added in the same period. The number of DWAs ended and/or added across the different provinces, territories, and regions since 2015 are shown in Figure 1.

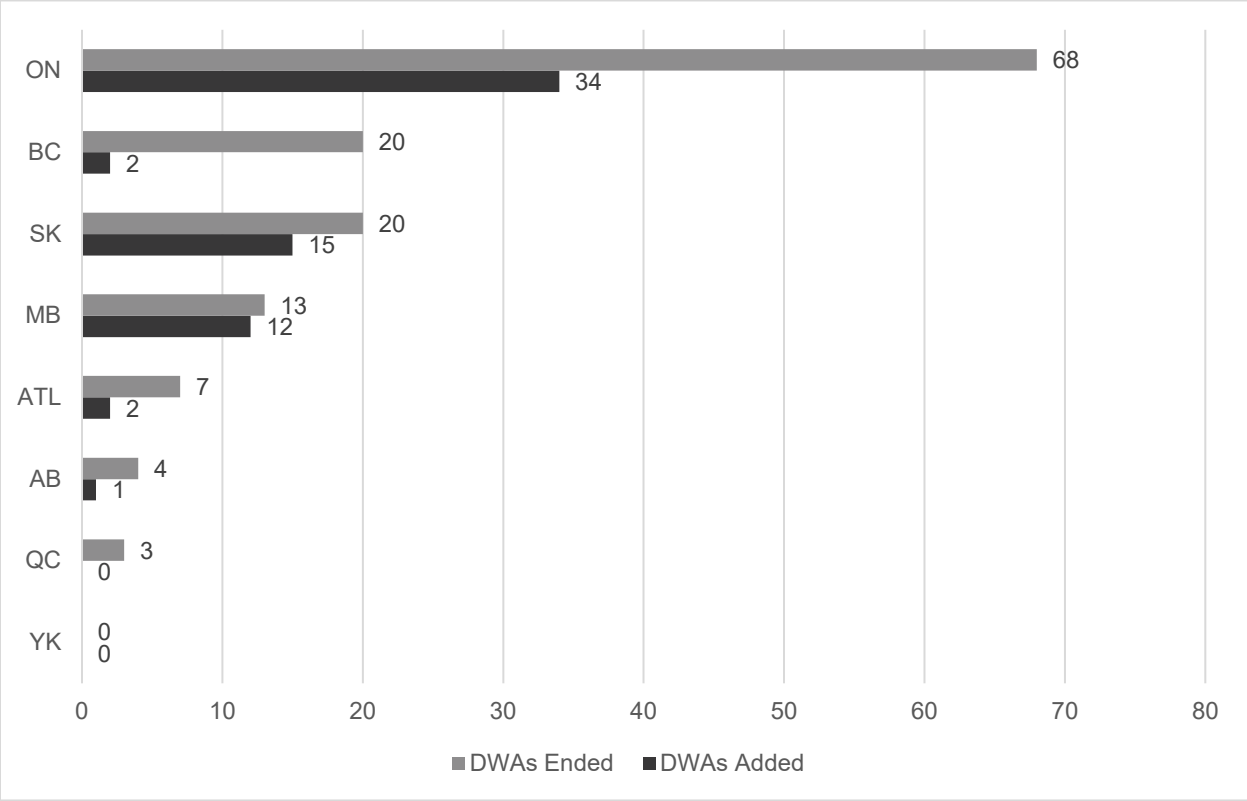


Figure 1
Long Term DWA's (LT DWAs) Ended and New since 2015 – by Province, Territory or Region

Based on July 2022 ISC data, there are currently 31 DWAs in effect - affecting 27 separate communities. These are limited to three provinces as follows:

- Ontario - 22
- Saskatchewan – 6
- Manitoba - 3

The year-by-year change in DWAs ended or added since 2015 is shown in Figure 2, together with a simulated line for the total DWAs remaining in effect in each year (back calculated from the July 2022 data).

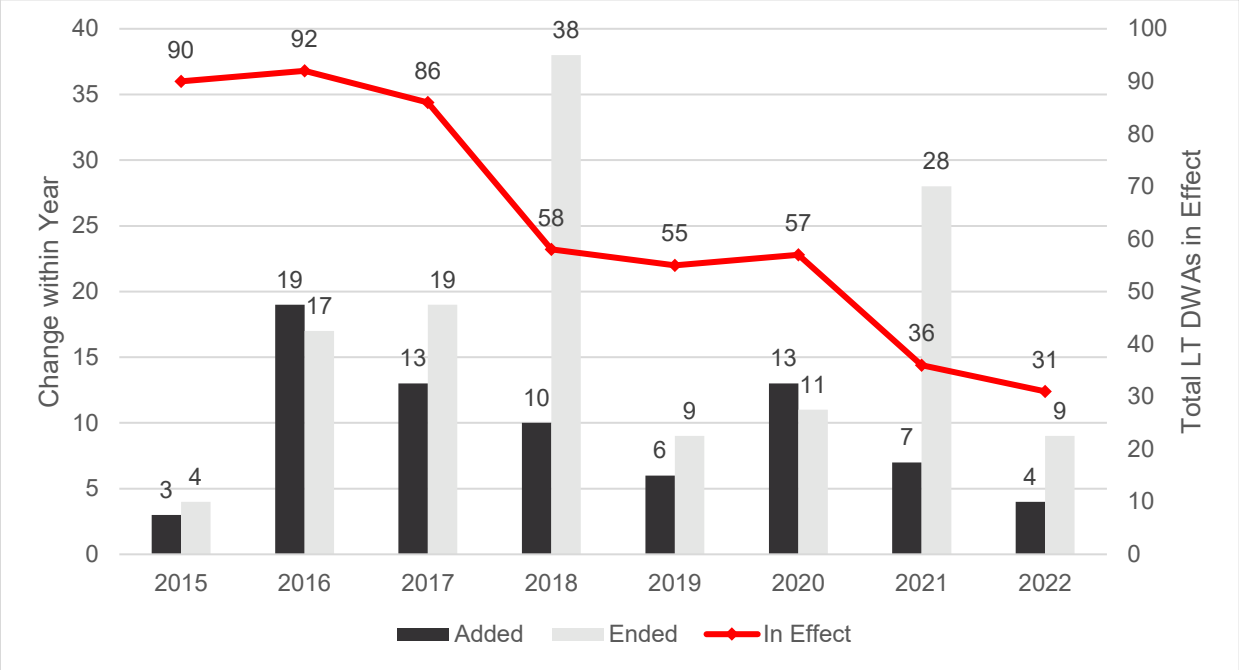


Figure 2
Long Term DWAs – Progress since 2015

It should be noted that the 2022 data represents only the first six months of the year. The final figure for the year may be a little higher but it would not be expected to significantly impact the overall downward trend evident since 2015. This trend indicates that recent investment is having a positive effect in reducing LT DWAs. ISC has invested more than $2.68 billion of funds (excluding operating expenses or operations and maintenance) to support 950 water and wastewater projects, of which 464 are completed as of the end of Q2 2022. Of these projects a total of 746 projects are new water and wastewater treatment plants or lagoons, or renovations and upgrades to existing water and wastewater systems, 400 of which are completed. These projects have or will benefit 586 communities, serving approximately 466,000 people.

ISC estimates that approximately $706.9 million has specifically been spent on 146 projects to address long-term (LT) drinking water advisories (i.e. those lifted and those still in effect) in First Nations communities. This has included targeted funding spent on infrastructure repairs, upgrades and new construction projects. It does not include operations and maintenance funding, or funding spent on operator support and capacity building to address long-term drinking water advisories.

4.0 Investment Need to Eliminate Existing Drinking Water Advisories

Investment required to eliminate the 31 remaining LT DWAs:

$169M

Based on the level of investment identified above from ISC data, the average cost to address each LT DWA is approximately $4.8 M. Taking account of inflation over the period since 2015 at an assumed 3% per annum, the average cost in 2022 $CAD equates to $5.4 M per LT DWA. This would indicate a total investment of $169 M is required to address the 31 currently remaining LT DWAs. On the basis that this level of investment will maintain the current downward trend in long-term DWAs in effect, it should be possible to virtually eliminate persistent LT DWAs by 2030.

It should be noted, however, that additional investment will be required to effectively operate and maintain the upgraded systems. AFN's 2022 Asset Needs Study for First Nations identified approximately $15.6 B of total investment for water infrastructure over the 20-year period 2021 to 2040. This total investment need included $9.6 B in operating expenditure over the 20-year period ($480 M per year), representing about 60% of the total investment need. This percentage of O&M investment is typical for best-practice lifecycle management of water systems.

Operating budget to 2030 for upgraded infrastructure:

$254M

Total investment need, including capacity building, associated with DWAs:

$465M

Allowing for O&M to represent 60% of the total investment against the identified capital investment need of $168.6 M (40%), would result in an O&M investment of $254 M and a total investment of $423 M An additional allowance of 10% might reasonably be added for capacity building and operator support over the period indicating a total expected investment need of $464 M.

This expenditure is specifically targeted at long-term DWAs. It should be noted that there are other water quality issues on First Nations reserves and that there are often a number of short-term DWAs in place (15 in July 2022). It is suggested that the O&M investment identified in the Asset Needs Study, together with the additional investment identified in this paper, should allow for the effective mitigation of other water quality issues, including short-term DWAs.

In summary an additional investment need of $465 M has been identified to support ending existing long-term drinking water advisories up to 2030.

The identified investment levels are considered to represent the lower end of the range of probable costs to fully address the issues and end the routine presence of LT DWAs on First Nations. This is due to a variety of factors outlined in Section 5.

5.0 Future Potential Drinking Water Advisories and Access To Safe Drinking Water

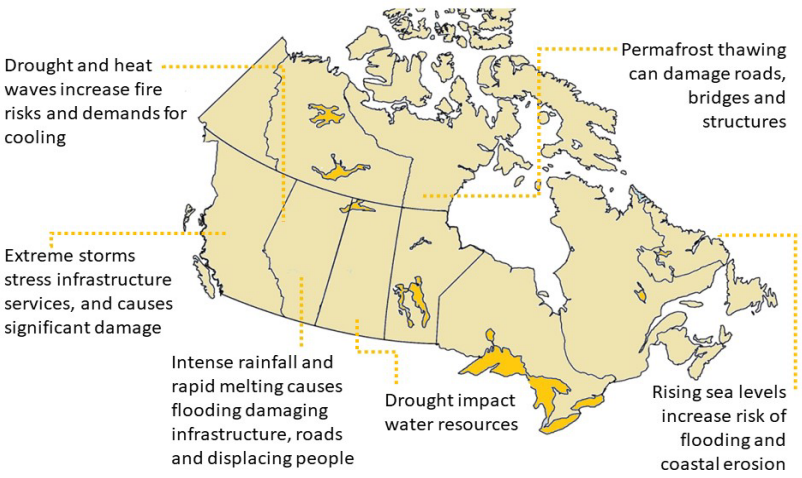
Drinking water supplies face a variety of pressures ranging from aging and deteriorating infrastructure and equipment in networked or decentralized systems, deterioration of source waters from natural events or other water users and interested parties, or growth and drought related pressures on water supplies.

Decentralized Systems - First Nations drinking water infrastructure is generally much more decentralized that that found in other Canadian communities. The identification of, and remedy for, long-term drinking water issues is therefore likely to represent a more complex and longer-term challenge as increasing awareness of water quality issues in wells and cisterns is understood.

Asset Deterioration - As indicated in Section 4 above the Asset Needs Study indicates O&M and renewal investment levels required to mitigate the impacts of normal asset deterioration. The investment identified in that study is therefore essential to maintaining the integrity of those systems and mitigating the effects of deterioration on drinking water quality.

Impacts to Source Waters from Other Parties - Effective engagement with other water users and control of industry in the vicinity of watersheds will also be essential to mitigate the likelihood and effects of potential contamination events.

Climate Change - Climate change a new threat that has the ability to significantly impact water security and lead to further drinking water advisories. Drought will put pressure on large and small systems alike and wildfire and flooding can both directly impact water infrastructure and the quality of source waters. Investment will be required to adapt to climate change and may involve the costly development of alternative sources of water.

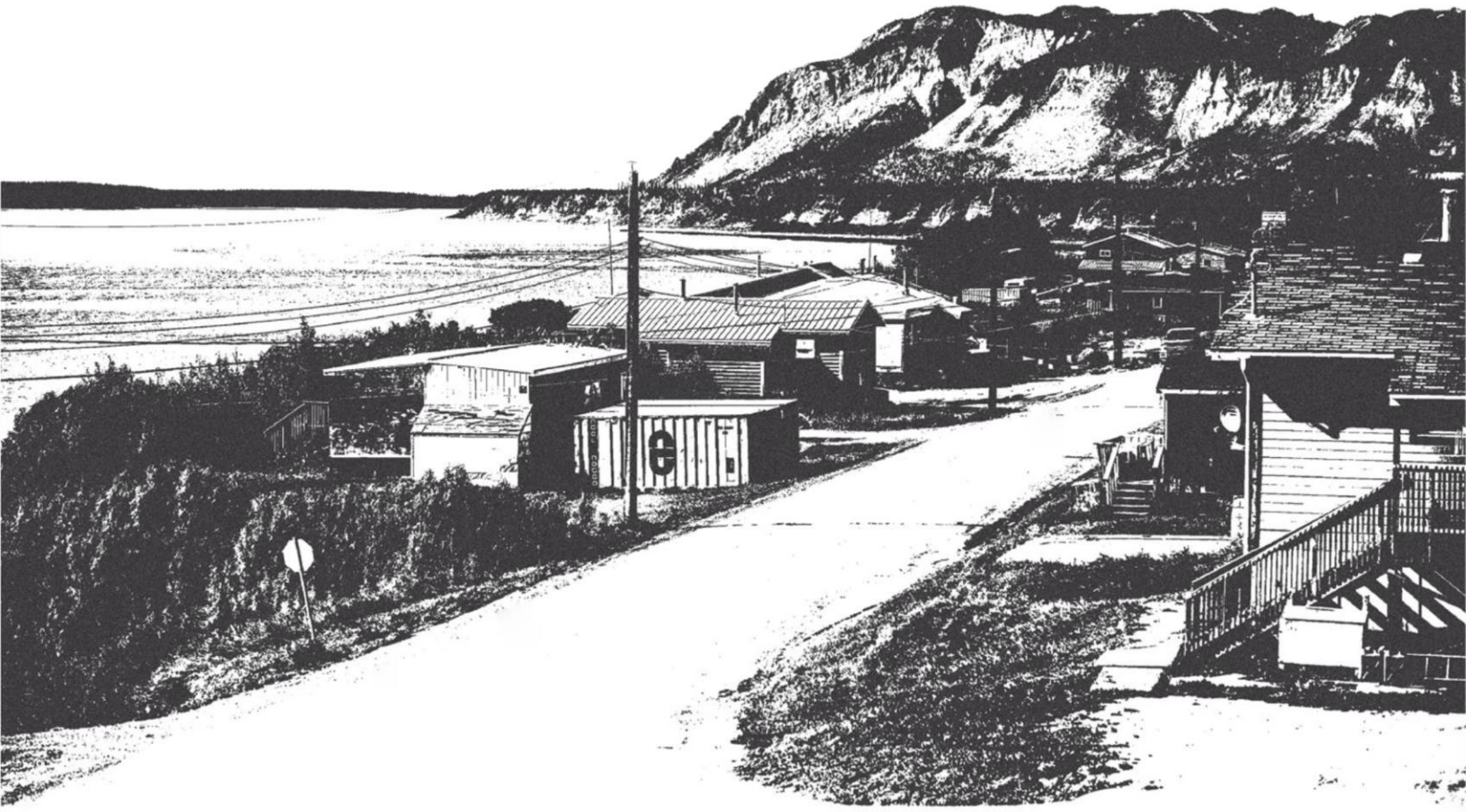


The Reducing Climate Risk discussion paper outlines the investment required to adapt to climate change including investment for water systems.

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

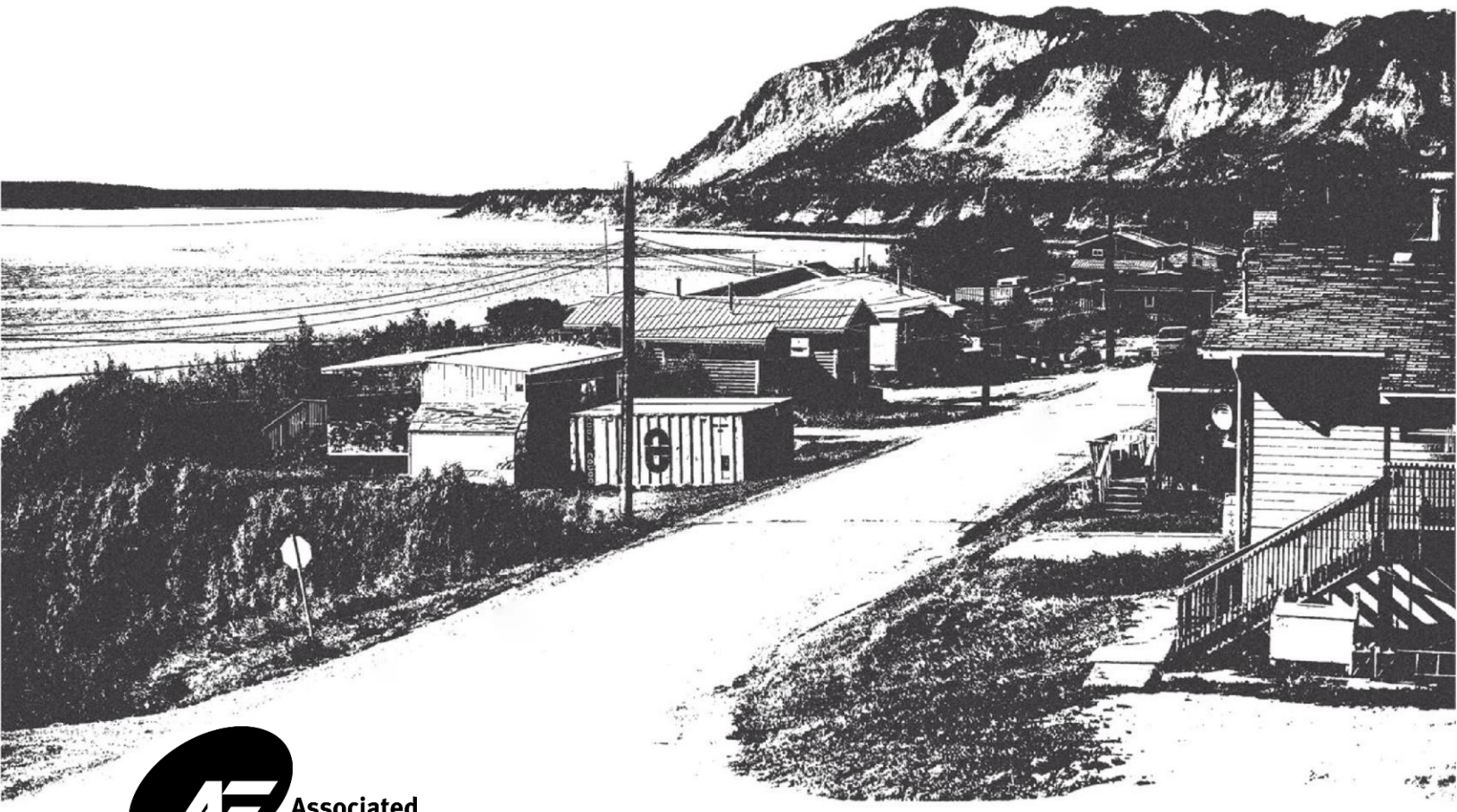
Appendix 5

AE DISCUSSION PAPER: ALL-SEASON ROAD ACCESS



Closing the Infrastructure Gap by 2030

AE DISCUSSION PAPER: ALL-SEASON ROAD ACCESS FOR FIRST NATIONS



Associated Engineering

Contents

1.0 Introduction

Numerous First Nations communities face connectivity challenges as many are in rural areas with seasonal roads or a complete lack of road infrastructure. Improved connectivity and trade corridors will enable First Nations to participate in the larger Canadian economy and build long-term economic growth coast to coast.

Approximately 8000km of winter roads are built in Canada, the majority of which are located in northern Ontario and Manitoba. This estimate is based on the definition of winter road network developed by the FPT sub-working group on Northern Transportation in 2015. Establishment of this definition excluded approximately 2000km of winter road from the existing network and, consequently, some uncertainty does exist with regard to the actual extent of Canada's winter road network. For simplicity, this discussion paper uses an estimate of 8000km to describe the road network serving First Nation communities to conform with current research on the subject area. The winter road network in Manitoba is 2119km and serves 19 First Nations, while the Ontario network is 3160km and serves 31. The remaining 2721km of winter road network provides services to 17 First Nation and/or remote communities and industry across Saskatchewan, Alberta, and the northern territories (Figure 1).[1]

Figure 1: Canada's Winter Road Network

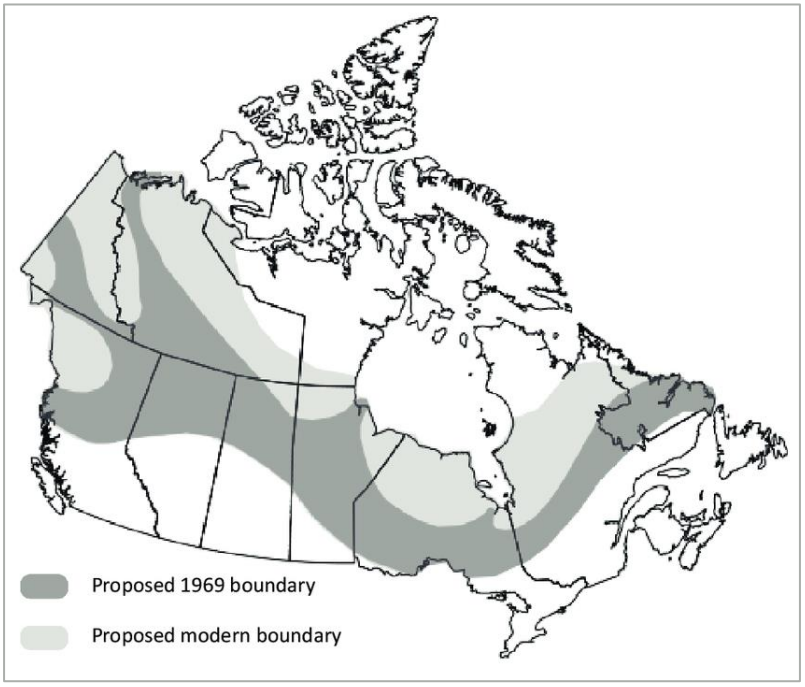
[1] 3 First Nation communities in Saskatchewan, 1 First Nation community in Alberta, 12 remote communities in NWT, and 1 First Nation community in Yukon

The creation of all-season roads also establishes an opportunity to improve communications connectivity via the concurrent installation of fibre optic cable to provide modern and reliable internet to remote First Nation communities. Many remote First Nation communities are without good internet connectivity or are served by substandard means. The launch points for all season road access often coincide with the backbone of communication infrastructure and the concurrent construction of communications infrastructure would present efficiencies for both networks. These opportunities have not been evaluated further in this annex; however, the connectivity annex provides insight on the additional costs of this activity.

2.0 The Mid-Canada Corridor

The needs of First Nations related to connectivity, including self-determination, access to economic opportunities, and sustainable development, are not new. Plans for a *Mid-Canada Corridor* intended to facilitate the orderly improvement of infrastructure, improve access to resources, and provide an improved standard of living to First Nations was proposed as early as 1968 by Richard Rohmer, and presented to the government of then-Prime Minister Pierre Trudeau (Figure 2). The corridor is closely correlated to the distribution of remote First Nation communities reliant on winter roads.

Figure 2: The Conceptual Boundary of the Mid-Canada Corridor



Interest in the Mid Canada Corridor was renewed in 2014 as a strategy for addressing issues, including First Nation reconciliation, environmental sustainability, infrastructure renewal, housing, wealth generation, and the provision of social services to both First Nation and non-First Nation communities across Canada's north. Recent work (2022) on the Mid-Canada Corridor, reconceptualized as the Canadian Northern Corridor, has further established that investment in the region could further address infrastructure deficits in northern regions and is an opportunity to improve the livelihoods of remote First Nations. Investment in the Mid-Canada Corridor concept consequently presents a significant opportunity for collaboration between Canada and First Nation peoples.

3.0 Benefits of an All-Season Road Network

The benefits of an all-season road network for remote First Nations are immense and include (but are not limited to):

- Reduced cost of living resulting from the cheaper provision of goods and services.
- Improved quality of life resulting from the more regular supply of goods and services, including improved access to health care and amenities not currently available in remote and isolated communities.
- Improved opportunities for inter-community travel, cultural exchange, and social well-being.
- Improved access to emergency services.
- Improved resilience to climate change.
- Economic benefits resulting from road construction including economic diversification associated with new services such as vehicle sales and services, overnight accommodations, restaurants, recreational equipment suppliers, and guiding services.
- Potential reduction in operating costs of community infrastructure.

For example, the all-season road connecting Tuktoyaktuk to Inuvik, completed on budget in 2017, has resulted in a $1.5M dollar reduction in the cost of living for residents of Tuktoyaktuk due to the regular availability of goods and services.

While an all-season road would provide many benefits for remote First Nations, these benefits may come at a cost, including the environmental impact of road construction, an undesirable influx of alcohol and narcotics, demographic change, and unmanageable costs[2] associated with road maintenance. Not all remote First Nations will support an all-season road, necessitating (at minimum) social impact assessments to investigate the significance of these impacts, which will add to the cost of building these roads. These studies, in addition to the environmental impact studies included in the capital cost of road construction, will result in a need for **$11M**.

[2] https://www.northernpolicy.ca/article/weathering-winter-roads-%E2%80%93-what-is-the-best-route-1354.asp

4.0 Climate Change

Climate change will impact Canada's winter road system. Future freezing degree days (FDD), or the conditions necessary to establish a winter road, are anticipated to decline across the national network. Studies in Ontario[3] suggest that the winter road season is already characterized by fewer FDD, although the road systems remain viable. In a changing climate, the seasonal viability of Canada's winter road system is likely to decrease further, increasing the uncertainty and risk of continued reliance on winter roads. A minimum of 380 FDD has been established as the threshold for constructing winter roads in Canada.

Impacts on the winter road system will be uneven, with some winter road networks proving viable under the RCP 8.5 climate change projection to 2050, while others are projected to fail to meet the minimum threshold of 380 FDD as early as 2030. Even where regional conditions are projected to support winter roads, the season is likely to be fairly short, and characterized by significant interannual uncertainty.

For example, the winter road providing access to Big Trout Lake (ON) was supported by a seasonal norm of 877 FDD between 1981 and 2010. Under the RCP 8.5 scenario, the 2050 norm for this network is likely to decline to 625 FDD, and will likely remain viable. However, interannual variability including rain-on-snow events and abnormal warm periods will likely increase the risk of relying on this network even if it can meet the minimum threshold for road construction. Conversely, the winter road supporting Kapuskasing (ON) was supported by a seasonal norm of 548 FDD over the same baseline, and seasonal conditions are projected to decline to 300 FDD during the 2050s, and the road network may become unviable as early as the 2030s.

The entire winter road system in Canada is, therefore, vulnerable to a changing climate, with conditions deteriorating at a faster rate as northern latitudes increase, resulting in a shorter access period and greater uncertainty for all communities regardless of where they are. Given the reliance these remote communities have on the winter road network for access, food, and security, and the immediate issue that climate change presents for year-round access, this vulnerability presents a significant challenge to closing the infrastructure gap by 2030 with issues and the cost to maintain the winter road increasing rapidly after that time.

[3] E.G. Hori, Y., Cheng, V., Gough, W., Jien, J., and Tsuji, L. 2018. Implications of projected climate on winter road

5.0 Closing the Infrastructure Gap by 2030: Ensuring Year-Round Access

This section provides the construction costs estimated for replacing Canada's winter road network with an all-season alternative built to a gravel road standard. The cost to build winter roads across Canada is already increasing and will continue to increase with time. For example, the Tłı̨chǫ winter road system cost $1,050 per km to build in 2004, and the Government of the Northwest Territories reported that these costs had risen to $4,935/km in 2014 – a five-fold increase within a decade's time. This rising cost provided a sufficient rationale to replace the Tłı̨chǫ winter road with an all-season alternative in 2020, at a capital cost of **$0.28B**.

While the cost of replacing a winter road with an all season road will vary considerably between regions and is dependent on factors such as geology, topography, and hydrology, the overall cost per kilometer is remarkably consistent between projects. The following table was compiled from public records for all-season road projects completed between 2016 and 2022, adjusted to 2022 dollars where appropriate, and demonstrates an average cost to construct an all season road in Canada ranges between **$2.313M** and **$2.804M** per kilometer. These costs were confirmed via an independent assessment of an all-season road construction project for the Moose Cree Nation (ON) that estimated construction costs would be $1.6M/km to $3.4M/km.[4]

Table 5.1: Assessed unit cost to construct an all-season road in Canada

Road Network	Extent (km)	Estimate (low)	Estimate (high)	Cost/km (low)	Cost/km (high)
ON: Ring of Fire	450	$1,100,000,000	$1,600,000,000	$2,444,444	$3,555,555
NWT: Norman Wells	321	$700,000,000	N/A	$2,180,685	N/A
NWT: Tibbet Lake	415	$1,100,000,000	N/A	$2,650,602	N/A
NWT: TASR Project	97	$280,400,000	N/A	$2,890,721	N/A
NWT: Tuktoyaktuk	138	$299,000,000	$325,000,000	$2,166,667	$2,355,072
MB: Shoal Lake	24	$37,000,000	$60,000,000	$1,541,667	$2,500,000
Average cost/km for road construction				**$2,312,465**	**$2,803,543**

[4] Northern Policy Institute. 2015. Weathering Winter Roads – What is the Best Route? [Accessed online] https://www.northernpolicy.ca/article/weathering-winter-roads-%E2%80%93-what-is-the-best-route-1354.asp. Costs adjusted to 2022 values

Based on this estimate range, the potential cost to improve Canada's winter road network is between **$18.504B** and **$22.432B**. The cost of labour and operations will substantially increase this estimate as will topography and substrate conditions.

The Asset Needs Study indicated that the cost to maintain a gravel road in Zone 3 communities is 1.7% of the assessed value of the road. By virtue of constructing all season roads, all Zone 4 communities (i.e., those without all season road access) become Zone 3 communities, which are defined as remote communities greater than 350km from an urban centre, but with all season access. The 1.7% of asset value equates to an annual maintenance cost of $39,312/km to $47,660/km.

