

Northern Connectivity

Ensuring Quality Communications

(NC-EQC)

February 11, 2014

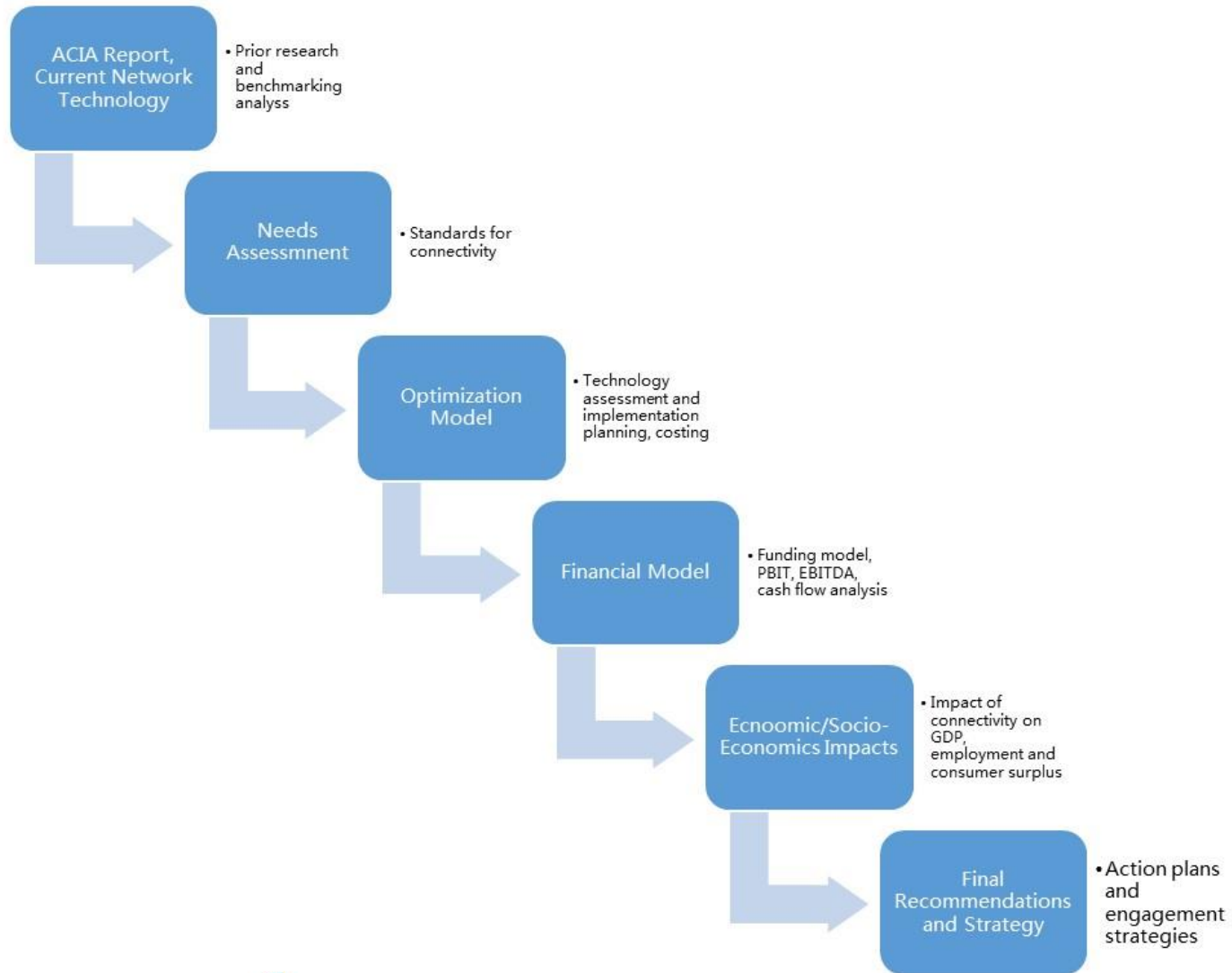
Delivered to
NCIS-WG

Prepared by
Nordicity

Report Summary

- This report provides - as the basis for future detailed connectivity planning in the territories – the following key deliverables:
 - Recommended goals and standards for broadband connectivity based on current and projected user needs and challenging economics of connectivity in the North;
 - Financial sustainability model;
 - Analysis of the social and economic benefits of improving broadband connectivity in the three Territories, and consequences of inaction; and,
 - A comprehensive implementation and engagement plan.

Approach and Methodology



Connectivity Needs & Network Performance Analysis: Key Findings

- Based on current connectivity, **the recommended current minimum broadband speed requirement for Northern users' is 9 Mbps download and 1.5 Mbps upload.**

Standard	Recommendation
Minimum Bandwidth*	Download: 9 Mbps (now), evolving into the future Upload: 1.5 Mbps *Overall average usage per household for the population across the territories.
Reliability	No specific standard, technology dependent
Redundancy	100% of the projected bandwidth used for critical applications <i>e.g.</i> , health, safety & security
Service Quality	Bandwidth – differentiated according to population, demand by different user categories, simultaneous usage, type of platform Jitter (Packet Delay Variation) – 0.5ms average, not to exceed 10ms maximum jitter more than 0.1% of the time Lost or dropped packets - <0.1%
Service Availability	99.99% of the time.