Table 5.2: Estimated cost to create all-season roads to replace Canada's Winter Road Network

Region	Extent (km)	Cost/km (low)	Cost/km (high)	Estimate (Low)	Estimate (High)
Ontario	3,160	$2,313,000	$2,804,000	$7,309,080,000	$8,860,640,000
Manitoba	2,119	$2,313,000	$2,804,000	$4,901,247,000	$5,941,676,000
Remainder	2,721	$2,313,000	$2,804,000	$6,293,673,000	$7,629,684,000
Total estimated cost to replace winter road network				**$18,504,000,000**	**$22,432,000,000**
Derived Annual Maintenance	8,000	$39,312	$47,660	$314,196,000	$381,280,000

6.0 Implications for 2030 and Beyond

The grand total estimate for closing the infrastructure gap created by Canada's winter road network is $18.515B to $22.432B. This estimate will provide a number of benefits to remote First Nations including a reduced cost of living, improved health care, and improved resilience to climate change. Replacing the winter road network with an all-season road alternative is also consistent with recommended Canadian development policy for it's northern regions and presents an unparalleled opportunity for the Government of Canada to collaborate with First Nations for the benefit of First Nations and non-First Nations alike. However, First Nations must proceed carefully with the planning of this road network, as capacity improvements are necessary to ensure they can benefit from anticipated investments. The negative aspects of an all-season road network must also be considered carefully.

Consequently, it is easy to establish a path forward, with a focus on road networks for which demand is clearly established, that are vulnerable to climate change, and for which provincial/territorial governments have already declared their support. Given the planning and construction timelines associated with the development of all-season road networks, implementing these priorities clearly establishes the immediate pathway for closing Canada's infrastructure gap until 2030. While a comprehensive audit of proposed road networks was not completed in support of this annex, those proposed projects that were evaluated constitute $2.900B and $3.400B, and it is therefore likely that upwards of $5.00B could be operationalized by 2030 in support of the development of all season road access for remote First Nations. This would require up to an $85M annual operating cost.

Investment required to operationalize supported vulnerable all-season road access by 2030:

$5.0B

Concurrently, additional environmental impact assessments, social impact assessments, and feasibility planning could also be completed to identify subsequent projects for completion after 2030. Demand for new road construction will likely increase as climate change negatively influences the winter road network after 2030, and these plans will likely require operationalization after that time with rising intensity. The majority of winter roads will require replacement before 2050 with the exception of very resilient winter road networks serving communities that prefer their isolation.

Annual operating budget for $5.0B of all season roads:

$85M

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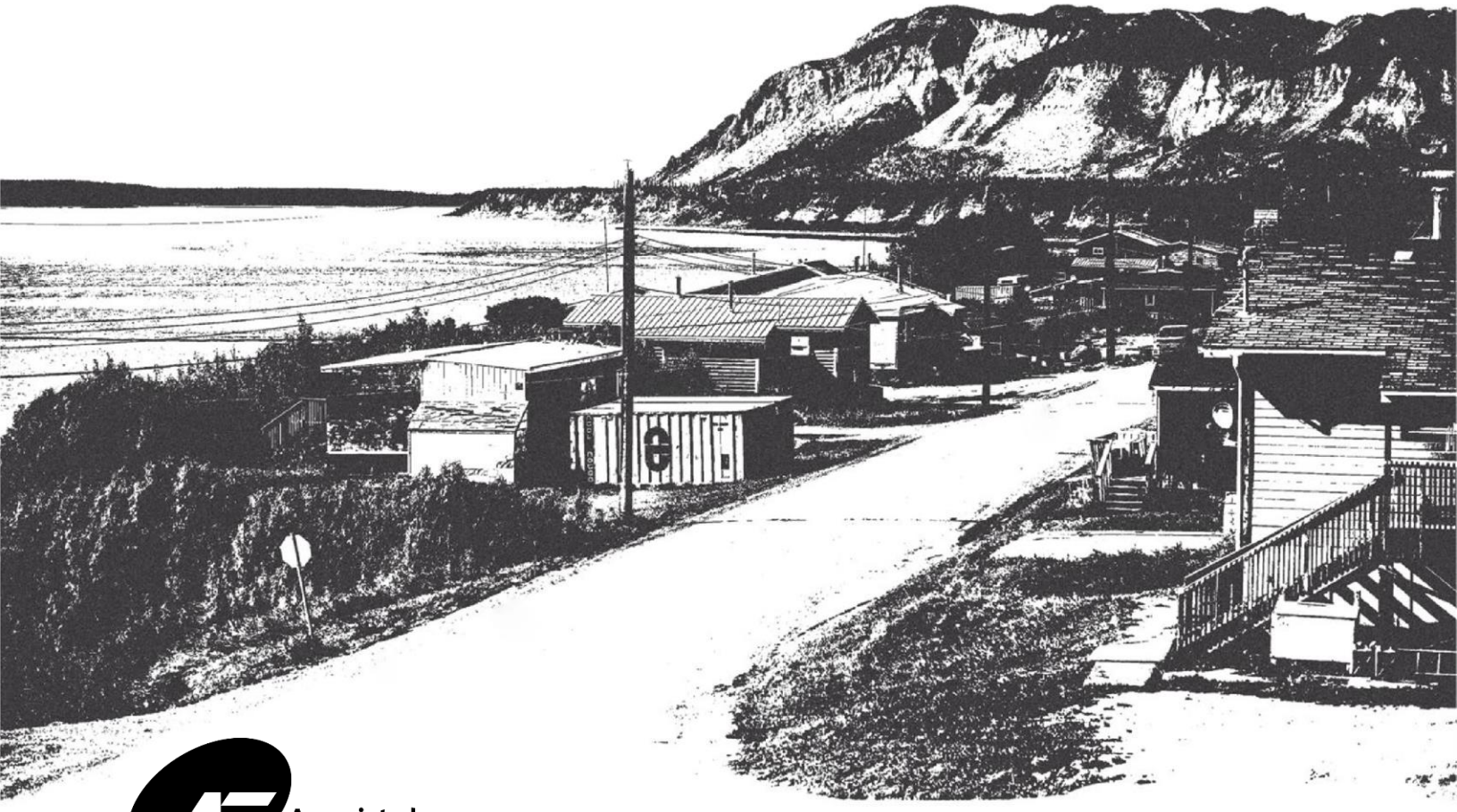
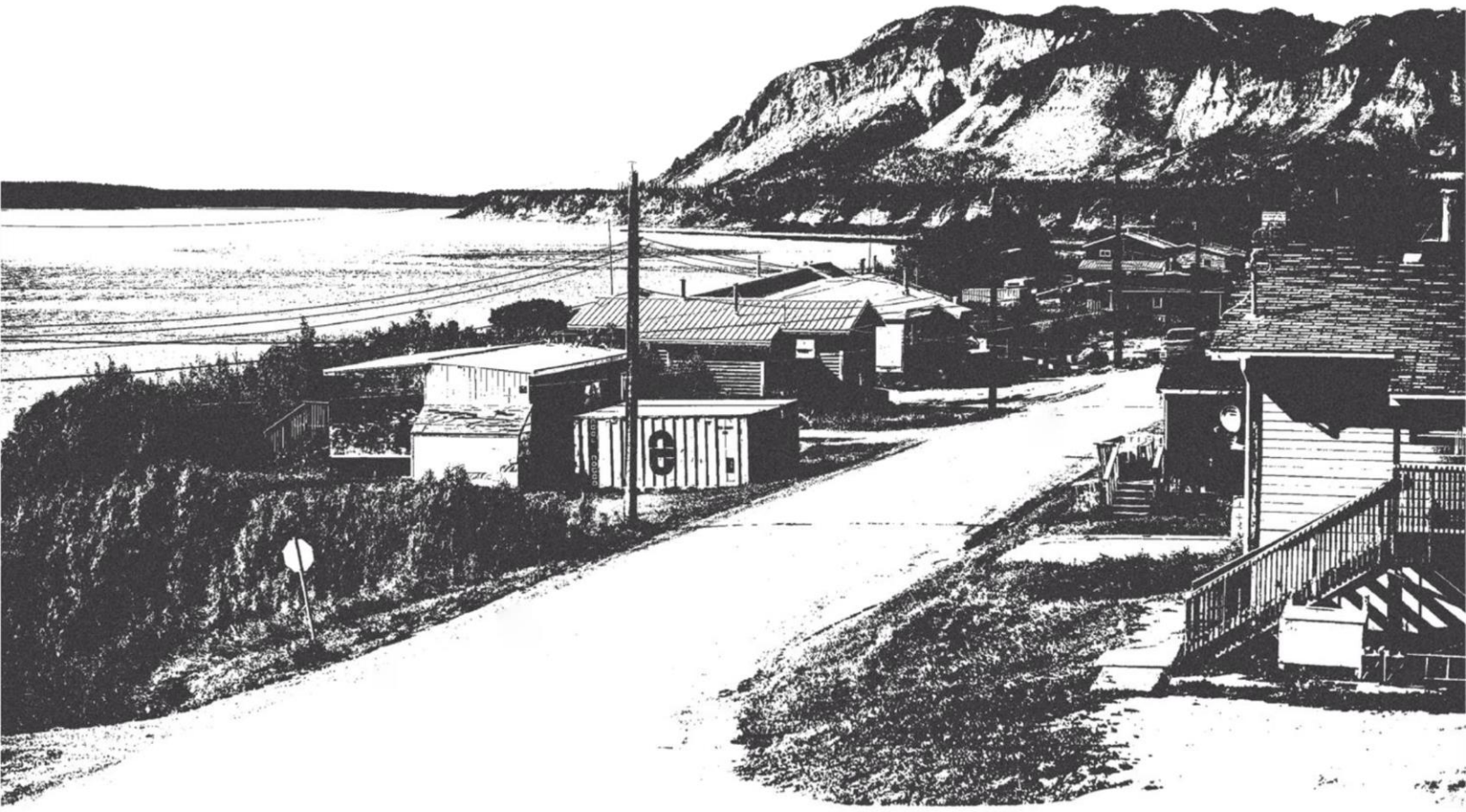


Associated Engineering

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

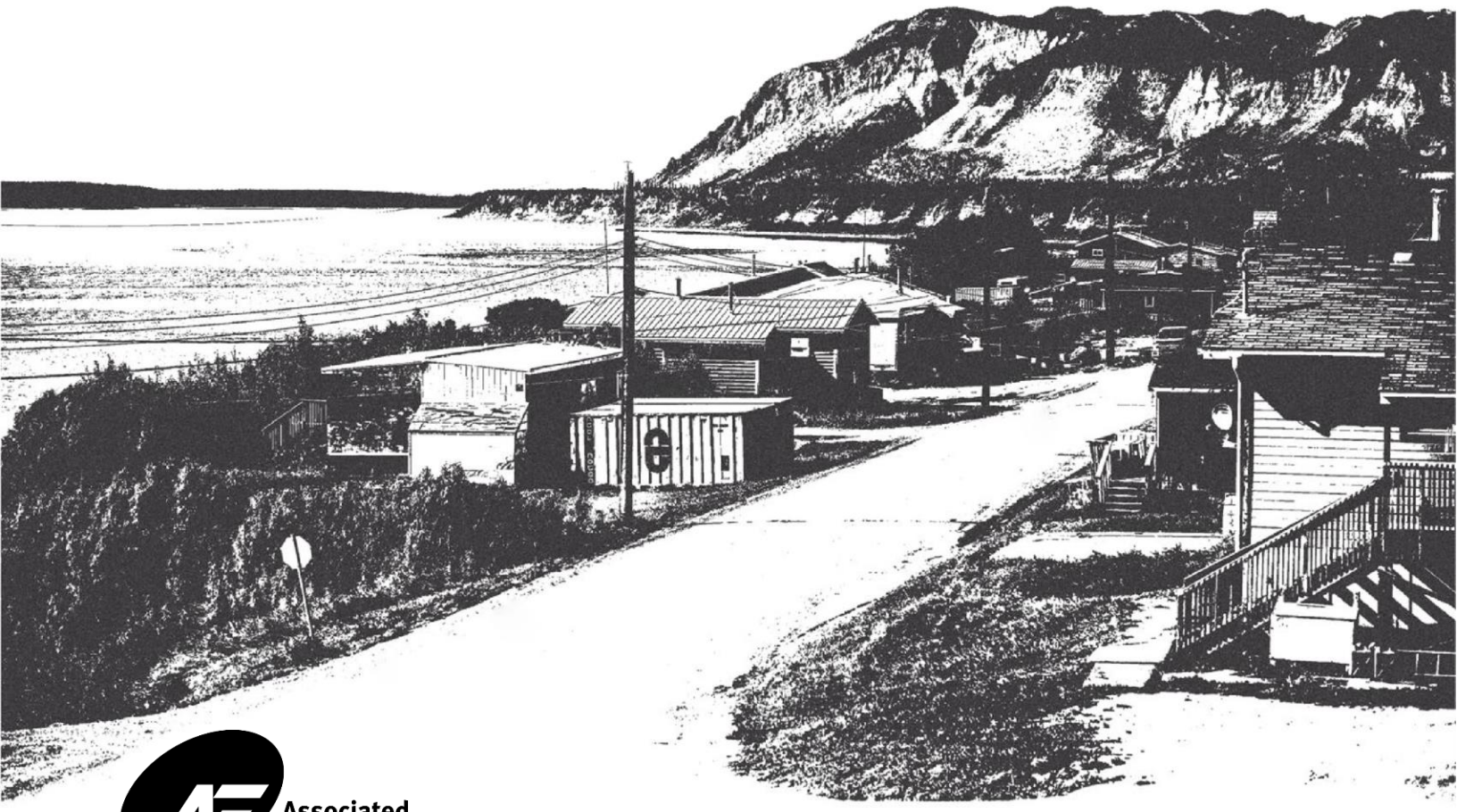
Appendix 6

AE DISCUSSION PAPER: CLIMATE CHANGE ADAPTATION



Closing the Infrastructure Gap by 2030

AE DISCUSSION PAPER: CLIMATE CHANGE ADAPTATION



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Contents

1.0 Introduction

Climate change adaptation is integral to the management of First Nation assets and constitutes an important element of strategically *Closing the Infrastructure Gap by 2030* while protecting federal investments. First Nation infrastructure is currently exposed to environmental hazards, and this exposure will increase over the coming decade, and likely escalate rapidly thereafter. First Nation assets will experience greater interannual stress resulting in increased costs related to changing frequency or type of maintenance, reduced lifespans, and a likely increase in the liability incurred by the renewal and refurbishment in the absence of some form of adaptation. **The adaptation of First Nation assets to climate change is necessary to lower future financial requirements in addition to ensuring community health and well-being**.

For example, emergency response and recovery transfers issued from Indigenous Services Canada to First Nations increased from $32M in 2012-13 to $154M in 2021-22 – rise of 381% over 10 years. Figure 1 presents a forecast for the implications of rising climate risk based on the emergency response transfer data for First Nations.

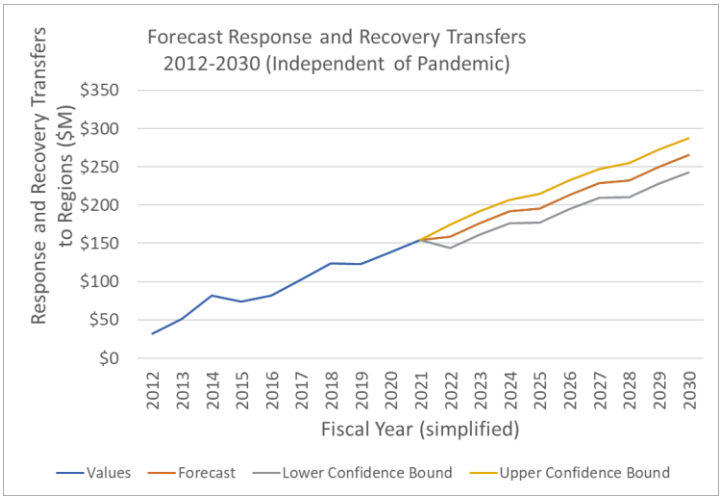

Figure 1: Forecast Response and Recovery Transfer Scenarios

Forecast payments will amount to $243M to $287M per year over the period 2022 to 2030. While the eligibility criteria for releasing these funds was unavailable at the time of writing, ISC funding programs for disaster relief to First Nations. Disaster relief funding commonly addresses the cost to evacuate displaced citizens, provide essential services during the evacuation period, and assist recovery through the repair and replacement of damaged infrastructure.

These payments constitute a reactive response to risk and reflect where First Nations are not prepared for disaster rather than the true cost to prepare for the sweeping environmental transformation attributed to climate change. Given more than 10,000 First Nation residents were evacuated in 2018-19 alone, and future displacements are likely to be much higher with forecast population growth a rising severity of extreme weather events, significant community disruption will occur without adaptation. **Therefore, while total emergency response and recovery payments over the ten-year period amounts to approximately $2.23B, this does not account for the community benefits that adaptation provides.** The true cost of disaster preparedness and relief to First Nations, given the escalating risk presented by a severe onset of climate change (described in the following section), are likely to be higher than these forecasts suggest.

2.0 The Emerging Climate Risk for First Nation Infrastructure

The impacts of climate change and resulting stresses are regionally specific. While many severe weather events present a consistent threat across Canada, such as an increased incidence and severity of forest fires or flooding, the actual likelihood and exposure of assets to environmental hazards will result from regionally specific contexts.

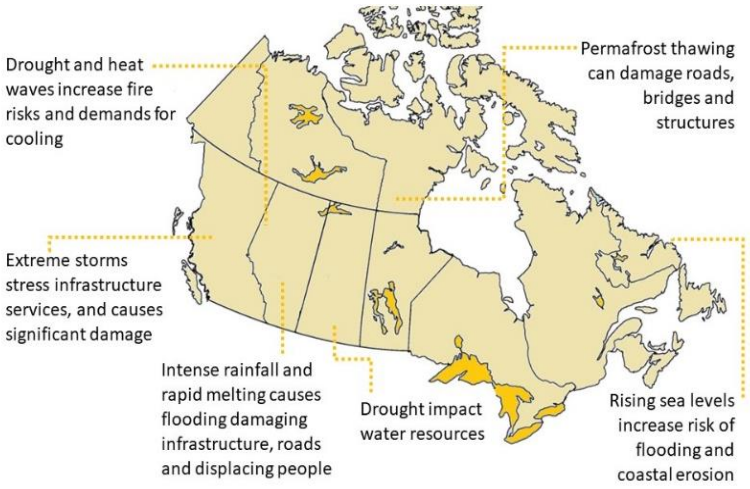

Figure 2: Regional Impacts of Climate Change

Communities will also be vulnerable to regionally specific hazards (Figure 2). Coastal communities will be increasingly exposed to rising sea levels, increased coastal erosion, increased coastal squeeze, and more severe storm surges. Interior communities will experience more frequent and severe forest fires, increased incidents of drought, and more severe precipitation events. Northern communities will experience challenges related to permafrost thaw, ground subsidence, and increasing snow loads**.**

Reducing climate risk through adaptation will therefore require site-specific modifications to buildings and linear infrastructure, beginning immediately, and becoming more significant over time. The present challenges of adapting First Nation infrastructure to climate change and protecting these assets from further extreme weather events will be a collaborative effort between the Government of Canada and First Nations, who are more vulnerable to climate change due to their more rural and remote locations.

3.0 Escalating Climate Risk Beyond 2030

The impacts of climate change are influenced heavily by the success of current efforts to reduce global carbon (often expressed in terms of CO2(e)) emissions. Given current trends there is a significant likelihood that climate change will rapidly increase in severity through to 2030 and beyond, and regional climate-related hazards will escalate accordingly.

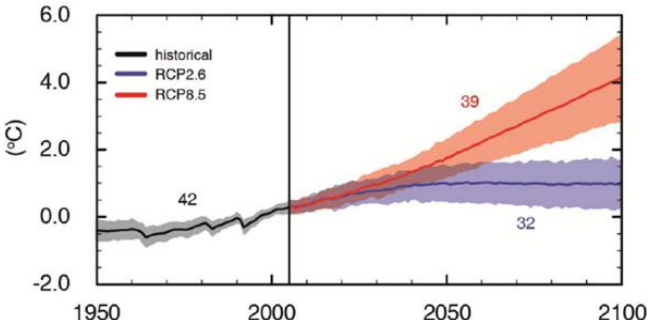

Figure 3: Influence of Emissions on the Severity of Climate Change Comparing RCP 2.6 with RCP 8.5

Figure 3 illustrates this dynamic based on two scenarios produced by the International Panel on Climate Change (IPCC) and commonly referenced in climate assessments: RCP 2.6 and RCP 8.5. The RCP 2.6 scenario illustrates a low emission global scenario that is predicated on strong mitigation actions. This scenario presents a pathway that limits global average warming levels to 0.9C to 2.3C by 2090. The RCP 8.5 scenario illustrates a high emission scenario that assumes limited mitigation measures to manage the onset of climate change. This scenario presents a pathway that indicates global warming levels of 3.2C to 5.4C by 2090. Increases to mean annual temperature will not be consistent across Canada and northern regions will continue to warm faster and to a greater extent than southern regions.

The more severe climate change becomes, the greater the need for adaptive action by First Nation communities to manage the risk to their infrastructure, and the more costly these actions will become after 2030.

4.0 Higher Order Losses Associated with Extreme Weather Events

In addition to the explicit impact that climate change will have on infrastructure, expressed in terms of the cost to either maintain or renew it, extreme weather events will also have an implicit impact on the economies and well-being of First Nation communities. These higher-order losses result from the consequences of service disruptions resulting from damaged or destroyed infrastructure and include increases in community debt, dispossessed residents, and business closures. World Bank research has shown that higher-order losses are incurred more substantially by communities with low economic diversification and/or more social inequity – characteristics common to many First Nation communities. Resolving the issue of higher order losses requires economic diversification, improved climate readiness, and the redress of social vulnerability – all of which constitute strategic adaptation in the form of effective infrastructure investments and the capacity of First Nations to manage their own operations.

5.0 Closing the Infrastructure Gap By 2030: Immediate Cost Implications of Adaptation

High-level adaptation costs have been developed to assess the additional financial investment necessary to manage the risk of climate change to First Nation infrastructure by 2030. Risk is defined here as the combined impact of:

- The likelihood of the event based on available climate projection data and specific to the region in which the asset is situated.
- The exposure of the asset to climate hazards, which is specific to its location.
- The consequence of the climate event, expressed in terms of the asset type, its size, and its value. Consequence was appraised in terms of potential damage to the asset resulting from chronic issues, such as declining road surface conditions resulting from more frequent extreme heat events or more acute events such as a severe storm.

One-hundred and ninety-seven (197) potential adaptations were proposed to manage the risk of climate change to First Nation assets based on assessed risks. The market value of each adaptation was established based on professional expertise and applied against all assets listed in the registry either as an ongoing fee (for chronic events) or as a percentage of its current replacement value (for acute events). Adaptation costs are presented by zone, by both capital needs and operations/maintenance needs, and by asset class. Housing and buildings constitute separate asset classes given these assets are managed by different policies and financial accounts by most First Nations.

Costing Methodology – Accounting for Remoteness

- The costs for materials and labour are higher in remote communities.
- Cost escalation factors of 1, 1.15, 1.25, and 2 are applied to capital costs in Zones 1, 2, 3, and 4 respectively.
- These escalation factors apply to Residential and non-Residential Buildings, Transportation Assets, and Utilities

5.1 Cost Implications of Adaptation for Housing

Our cost estimate for adapting housing to future climate impacts is based on the uptake of more weather-resistant cladding, replacement of asphalt shingle with tin roofing materials, the installation of window canopy on south and west facing walls, and site-specific improvements (new vegetation selections, regrading, and the thinning/removal of existing vegetation). Based on these assumptions, the total cost of adaptation for the housing asset class is **$4.88B**. A more detailed breakdown of this estimate by zone and cost class is provided in Table 1.

Table 1: Estimated Cost to Adapt First Nation Residential Housing to Future Climate Conditions

Subclass	Capital Needs				O&M Needs	Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4		
Residential	$1.35 B	$1.93 B	$0.21 B	$1.38 B	N/A	$4.88 B
Class Total*	**$1.35 B**	**$1.93 B**	**$0.21 B**	**$1.38 B**		**$4.88 B**

5.2 Cost Implications of Adaptation for Transportation

Adapting transportation infrastructure to remain viable in a changing climate will require more regular road resurfacing as shifts in mean annual temperature increase the severity of frost heaves and surface damage. Annual operations and maintenance (O&M) costs will increase as a result. Bridges will necessitate similar annual O&M expenditures as materials are stressed by more regular extreme heat events and other more chronic impacts. Capital expenditures will increase as larger culverts and other investment needs emerge. Based on these assumptions, the total cost for adapting transportation assets is **$8.92 B**. A more detailed breakdown of this estimate is provided in Table 2.

Table 2: Estimated Cost to Adapt First Nation Transportation Assets to Future Climate Conditions

Subclass	Capital Needs				O&M Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	
Bridges	$0.10 B	$0.08 B	$0.01 B	$0.11 B	$0.84 B	$0.69 B	$0.04 B	$0.75 B	$2.61 B
Road	$2.24 B	$2.87 B	$0.10 B	$0.90 B	$0.07 B	$0.10 B	<$0.01 B	$0.03 B	$6.31 B
Class Total*	**$2.34 B**	**$2.95 B**	**$0.11 B**	**$1.00 B**	**$0.91 B**	**$0.78 B**	**$0.05 B**	**$0.78 B**	**$8.92 B**

*Numbers may not sum to the Class Total due to rounding

5.3 Cost Implications of Adaptation for Utilities

Utilities will experience increased disruptions from an increased incidence of downed trees and branches along power lines, downed infrastructure related to ice storms and annual forest fire disruptions, and renewal as new design standards emerge. These risks, which effectively serve as potential disruptions to the levels of service provided by this infrastructure class and will require new funding to update and adapt utility infrastructure to climate change. For example, water and wastewater infrastructure will be negatively impacted by climate change across Canada, resulting in a range of management implications that will necessitate upgrades to utility infrastructure in every case (Table 3).

Table 3: Implications of Climate Hazards for Water/Wastewater Management

Water Hazard	Management Implication			
	Quantity	Quality	Conveyance	Treatment
Drought	Diversifying or increasing the amount of groundwater storage available.	Increased concentration of pathogens will necessitate more frequent testing.	Increased maintenance costs due to rising rates of corrosion and siltation blockages.	Adjust water treatment to facilitate increased water reclamation and rising concentrations of pathogens.
Storms and Flooding	Increased quantity of poor quality water (runoff) resulting in increase of contaminants in water (sediment, pathogens, and agricultural pollutants) necessitates more frequent testing.		Increased maintenance costs due to increased overflows, blockages, and pump station outages.	Adjust water treatment to address new levels of pathogens. Increased cost to maintain infrastructure due to storm damage.
Increased Water Temperature	N/A	Increased eutrophication, excess algal growth, and odour will necessitate more frequent testing.	Increased maintenance costs due to increased odours and blockages.	Increased monitoring and testing to compensate for increased temperatures.
Sea-level Rise	Decreased quantity and quality resulting from salt-water intrusion necessitating new control structures and increased testing.		Increased maintenance costs due to changing hydrological conditions and related breakages.	Increased costs due to increased infrastructure damage and inefficiencies due to incidence of flooding and ecological change.

Based on these assumptions, the total cost for adapting utilities assets is **$2.58 B**. A more detailed breakdown of this estimate by zone and cost class is provided in Table 4. While additional costs will be required to upgrade other asset classes such as telecommunications, and roads, these have not been factored into this assessment and constitute an additional cost to close the infrastructure gap beyond 2030.

Table 4: Estimated Cost to Adapt First Nation Utilities Assets to Future Climate Conditions

Subclass	Capital Needs				O&M Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	
Electrical Power Supply and Dist. System	$0.04 B	$0.06 B	$0.01 B	$0.05 B	$0.03 B	$0.04 B	<$0.01 B	$0.03 B	$0.26 B
Solid Waste Collection and Disposal System	$0.05 B	$0.08 B	$0.00 B	$0.08 B	$0.03 B	$0.05 B	<$0.01 B	$0.06 B	$0.35 B
Waste Collection and Disposal Collection	$0.21 B	$0.40 B	$0.02 B	$0.26 B	$0.07 B	$0.12 B	$0.01 B	$0.08 B	$1.17 B
Water Supply	$0.10 B	$0.17 B	$0.01 B	$0.08 B	$0.12 B	$0.20 B	$0.01 B	$0.10 B	$0.79 B
Class Total*	**$0.40 B**	**$0.71 B**	**$0.04 B**	**$0.48 B**	**$0.24 B**	**$0.42 B**	**$0.03 B**	**$0.26 B**	**$2.58 B**

*Numbers may not sum to the Class Total due to rounding

These costs do not include the need for increased emergency preparedness as access/egress routes and supply chains are disrupted, and First Nations will require additional resources and support to prepare adequate response plans to respond to climate-related disruptions as they occur. As suggested in the introduction, it is vital that First Nations are positioned to anticipatorily plan for increases in local climate risks that will affect the levels of service provided by their utilities and other infrastructure, either through the development of adaptation plans or the mainstreaming of adaptation into other policy streams, and the development of climate-ready emergency response plans. It is estimated that an additional ~$120M is required to finance these planning processes bringing the total cost to **$2.70 B.** In addition, the preservation and enhancement of natural assets such as firebreaks will be necessary to mitigate the threat created by climate change.

5.4 Cost Implications of Adaptation for Buildings

Buildings will necessitate many adaptations to the structural envelope, site, and mechanical systems to adapt to a changing climate. Mechanical system upgrades will include measures such as HVAC improvements necessary to circulate cool air during hotter summers. Building envelopes will require modification to offset longer periods of increased heat and/or extreme weather events, necessitating weather-resistant siding, and the use of lighter colours to facilitate cooler interior conditions. Building system redesign may also include the relocation of electrical systems to reduce their vulnerability to flooding. Site design improvement may include new vegetation selections, regrading, and the thinning/removal of existing vegetation to reduce vulnerability from windthrow (the uprooting of trees by the wind). Based on these assumptions, the total cost for adapting building assets is **$4.30 B.** A more detailed breakdown of this estimate is provided in Table 5.

Table 5: Estimated Cost to Adapt First Nation Buildings Assets to Future Climate Conditions

Subclass	Capital Needs				O&M Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	
Administration	$0.09 B	$0.09 B	$0.01 B	$0.04 B	$0.02 B	$0.02 B	$0.00 B	$0.01 B	$0.26 B
Institutional	$0.12 B	$0.23 B	$0.01 B	$0.05 B	$0.06 B	$0.12 B	$0.01 B	$0.03 B	$0.64 B
Operative	$0.14 B	$0.17 B	$0.01 B	$0.11 B	$0.08 B	$0.09 B	$0.01 B	$0.06 B	$0.66 B
Recreational	$0.42 B	$0.55 B	$0.03 B	$0.29 B	$0.22 B	$0.28 B	$0.01 B	$0.14 B	$1.94 B
Utility	$0.10 B	$0.19 B	$0.01 B	$0.15 B	$0.08 B	$0.15 B	$0.01 B	$0.12 B	$0.80 B
Class Total*	**$0.86 B**	**$1.23 B**	**$0.07 B**	**$0.63 B**	**$0.45 B**	**$0.66 B**	**$0.04 B**	**$0.35 B**	**$4.30 B**

*Numbers may not sum to the Class Total due to rounding

6.0 Pathway to Reduced Climate Risk: 2030

The grand total estimate to adapt First Nation assets across all classes to environmental conditions in 2080, as anticipated by the RCP8.5 scenario, is **$20.79B**. This estimate anticipates **$15.70B** necessary for new capital expenditures, **$4.97B** to support increased O&M requirements, and **$0.12B** to support emergency preparedness/ adaptation planning. This estimate essentially amounts to a premium on renewal, and it should be noted that, despite being a sizeable sum, the expense resulting from doing nothing to adapt First Nation infrastructure to climate change will result in higher recovery costs, higher-order losses, and future community redevelopment requirements over the coming decades. Further, with adaptation, future escalations in annual response and recovery payments (coinciding with a resilience to climate change), will be less substantial beginning immediately.

As illustrated in Figure 3, the severity of climate change becomes both more significant and uncertain after 2050. New assets are also going to be constructed over the time period between 2022 to 2080 that will complicate the adaptation needs of First Nations.

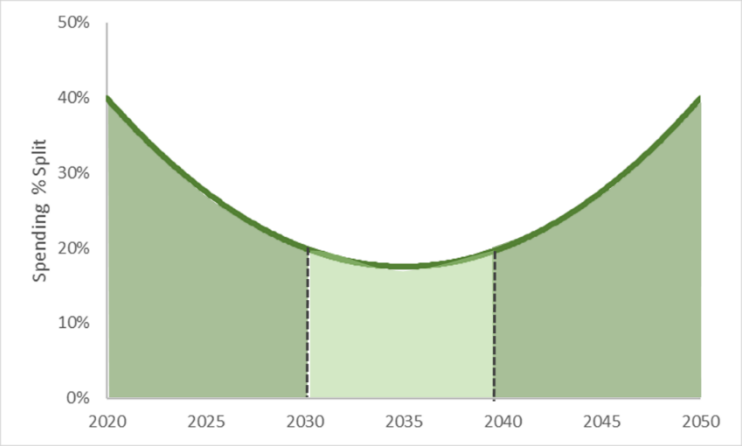

Figure 4: Adaptation Spending Breakdown

A pragmatic approach to adaptation would suggest that existing assets should be resilient to climate change by 2050 thereby ensuring existing assets are improved and positively contribute to community resilience over an intervening period of relative certainty. This timeline establishes a 28 year investment period over which to utilize the proposed $20.8B in a realistic way that benefits First Nations.

Adaptation needs and asset management cycles further suggest that three investment periods characterize the 2050 timeline:

- An initial period to 2030 over which current asset renewal and improvement needs create an opportunity to improve community resilience to climate change.
- A second period between 2030 and 2040 over which adaptation becomes an ongoing initiative and responds to changing construction standards and increased certainty with regard to environmental conditions.
- A period between 2040 and 2050 during which asset renewal cycles and an increasing severity of climate change result in a new period of significant adaptation investments.

The investment curve derived from this forecast suggests a 40%-20%-40% split between the three decades. **The total forecast cost of adaptation to 2030 under this curve establishes an investment need of $8.32B.**

Synergies will also exist between proposed adaptation-related improvements and those proposed to facilitate conventional asset renewal and/or to reduce the carbon footprint of First Nation assets. Such synergies will further manage the investment cost of adaptation and respect the capacity of First Nations to implement necessary retrofits thereby ensuring the potential economic benefits of this work also flow to First Nation communities. For example, upgrading mechanical systems that also supply cool air will result in improved building performance, reduced carbon emissions, and increased resilience. Similarly, improving building insulation or other building envelope retrofits implemented for energy efficiency purposes should be timed to include improvements to cladding to reduce climate risks. These various considerations influence the timing of asset renewal resulting in a stepwise strategic approach to adaptation and result pathway to climate resilient First Nation infrastructure.

The pathway to reduced climate risk arises from prioritized and results-driven federal investments. Adapting First Nation infrastructure is necessary now to manage existing climate risk and these risks will increasingly affect community resilience and societal well-being over the coming decades. Adaptation and improved asset resilience can also create new opportunities for economic prosperity in First Nation communities. Financing adaptation is consequently important to *Closing the Infrastructure Gap by 2030*.

Appendix 1

ADAPTATION COST ANALYSIS

Appendix 1 - Adaptation Costing Methodology

To determine the cost of adaptation assets, a list of 197 potential adaptation actions was created to manage the risk of climate change across seven major climate hazards. These hazards include:

1. Coastal Flooding,
2. Drought,
3. Extreme Heat,
4. Forest Fire,
5. Freezing Rain,
6. High Winds, and
7. Localized Flooding.

These adaptation actions were created for non-residential buildings, transportation (roads and bridges), and utility systems.

For each of the adaptation actions, the market value of each adaptation for a representative average-sized asset of that class was established based on professional expertise. These adaptation actions include costs for one-time capital interventions during the course of an asset's life (e.g., regrading a site to reduce the impacts of localized flooding), renewal premiums to replace an asset with a new asset that is more climate resilient at the end of its service life (e.g., constructing an asset using heat tolerant materials and finishes), and ongoing annual operations & maintenance costs for those adaptation actions (e.g., operating a cooling centre in public-use buildings during extreme heat events). All one-time capital costs are assumed to occur at or before 2030, and all on going operations & maintenance costs are assumed to start accruing in 2023 (8 years of maintenance costs). Renewal premiums are applied only to assets that reach the end of their service lives at or before 2030. Each adaptation action has costs expressed as a percentage of the current replacement value for assets in that asset class.

It is assumed that a certain number of assets in each asset class are exposed to each hazard, and the data used to calculate risk likelihoods and consequences were predicated on industry-applied knowledge and professional insight. As geographic locations for First Nation's assets are not available in the asset inventory, a Canada-wide average exposure ratio (the number of assets exposed to a specific hazard compared to the total number of assets in that site) was estimated based on exposure ratios for sites across Canada for each asset class and hazard type. These Canada-wide exposure ratios were used in place of region-specific information and are a limitation of this approach.

The Adaptation Action capital cost, renewal premium, and operations & maintenance cost ratios for each asset class and hazard are provided in tables A-1 through A-3. The exposure ratios for each asset class are in Table A-4.

Table A-1
One-Time Capital Cost Ratios for Each Hazard and Asset Class

		One-Time Capital Cost Ratio						
Asset Category	**Asset Class**	Coastal Flooding	Drought	Extreme Heat	Forest Fire	Freezing Rain	High Winds	Localized Flooding
Buildings	Administration	0.0%	0.0%	50.0%	5.2%	0.0%	0.0%	108%
Buildings	Institutional	3.0%	0.0%	50.0%	5.2%	0.0%	0.0%	108%
Buildings	Operative	3.0%	0.0%	50.0%	5.2%	0.0%	0.0%	108%
Buildings	Recreational	3.0%	0.0%	50.0%	5.2%	0.0%	0.0%	108%
Buildings	Residential	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Buildings	Utility	0.0%	0.0%	50.0%	5.2%	0.0%	0.0%	108%
Grounds	Ports	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Bridges	56.0%	0.0%	0.0%	4.0%	0.0%	6.0%	116%
Transportation	Other structures	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Road	0.0%	0.0%	15.0%	7.0%	0.0%	1.0%	21%
Utility	Electrical power supply and dist. System	0.0%	0.0%	52.0%	12.0%	0.2%	6.0%	2.5%
Utility	Solid waste collection and disposal system	0.0%	0.0%	52.0%	12.0%	0.0%	0.0%	2.5%
Utility	Waste collection and disposal collection	0.0%	0.0%	52.0%	12.0%	0.2%	6.0%	2.5%
Utility	Water supply	0.0%	100.0%	52.0%	12.0%	0.2%	6.0%	2.5%

Table A-2
Renewal Premium Cost Ratios for Each Hazard and Asset Class

		Renewal Premium Cost Ratio						
Asset Category	**Asset Class**	Coastal Flooding	Drought	Extreme Heat	Forest Fire	Freezing Rain	High Winds	Localized Flooding
Buildings	Administration	0.0%	0.0%	20.0%	50.0%	0.0%	0.0%	13.3%
Buildings	Institutional	20.0%	0.0%	20.0%	26.5%	0.0%	5.2%	20.0%
Buildings	Operative	20.0%	0.0%	31.3%	25.5%	0.0%	10.4%	12.5%
Buildings	Recreational	20.0%	0.0%	20.0%	26.5%	0.0%	5.2%	20.0%
Buildings	Residential	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Buildings	Utility	0.0%	0.0%	0.0%	23.3%	0.0%	8.0%	10.0%
Grounds	Ports	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Bridges	45.0%	0.0%	50.0%	175.0%	0.0%	0.0%	150.0%
Transportation	Other structures	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Road	0.0%	0.0%	20.0%	13.0%	0.0%	7.9%	0.0%
Utility	Electrical power supply and dist. System	0.0%	0.0%	90.0%	40.0%	0.0%	0.0%	25.0%
Utility	Solid waste collection and disposal system	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	20.0%
Utility	Waste collection and disposal collection	0.0%	0.0%	120.0%	30.0%	0.0%	0.0%	25.0%
Utility	Water supply	0.0%	0.0%	35.0%	45.0%	0.0%	0.0%	26.7%

Table A-3
On-going Annual Operations and Maintenance Cost Ratios for Each Hazard and Asset Class

		On Going Annual Operations and Maintenance Cost Ratio						
Asset Category	**Asset Class**	Coastal Flooding	Drought	Extreme Heat	Forest Fire	Freezing Rain	High Winds	Localized Flooding
Buildings	Administration	0.0%	0.0%	2.2%	0.2%	0.4%	0.1%	1.1%
Buildings	Institutional	0.1%	0.0%	2.2%	0.2%	0.4%	0.1%	1.1%
Buildings	Operative	0.1%	0.0%	2.2%	0.2%	0.4%	0.1%	1.1%
Buildings	Recreational	0.1%	0.0%	2.2%	0.2%	0.4%	0.1%	1.1%
Buildings	Residential	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Buildings	Utility	0.0%	0.0%	2.2%	0.2%	0.4%	0.1%	1.1%
Grounds	Ports	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Bridges	0.8%	0.2%	0.1%	0.3%	0.0%	0.5%	0.9%
Transportation	Other structures	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Road	0.0%	0.0%	0.1%	0.1%	0.2%	0.2%	0.1%
Utility	Electrical power supply and dist. System	0.0%	0.0%	1.4%	1.4%	0.4%	0.6%	0.0%
Utility	Solid waste collection and disposal system	0.0%	0.0%	1.6%	2.4%	0.0%	0.0%	0.0%
Utility	Waste collection and disposal collection	0.0%	0.0%	1.4%	1.4%	0.4%	0.6%	0.0%
Utility	Water supply	0.0%	3.0%	1.4%	1.4%	0.4%	0.6%	0.0%

Table A-4
Exposure Ratios for Each Hazard and Asset Class

		Exposure Ratio						
Asset Category	**Asset Class**	Coastal Flooding	Drought	Extreme Heat	Forest Fire	Freezing Rain	High Winds	Localized Flooding
Buildings	Administration	0.6%	0.6%	9.0%	16.7%	0.6%	9.0%	5.8%
Buildings	Institutional	0.6%	0.6%	9.0%	16.7%	0.6%	9.0%	5.8%
Buildings	Operative	0.6%	0.6%	9.0%	16.7%	0.6%	9.0%	5.8%
Buildings	Recreational	0.6%	0.6%	9.0%	16.7%	0.6%	9.0%	5.8%
Buildings	Residential	0.6%	0.6%	9.0%	16.7%	0.6%	9.0%	5.8%
Buildings	Utility	0.6%	0.6%	9.0%	16.7%	0.6%	9.0%	5.8%
Grounds	Ports	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Bridges	0.0%	0.0%	8.3%	16.7%	0.0%	8.3%	50.0%
Transportation	Other structures	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Transportation	Road	0.0%	34.8%	60.9%	60.9%	21.7%	47.8%	91.3%
Utility	Electrical power supply and dist. System	0.0%	8.6%	11.4%	20.0%	8.6%	2.9%	22.9%
Utility	Solid waste collection and disposal system	0.0%	8.6%	11.4%	20.0%	8.6%	2.9%	22.9%
Utility	Waste collection and disposal collection	0.0%	8.6%	11.4%	20.0%	8.6%	2.9%	22.9%
Utility	Water supply	0.0%	8.6%	11.4%	20.0%	8.6%	2.9%	22.9%

Appendix 2

COST SUMMARY TABLE

Appendix 2 - Cost Summary Table

Table B-1
Cost Summary Table for All Adaptation Costs

Subclass	Capital Needs				O&M Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4	
Buildings	**$0.86 B**	**$1.23 B**	**$0.07 B**	**$0.63 B**	**$0.45 B**	**$0.66 B**	**$0.04 B**	**$0.35 B**	**$4.30 B**
Administration	$0.09 B	$0.09 B	$0.01 B	$0.04 B	$0.02 B	$0.02 B	$0.00 B	$0.01 B	**$0.26 B**
Institutional	$0.12 B	$0.23 B	$0.01 B	$0.05 B	$0.06 B	$0.12 B	$0.01 B	$0.03 B	**$0.64 B**
Operative	$0.14 B	$0.17 B	$0.01 B	$0.11 B	$0.08 B	$0.09 B	$0.01 B	$0.06 B	**$0.66 B**
Recreational	$0.42 B	$0.55 B	$0.03 B	$0.29 B	$0.22 B	$0.28 B	$0.01 B	$0.14 B	**$1.94 B**
Utility	$0.10 B	$0.19 B	$0.01 B	$0.15 B	$0.08 B	$0.15 B	$0.01 B	$0.12 B	**$0.80 B**
Housing	**$1.35 B**	**$1.93 B**	**$0.21 B**	**$1.38 B**	**$0.00 B**	**$0.00 B**	**$0.00 B**	**$0.00 B**	**$4.88 B**
Residential	$1.35 B	$1.93 B	$0.21 B	$1.38 B	N/A				**$4.88 B**
Transportation	$2.34 B	$2.95 B	$0.11 B	$1.00 B	$0.91 B	$0.78 B	$0.05 B	$0.78 B	**$8.92 B**
Bridges	$0.10 B	$0.08 B	$0.01 B	$0.11 B	$0.84 B	$0.69 B	$0.04 B	$0.75 B	**$2.61 B**
Road	$2.24 B	$2.87 B	$0.10 B	$0.90 B	$0.07 B	$0.10 B	$0.00 B	$0.03 B	**$6.31 B**
Utility	**$0.40 B**	**$0.71 B**	**$0.04 B**	**$0.48 B**	**$0.24 B**	**$0.42 B**	**$0.03 B**	**$0.26 B**	**$2.58 B**
Electrical Power Supply and Dist. System	$0.04 B	$0.06 B	$0.01 B	$0.05 B	$0.03 B	$0.04 B	$0.00 B	$0.03 B	**$0.26 B**
Solid Waste Collection and Disposal System	$0.05 B	$0.08 B	$0.00 B	$0.08 B	$0.03 B	$0.05 B	$0.00 B	$0.06 B	**$0.35 B**
Waste Collection and Disposal Collection	$0.21 B	$0.40 B	$0.02 B	$0.26 B	$0.07 B	$0.12 B	$0.01 B	$0.08 B	**$1.17 B**
Water Supply	$0.10 B	$0.17 B	$0.01 B	$0.08 B	$0.12 B	$0.20 B	$0.01 B	$0.10 B	**$0.79 B**
Emergency Preparedness	**$0.00 B**	**$0.00 B**	**$0.00 B**	**$0.00 B**	**$0.04 B**	**$0.06 B**	**$0.01 B**	**$0.02 B**	**$0.12 B**
Grand Total	**$4.95 B**	**$6.82 B**	**$0.44 B**	**$3.49 B**	**$1.64 B**	**$1.91 B**	**$0.12 B**	**$1.42 B**	**$20.79 B**

*Numbers may not sum to the Class Totals or Grand Total due to rounding

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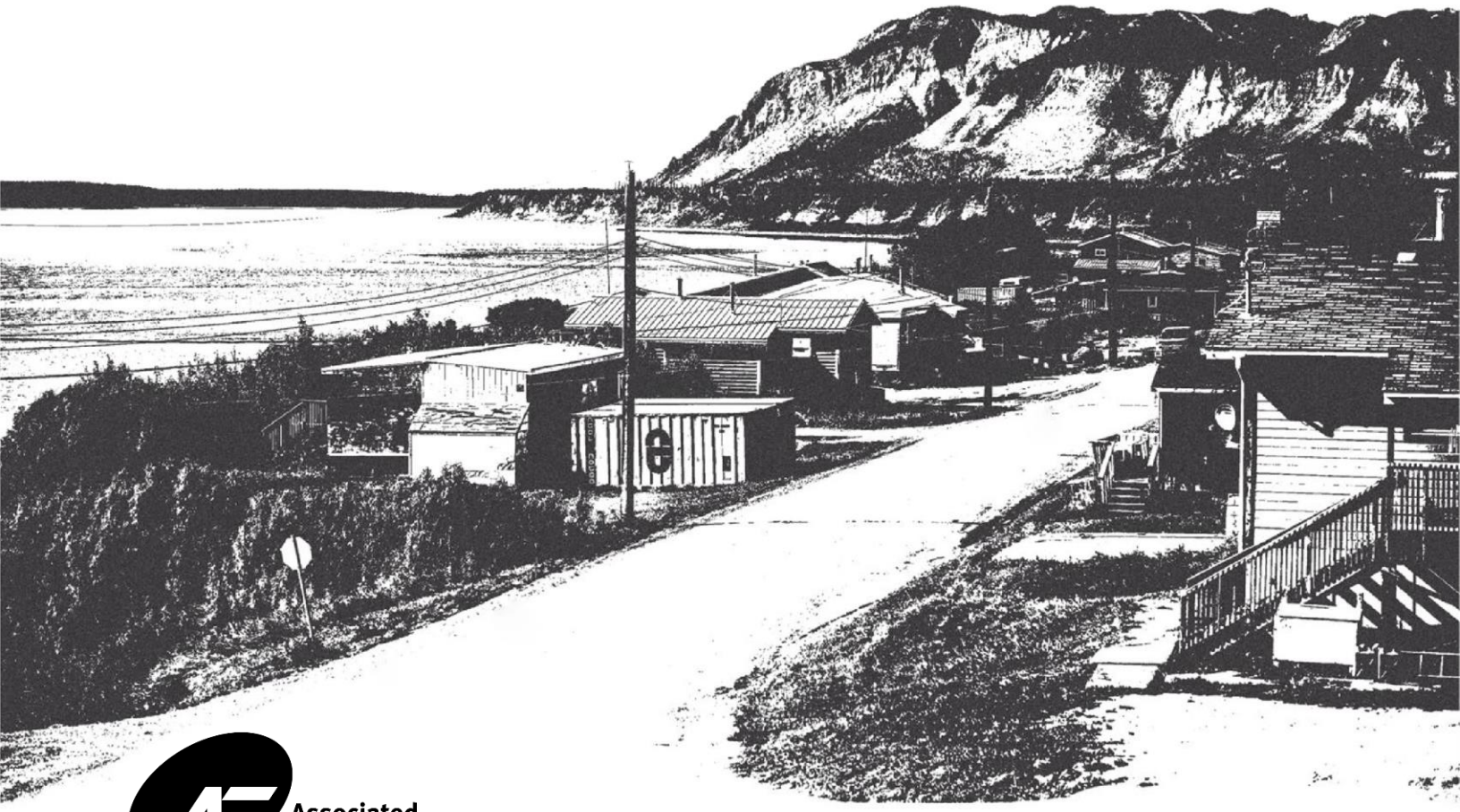
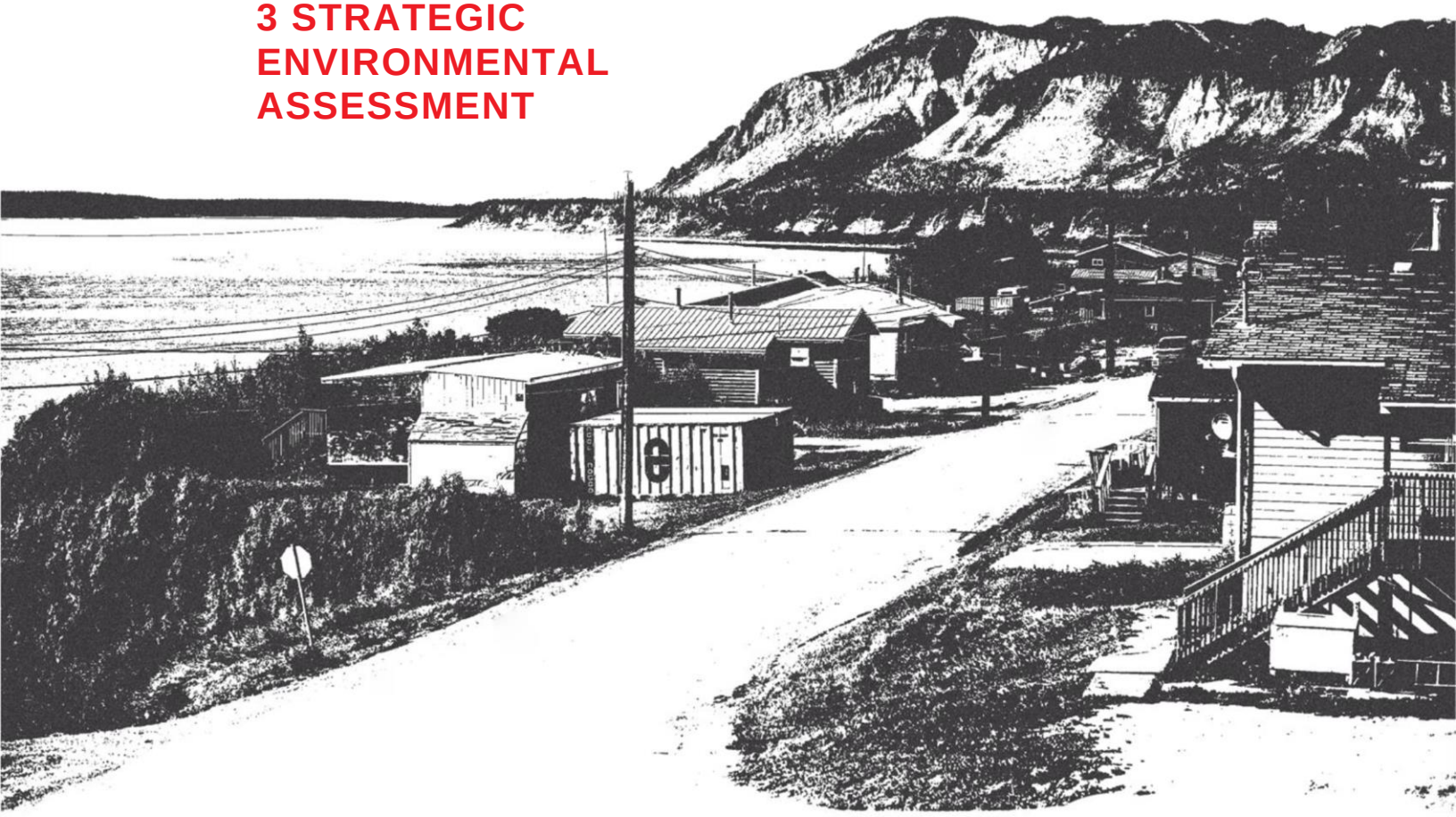


Associated Engineering

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

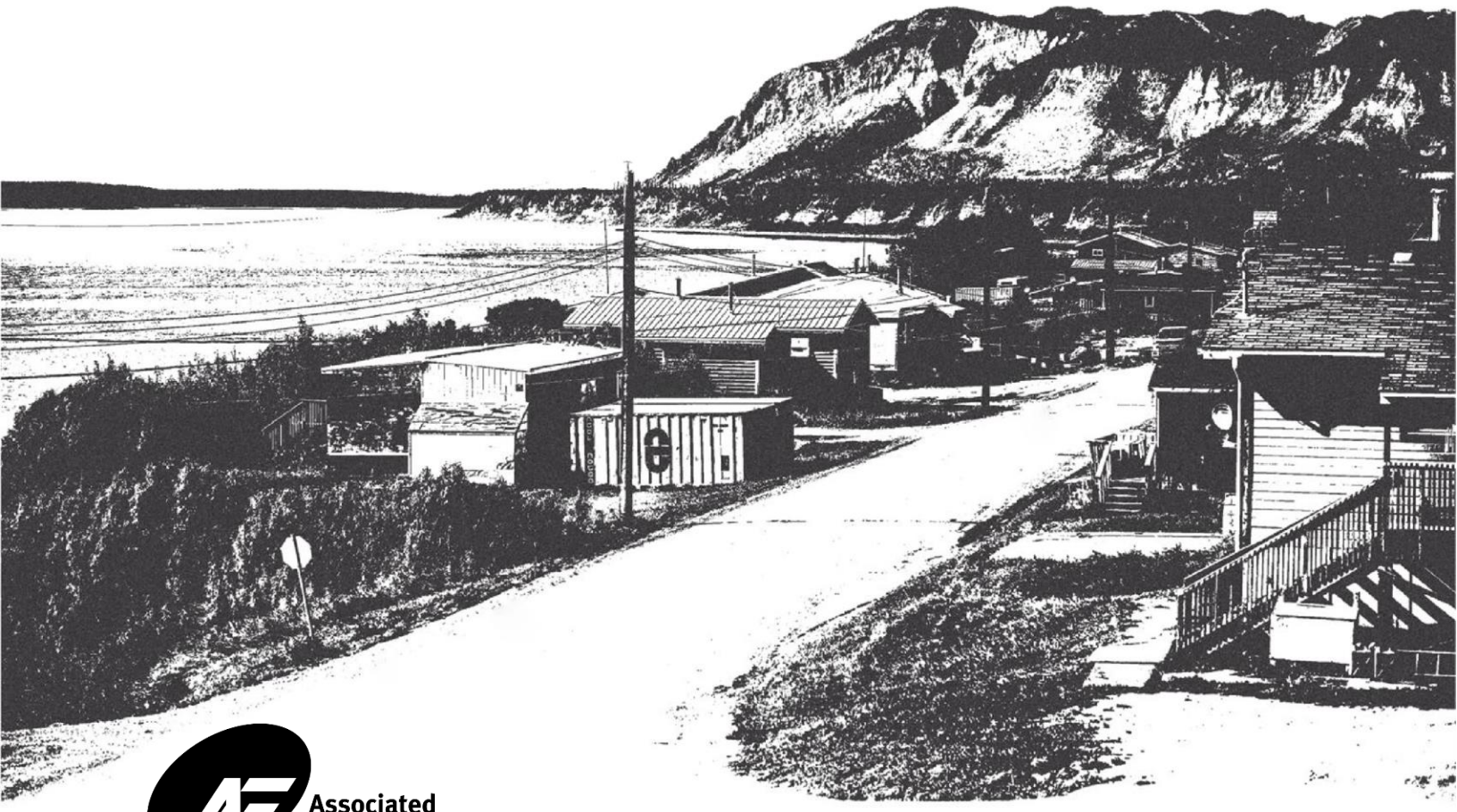
Appendix 7

AE DISCUSSION PAPER: TOWARD NET-ZERO INFRASTRUCTURE/ ANNEX 3 STRATEGIC ENVIRONMENTAL ASSESSMENT



Closing the Infrastructure Gap by 2030

AE DISCUSSION PAPER: TOWARD NET ZERO INFRASTRUCTURE/ ANNEX 3 STRATEGIC ENVIRONMENTAL ASSESSMENT



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Contents

1.0 Introduction: Reducing Emissions by 2030

An important part of achieving Canada's net-zero future starts by *Closing the Infrastructure Gap* by 2030 for First Nations. The need to reduce the carbon emitted by existing federally funded infrastructure and prepare new facilities on First Nation lands for net-zero capacity is an immediate starting point to deliver on the *Canadian Net-Zero Emissions Accountability Act*. The carbon emissions reduction target established by the Canadian government, specifically to be 40 percent below 2005 levels by 2030, presents a firm foundation for this evaluation by defining the investment gap for First Nation infrastructure and establishing key focal areas for this assessment. **This discussion paper proposes a base cost to inform the implication of climate change mitigation for asset renewal by 2030.**

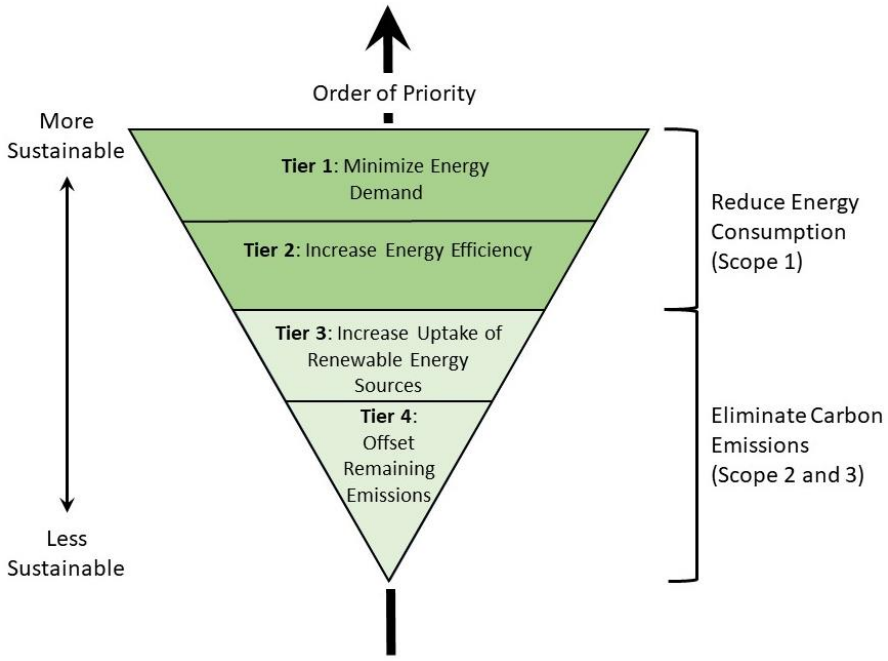


Figure 1
Energy Hierarchy

The actions evaluated in this memo constitute Tier 2 in the energy hierarchy (Figure 1). The hierarchy establishes a theoretical framework for achieving net zero based on the complexity and cost of actions, which increase as you approach the "peak" of the triangle, while the sustainability of the action declines. Decreases in sustainability exist because earlier tier actions manage overall energy consumption, thereby reducing the need for energy and the fuels necessary to generate it. Later tier actions offset emissions through fuel switching and managing emissions elsewhere though offsets and are only effective if energy demand has been managed first. The first two tiers of energy hierarchy are also intended to manage Scope 1 emissions, defined by the international Greenhouse Gas Protocol as those directly resulting from an organization's facilities and vehicles, which are the primary form of emissions by First Nations. Scope 2 and Scope 3 emissions, or those attributable to indirect activities associated with the upstream (Scope

2) and downstream (Scope 3) activities of a First Nation, will be managed by Tier 3 and Tier 4 investments and may require partnerships to operationalize. Overlaps in these activities will exist depending on the actual operations of a First Nation, and Tier 3 and 4 investments will reduce Scope 1 emissions, while Tier 1 and 2 investments will also reduce Scope 2 and 3 requirements.