Capital Cost Analysis (Option 2): Base Network Upgrade with redundancy for Critical Traffic

	Microwave Costs (\$000)	Fibre Costs (\$000)	Satellite Costs (\$000)	Redundant Satellite Link Costs (\$000)
Yukon	\$15,847	\$1,750	\$4,225	\$39,814
NWT	\$27,988	\$1,413	\$37,686	\$58,033
Nunavut	\$-	\$-	\$533,771	\$44,474
3-Territory Totals	\$43,835	\$3,164	\$575,682	\$142,321



Main Link Upgrade Costs	\$622,680
Redundant Link Upgrade Costs	\$142,321
3-Territory Grand Total	\$765,001

Upper Estimate (+50%)	\$1,147,502
Lower Estimate (-50%)	\$382,501

This option is designed using a least-cost methodology where current technology is upgraded, and no new fiber builds are modeled. This option assumes the existence of the MacKenzie Valley Fibre Link (MVFL).

Capital Cost Analysis (Option 3): Base Network Upgrade with redundancy for All Traffic

	Microwave Costs (\$000)	Fibre Costs (\$000)	Satellite Costs (\$000)	Redundant Satellite Link Costs (\$000)
Yukon	\$15,847	\$1,750	\$4,225	\$368,316
NWT	\$27,988	\$1,413	\$37,686	\$653,247
Nunavut	\$-	\$-	\$533,771	\$533,771
3-Territory Totals	\$43,835	\$3,164	\$575,682	\$1,555,334



Main Link Upgrade Costs	\$622,680
Redundant Link Upgrade Costs	\$1,555,334
3-Territory Grand Total	\$2,178,014
Upper Estimate (+50%)	\$3,267,021
Lower Estimate (-50%)	\$1,089,007

Another option examined involved assessing the impact of modeling the networks while assuming provision of redundancy for 100% of traffic. This option resulted in large cost increases attributable to increased satellite costs.

Capital Cost Analysis (Option 2 vs. Option 4): Comparing Upgrades to New Fibre Build Options