For example, organizations like First Nation governments and development corporations should first work to minimize their energy demand through simple behavioural changes such as reducing vehicle trip distances or turning off lights and/or turning down the heat when they leave the office for the day. Increasing energy efficiency involves implementing energy conservation measures (ECMS) such as those considered in this discussion paper, which work to do more with the energy currently being utilized for operational purposes.

Once demand has been minimized, efforts to reduce carbon should switch away from a focus on energy reduction to a focus on eliminating operational carbon emissions. These activities can include fuel switching from fossil fuels to renewable alternatives such as solar, hydroelectric, or biomass heating sources. The final suite of recommended actions focuses on offsetting those carbon emissions that cannot be eliminated from First Nation operations. This is done by purchasing carbon offsets to compensate for travel emissions or by establishing regulatory frameworks whereby offsets can be leveraged from renewable energy projects or natural assets. Establishing these regulatory frameworks also presents an opportunity for First Nations to benefit financially from these assets. Efforts to eliminate carbon are viewed as less sustainable than those intended to reduce energy consumption, given new resources must be utilized to produce renewable energy, and carbon offsets assume the continued use of fossil fuels. The hierarchy consequently recommends taking action to reduce energy consumption before actions to eliminate carbon emissions.

2.0 Beyond 2030: Getting to Net-Zero Emissions

Technologies available to reduce carbon emissions are maturing rapidly, and new opportunities for First Nations climate mitigation initiatives will likely shift in focus over the next decade from energy efficiency to achieving net-zero emissions. Getting to net-zero beyond 2030 is not only likely, it will be a necessity for all public agencies regardless of jurisdictional scale and represents the next step in managing First Nation assets. For roads and utilities, emerging opportunities related to new vehicle choices, renewable fuel sources, and changing material choices in construction, will likely lead to unprecedented renewal costs for First Nations infrastructure beyond what is included in the scope of this discussion paper.

Similarly, changes to the national building code, and fuel switching conversions to renewable energy options for heat and electricity, will lead to new opportunities and trade offs for buildings. New skillsets will be required by shifting industry norms in all cases. These infrastructure-related investments further constitute an opportunity to diversify First Nation economies and offset the vulnerabilities created by climate change (described in Memo 2 – Reducing Climate Risk).

Strategically, the pathway to net-zero emission begins with efforts to improve the energy efficiency of existing First Nation assets and evolves rapidly to include new opportunities for economic diversification, improved equity, and community development through complex investments in their asset portfolios.

3.0 Improving the Energy Efficiency of First Nation Assets By 2030: Non-Residential Buildings

The actual cost to retrofit First Nation buildings is highly context-specific and dependent upon a variety of factors, including the fuels used to provide heat and electricity, material costs, and simple payback periods. Several assumptions were necessary to provide a cost to retrofit these asset classes by 2030. Building retrofits were predicated on a high-level appraisal of the complexity of building mechanical ventilating and heating systems on the expectation that the retrofit cost for a complex system is more expensive than the cost to retrofit a simple system.

The variables used to define a simple versus a complex building are provided in Table 1. The linear relationship that emerges is based on real cost data from 26 buildings covering a range of asset classes and energy conservation measures (ECMs). Most of the ECMs evaluated for this assessment reduce carbon emissions by improving the efficiency of heat and electricity consumption, either by directly reducing the demand for them (for example through improvements to mechanical system efficiencies) or by indirectly reducing the amount of fossil fuels necessary to produce them (such as through the installation of LED lights). Fuel switching to a renewable power source was only considered within the context of installed solar PV arrays, which assumes the power being offset is produced by fossil fuel generators.

Table 1
Variables Defining Complexity in Buildings

Variable	Simple	Complex
Ventilation	Between 0 and 1 dedicated units.	2 or more dedicated units.
Floor area	Up to and including 800m^2	Greater than 800m^2
Heating sources	Between 0 and 2 dedicated units	More than 2 dedicated units
Occupancy	Up to 30 people	30 people or more
Solar PV	Installed	Installed

A deeper look at this data reveals that, while the cost of simpler ECMs is scalable (e.g., the installation of solar PV, controls recommissioning, and door sweeps and seals), more complex ECMS (e.g., boiler or control upgrades) are not. The cost of unscalable retrofits is driven instead by the type of unit installed, its age, its efficiency, its relationship to other mechanical systems, and so on. For this reason, a moderately strong correlation was observed between the floor area of simple buildings and the cost to retrofit them, and no correlation was observed for complex systems. This data still proved useful; however, given that 80% of buildings in the AFN asset registry could be categorized as simple. The estimate provided is, therefore, predicated on the value of retrofits estimated for simple buildings correlated to floor area and a base cost of $190,000 applied to complex buildings based on the data available.

Costing Methodology - Remoteness

- The costs for materials and labour are higher in remote communities.
- Cost escalation factors of 1, 1.15, 1.25, and 2 are applied to capital costs in Zones 1, 2, 3, and 4 respectively.
- These escalation factors apply to residential and non-residential buildings, utilities, and utility-scale renewable systems.

Building on these assumptions, the total cost to retrofit First Nation buildings across Canada is **$1.12 B**. Table 2 provides a more detailed account of this estimate.

Table 2: Estimated Cost to Improve the Energy Efficiency of First Nation Non-Residential Buildings

Subclass	# of Buildings	Capital Needs				Total Investment
		Zone 1	Zone 2	Zone 3	Zone 4	
Administration	955	$0.05 B	$0.05 B	<$0.01 B	$0.03 B	$0.13 B
Schools and Institutional	648	$0.04 B	$0.08 B	$0.01 B	$0.04 B	$0.17 B
Operative	2,335	$0.07 B	$0.12 B	$0.01 B	$0.08 B	$0.28 B
Recreational	1,165	$0.05 B	$0.08 B	$0.01 B	$0.04 B	$0.18 B
Utility	1,593	$0.08 B	$0.16 B	$0.02 B	$0.11 B	$0.37 B
Class Total*	**6,696**	**$0.29 B**	**$0.49 B**	**$0.04 B**	**$0.30 B**	**$1.12 B**

*Numbers may not sum to the Class Total due to rounding.

4.0 Improving the Energy Efficiency of First Nation Housing

Retrofitting a home is very similar to retrofitting a building, and includes improvements to the structural envelope, heating and ventilation systems, and lighting. A total cost of $8.21B is estimated for the retrofit of approximately 130,000 First Nation homes assessed through this study. A more detailed breakdown of this estimate is provided in Table 3. Envelope improvements include better performing wall and roof insulation, the installation of energy-efficient doors and windows, the installation of programable thermostats, and installation or renewal of mechanical ventilation systems. Heating system improvements are anticipated to include the upgrade of fossil fuel systems to a more efficient option or the replacement of existing systems with renewable/electrical alternatives. Lighting improvements are anticipated to result from the replacement of incandescent lighting systems with LED equivalents.

Table 3: Estimated Cost to Improve the Energy Efficiency of First Nation Housing

Subclass	# of Houses	Capital Needs				Total Investment
		Zone 1	Zone 2	Zone 3	Zone 4	
Residential	129,754	$2.28 B	$3.20 B	$0.37 B	$2.35 B	$8.20 B
Class Total*	**129,754**	**$2.28 B**	**$3.20 B**	**$0.37 B**	**$2.35 B**	**$8.20 B**

5.0 Improving the Energy Efficiency of First Nation Assets by 2030: Vehicles and Fleet Infrastructure

Vehicle electrification costs were established based on a cost comparison between conventional thermal light-duty vehicles and their electric counterparts. This comparison resulted in a 20% price escalation in the cost of a conventional vehicle to reduce its emissions. An additional flat rate of $3000.00 per Type 2 charger was included in the estimate to account for infrastructure upgrades necessary to power an electrified vehicle fleet, assuming one charger could provide power to four vehicles. Based on these assumptions, the total cost to electrify the light-duty fleet is **$0.19B**. A more detailed breakdown of this estimate is provided in Table 4.

Table 4: Estimated Cost to Improve the Energy Efficiency of Light Duty Vehicles

Subclass	Quantity	Capital Needs				Total Investment
		Zone 1	Zone 2	Zone 3	Zone 4	
Light Duty Fleet	19,110	$56 M	$77 M	$7 M	$30 M	$169 M
Vehicle Chargers	4,778	$5 M	$8 M	$0.2 M	$5 M	$17 M
Class Total*	**23,888**	**$60 M**	**$84 M**	**$8 M**	**$35 M**	**$187 M**

*Numbers may not sum to the Class Total due to rounding.

Light duty vehicles make up a small portion of the total registered vehicular assets belonging to First Nations in Canada. Unfortunately, at the time of writing, electrical options are only commercially available to replace light-duty vehicles. It is anticipated that clean-powered heavy-duty alternatives, in the form of electric or hydrogen-fueled vehicles, will become market-ready over the next decade. The cost to improve the energy efficiency of vehicle and fleet assets will likely increase as these alternatives become available.

6.0 Improving the Energy Efficiency of First Nation Assets by 2030: Utilities

Water & Wastewater Utilities: The cost to retrofit utility systems is context-dependent and varies based on the characteristics of the system. While deep decarbonization of these systems may need to take place after technologies mature, in the near-term, energy reduction ECMs can be adopted to reduce energy use. Based on knowledge of previous energy reduction projects for water and wastewater systems, energy savings of 10% for pump and mechanical systems and 5% for pump-only systems can be achieved with a payback period of 5 years. Capital costs for these ECMs were estimated using the potential savings for operations & maintenance energy costs from the *AFN Asset Needs Study* with an assumed 5-year payback period.

Electrical Utilities: An effective ECM for streetlights is to transition from incandescent to LED or solar light standards. These standards have a flat installation cost of $8000.00. The power generation transition for electricity generation is further described in Section 7 below.

Solid Waste Management: The emissions generated by landfills and refuse sites vary by landfill size and waste composition. While more complex systems like landfill gas recapture or incineration are effective for larger systems, they are often not cost-effective for smaller systems. Biocovers can be used in place of conventional landfill covers to reduce emissions for small systems cost-effectively. The cost to implement a biocover is assumed to be equivalent to the cost of a conventional cover. Therefore no additional costs have been identified for solid waste management in this analysis.

Based on these assumptions, the total cost to implement these utilities systems ECMs is **$0.20B**. A more detailed breakdown of this estimate is provided in Table 5.

Table 5: Estimated Cost to Improve the Energy Efficiency of Utilities Systems

Subclass	Capital Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	
Water Supply	$0.01 B	<$0.01 B	<$0.01 B	$0.02 B	$0.03 B
Waste Collection and Disposal Collection	$0.01 B	<$0.01 B	<$0.01 B	<$0.01 B	$0.01 B
Electrical Power Supply and Dist. System	$0.06 B	$0.07 B	$0.01 B	$0.02 B	$0.16 B
Solid Waste Collection and Disposal System	$0 B	$0 B	$0 B	$0 B	$0 B
Class Total*	**$0.07 B**	**$0.08 B**	**$0.01 B**	**$0.04 B**	**$0.20 B**

*Numbers may not sum to the Class Total due to rounding.

7.0 Utility-Scale Renewables for Remote First Nations

Generating electricity from renewable fuel sources will be required for First Nations to reach net-zero, especially in Zones 3 and 4, where local power production is commonly provided directly to communities by locally situated diesel or liquid natural gas generators. Utility scale renewable energy project are characterized by fuel switching away from these carbon intensive fuels to more renewable fuel sources such as solar photovoltaic (PV) arrays, wind turbines, geothermal systems, hydroelectric systems. Small modular nuclear reactors (SMRs) present another emerging low carbon emitting alternative. Each renewable power system is characterized by trade-offs and co-generation (hybrid heat and power production) options will exist that will provide additional benefits. Renewable generation costs have been estimated based on an average name-plate generation capacity of 1 MW established by the interconnection and transmission limits that characterize many remote power grids (Table 6). These costs further assume the installation of wind or solar PV technologies given the greatest economies of scale currently associated with them. The capital costs for utility-scale solar and on-shore wind are from *Canada Energy Regulator's Current Policies 2030* scenario assumptions.

Table 6: Estimated Cost to Build Utility Scale Renewable Systems

Subclass	Capacity (MW)	Capital Needs				Total Investment
		Zone 1	Zone 2	Zone 3	Zone 4	
Utility Scale Renewable Electricity Generation	137	$0 B	$0 B	$0.04 B	$0.25 B	$0.29 B
Class Total*	**137**	**$0 B**	**$0 B**	**$0.04 B**	**$0.25 B**	**$0.29 B**

8.0 The Road to Net-Zero

The grand total estimate to increase the energy efficiency of First Nation assets across all classes is **$9.70 B**. Strategically, many efficiencies exist that can inform how to disburse these funds to improve the viability of proposed retrofits and should be timed to coincide with structural renovations and other asset renewal activities to reduce the potential for duplication and waste. These efficiency and timing considerations subsequently form a pathway to net-zero emissions for First Nations.

For example, ventilation system upgrades for First Nation homes and buildings will reduce energy consumption and carbon emissions – but will also decrease the likelihood of mould growth, improve interior air quality, decrease energy costs, and are likely a requirement of standard building renewal activities. Improvements to ventilation systems will provide benefits far outside of carbon emission reductions. Similarly, window upgrades yield many energy efficiency benefits and should be installed at the same time as cladding to avoid duplication. Given that operations and maintenance costs will increase for aging assets, at the same time, they potentially will be reduced by energy efficiency and renewable energy upgrades. Operations and maintenance pressures and costs will then shift, and it is therefore assumed that they will offset each other in the short term. This assumption will vary from asset to asset depending on the actual retrofits completed and the condition of the asset, however, no net increase in O&M costs is an appropriate assumption for this portfolio-wide assessment.

Efficiencies also exist between the implementation of ECMs and the adaptation of First Nation infrastructure and operations to future climate conditions, building envelope improvements, changes to mechanical systems, and site design considerations, will further influence the timing of ECM implementation. For example, cladding selections can offset the implications of rising outdoor ambient temperatures (cooling interiors and lasting longer than current choices), and should be installed at the same time that other envelope improvements (e.g. window upgrades) are implemented Trade-offs will also likely exist between more conventional renewal activities and the uptake of ECMs, and should be anticipated as a part of renovation planning. To better understand these synergies/trade-offs and determine their costs and benefits within a local context, it is recommended that each First Nation create a corporate energy plan, an estimated cost $75,000 per plan. Total funding for these plans constitutes an additional **$47.8 M** to establish an effective pathway to net-zero.

Bringing everything together, the pathway to net zero begins with actions to foster behavioural changes, in keeping with the energy hierarchy above. These actions will coincide with ongoing efforts to improve energy efficiency and living conditions within First Nation communities and should complement such efforts where possible. New energy efficiency actions should follow, focusing first on fleet vehicle improvements, given the regular turnover of this asset class and the benefits of reducing emissions related to transportation where possible. Improved building efficiency should follow, with ECM implementation coinciding with renewal schedules, community development interests, and adaptation priorities. Energy efficiency improvements in other asset classes, such as utilities, telecommunications, and roads/bridges should follow, again coinciding with other priorities such as energy generation. The pathway to net zero consequently goes far beyond the reduction of carbon emissions and affects the health and wellbeing of all First Nation people across Canada, requiring the strategic evaluation of First Nation needs and ensuring adequate funding is available to ensure assets are renewed, replaced, or commissioned at the optimal time.

Appendix 1

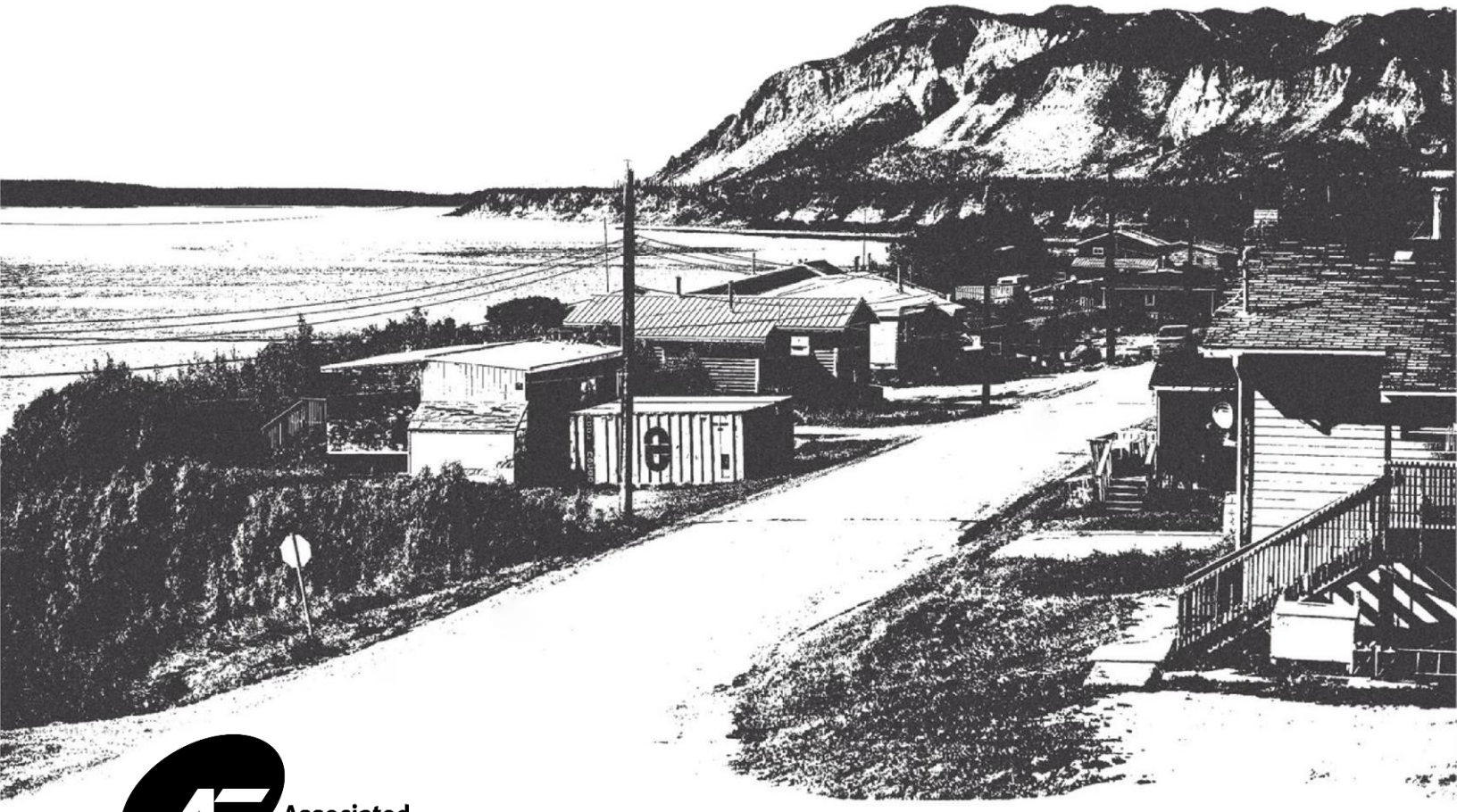
COST SUMMARY

Table A-1

Cost Summary Table for All Net-zero Costs

Subclass	Capital Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	
NON-RESIDENTIAL BUILDINGS	**$0.29 B**	**$0.49 B**	**$0.04 B**	**$0.30 B**	**$1.12 B**
Administration	$0.05 B	$0.05 B	<$0.01 B	$0.03 B	$0.13 B
Schools and Institutional	$0.04 B	$0.08 B	$0.01 B	$0.04 B	$0.17 B
Operative	$0.07 B	$0.12 B	$0.01 B	$0.08 B	$0.28 B
Recreational	$0.05 B	$0.08 B	$0.01 B	$0.04 B	$0.18 B
Utility	$0.08 B	$0.16 B	$0.02 B	$0.11 B	$0.37 B
HOUSING	**$2.28 B**	**$3.20 B**	**$0.37 B**	**$2.35 B**	**$8.20 B**
Residential	$2.28 B	$3.20 B	$0.37 B	$2.35 B	$8.20 B
UTILITY	**$0.07 B**	**$0.08 B**	**$0.01 B**	**$0.04 B**	**$0.20 B**
Electrical Power Supply and Dist. System	$0.06 B	$0.07 B	$0.01 B	$0.02 B	$0.16 B
Utility-Scale Renewables	$0 B	$0 B	$0.04 B	$0.25 B	$0.29 B
Solid Waste Collection and Disposal System	$0 B	$0 B	$0 B	$0 B	$0 B
Waste Collection and Disposal Collection	$0.01 B	<$0.01 B	<$0.01 B	<$0.01 B	$0.01 B
Water Supply	$0.01 B	<$0.01 B	<$0.01 B	$0.02 B	$0.03 B
NET-ZERO PLANNING	**$0.02 B**	**$0.02 B**	**<$0.01 B**	**$0.01 B**	**$0.05 B**
Net-zero Planning	$0.02 B	$0.02 B	<$0.01 B	$0.01 B	$0.05 B
Grand Total*	**$2.71 B**	**$3.87 B**	**$0.43 B**	**$2.73 B**	**$9.75 B**

ASSEMBLY OF FIRST NATIONS • ASSEMBLÉE DES PREMIÈRES NATIONS

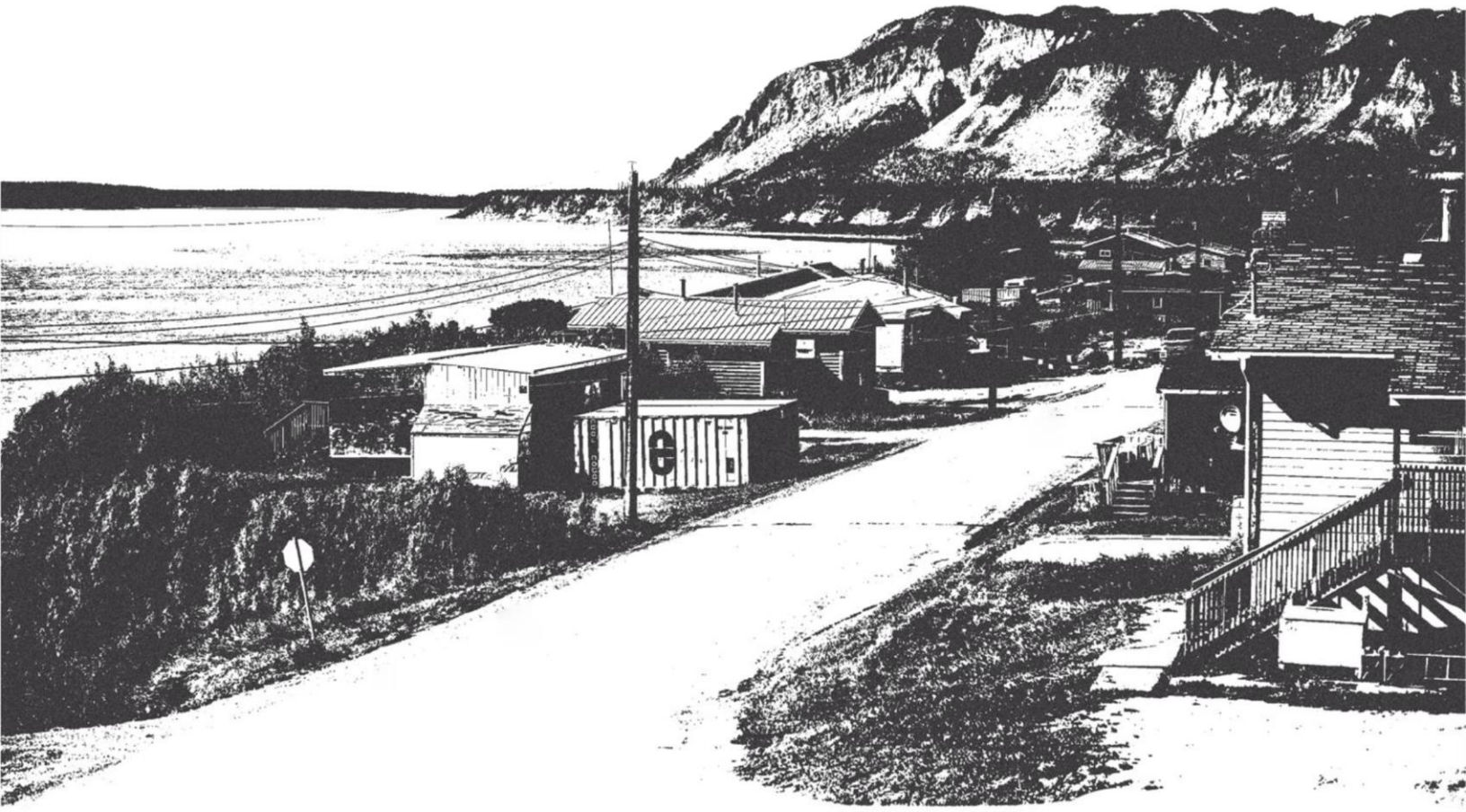


Associated Engineering

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

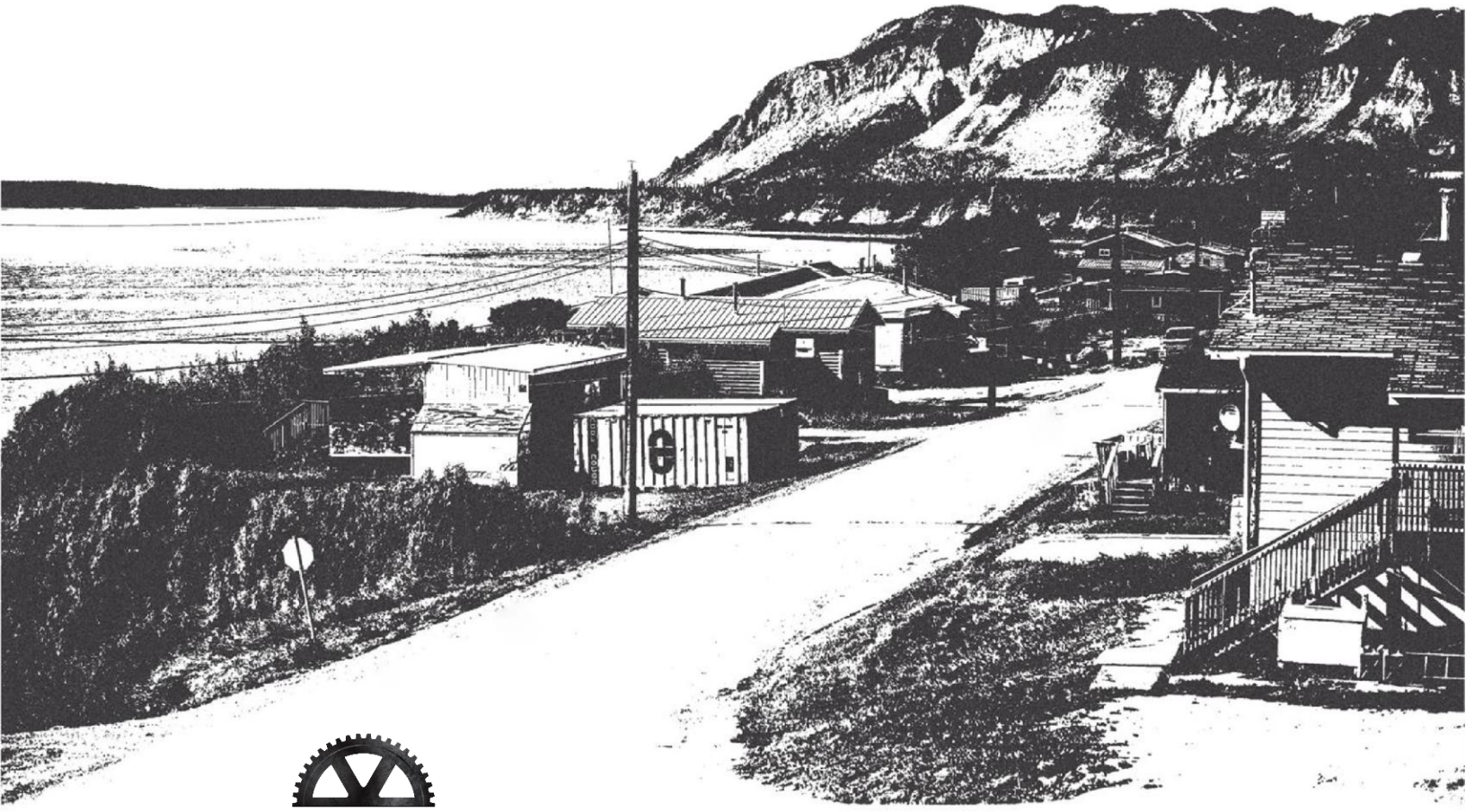
Appendix 8

PLANETWORKS DISCUSSION PAPER: CONNECTIVITY



Closing the Infrastructure Gap by 2030

PLANETWORKS DISCUSSION PAPER: CONNECTIVITY



PLANETWORKS CONSULTING

Contents

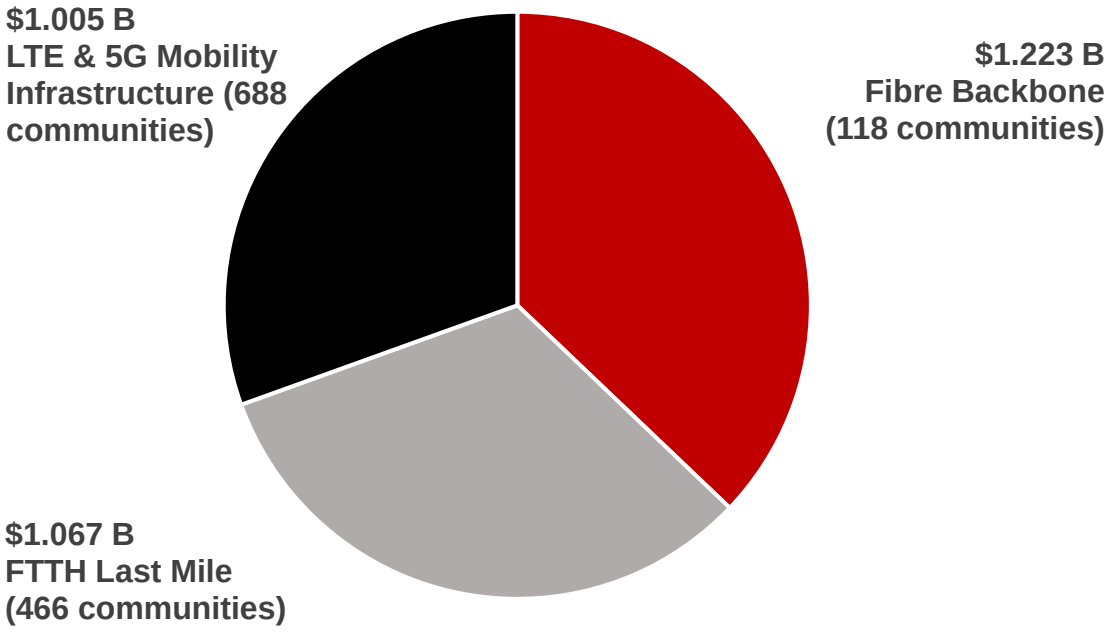
1.0 Introduction

This paper uses publicly available data to identify the extent of the wired and mobility wireless infrastructure gaps in First Nation communities and provides capital budgets to resolve the gaps and ensure every First Nation community has:

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

The infrastructure gap is estimated at $3.3 billion and of the 748 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. The remaining 728 communities need one or more of the three infrastructure elements. The table below summarizes the breakdown of the $3.3 billion gap across the three infrastructure elements and how many of the First Nation communities are affected.

$3.3 Billion to Address the Infrastructure Gap



1.1 Background

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 communities do not have access to high-speed internet or mobility 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 Universal Broadband Fund (UBF) in 2019 with an initial allocation of $750 million. The UBF awards are intended to address connectivity issues to rural and unserved communities where it is not economical to build out infrastructure unless upfront capital is awarded through government grants. The UBF is a matching program and, for First Nations, allocates a grant of up to 90% of the capital needed by a First Nation to build out the infrastructure. In addition to the CRTC 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. As of August 2022, the CRTC has awarded $226.5M in funding to improve fixed and mobile wireless broadband Internet access service for 205 communities, 39 of which are First Nations.

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 mobility services are also an essential service and that many First Nations not having mobility access, could not run the ArriveCan application, necessary for travel nor receive automated alerts on outbreaks, among other shortfalls. Furthermore, First Nations have been long calling for mobility coverage of well-used highway corridors such as BC's Highway of Tears, between Prince George and Prince Rupert, 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 mobility 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.

1.2 Study Approach

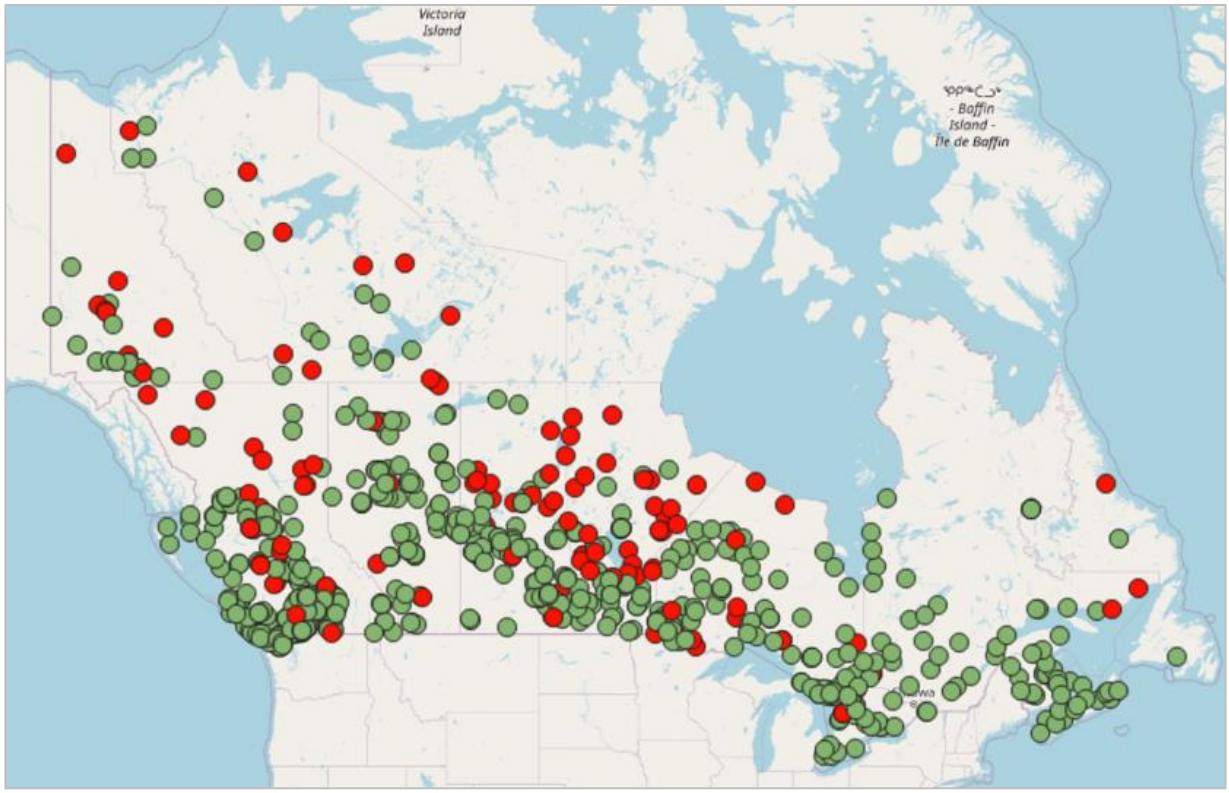
This study assesses the infrastructure in place for 50 /10 and mobility services for First Nations. All analyses were performed at the local level. First Nations having multiple communities comprising the Nation, were split into individual communities. First Nation communities with 0 population and 0 roads in the various public databases were excluded, leaving a study group of 748 communities. Presented information, unless expressly stated otherwise, is derived from publicly available information for First Nations, some of which may be dated, optimistic or erroneous.

1.3 Next Steps

Next steps include working with Innovation, Science and Economic Development Canada (ISED), ISC and others to update the data to ensure that it is as current as possible, that the data has been accurately interpreted, and to add to the dataset additional information that would be helpful to the Assembly of First Nations (AFN) in planning. For example, for those First Nations with funded projects, it would be helpful to add breakdowns of whether the funding addresses backbone or last mile or both, total project cost, total federal funding approved for the project and completion year. It would also be helpful to add other supporting infrastructure such as year-round road access or diesel power. This level of information is not available in the publicly available databases and would have to be obtained from ISED and others directly. Finally, for the wireless capital, we will need to refine the public data for LTE services as the databases often optimistically portray LTE coverage in First Nations. Consequently, at this stage a single, new cell tower is applied to every First Nation without an existing cell tower within the community. In the next iteration we will endeavour to determine which communities may need additional towers for proper coverage.

1.4 Definitions and Descriptions

For this analysis, there are four primary elements to telecommunications infrastructure, the backbone network, the outside plant access network, the drop, and the customer premises equipment. 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's community, to an existing Internet PoP in the next closest serviced community. The green dots on the map indicate that, of the 748 First Nation communities, 622 (83% of the total) either have a fibre backbone in place (504 communities) or have funded plans to build a fibre backbone (118 communities). The remaining 126 (red) do not have a fibre backbone and are split, 29 with a low-capacity satellite backbone and 97 with no backbone.

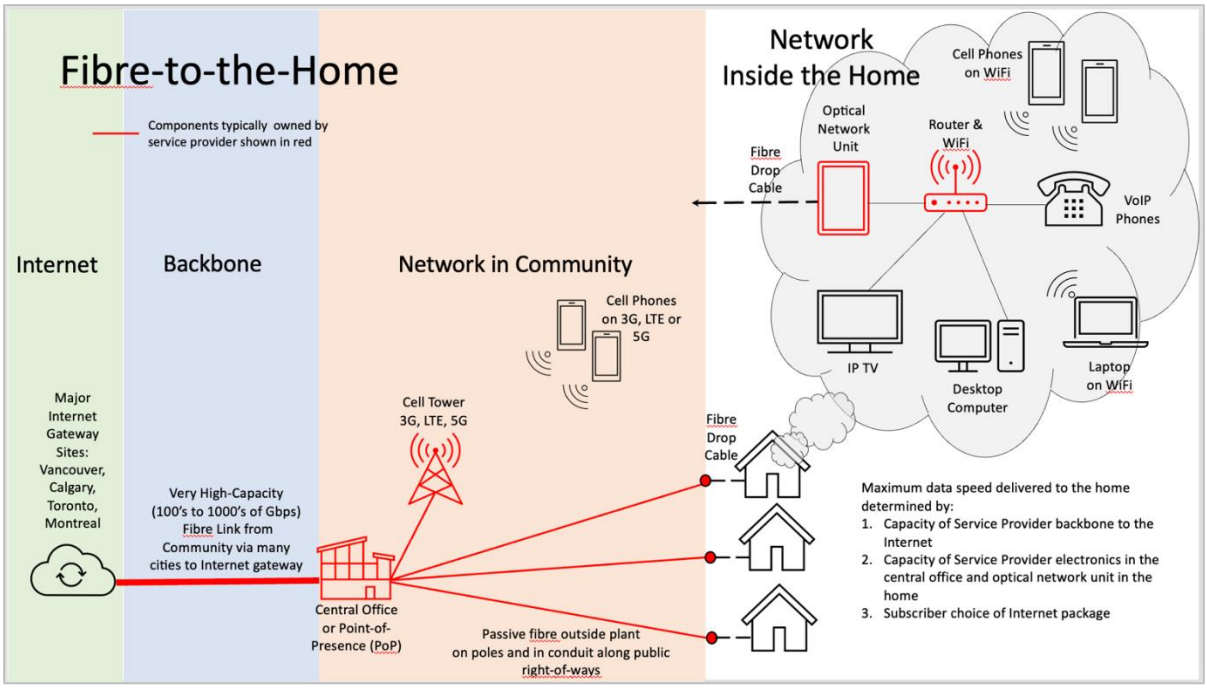


The outside plant access network is the part of the network between the First Nations PoP and the customer property line. The customer premise equipment includes the optical network units and service gateway routers necessary to enable service. For the purposes of the study, we have combined the PoP, the outside plant access network, the drop and the customer premise equipment for all dwellings in the community into the “last mile”.

If there is a funded project in the database from one of many funding streams and it is clear what the project has funding – fibre backbone or FTTH last mile, it is excluded from communities qualifying for further funding. For instance, the study considers 622 communities as having a fibre backbone based on the available data. Of the 622 communities, 118 of these communities have a funded project to build a backbone and therefore do not require further funding.

The data handling capacity of optical systems is defined by the terminal electronics, 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 better service with the simple replacement of electronics in the PoPs and the customer premises equipment in the homes. Consequently, the end goal is to build a fibre optic backbone to every First Nation PoP which connects to a Fibre-to-the-Home (FTTH) network as illustrated in the following diagram.

While the universal broadband objective is currently asymmetrical (50 down 10 up), data services should ultimately be upgradeable to higher speeds and have symmetrical speeds (same up speed as down) with unlimited data caps.



For communities with no existing or planned fibre backbones and no 50/10 last mile networks, upgrade projects should be executed to replace both the backbone and the last mile at the same time. This approach facilitates high-capacity service to dwellings immediately upon project completion and to avoids stranding capital 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.

As shown above, mobility cell sites, with todays' streaming capabilities in LTE and 5G phones, require high-capacity connections, typically 2,000 Mbps or more per cell site. This requires fibre for the last mile to the cell site and fibre for the backbone to the Internet. LTE, Long Term Evolution, sometimes referred to as 4G is the minimal acceptable mobility technology to support streaming and internet browsing. Any new infrastructure, especially if government funding is used, should be 5G capable, the evolution of LTE. First Nations with 3G service today will have a tower in the community which could be re-used for 5G with the changeout of antennas, electronics and possibly some tower reinforcement activities. First Nations with no mobility services, will require a tower plus the 5G electronics, typically at a capital cost of $1.5M.

Wired access technologies include coaxial cable capable of 50/10, fixed wireless access (FWA) capable of 50/10 but practically 25/5 and digital subscriber line (DSL) also capable of 50/10 but practically 15/1 or less. In the databases, 13% of First Nation communities that are being reported as having 50/10, do so apparently with DSL. To meet the CRTC mandate by 2030 and prepare First Nations for the evolution of better, faster service, the FWA and DSL access networks must be replaced with FTTH. Note that while coaxial cable access networks do meet 50/10, 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. Consequently, for this study, any First Nation community without an existing or planned funded FTTH last mile today will be included in the capital calculation for 50/10.

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 DSL due to lack of awareness of the advantages in the new last mile technology or presence of multi-year service contracts, a common tactic used by service providers to reduce subscriber churn and movement to competitors' networks. To address the distinction, we have identified the maximum wired up and down speed, determined by the fastest technology present and the average wired up and down speed to reflect the average user experience. The same holds true for LTE performance. We have identified both the maximum wireless up and down speed and in certain areas, the average up and down speed to reflect the average user experience.

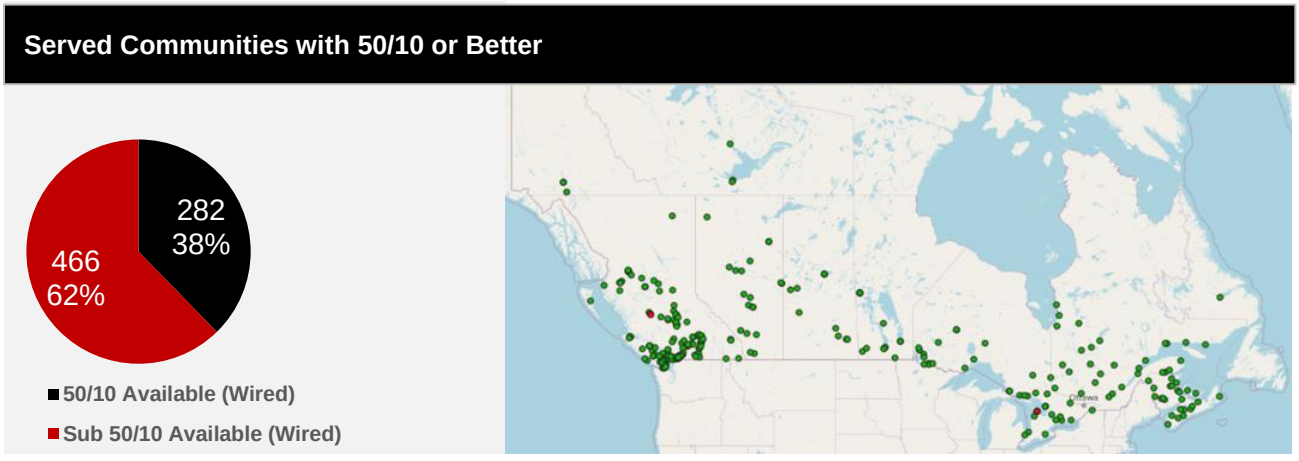
Finally, there are disruptive technologies emerging using new low earth satellites (LEOs) that will provide interim connectivity solutions for remote First Nations. SpaceX, owned by Elon Musk, deployed a retail, residential service called Starlink, available to communities south of 53o latitude in 2020 and will extend this service further north in 2023. Starlink does represent a good stop-gap solution to address connectivity to unserved areas while FTTH is being built. There are several wholesale LEO satellite 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.

2.0 Availability of 50/10

The following sections identify the First Nation Communities that are 50/10 today, “Served Wired” communities, those communities not 50 /10, “Unserved Wired” communities, and those with funded plans for 50/10.

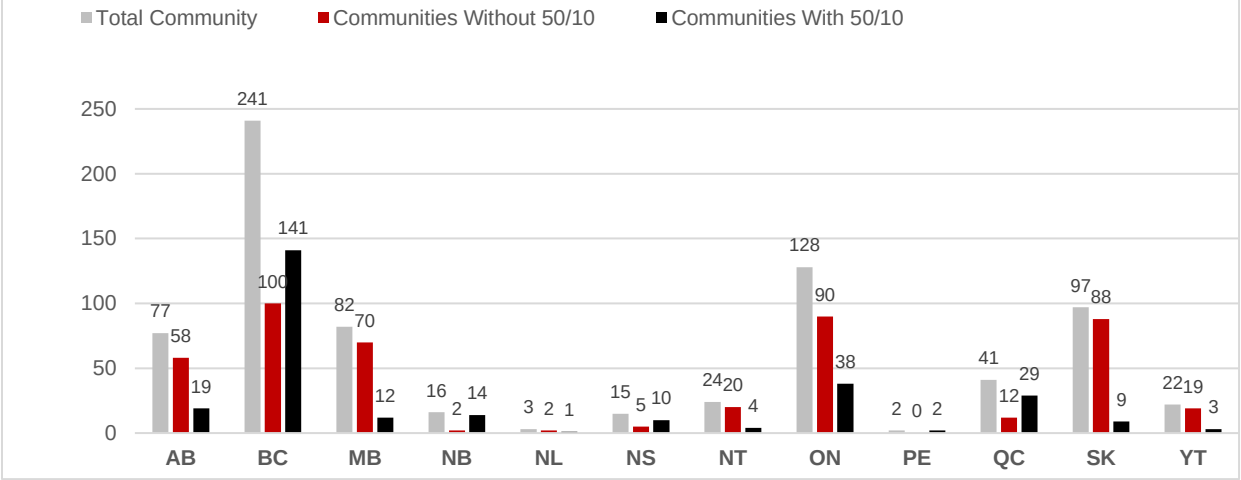
2.1 Served Wired Communities with 50/10 or better today

The following charts outline the availability of 50/10 today via wireline and the access technologies used.



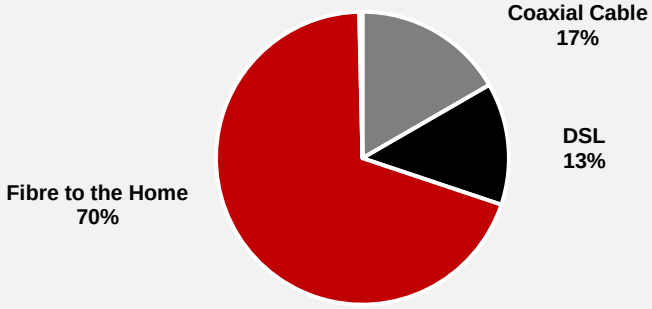
Today, 282 or 38% of the First Nation communities are “served” and have 50/10 or better available to them. Due to the prolific availability of fibre backbones near urban centers, these communities tend to be in areas close to urban centers as indicated in green in the map above. From a Provincial or Territorial view, British Columbia, Quebec, New Brunswick and Nova Scotia have more First Nations communities with 50/10 than not.

Served Communities with 50/10 or Better



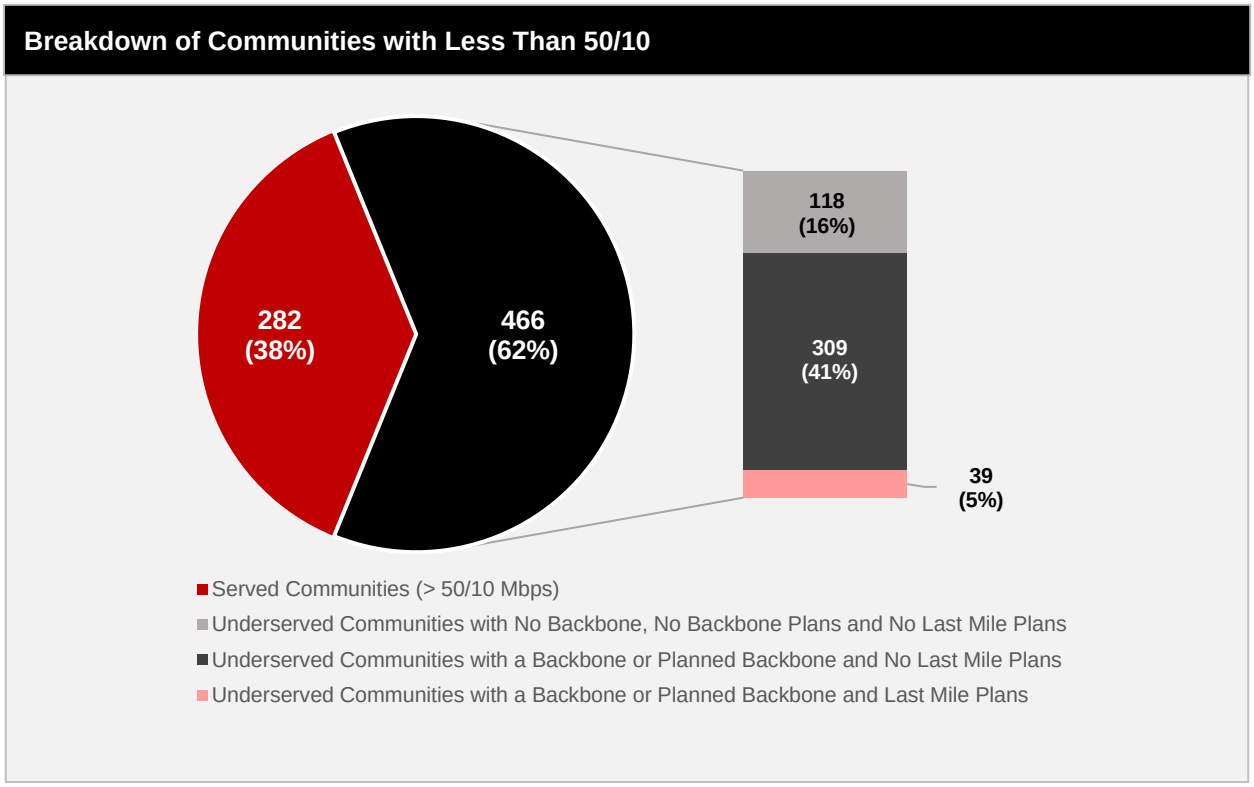
The access technology enabling 50/10 is predominantly Fibre-to-the-home with 70% or 196 of the 282 served communities. The remaining 30% are a mix of coaxial cable and DSL and will ultimately need to be upgraded to FTTH for faster service beyond the mandated 50/10 with symmetrical up and down speed performance.

Last Mile in Served Wired Communities



2.2 Unserved Wired Communities

Four hundred and sixty-six First Nation communities, 62% of the total, are unserved. These unserved wired communities fall into two categories, those with funding applications in place to build out 50 /10 (excluded from this paper's capital calculations) and those without funding plans.



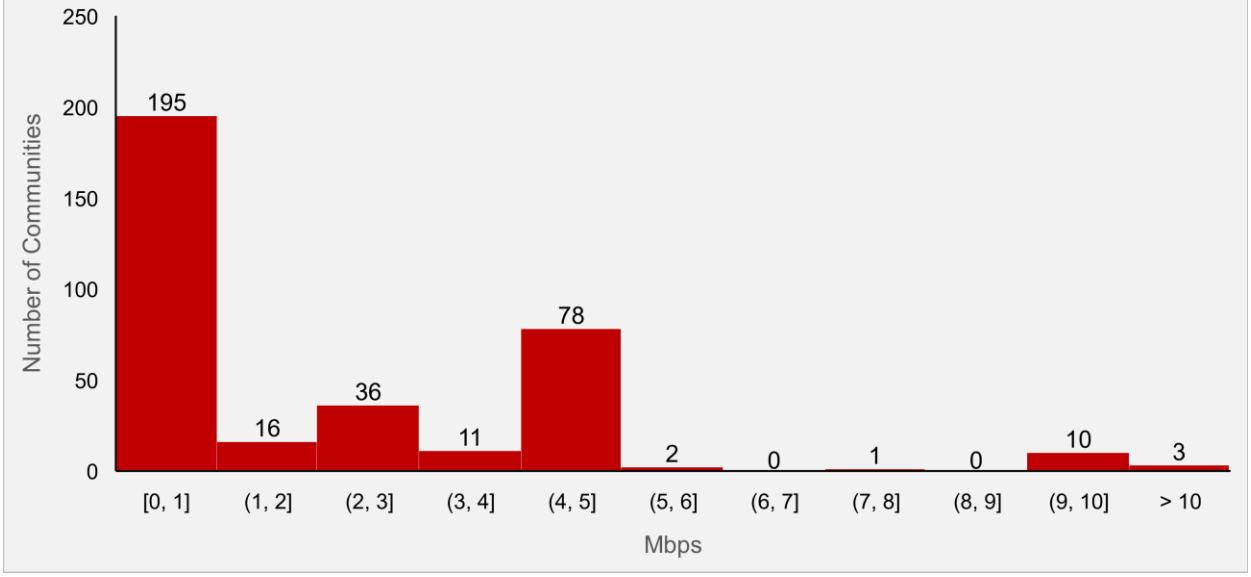
It is interesting to note that despite the funding opportunities having been available since 2019 for 50/10 builds, only 5% of First Nation communities have grants in place to build out 50 /10 infrastructure. Forty-one percent of First Nations communities have either fibre backbones in place or funded plans for backbones and require only a last mile build yet have not applied for funding. The remaining 16% of the communities, 118, are very remote, require both a fibre backbone and FTTH last mile and will be challenging to serve. Twenty-nine of these challenging 118 communities are currently served by satellite due to many reasons including no year-round road access. 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. 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, "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 29 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 replaced their Anik F2 satellite backbone services with One Web in October 2022 and increased the down capacity into each satellite community at least five-fold over the Anik F2 service. The OneWeb service 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 high, in the order of $20,000 per month for one 150 / 30 service, which when shared over a satellite community with 100 dwellings is $200 per month per dwelling just for the backbone service; with a final price including last mile of twice the Starlink residential service that supports speeds bursting up to 300 / 13 per dwelling.

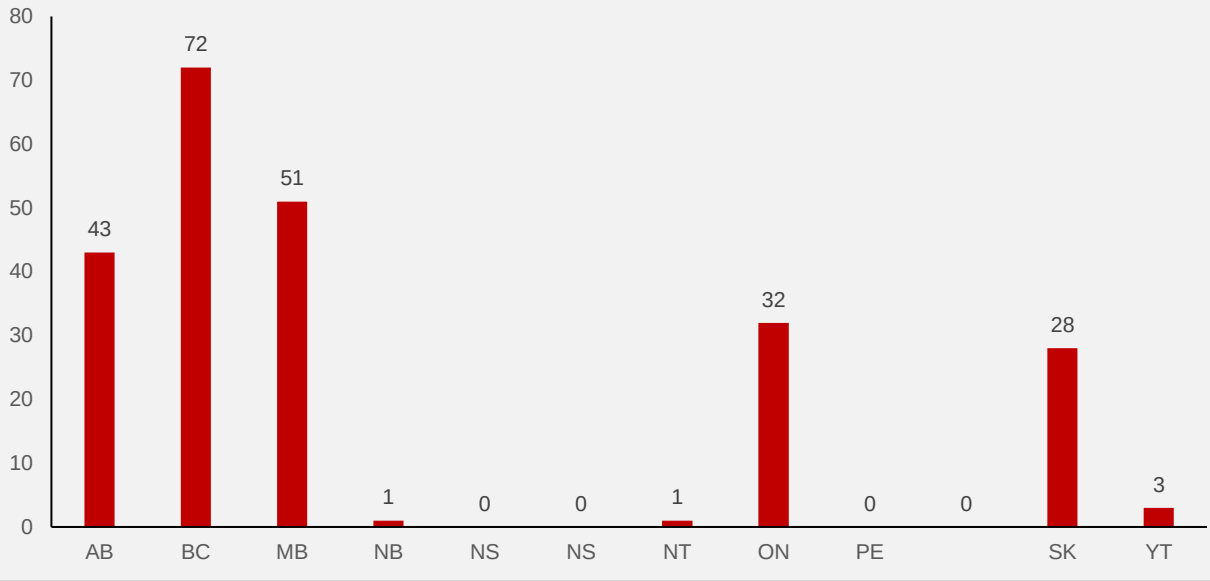
For the 466 unserved communities, the performance of wired connectivity is insufficient to support modern communications methods. Basic services such as "Zoom calls" are impossible. The charts below summarize the average last mile downstream performance in the 309 unserved wired communities with no funding plans in place today. Most of these communities experience less than 1Mbps downstream on average.

Average Bandwidth Down



Of the unserved wired communities, there are 239 high-need communities with no last mile wired access, not even DSL over the old telephone lines. In the database, these communities are reported as having a maximum down of 0 Mbps. These high-need communities need to be addressed with solutions immediately. The chart below shows the distribution by province of First Nations committees with a maximum wired down speed of 0 Mbps.

Number of High-Need First Nation Communities by Province Reporting Maximum Down of 0 Mbps (239 Communities)



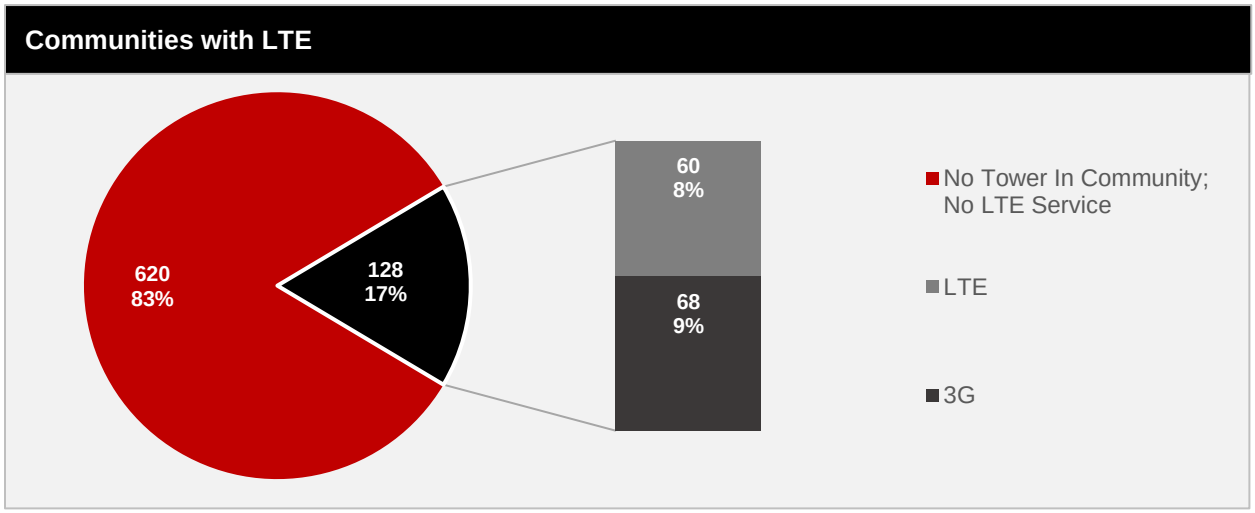
3.0 Availability of LTE or 5G Mobility Services

To achieve good 5G internet browsing and video streaming, each First Nation needs at least one cell site within the community itself (last mile) with a high-capacity backbone scalable to 10,000's Mbps to address future demands. Fibre is the only backbone technology to cell sites that is futureproof for mobility services. A fibre backbone is also required for 50/10 wired services and can easily support connection requirements for both wired and wireless making both the wired and wireless infrastructure builds to unserved First nation communities synergistic. In fact, for unserved First Nations communities with neither LTE or 5G mobility services, nor 50 /10 wired 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 mobility services are deployed first with an interim solution of Fixed Wireless Access (FWA) to give the community access to mobility services and at least 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 urban centers and is the end goal due to its data capacity scalability. Any new investment in mobility services should be 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 capital provisions for tower reinforcement.

3.1 Served Wireless Communities with LTE today or better

The public databases do track LTE availability although for First Nation communities, the LTE coverage data seems overly optimistic since most First Nations communities do not have a cell tower in town and for LTE video streaming and internet browsing experiences to be good, the cell site must be close to the dwellings. For the purposes of this study, we identified those First Nations with cell towers in town and 100% LTE or 3G coverage. The following table and map reflect the current situation, 83% or 620 First Nation communities do not have cell towers in town and will require at least one tower to provide reliable LTE coverage. Of the 128 communities that do have cell towers in town, roughly half are delivering 3G and need to be upgraded. Only 8% of all First Nation communities have reliable LTE service today, the remaining 92% are Unserved Wireless communities.



There are 572 communities with either existing backbones or funded backbone plans but no LTE tower in the community. These communities represent an excellent opportunity for early deployments of mobility services combined with 50/10 fixed wireless access as a stop gap measure until FTTH is ready for deployment.

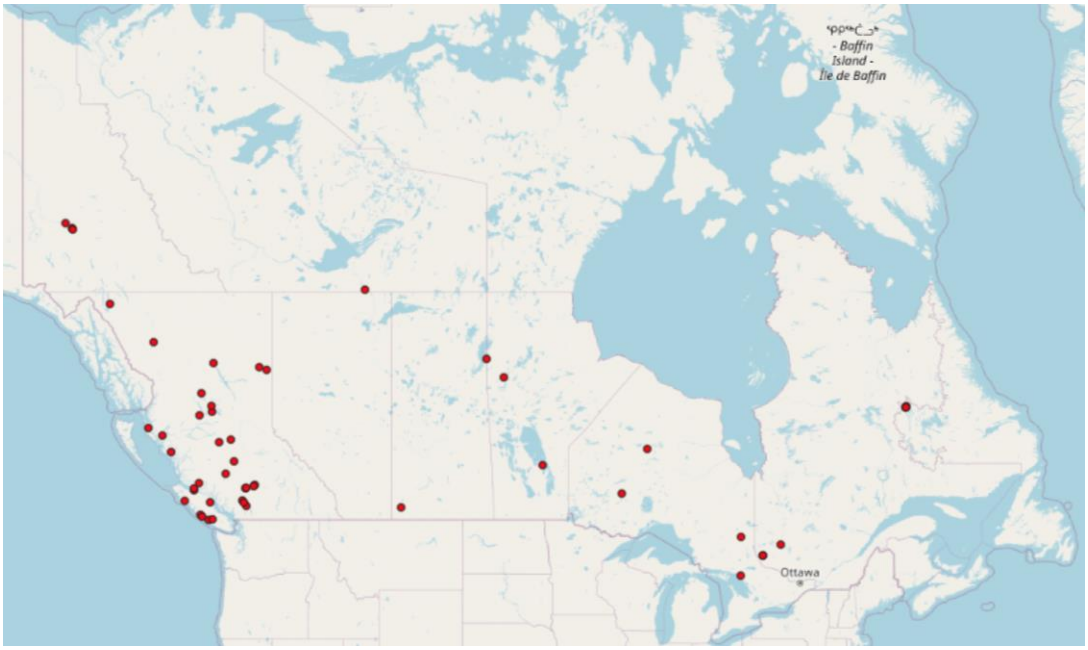
3.2 Mobility Coverage of Highways

Mobility coverage along unserved highway corridors has become a First Nations safety policy issue due to deaths of First Nations women along unserved highways. The challenge with the coverage to these areas is that there are no incremental revenue opportunities associated with the cell sites, only additional opex costs, making 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 mobility coverage and of course the 688 First Nations without in-community mobility service identified in the section above, making capital for this activity extraordinarily difficult to quantify as it simply is not reasonable to have 100% coverage on all Canadian highways.

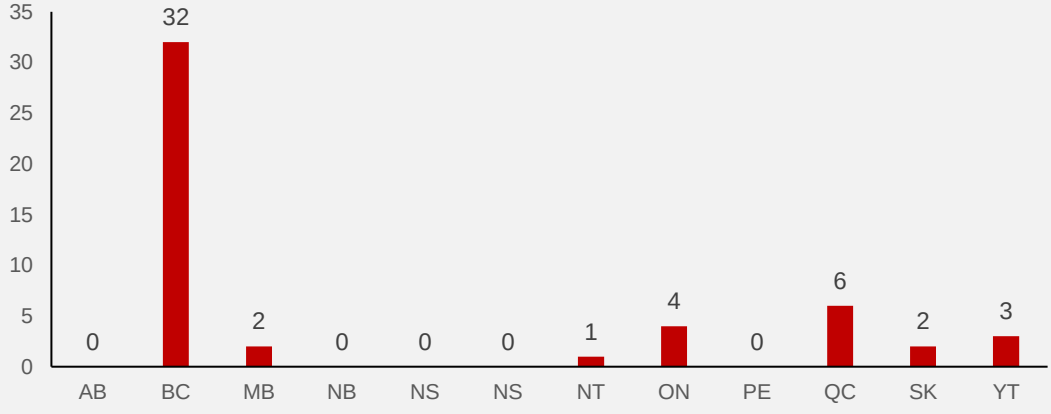
While the funding and requirements get sorted out for highway coverage, there are emerging technologies solutions using Low Earth Orbit satellites that will provide stop-gaps including the iPhone 14 with a built-in app to enable emergency short messages via LEO satellite on unserved highways purported 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 mobility services available.

4.0 First Nations with No Wired or Wireless Service

Of the 748 First Nation Communities in this study, 50 are reported in the databases as having a maximum wired down speed of 0 Mbps and a maximum wireless down speed of 0 Mbps meaning that these First Nation communities have no access to service of any kind. Most of these communities, 32 of 50, are located in BC.



First Nation Communities By Province 0Mbps Max wired down and 0Mbps Max wireless down (No service of any kind)



5.0 Capital to address the Infrastructure Gap

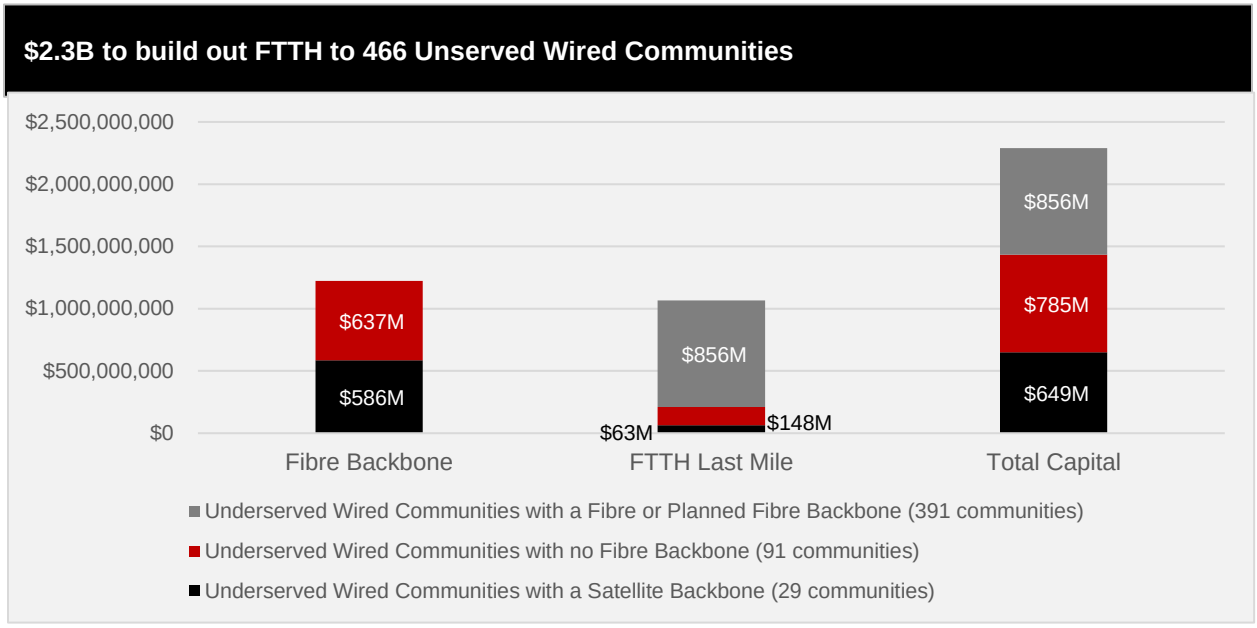
For the purposes of long-term planning, the capital identified in this section equates to the funding necessary for every First Nations community to have a fibre backbone, FTTH wired last mile and LTE or 5G mobility services. The cost estimates use community data from the database, and cost metrics information from in-house Planetworks' data. This capital should not be confused with any additional capital needed for interim solutions necessary while the fibre backbones or FTTH last mile are staged in. It takes years to build fibre infrastructure and for 239 First Nation communities with not even access to DSL and a max wired down speed of 0 Mbps, there is pressure for immediate short term quick solutions which will require additional funds.

5.1 Findings

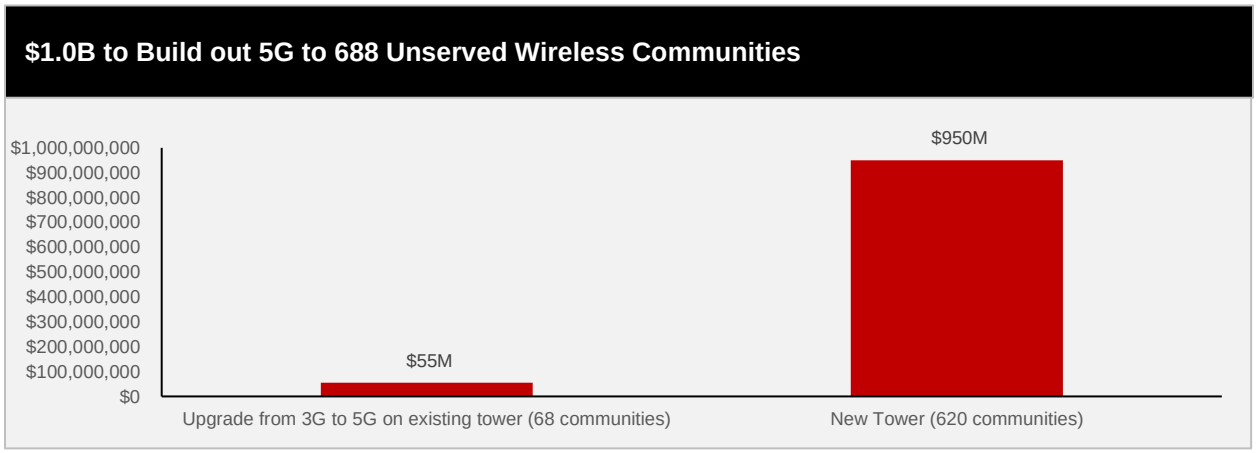
With telecommunications outside plant being built all over the world during the past 3 years, further accelerated both by bandwidth demand due to COVID stay-at-home policies and by the availability of government grants, the current demand greatly exceeds the material supply for fibre cable and other key components, driving up capital 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 is especially 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 down, and to make the project big enough to secure the labour and stabilize the capex throughout the project. Alternatively, if the First Nations requirements could be 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.

The table below indicates that to build out fibre to the 466 unserved wired communities, $2.3 billion is required to close the infrastructure gap.



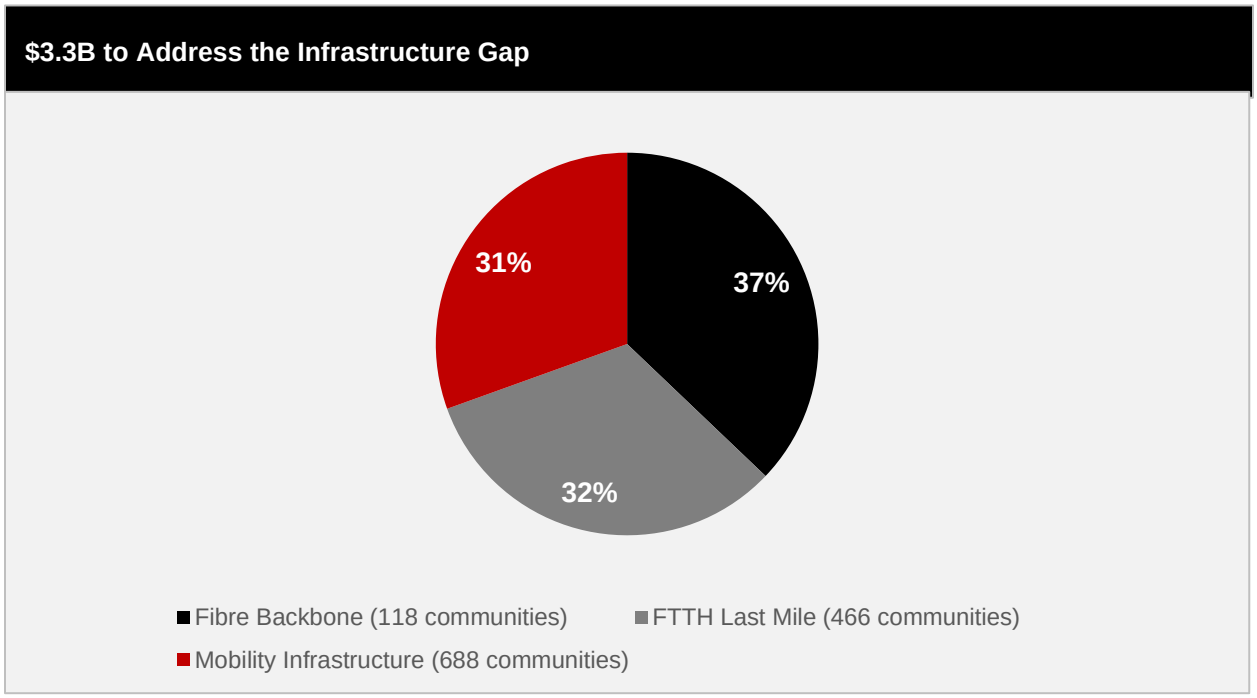
Like the situation with the FTTH last mile, the capital planning for 5G is very volatile due to worldwide demand and supply issues. Steel for towers is scarce and labour to install the towers scarcer still causing extreme variability in capital costing especially for First Nation communities typically 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 all, the tower and labour costs would be stabilized due to volume. For the purposes of this study, all First Nations communities need at least one tower in town for 5G services. The capital expenditures assume one tower per community which may not fully cover the community. As the data is refined over the next months, we will find methods to determine which communities will require more than the one tower we have allocated for coverage. Assuming one tower in every community currently without one, the infrastructure gap for 620 communities amounts to $1.0 billion as indicated below. Once the cell tower infrastructure is in place, besides providing mobility services to community, the mobility infrastructure can be overlayed for fixed wireless access for $16 million.



The Fixed Wireless Access (FWA) reuses the mobility cell tower infrastructure to supply high-speed internet to each dwelling via wireless. A cell site is constructed and activated in months while FTTH last mile can take many months to years. Consequently, FWA represents a good interim solution to provide high-speed connectivity to unserved wired dwellings while the FTTH infrastructure is built. Some FWA installations on the periphery of the cell service area will require that an antenna be installed on the dwelling roof connecting to a modem inside while other installations close to the cell site simply involve sitting the modem near a window. The FWA overlay to cell assumes $250 on average per dwelling for the customer premises equipment.

Fixed Wireless Overlay Once Mobility Infrastructure in Place (Optional)	Communities	Dwellings	Capital
Unserved Wired Communities	466	65,538	$16.4M

The infrastructure gap totals $3.3 billion and is almost equally split $1.22 billion fibre backbone, $1.07 billion FTTH last mile, $1.00 billion mobility infrastructure. The capital does assume that the communities with funded projects for backbone and FTTH last mile will be able to complete the full project with no additional funding, which considering the current material and labour supply issues may not be fully valid and will need to be qualified in the next iteration of data refinement.



5.2 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 costs are estimated to be accurate within +100%/–50% (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

6.0 Strategies to Address the Under Served

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

6.1 Build out the backbone and mobility infrastructure first and use the mobility infrastructure to deliver 50 /10 via wireless to unserved wired dwellings until FTTH is built out

The 5G mobility service in each First nations community, like FTTH requires a fibre backbone making both FTTH and 5G builds synergistic. Mobility networks are quick to build, in the order of months versus FTTH which is many months and with current fibre supply issues, can be years. One option is to build out the fibre backbone and mobility cell site in every community and with comparatively minimal additional capital, overlay the mobility 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.

6.2 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.

6.3 Verify First Nation community data and investigate the barriers for First Nations to apply for funding

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. We have removed funding requirements for any First Nation community with a funded project. This may or may not be a relevant assumption and needs to be tested with external data. With the cost escalation in materials and labour, there is a good chance that those funded First Nation communities may have to scale back their endeavors and additional capital will be needed. It is important to canvass each First Nation to verify why so many have not participated in the funding availability, inventory the facilities in place which can be used for new infrastructure and 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.

6.4 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 mobility infrastructure within First Nations communities, lobby the Federal Government to address the lack of mobility service within nations with funding streams specially dedicated to mobility with interim fixed wireless access as eligible for funding.

6.5 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 capital 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.

6.6 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 mobility service providers have for building out the tower infrastructures in-community necessary for 5G service.

6.7 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.

6.8 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. All satellite solutions will a typically three year shelf life before being usurped by another.

6.9 Lobby for National affordable satellite backbone solutions.

On-going monthly opex costs for One Web services are cost prohibitive and while Starlink represents a good solution for dwellings within many First Nation, a high-capacity community-based satellite backbone solution is necessary that is affordable. This may require on-going subsidies for satellite communities.

6.10 Lobby for emerging solutions for mobility coverage on unserved highways and provide centralized service testing

A variation of 6.8 above, track new technologies using LEO satellites such as the iPhone 14 with its embedded emergency calling to address the mobility 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.

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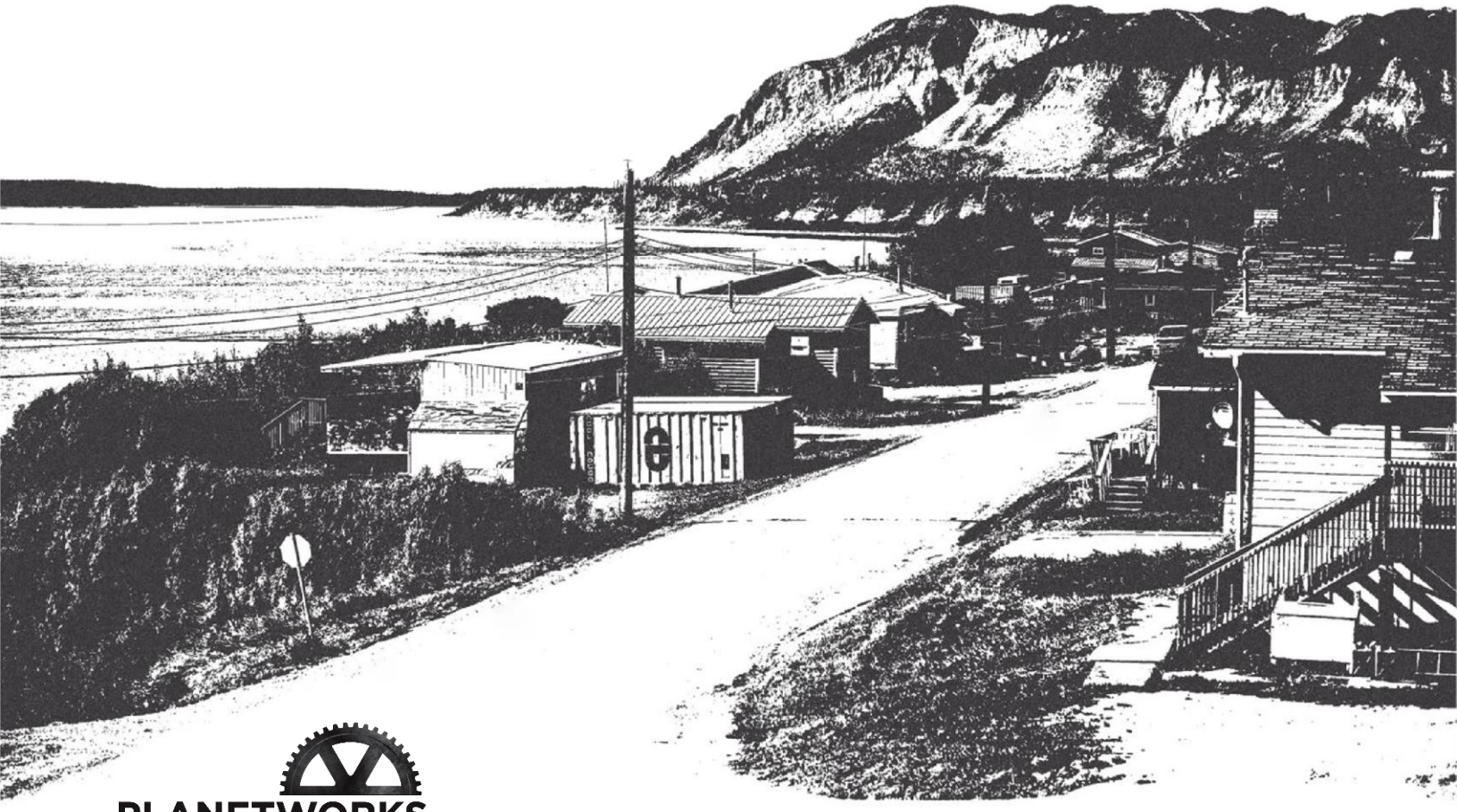
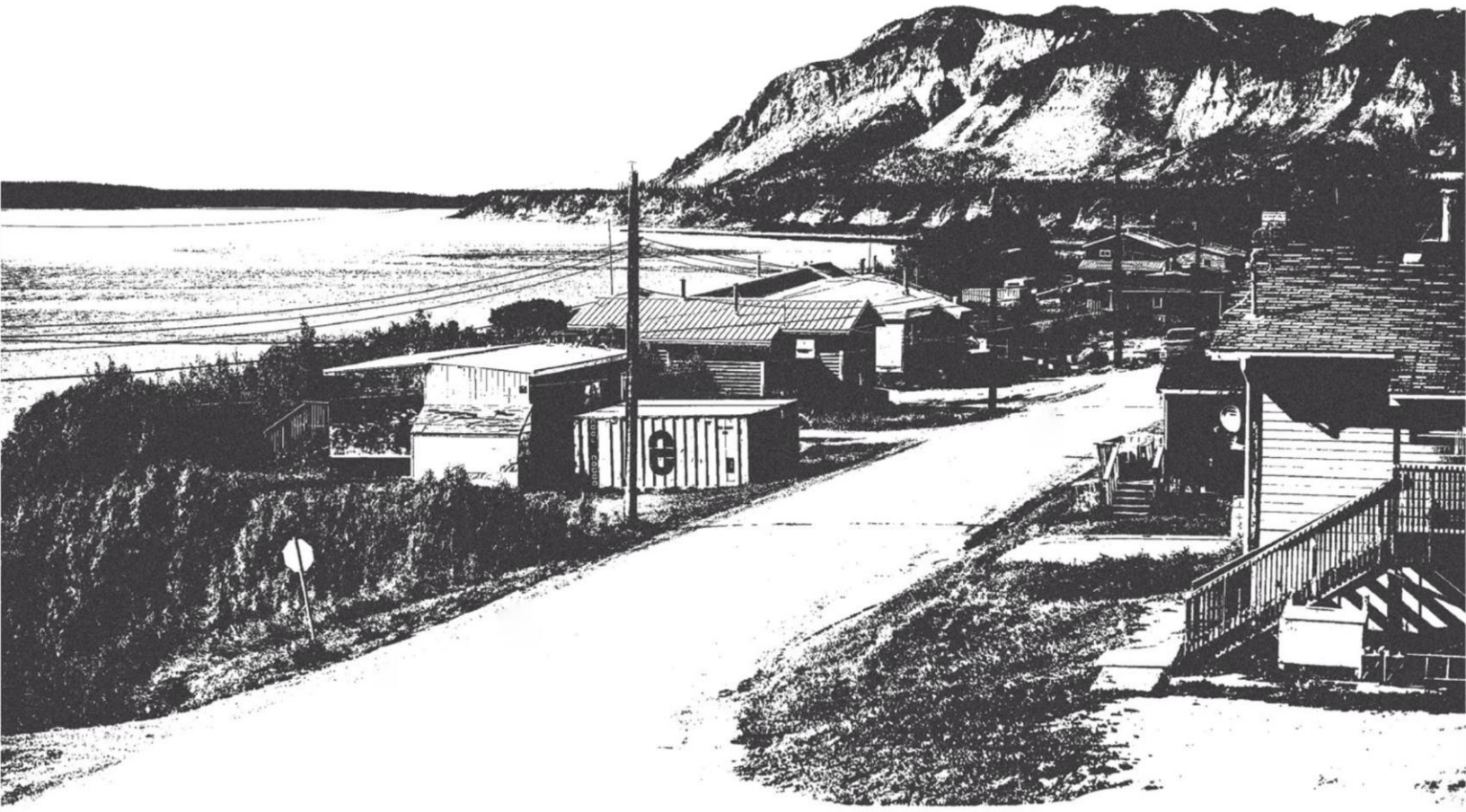


PLANETWORKS CONSULTING

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

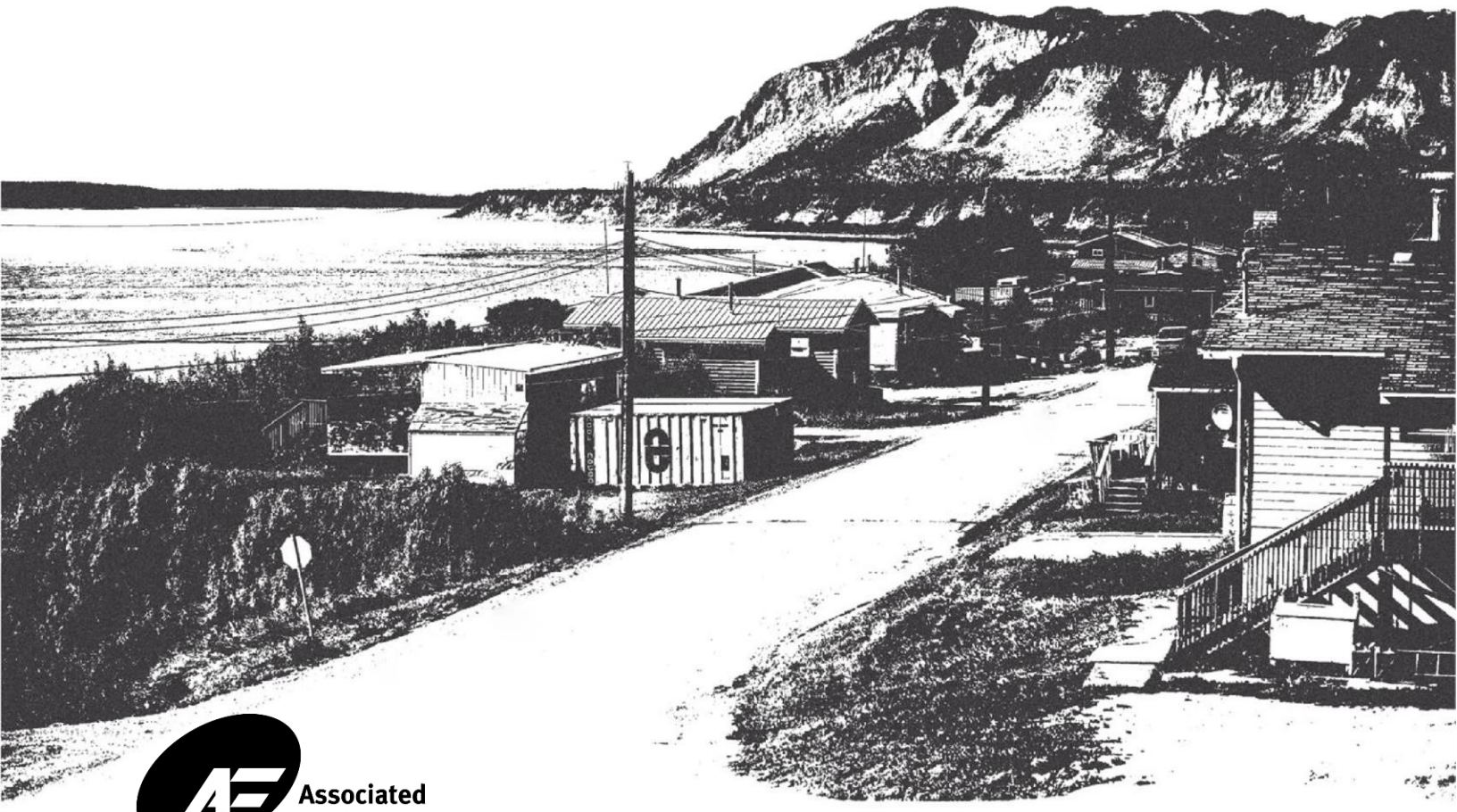
Appendix 9

AE DISCUSSION PAPER: ADDRESSING ACCESSIBILITY



Closing the Infrastructure Gap by 2030

AE DISCUSSION PAPER: ADDRESSING ACCESSIBILITY



Associated Engineering

Contents

1.0 Introduction

Improving accessibility and promoting the inclusion of First Nations persons with disabilities cuts across multiple areas of responsibility: health, social services, infrastructure, and housing. It is also significantly influenced by other considerations such as funding, isolation, and governance capacity. Recent interpretations of the Accessible Canada Act (ACA, published in A Distinct First Nations Accessibility Law Discussion Guide for First Nations (AFN, 2022) suggest that First Nations are unable to meet the requirements of the ACA, enforce its regulations, or operationalize the United Nations Convention on the Rights of Persons with Disabilities and the United Nations Declaration on the Rights of Indigenous Peoples because they do not have adequate resources. Given the high rates of disabilities within the First Nation population and the legacy of poor infrastructure planning, an improved uptake of accessibility design principles in First Nation assets is an integral part of Closing the Infrastructure Gap by 2030.

First Nations cannot address the magnitude of this challenge alone and an opportunity exists for the Federal government to support improved accessibility to successfully accommodate the unique circumstances of Indigenous peoples with disabilities. Inclusion of accessible design principles in the management of First Nation assets is necessary to ensure community health and well-being, and to assist those who have disabilities to remain on reserve rather than being forced to seek special accommodations off reserve.

2.0 Unique Situation of Indigenous Peoples With Disabilities

Indigenous peoples with disabilities are dealing with multiple factors that go beyond mere access to buildings or the ability to use washrooms. A 2014 report entitled Expanding the Circle: Aboriginal People with Disabilities Know their Rights states that, “Due to the intersectional impact of aboriginal status and disability status, this disproportionately large population of aboriginal Canadians with disabilities faces massive barriers and challenges in accessing appropriate educational opportunities, accessible transportation, housing, support services, employment, recreation, and cultural opportunities.” Rates of homelessness are disproportionately high among this group emphasizing their vulnerability.

Statistics Canada’s Canadian Survey on Disability in 2017 found that 22% of Canadians live with a disability, with one in five of these people are classified as having a very severe disability (4.5% of total population). Although data on First Nations Peoples with Disabilities (FNPWD) is limited, it is estimated that Indigenous peoples are affected by disability 20-50% greater than non-Indigenous populations, a reflection of the higher rate of environmental and trauma-related disabilities. Bringing First Nation infrastructure in line with national accessibility best-practices, especially the improvement of housing, is a priority of First Nation governments.

3.0 A Question of Human Rights

The Canadian Human Rights Act (CHRA) protects people in Canada, including First Nations, from discrimination based on 11 prohibited grounds of discrimination, including race and disability. The law protects those employed or served by the federal or First Nations governments. Companies in the private sector that are federally regulated, such as banks and broadcasters, are also covered by this human rights law.

The Employment Equity Act (EEA) requires federally regulated employers and crown corporations to eliminate barriers that prevent persons with disabilities (and other designated groups) from participating equally in the workforce. It also calls for these employers to provide accommodations, such as ensuring the technology used to perform a job is accessible.

Individual provinces and territories have human rights acts. These laws protect persons with disabilities from being discriminated against in several areas, e.g., provision of goods and services, employment and housing. These laws also prohibit discrimination based on race, age, marital status, gender, and sexual orientation.

The Accessible Canada Act (ACA), (Bill C-81) addresses accessibility across the country. It applies to Parliament, Crown corporations and First Nations Band Councils and requires the federal government and private sector businesses under federal jurisdiction, such as banking, telecommunications and transportation to eliminate barriers encountered by persons with disability. The federal government maintains that organizations falling under this policy's regulations still have flexibility on how to implement it.

First Nations object to how the ACA is being implemented. They believe the legislation infringes on First Nations' ability to self-determine and self-govern in relation to accessibility issues. The legislation gives broad administration and enforcement powers to the Accessibility Commissioner, including the power to inspect First Nations at any time and the ability to levy significant fines.

The legislative context established by these various acts means that entities must consider whether they are accessible and how they plan to become accessible in the near future; it will have far reaching effects on First Nations. All First Nations governments and First Nations organizations including service delivery entities are obligated to meet these standards, especially in the housing, health and social services sectors. The financial implications of accessibility design are consequently clear, apply to all First Nations, with an implementation timeline corresponding to that established for Closing the Infrastructure Gap by 2030. These implications further imply that legislative change may be necessary to further First Nations governance and the management of their assets.

4.0 Accessibility and Universal Design

Accessible design is a design process in which the needs of persons with disabilities are specifically considered, enabling them to independently use products, services and facilities. Accessibility from a design perspective is primarily concerned with people who have various types of disabilities and was historically developed in response to demands to make public facilities and services more fully accessible.

Universal design is a broader concept and can be defined as the design of buildings, products or environments to make them accessible to all people, regardless of age, disability or other factors. Its motto is “no one left behind.” Attention to universal design means that a mother with a stroller can easily navigate a crosswalk or door entry, or that someone with a visual impairment can rely on tactile cues in the environment to get around. This definition, while more comprehensive, is not standard in Canada.

Costing measures in this memo use the definition of accessible design above. The AFN, in its planning beyond 2030, could consider incorporating principles from universal design which are focused on all users, not just persons with disabilities.

5.0 Accessibility Standards and Best Practices

Buildings constructed or renovated in Canada must meet provincial or territorial building codes, which include specific accessibility measures. The Accessible Canada Act is developing national accessibility standards for voluntary compliance until they are adopted into regulations. Other guidelines and standards that go beyond standard practice to improve accessibility for all building users compliment these emerging measures.

With a 2030 perspective in mind, reputable standards such as those recommended by the City of Calgary and other municipalities for their buildings, were referenced in developing a bundle of accessibility measures. These municipal standards are more robust than current building codes and represent the direction in which accessibility standards are evolving to meet the needs of persons with disabilities.

6.0 Closing The Accessibility Gap By 2030: Immediate Cost Implications of Accessibility

6.1 Pricing Accessibility Measures

The cost of accessibility measures varies immensely depending on construction type (wood, steel, concrete), whether measures are minor or extensive renovations, and whether a retrofit or new construction is contemplated.

- The additional expense for adding accessibility measures to a new building is minor, a maximum of 2%, regardless of construction type.
- Retrofitting timber frame buildings is easier and cheaper than introducing accessibility measures in concrete or masonry buildings. It is less likely that a structural engineer's services will be required in a wood building.
- Buildings not designed to modern codes are more expensive to retrofit and more difficult to price because of the variance between individual buildings' construction and wear and tear on the building fabric.
- Some accessibility measures, such as widening hallways, are cost prohibitive, given that moving a bearing wall brings structural implications and can affect more than one system in a structure.
- Retrofitting washrooms in non-residential buildings to add a wheelchair accessible stall are less expensive (about $2000 in the average Canadian city) than having to widen and lengthen a bathroom in a home so that it is wheelchair accessible.

Professional expertise helped establish the market value of a basket of accessibility measures in order to address the uncertainty of pricing accessibility measures,. Three major categories of measures emerged for residential and non-residential construction and were applied against all assets listed in the registry either as:

- Category 1: a bundle of minor measures such as grab bars in bathrooms or washrooms.
- Category 2: a bundle of more extensive measures such as widening corridors and entries, replacing change rooms in recreation centres with fully accessible design, or changing vanity and kitchen counter heights to accommodate wheelchair users.
- Category 3: a bundle of measures including elevators or stair lifts, ceiling rails to enable transport of a bed-bound person to a bath, exterior ramps and secondary fire exits. Note that secondary fire exits are now mandatory under Canadian fire codes.

For a list of measures necessary to improve the accessibility of First Nation residential and commercial assets included within each bundle see Appendix A.

Using the statistics available from Statistics Canada and Indigenous sources, and based on professional expertise, the following assumptions were made regarding what percentage of buildings would require some kind of accessibility accommodation:

For residential buildings:

- About 30% of all homes on First Nations require some kind of retrofitting to accommodate persons with disabilities
    - 23% of all homes require Category 1 measures @ $10,000
    - 5.5% of all homes require Category 2 measures @ $30,000
    - 1.5% of all homes require Category 3 measures @ $45,000

For non-residential buildings:

- All non-residential buildings built prior to 2012 will require renovations to bring them up to current codes and best practice standards. Eighty-seven (87%) of the AFN building inventory was built before 2012.
    - 45% of all non-residential buildings will require Category 1 measures @ $10,000.
    - 45% of all non-residential buildings will require Category 2 measures @ $37,000 for operational and utilities buildings and $100,000 for admin and rec/cultural buildings.
    - 10% of all non-residential buildings will require Category 3 measures including exterior ramps @ $15,000.
- About 10% of all non-residential buildings will require all three categories of measures:
    - Non-residential buildings @ $125,000.
    - Operational and utilities buildings @ $62,000.

Retrofit costs are presented by asset subclass, zone, capital needs and category. Residential and non-residential buildings constitute separate asset classes given these assets are managed by different policies and financial accounts by most First Nations.

Costing Methodology – Accounting for Remoteness

- The costs for materials and labour are higher in remote communities.
- Cost escalation factors of 1, 1.15, 1.25, and 2 are applied to capital costs in Zones 1, 2, 3, and 4 respectively.
- These escalation factors apply to Residential and non-Residential Buildings.

6.2 Cost Implications of Residential Accessibility Measures

The total cost of residential accessibility measures is 770.7 M. A more detailed breakdown of this estimate by zone and cost class is provided in Table 1.

Table 1: Estimated Cost to Renovate First Nation Residences to Accommodate Disabilities

Subclass	Capital Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	
Residential					
Category 1	$33.5 M	$47.1 M	$5.5 M	$34.5 M	$120.6 M
Category 2	$116.3 M	$163.6 M	$19.0 M	$120.0 M	$418.9 M
Category 3	$64.2 M	$90.3 M	$10.5 M	$66.2 M	$231.2 M
Class Total*	**$214.0 M**	**$301.0 M**	**$35.0 M**	**$220.7 M**	**$770.7 M**

*Numbers may not sum to the Class Total due to rounding

6.3 Cost Implications of Non Residential Accessibility Measures

The total cost for renovating non residential buildings to accommodate disabilities is $250M. A more detailed breakdown of this estimate is provided in Table 2.

Table 2: Estimated Cost to Renovate First Nation Non Residential Buildings to Accommodate Disabilities

Subclass	Capital Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	
Non-Residential					
Category 1	**$11.9 M**	**$18.3 M**	**$1.4 M**	**$7.6 M**	**$39.1 M**
Administration	$1.9 M	$2.1 M	$0.2 M	$0.8 M	$5.0 M
Schools and Institutional	$1.9 M	$3.7 M	$0.2 M	$1.8 M	$7.7 M
Operative	$3.8 M	$5.4 M	$0.4 M	$2.4 M	$12.0 M
Recreational	$2.0 M	$3.1 M	$0.2 M	$1.0 M	$6.2 M
Utility	$2.2 M	$3.9 M	$0.4 M	$1.6 M	$8.2 M
Category 2	**$41.3 M**	**$63.5 M**	**$4.8 M**	**$26.3 M**	**$135.9 M**
Administration	$6.7 M	$7.4 M	$0.6 M	$2.8 M	$17.5 M
Schools and Institutional	$6.6 M	$12.9 M	$0.8 M	$6.4 M	$26.7 M
Operative	$13.3 M	$18.8 M	$1.4 M	$8.2 M	$41.7 M
Recreational	$7.0 M	$10.6 M	$0.7 M	$3.3 M	$21.7 M
Utility	$7.7 M	$13.7 M	$1.2 M	$5.7 M	$28.3 M
Category 3	**$22.8 M**	**$35.0 M**	**$2.7 M**	**$14.5 M**	**$75.0 M**
Administration	$3.7 M	$4.1 M	$0.4 M	$1.5 M	$9.7 M
Schools and Institutional	$3.6 M	$7.1 M	$0.5 M	$3.5 M	$14.7 M
Operative	$7.4 M	$10.4 M	$0.7 M	$4.5 M	$23.0 M
Recreational	$3.9 M	$5.9 M	$0.4 M	$1.8 M	$12.0 M
Utility	$4.2 M	$7.6 M	$0.7 M	$3.1 M	$15.6 M
Class Total*	**$76.0 M**	**$116.8 M**	**$8.8 M**	**$48.4 M**	**$250.0 M**

*Numbers may not sum to the Class Total due to rounding

7.0 Pathway To Closing The Infrastructure Gap When It Comes To Accessible Design: 2030

The grand total estimate to retrofit First Nation assets across all categories and classes is $1.02 B (c.f. Appendix B). This total is based on measures that are exclusive to buildings and does not include other important accessibility measures related to communications, technology, and of a more universal organizational or attitudinal nature. An essential first step for First Nations to consider is how to prioritize competing demands for scarce funding. There is a mountain of challenges crying out to be addressed but capacity is limited. Where to start?

Accessibility audits are best conducted as part of a broader asset management audit in communities. This accessibility memo is one of four, the others being on adaptation to climate change, mitigation to reduce energy use and GHG emissions, and drinking water advisories. Conducting audits of all four aspects provides a strategic foundation for deciding where to spend money first, and which measures are synergistic. Mitigation measures such as additional insulation improve livability of homes and non-residential buildings when the power goes out or there's a heat wave. If an adaptation and mitigation audit results in major renovations to residences, that's the time to consider adding a wheelchair ramp or moving a bearing wall. If the community needs to replace a septic field, use this work as a good time to retrofit a bathroom.

The following steps are useful before conducting an audit:

1. Select the accessibility standard that will guide decision-making. Sometimes this standard is set by building codes while the ACA provides important (mandatory) standards to be followed. A community can, however, choose to go further and incorporate universal design principles. This type of decision is best made with contributions from a diverse group in the community.

2. Select prioritization factors. If the decision to pursue accessibility measures is motivated by lawsuits or complaints, consider measures that will reduce legal risks.

3. Consider what is critical, essential or nice-to-have by way of measures. Invite community members, elders council representatives and youth to help choose, since decision making affects their families' wellbeing and the community's finances. This step requires a good understanding of which measures will have a high user impact and bring the most immediate benefits. For instance, improved access to cultural buildings, complete with accessible washrooms, means that everyone – regardless of ability – can participate in community life. How would the community rate this measure compared to other measures?

4. Price measures the community is likely to adopt, and some it may not adopt, so that people are well informed about the costs involved and can make trade-offs. While it would be ideal if every wheelchair user had a garage to protect them from the elements when transferring from a wheelchair to a vehicle, this may not be reasonable from a cost perspective.

First Nations' values around the importance of family and community are a stepping stone to making wise decisions about accessibility measures. In the end, accessibility is based on a combination of regulatory compliance and a commitment to community wellbeing. These two together can inform better policy and action.

Appendix 1

ACCESSIBILITY COSTING METHODOLOGY

To determine the cost of accessibility measures in residential and non-residential buildings, a list of three categories of actions was created. These include:

Category 1 measures: minor accessibility measures.

Residential: examples

- Grab bars in bathroom tubs/showers (at sitting and standing heights)
- Change bathroom fixtures
    - Toilet seat height of 430-486mm: add an elevated base or install thicker toilet seat or use plastic toilet seat insert to raise height
- Provision of new bathroom fixtures: automatic or lever type faucets
- Mark parking stalls clearly as exclusive to those with disabilities (signage and/or paint on pavement)
- Widen doorways by installing offset hinges or removing doors or trim
- Flooring upgrades to eliminate tripping hazards
- Minimize height of door threshold or replace with cushioned threshold that flattens as chairs rolls over it
- Change doorknobs to lever style handles
- Install walk-in tub
- Provide level pathway to entry
- Lower wall switches to a height easily reached by wheelchair users (600-1000mm); install rocker-type wall switches

Non-residential buildings: examples

- Grab bars in washrooms
- Provision of new bathroom fixtures: automatic or lever type faucets
- Pave accessibility parking stalls
- Mark stalls clearly as exclusive to those with disabilities (signage and/or paint on pavement)
- Eliminate tripping hazards
- Minimize height of door threshold or replace with cushioned threshold that flattens as chairs rolls over it
- Change doorknobs to lever style handles
- Lower wall switches to a height easily reached by wheelchair users (600-1000mm); install rocker-type wall switches

Category 2 measures: major accessibility measures to accommodate persons with disabilities with more serious disabilities.

Residential: examples

- Level entryways e.g., threshold ramp

- Widen door openings
- Provision of wheelchair roll-in shower or larger walk-in tub
- Lower height of kitchen counters and bathroom sinks/vanities, or replace these to accommodate wheelchair users
- Provision of minimum 1.5m turning circle in washrooms for disabled users
- If thick carpet pile is present, replace with vinyl, tile or laminate flooring
- Crash rails to protect wall surfaces from wheelchair damage
- Adjustments to garage to facilitate wheelchair user
- Medic alert installation
- Contractor's General Requirements

Non-residential: examples

- Level entryways– e.g., threshold ramp
- Free-standing wheelchair ramp on the exterior of buildings to provide access
- Addition of power door operators
- Widen door openings
- Widen hallways (1.2m minimum width)
- Change height of bathroom vanities, or replace these to accommodate wheelchair users
- Provision of wheelchair accessible washroom(s)
- Provision of minimum 1.5m turning circle in washrooms and door entries
- Crash rails to protect wall surfaces from wheelchair damage
- Medic alert installation
- Drinking fountain: provide at least one wheelchair accessible fountain on each floor
- Secondary fire exit
- Contractor's General Requirements

Category 3 measures: measures to convert buildings for disabled people.

- Elevators or chair lifts to improve accessibility between floors
- Ceiling rails to permit transportation from a bedroom to a bathroom
- Secondary fire exit
- Freestanding wheelchair ramp on exterior of building

Professional judgement was used to determine how many measures in each category would be required.

For each of the retrofitting actions, the market value of each adaptation for a representative average-sized asset of that class was established based on professional expertise. These retrofitting actions include costs for one-time capital interventions during the course of an asset's life. All one-time capital costs are assumed to occur at or before 2030.

Appendix 2

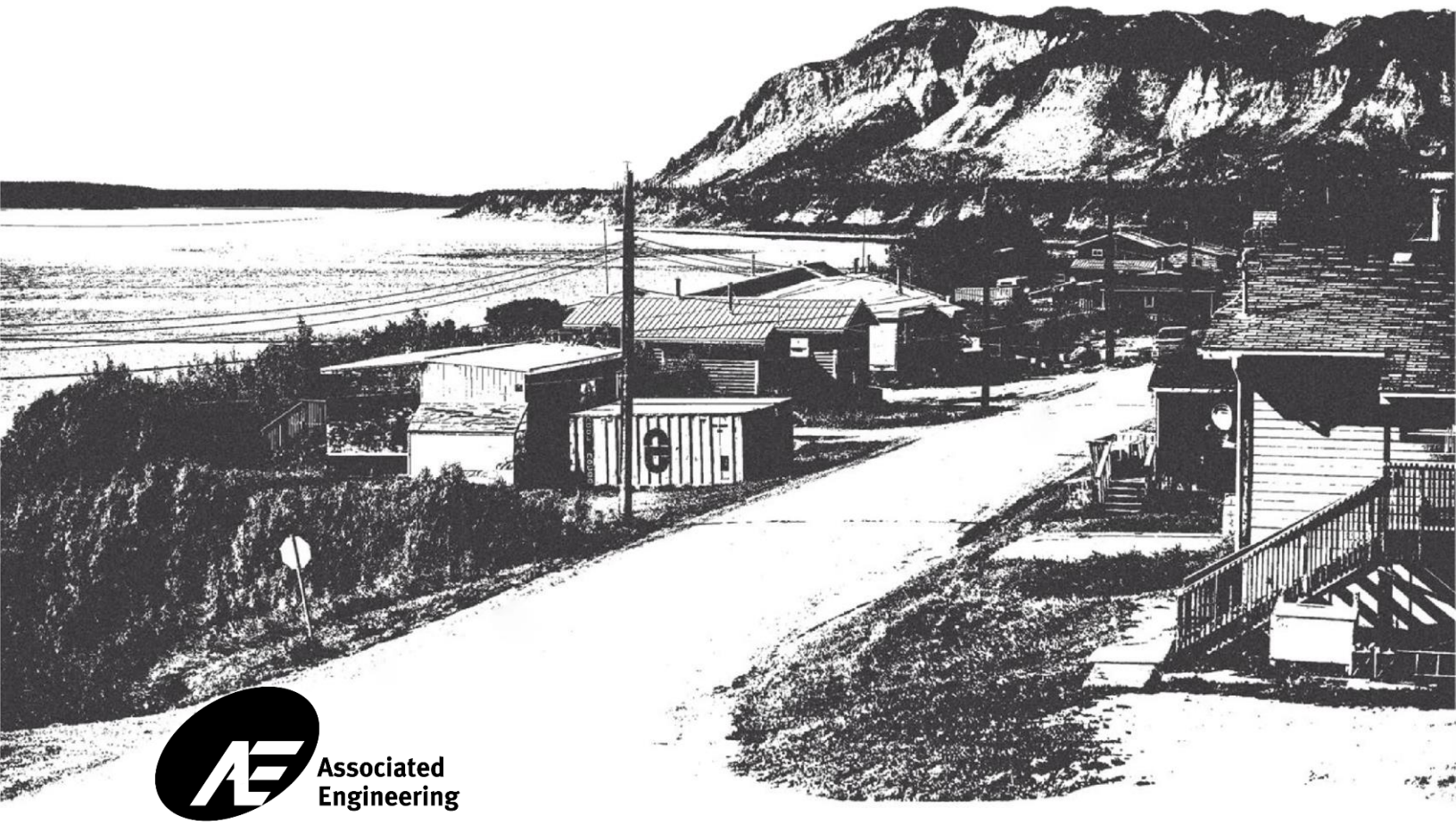
COST SUMMARY TABLE

Table B-1

Cost Summary Table for All Accessibility Costs

Subclass	Capital Needs				Total Investment
	Zone 1	Zone 2	Zone 3	Zone 4	
Category 1	**$45.4 M**	**$65.4 M**	**$6.9 M**	**$42.1 M**	**$159.7 M**
Administration	$1.9 M	$2.1 M	$0.2 M	$0.8 M	$5.0 M
Schools and Institutional	$1.9 M	$3.7 M	$0.2 M	$1.8 M	$7.7 M
Operative	$3.8 M	$5.4 M	$0.4 M	$2.4 M	$12.0 M
Recreational	$2.0 M	$3.1 M	$0.2 M	$1.0 M	$6.2 M
Residential	$33.5 M	$47.1 M	$5.5 M	$34.5 M	$120.6 M
Utility	$2.2 M	$3.9 M	$0.4 M	$1.6 M	$8.2 M
Category 2	**$157.6 M**	**$227.1 M**	**$23.8 M**	**$146.3 M**	**$554.8 M**
Administration	$6.7 M	$7.4 M	$0.6 M	$2.8 M	$17.5 M
Schools and Institutional	$6.6 M	$12.9 M	$0.8 M	$6.4 M	$26.7 M
Operative	$13.3 M	$18.8 M	$1.4 M	$8.2 M	$41.7 M
Recreational	$7.0 M	$10.6 M	$0.7 M	$3.3 M	$21.7 M
Residential	$116.3 M	$163.6 M	$19.0 M	$120.0 M	$418.9 M
Utility	$7.7 M	$13.7 M	$1.2 M	$5.7 M	$28.3 M
Category 3	**$87.0 M**	**$125.3 M**	**$13.1 M**	**$80.7 M**	**$306.2 M**
Administration	$3.7 M	$4.1 M	$0.4 M	$1.5 M	$9.7 M
Schools and Institutional	$3.6 M	$7.1 M	$0.5 M	$3.5 M	$14.7 M
Operative	$7.4 M	$10.4 M	$0.7 M	$4.5 M	$23.0 M
Recreational	$3.9 M	$5.9 M	$0.4 M	$1.8 M	$12.0 M
Residential	$64.2 M	$90.3 M	$10.5 M	$66.2 M	$231.2 M
Utility	$4.2 M	$7.6 M	$0.7 M	$3.1 M	$15.6 M
Class Total*	**$289.9 M**	**$417.8 M**	**$43.8 M**	**$269.1 M**	**$1,020.7 M**

*Numbers may not sum to the Class Totals due to rounding

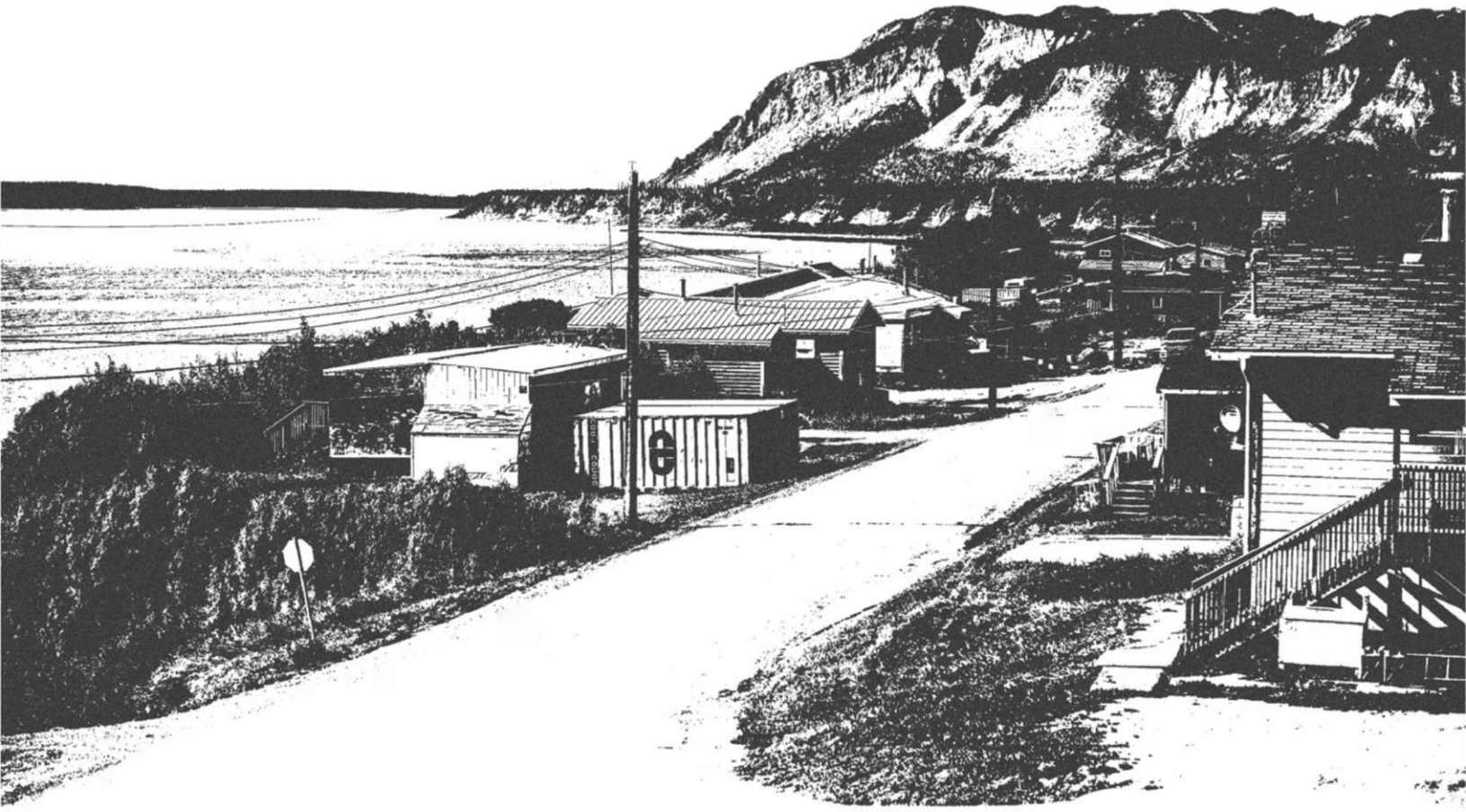


Associated Engineering

CLOSING THE INFRASTRUCTURE GAP BY 2030
COST REPORT FOR BUDGET 2023

Appendix 10

ISC DOCUMENT:
FIRST NATIONS DIRECT ASKS

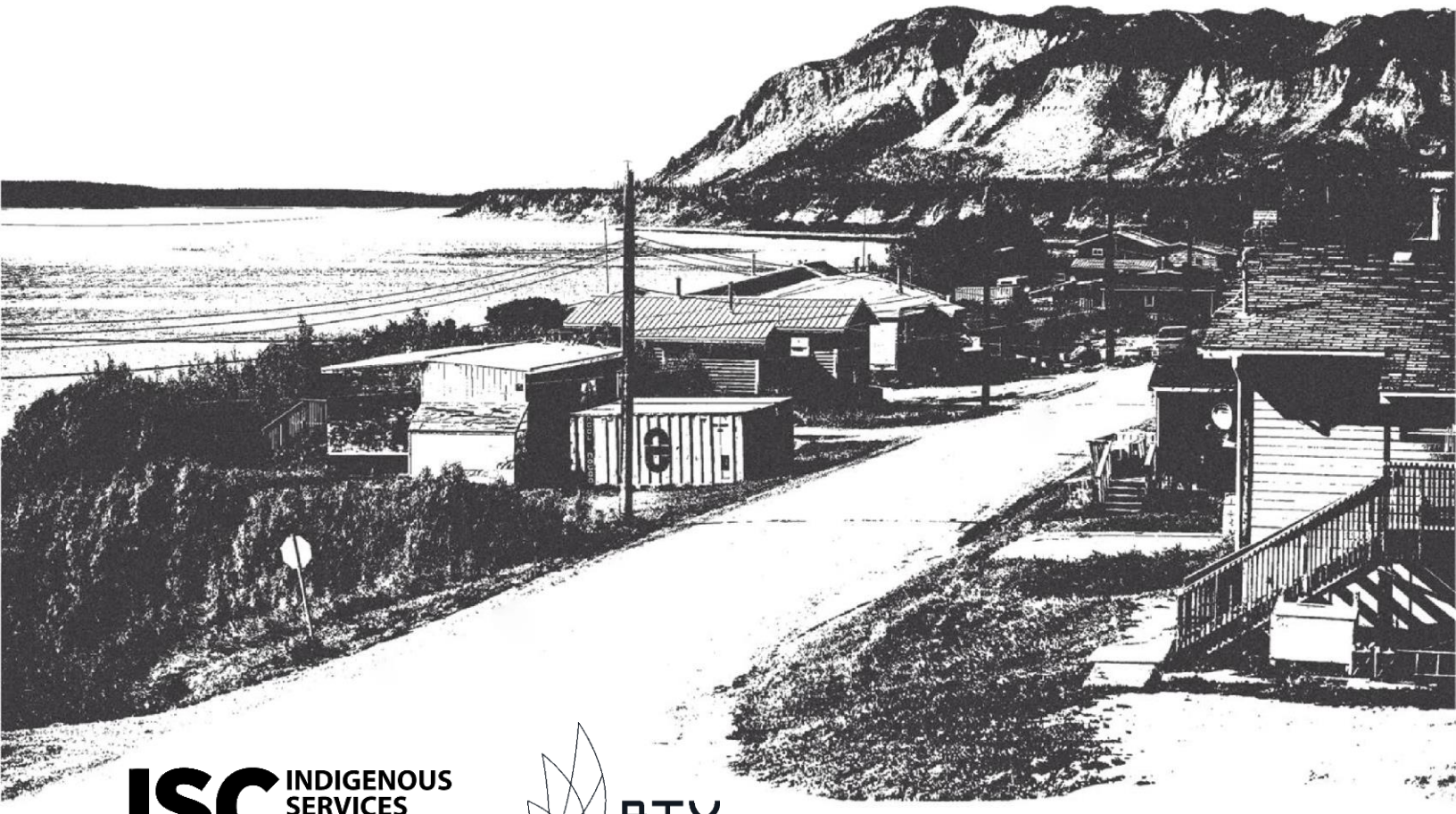


ANNEX 1 - CLOSING THE INFRASTRUCTURE GAP BY 2030:
COST REPORT FOR BUDGET 2023

Appendix 10 – **ISC Document First Nations Direct Asks**

ISC SURVEY RESULTS							
Asset Class	**Zone 1**	**Zone 2**	**Zone 3**	**Zone 4**	**Grand Total**	**Exclusions for AFN**	**Total Need following ISC gap analysis**
Community Accessibility Assets (CA)	$0	$0	$0	$8,548,765,002	$8,548,765,002	$0	$8,548,765,002
Community Assets (CO)	$3,154,868,529	$7,566,515,367	$873,480,130	$1,781,551,163	$13,376,415,189	$0	$13,376,415,189
Cultural Assets (CU)	$261,898,228	$369,939,080	$22,100,000	$129,498,707	$783,436,015	$67,299,450	$716,136,565
Economic Development (ED)	$519,660,771	$581,990,775	$38,650,000	$291,981,198	$1,432,282,744	$0	$1,432,282,744
Education and Training (ET)	$1,116,225,095	$2,472,121,231	$411,116,173	$412,691,772	$4,412,154,272	$1,828,823,078	$2,583,331,194
Electronic Connectivity (EC)	$0	$0	$0	$0	$0	$0	$0
Emergency Services (ES)	$415,431,158	$996,182,642	$87,412,233	$285,034,759	$1,784,060,792	$420,892,003	$1,363,168,789
Health (HS)	$2,622,775,105	$1,709,872,756	$112,699,900	$555,354,449	$5,000,702,211	$0	$5,000,702,211
Housing (HO)	$0	$0	$0	$0	$0	$0	$0
Recreation Assets (RA)	$288,332,520	$551,699,938	$35,465,600	$281,707,968	$1,157,206,026	$0	$1,157,206,026
Social Programs (SP)	$1,046,775,838	$1,548,130,530	$157,769,800	$412,239,000	$3,164,915,168	$0	$3,164,915,168
Solid Waste and Recycling (SW)	$255,440,980	$309,181,141	$33,101,879	$149,334,470	$747,058,469	$253,823,149	$493,235,320
Transportation Infrastructure (TR)	$750,299,666	$1,616,782,967	$53,325,058	$1,678,567,617	$4,098,975,308	$3,882,615,159	$216,360,149
Water, Wastewater and Utilities (WW)	$1,967,519,433	$3,355,510,215	$396,826,184	$1,161,400,679	$6,881,256,511	$4,305,019,662	$2,576,236,849
Grand Total	**$12,399,227,324**	**$21,077,926,643**	**$2,221,946,956**	**$15,688,126,784**	**$51,387,227,707**	**$10,758,472,500**	**$40,628,755,206**

ASSEMBLY OF FIRST NATIONS • ASSEMBLÉE DES PREMIÈRES NATIONS

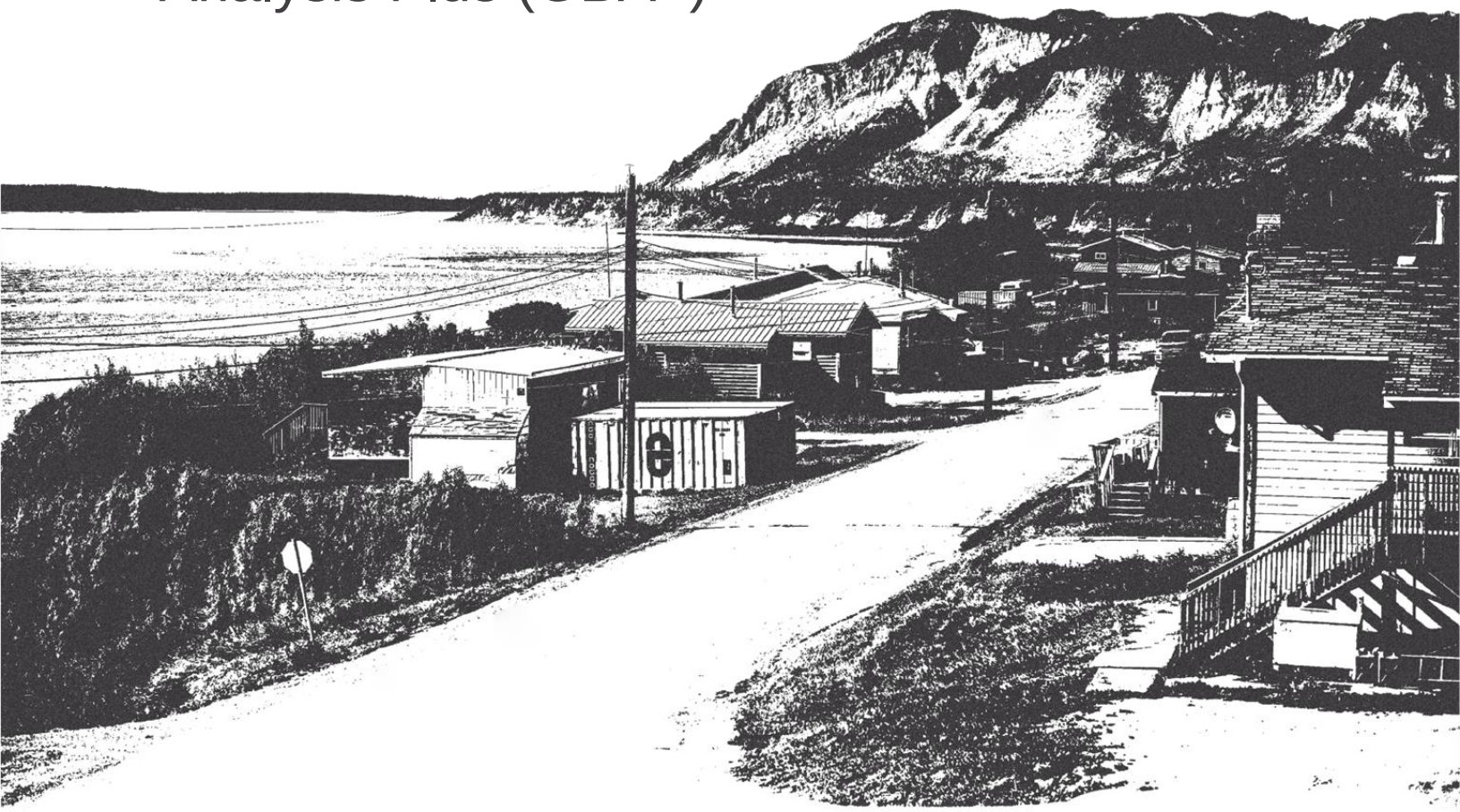


ISC INDIGENOUS SERVICES CANADA

BTY

Closing the Infrastructure Gap 2030

Annex 2: Gender-Based Analysis Plus (GBA+)



Budget/Off-Cycle Proposal
Annex 2: GBA Plus Departmental Summary

Please refer to the User Instructions document before completing this template. Hover over info buttons to see additional details for each section. Please do not make any structural modifications to this template, as this will create issues for data capture.

1. GENERAL INFORMATION		
Proposal Title	Closing the Infrastructure Gap by 2030: AFN Budget 2023 Cost Report	
Sponsoring Department	Indigenous Services Canada	Other Departments: Click here to enter text.
Type of measure *(Check all that apply)*	☐ Program ☐ Policy ☐ Legislation or regulation	☐ Revenue ☒ Other: Cost Report
	☒ New	☐ Existing – Modified (scope, scale) ☐ Existing – Renewal (no changes)
Timing of conduct of GBA Plus ⓘ *(Check all that apply)*	☐ Early in idea development phase (when options / proposals are being developed) ☐ Mid-point (when options and proposals are being finalized) ☒ Later stage (after proposals are finalized, prior to submission of proposal) Comment:	☐ Existing GBA Plus is still current ☐ Existing GBA Plus was refreshed

2. BRIEF DESCRIPTION OF BUDGET/OFF-CYCLE PROPOSAL ⓘ (300 words maximum)

Problem Statement:
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 inequality, especially when compared to the social infrastructure services that are regularly and consistently provided to most Canadians.

Proposal Summary:
The federal budget request outlined in this historic First Nations-led report is a fully substantiated cost estimate based on years of AFN technical studies, First Nations engagements, and decades of ISC records. The AFN, as directed by the First Nations-In-Assembly, has engaged industry experts to use this research to estimate the national infrastructure need and sustain it for future generations of First Nations.

These critical investments are fiduciary reparations needed for over a century of underfunded programs to First Nations and will improve their self-determination and socioeconomic outcomes, as well as minimize the disparity between First Nations and Canadians' access to essential community infrastructure services and housing.

3. TARGET GROUP (POLICY INTENT)

What is the primary target group for this proposal? In particular, this proposal is primarily designed to provide ultimate benefits to:

☐ All Canadians* (i.e. rather than specific sub-groups).
- ☐ This is a tax integrity proposal.
- ☐ Individuals in other countries.

☐ Specific regions and/or sectors of the economy, namely
- ☐ Specific regions (e.g. remote, rural, urban).
- ☐ Specific industries or sectors of the economy (e.g. oil industry, auto industry).

☒ A particular demographic group.
- ☐ Women**
- ☐ Men
- ☐ 2SLGBTQI+
- ☒ Indigenous Peoples
- ☐ Black or other racialized / visible minority communities
- ☐ Persons with disabilities or health issues or their caregivers
- ☐ Children or Youth
- ☐ Students
- ☐ Seniors
- ☐ Veterans
- ☐ Newcomers or Immigrants
- ☐ Individuals of particular socio-economic status
- ☐ Individuals of particular educational level
- ☐ Individuals of particular familial characteristics (e.g. marital status, family status)

Please explain (1-2 sentences/250 words):

Specifically, First Nations across Canada.

Note: *exceptionally, if none of the options above can adequately reflect the intended group of the proposal, please use the explanatory box to provide further details.*

**Applicable to all persons living in Canada*

***Select for initiatives aimed at helping women specifically and/or advancing gender equality more broadly.*

4. EXPECTED OUTCOMES

The proposal should be assessed in relation to the direct, indirect benefits and barriers to access/participation or negative impacts (section 5) on different demographic groups. This assessment should relate to the quality of life domains identified in the budget proposal where applicable. *For further information and examples, please consult the User Instructions.*

a) **Direct Benefits:** which gender and demographic groups are expected to directly benefit from the proposal, and what are their intersecting identity factors? ⓘ

The benefiting group(s) has the following **demographic characteristics that are predominant relative to the Canadian population at large.** ⓘ Please select at least one option in the Gender Identity box and select all other characteristics that apply.

Gender identity and sexual orientation	Population Group	Socio-economic, cultural and familial characteristics
☐ Predominantly Women (≥80%) ☐ Women (60%-79%) ☒ Gender balanced ☐ Men (60%-79%) ☐ Predominantly Men (≥80%)	☒ Indigenous Peoples ☒ First Nations ☐ Inuit ☐ Métis ☐ Black or other racialized / visible minority communities: *<specify>* ☐ White (Caucasian)	☒ Lower-educated individuals ☒ Highly-educated individuals ☒ Lower income ☐ Middle income ☐ Higher income
☐ 2SLGBTQI+*<specify>*		☐ English or French-language learners ☐ Newcomers or Immigrants *<specify>* ☐ Individuals in particular occupations or sectors: *<specify>*
Health characteristics	**Geographic characteristics**	☐ Single person households ☐ Two person households ☐ Parents ☐ Lone parent households ☐ Two parent households ☒ Other household type: First Nation communities have a mixture of all of the above, and where overcrowding exists, multiple families can dwell in one home.
☒ Persons with disabilities ☐ Persons with physical or mental health issues (or their caregivers)	☒ Urban populations ☒ Rural or remote populations ☐ Individuals in particular regions: *<specify>* ☐ Individuals in other countries *<specify>*	
Age and life stage		
☒ Individuals under the age of 18 ☒ Individuals between 18-29 ☒ Individuals between 30-60 ☒ Individuals over the age of 60		
☒ Students ☒ Workers		

Please select, as applicable:

☒ These traits describe multiple groups, rather than one distinct group with intersecting characteristics. Please explain below.

☐ The benefitting group has no notable characteristics beyond those of the Canadian population overall (no one group disproportionately benefits over another).

Please provide details, in 250 words or less, on these impacts and on the gender and diversity context related to this initiative, with specific breakdowns and data where feasible. Include an explanation on whether this proposal benefits multiple groups or one specific group. Sources and data gaps are to be noted in Section 9.

The proposed funding investment benefits First Nations families and communities directly through essential and long-term quality of life improvements which are gender balanced and intergenerational. Improving access and quality of housing, infrastructure, education, connectivity, utilities in a climate responsive and net zero framework will directly improve outcomes for First Nations women and children who are disproportionately at higher risk of adverse impacts of poverty, gender-based violence, and experience challenges in accessing necessary support resources within their communities. The benefits of this proposal are specifically informed by Canada's fiduciary reparations to First Nations, as well as the Calls to Action reported by the Truth & Reconciliation Commission of Canada, and the United Nations Declaration on the Rights of Indigenous Peoples.

There have been increasing opportunities for First Nations and federal departments to co-develop policy and program innovations right from idea generation, to development, implementation, and evaluation. Despite several recent best practices, the level of co-development remains uneven. Part of AFN's messaging to the federal government could be to advocate for inclusion of First Nations within all policy and program development, including specific reference to the need for shared work on culturally relevant GBA+ analysis of co-developed programs. A follow up GBA+ analysis would benefit this proposal.

Long-term benefits: if the long-term benefits of the proposal differ from the benefits specified above, please describe the long-term benefits and the affected group(s) in the box below, in 250 words or less.

The impact of addressing infrastructure funding needs identified in the report will benefit First Nations communities across Canada in the form of new utilities, grounds, transportation, community buildings, housing, and healthcare infrastructure assets for current and future generations of First Nations to use.

C

b) **Indirect Benefits:** which gender and demographic groups are expected to benefit indirectly from the proposal? Indirect beneficiaries are those that may receive secondary benefits of a proposal, for example through playing a role in the delivery of a proposal. ⓘ

The benefiting group(s) has the following **demographic characteristics that are predominant relative to the Canadian population at large**. Please select at least one option in the Gender Identity box and select all other characteristics that apply.

Gender identity and sexual orientation	Population Group	Socio-economic, cultural and familial characteristics
☐ Predominantly Women (≥80%) ☐ Women (60%-79%) ☒ Gender balanced ☐ Men (60%-79%) ☐ Predominantly Men (≥80%)	☐ Indigenous Peoples ☐ First Nations ☐ Inuit ☐ Métis ☒ Black or other racialized / visible minority communities: Blacks and Other People of Colour are employed in the engineering and construction industry and will benefit from the job creation of this proposal. ☒ White (Caucasian)	☒ Lower-educated individuals ☒ Highly-educated individuals ☒ Lower income ☒ Middle income ☒ Higher income ☒ English or French-language learners ☒ Newcomers or Immigrants *<specify>* ☐ Individuals in particular occupations or sectors: *<specify>* ☐ Single person households ☐ Two person households ☐ Parents ☐ Lone parent households ☐ Two parent households ☐ Other household type: *<specify>*
☐ 2SLGBTQI+ *<specify>*		
Health characteristics	**Geographic characteristics**	
☒ Persons with disabilities ☒ Persons with physical or mental health issues (or their caregivers)	☒ Urban populations ☒ Rural or remote populations ☐ Individuals in particular regions: *<specify>* ☐ Individuals in other countries: *<specify>*	
Age or life stage		
☐ Individuals under the age of 18 ☒ Individuals between 18-29 ☒ Individuals between 30-60 ☒ Individuals over the age of 60		
☐ Students ☒ Workers		

Please select **one of the below,** as applicable:
☒ These traits describe multiple groups, rather than one distinct group with intersecting characteristics. Please explain below.
☐ The benefitting group has no notable characteristics beyond the Canadian population overall (no one group disproportionately benefits over another).
☐ There is insufficient information to adequately assess the indirect benefits. Please explain.

Please provide details on these impacts and on the gender and diversity context related to this initiative, with specific breakdowns and data where feasible (in 250 words or less). Include an explanation on whether this proposal benefits multiple groups or one specific group. Sources and data gaps are to be noted in Section 9.

CTIG 2030 will boost both First Nations economic conditions and overall Canadian prosperity. Infrastructure investment dollars will grow Canada's long-term gross-domestic-product (GDP) by increasing the productivity of the Canadian economy. Improvements to the built environment spurs substantial job creation and generates further federal income via taxation and border levies from internationally transported goods destined for First Nation infrastructure and housing projects.

The Centre for Spatial Economics (C4SE) has surmised that 9.4 jobs are generated for every million dollars spent on infrastructure – and the value of GDP generated per dollar of public infrastructure spending lies between $2.46 and $3.83.[5] Many of the jobs generated by Closing the Gap will be in rural and remote areas and will create economic opportunities for both First Nations and non-First Nations people alike.

Long-term benefits: if the long-term benefits of the proposal differ from the benefits specified above, please describe the long-term benefits and the affected group(s) in the box below, in 250 words or less.

Public sector infrastructure investment unlocks capacity and boosts business opportunities for both First Nations and Canadians as a whole. The impact of infrastructure stimulus into the country's most underinvested and underdeveloped communities will ripple across a broad range of sectors – and radically change the Canadian economy from coast to coast.6 By connecting First Nations to the rest of Canada via essential infrastructure development, new trade corridors and commerce centres will form that were

previously non-existent. Interlinking First Nations investment, infrastructure development, climate resilience, and net-zero transitioning will make Canada a global leader in post-pandemic recovery — all while bringing essential services to its most disadvantaged segment of the population.

c) **Income Distributional Impacts:** what are the overall expected impacts of this proposal from an income distributional perspective and/or are benefits concentrated among individuals of different income levels?

Please **select one**:

☐ Strongly benefits high income individuals (strongly regressive)
☐ Somewhat benefits high income individuals (somewhat regressive)
☐ No significant distributional impacts
☐ Somewhat benefits low income individuals (somewhat progressive)
☒ Strongly benefits low income individuals (strongly progressive)

Please explain in 250 words or less:

This proposal has the potential to create more than 3 million jobs which will open up economic and employment opportunities for First Nations and First Nation businesses within their own communities — which generally see little economic activity and will allow low-income individuals to benefit from the revenues and employment opportunities created by infrastructure and construction projects.

d) **Generational Impacts:** identify the generation that is expected to benefit most from the proposal.

Please **select one:**

☒ Primarily benefits youth, children, or future generations
☐ No significant generational impacts
☐ Primarily benefits the baby boom generation or seniors

Please explain in 250 words or less:

Funding is needed to enable First Nations communities to bridge the infrastructure gap and obtain access to the same level of amenities that most non-Indigenous individuals have and provide a better quality of life to First Nation youth, children, and future generations of First Nations. This includes improved infrastructure for utilities, housing, education, transportation, recreation, and healthcare – unlocking growth in key areas such as geographic accessibility and digital connectivity for members of the community. Over 200 First Nations still lack high-speed internet access which limits First Nation youth participation in the digital world and hinders them from attending school or post-secondary training virtually when situated in remote or rural First Nation communities without proper internet access.

5. A) BARRIERS TO PARTICIPATION OR ACCESS AND/OR NEGATIVE IMPACTS *(if applicable)*

Identify which gender and demographic groups are expected to face a barrier to participation/access and/or be negatively affected by the proposal.

Please **select which is applicable**:

☒ One or more specific demographic group(s) faces a potential barrier to participating in or accessing the initiative ⓘ

☐ The proposal carries, or could carry, negative impacts for one or more specific demographic group(s) ⓘ

Please select the demographic characteristics of the group(s) which faces a barrier to access or is negatively affected. **For proposals that impact Canadians, demographic characteristics should only be selected if they are predominant relative to the Canadian population at large.** *(Select all that apply)*

Gender identity and sexual orientation	**Population Group**	**Socio-economic, cultural and familial characteristics**
☐ Predominantly Women (≥80%) ☒ Women (60%-79%) ☐ Gender balanced ☐ Men (60%-79%) ☐ Predominantly Men (≥80%)	☐ Indigenous Peoples ☐ First Nations ☐ Inuit ☐ Métis ☐ Black or other racialized / visible minority communities: *<specify>* ☐ White (Caucasian)	☐ Lower-educated individuals ☐ Highly-educated individuals ☐ Lower income ☐ Middle income ☐ Higher income ☐ English or French-language learners ☐ Newcomers or Immigrants *<specify>* ☐ Individuals in particular occupations or sectors: *<specify>* ☐ Single person households ☐ Two person households ☐ Parents ☐ Lone parent households ☐ Two parent households ☐ Other household type: *<specify>*
☐ 2SLGBTQI+ *<specify>*		
Health characteristics	**Geographic characteristics**	
☒ Persons with disabilities ☐ Persons with physical or mental health issues (or their caregivers)	☐ Urban populations ☐ Rural or remote populations ☐ Individuals in particular regions: *<specify>* ☐ Individuals in other countries *<specify>*	
Age or life stage		
☐ Individuals under the age of 18 ☒ Individuals between 18-29 ☒ Individuals between 30-60 ☐ Individuals over the age of 60		
☐ Students ☐ Workers		

Please provide details on the barriers to access and/or the negative impacts the group(s) selected above could experience. Include an explanation on whether this proposal affects multiple groups or one specific group. Sources and data gaps are to be noted in Section 9. If long-term impacts differ, please specify how.

The skilled trades labour pool is limited across Canada, to address this supply chain issue, the federal government should explore more initiatives to promote Canadian women's access to roles in the infrastructure and construction industry which predominantly employs men aged 18 to 60. Enabling women to help fill this labour shortage will equalize gender employment disparity in this industry and help Close the Infrastructure Gap by 2030 by providing untapped human resources to a national labour shortage.

B) GBA PLUS RESPONSIVE APPROACH

If barriers to access/participation and/or negative impacts are identified above, please specify program designs or implementation elements that seek to either reduce barriers to participation or mitigate potential negative impacts of the proposal itself.

i. Steps for addressing potential barriers to access/participation	***ii. Mitigation measures to respond to potential negative impacts***
I**f potential barriers are identified above**, have elements been incorporated into the design of the initiative to address these and to ensure that the proposal does not exacerbate existing inequalities?	**If negative impacts are identified above,** are there measures included in this proposal to mitigate these?
☐ This proposal includes elements in its design to reduce potential barriers and promote access. OR ☒ This proposal does not include elements to address the potential barriers identified above. Please describe the design elements to reduce potential barriers. Please provide a brief explanation in 250 words or less, if no such elements are present : The Closing the Infrastructure Gap by 2030 has the potential to create approximately 3 million jobs. Initiatives to promote skilled trades training, managerial, and accounting jobs in the construction industry for women must be explored as programs are developed.	☐ The proposal includes mitigation measures. Please describe the measures expected to mitigate potential negative impacts, in 250 words or less: Click here to enter text. OR ☒ The proposal does not include mitigation measures. ☐ Further work is required to develop mitigation measures ☐ No plans are underway to develop mitigation measures at this time (cost prohibitive, unfeasible, etc.). ☒ The proposal targets a specific client base; no mitigation measures are proposed to address the differential impact on groups outside of the target client base.

6. GENDER RESULTS FRAMEWORK *(if applicable)*

Since 2018, Canada has identified key gender equality objectives in six areas as outlined in Canada's Gender Results Framework.

If applicable, which is **the primary pillar** and goal that would be **demonstrably advanced** by this proposal? *Please choose only one pillar and the corresponding objective.*

- Education and Skills Development: Choose an item.
- Economic Participation and Prosperity: Choose an item.
- Leadership and Democratic Participation: Choose an item.
- Gender-based Violence and Access to Justice: Choose an item.
- Poverty Reduction, Health and Well-being: Reduced poverty and improved health outcomes
- Gender Equality Around the World: Choose an item.

Please elaborate, where applicable, in 250 words or less.

Closing the Infrastructure Gap by 2030 includes integrating and coordinating initiatives that improve housing, education, and other core infrastructure, enabling First Nations communities to become sustainable long-term environments that provide educational and economic opportunities and foster harmony and safety by investing in lacking First Nations community infrastructure. First Nations and the Government of Canada have the opportunity to cultivate untapped human capital by investing in the built environment to support healthy communities.

For reference: Gender Results Framework placemat - Women and Gender Equality Canada*https://cfc-swc.gc.ca/grf-crrg/index-en.html*

☐ This proposal is not expected to demonstrably advance one of Canada's gender equality goals.

7. PUBLIC AND STAKEHOLDER ENGAGEMENT, GENDER AND DIVERSITY CONSIDERATIONS

☐ Please select if gender and diversity considerations were discussed with stakeholders and were integrated into the design of this budget proposal.

a) If, yes to the above, please explain who was consulted or provide details including any concerns expressed about possible consequences relevant to the proposal on different groups of people (please include timing of consultations). Please explain in 250 words or less.

Click here to enter text.

8. MONITORING AND EVALUATION, PLANS FOR DISAGGREGATED DATA

a) Will this proposal be delivered through a third party or government department?

Government department

b) Please describe the proposed approach for monitoring and evaluating impacts of the proposal on different groups, for the collection of disaggregated administrative data and performance data, which could include qualitative data, and the reporting practices associated with this proposal. If no plans are in place, please explain why. Please explain in 250 words or less.

The Assembly of First Nations (Infrastructure Department) and Indigenous Services Canada have discussed a follow-up study tracking the socioeconomic improvements made to First Nations by adequate investment in their community infrastructure to Close the Infrastructure Gap by 2030, which includes bringing better access to health facilities for First Nations women and educational and recreational facilities for First Nations youth.

9. DATA SOURCES

What data sources were used to inform this GBA Plus analysis and the development of the proposal? Were there any notable data gaps? *(Select all that apply and specify in the right-hand column, please hyperlink URLs)*

☐ Internal administrative data	*<specify>*
☐ Statistics Canada	*<specify>*
☐ International Organizations (e.g. OECD, UN, etc.)	
☒ Other external data sources	*AFN REPORT: CULTURALLY RELEVANT FIRST NATIONS GENDER BASED ANALYSIS +*
☐ Data Gaps	*<specify>*

10. SUMMARY OF GBA PLUS (SUITABLE FOR PUBLICATION) (500 words maximum)

Please summarize the most salient points from the above analysis into a summary. Please describe impacts in a neutral, factual tone and avoid promotional language. For examples, see Budget 2022 Impacts Report.

The AFN is working towards a Gender-Based Analysis Plus (GBA+) framework built on the foundation of First Nations worldviews and ways of being. This work is primarily intended to support the AFN in advancing policy positions that account for the unique and important needs of all First Nations people: men, women, boys, girls, Two-Spirit, and all gender-diverse people. This work may also provide a useful lens for governments and industry to help understand the unique challenges and issues faced by First Nations people.

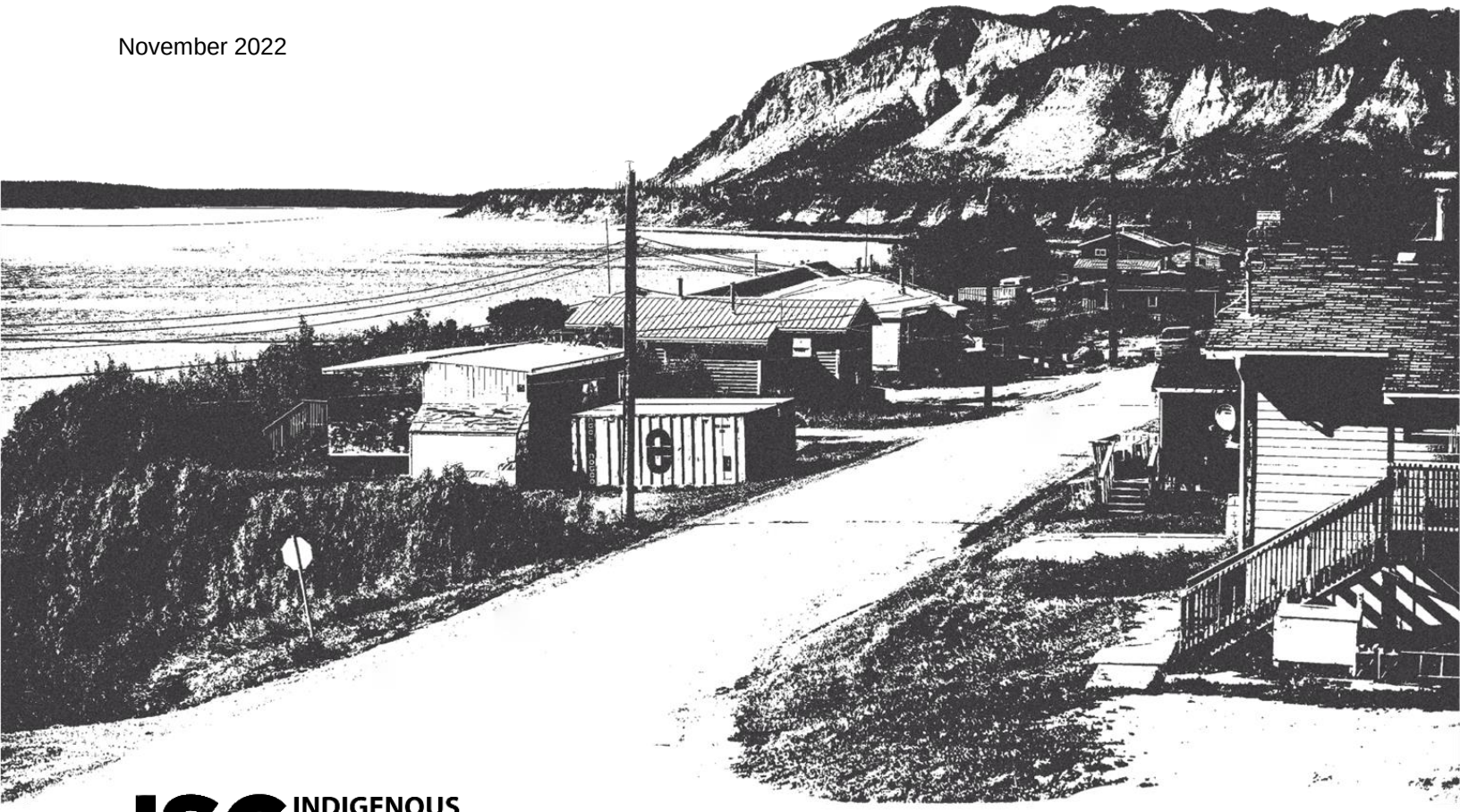
11. CONTACT INFORMATION

Name, Title, Phone number, Email address	Date
Matthew George, Senior Policy Analyst, (343) 575-0926, mgeorge@afn.ca	2022-11-04
Click or tap here to enter text.	Click to enter a date.
Click or tap here to enter text.	Click to enter a date.

Closing the Infrastructure Gap by 2030

A Collaborative and Comprehensive Cost Report Identifying the Infrastructure Investment Needs of Canada's First Nations

November 2022



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