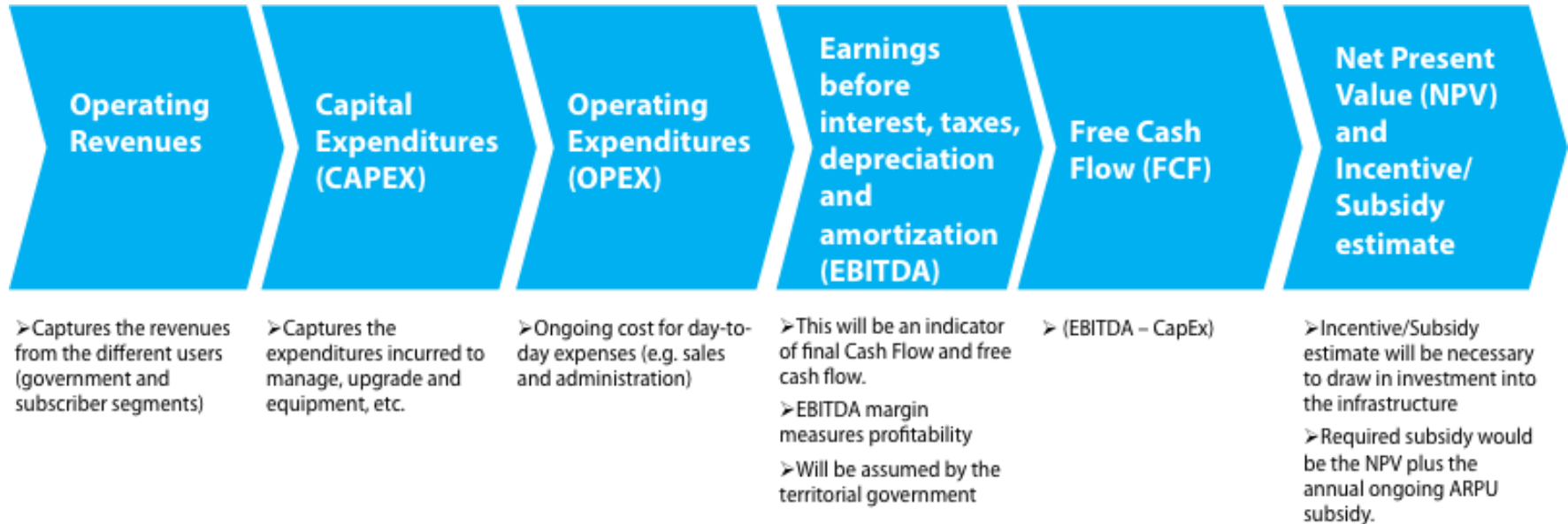


	Microwave Costs (\$k)	Fibre Upgrade Costs (\$k)	New Fibre Build Costs (\$k)	Satellite Costs (\$k)	Redundant Satellite Link Costs (\$k)
Yukon (Baseline)	\$15,847	\$1,750	\$-	\$4,225	\$39,814
NWT (Baseline)	\$27,988	\$1,413	\$-	\$37,686	\$58,033
Nunavut (Baseline)	\$-	\$-	\$-	\$533,771	\$44,474
TOTAL (Baseline)	\$43,835	\$3,164	\$-	\$575,682	\$142,321
GRAND TOTAL					\$765,001
Yukon (New Fibre)	\$4,853	\$1,750	\$74,707	\$4,225	\$18,900
NWT (New Fibre)	\$11,436	\$1,166	\$30,480	\$32,577	\$54,829
Nunavut (New Fibre)	\$49,994	\$-	\$219,517	\$67,878	\$78,774
TOTAL (New Fibre)	\$66,283	\$2,917	\$324,704	\$104,680	\$152,502
GRAND TOTAL					\$651,086

As an alternative, report also examined a Fibre-Build Option (Option 4). In this model, additional fibre links were built in each of the 3 territories, and an assumption was made regarding the existence of both the MVFL project AND the Arctic Fibre Projects.

The costs for these are NOT included.

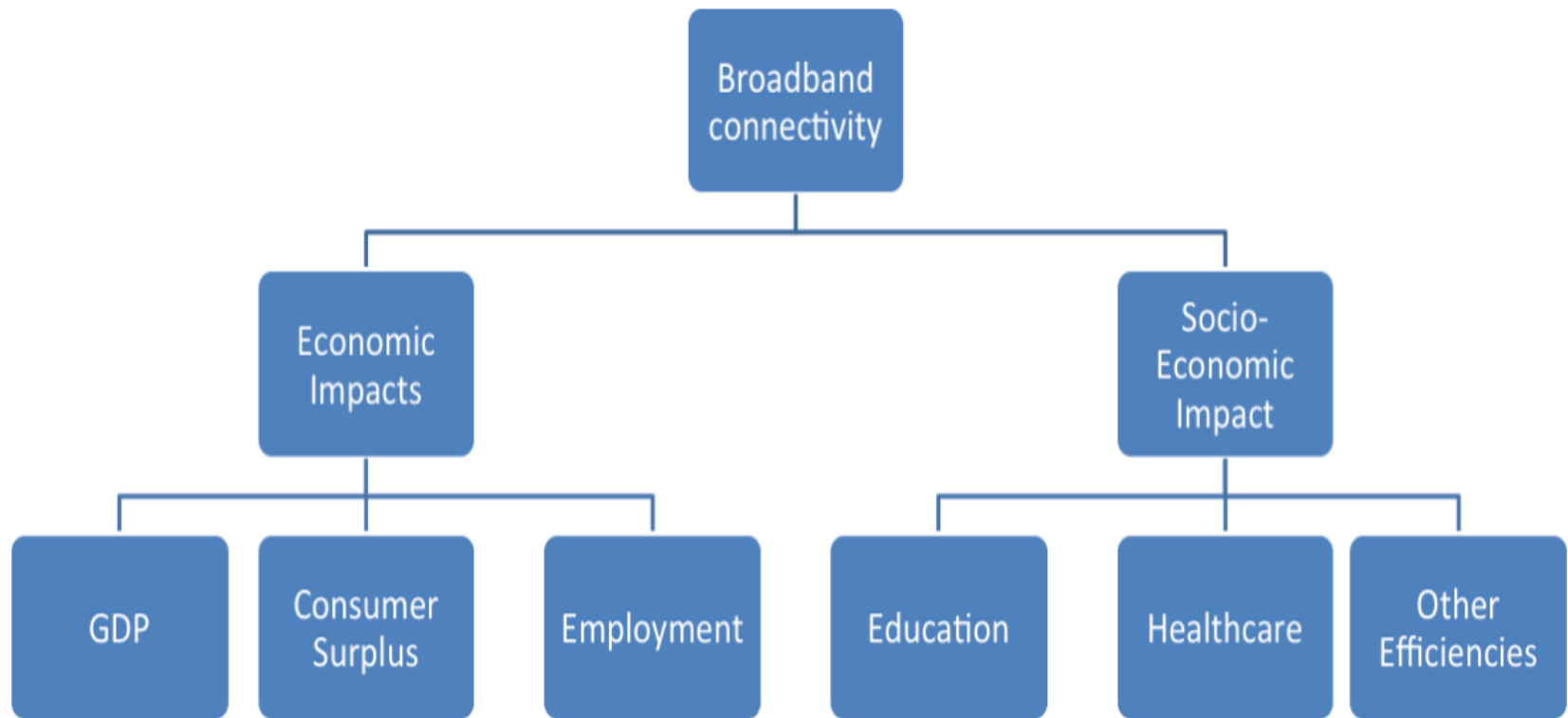
Sustainable Financial Model: Key Tasks & Outcomes



Financial Summary: All Territories Roll-up

	Option 1: Base Network Upgrade (no redundancy)	Option 2: Base Network Upgrade (critical traffic redundancy)	Option 3: Base Network Upgrade (full traffic redundancy)	Option 4: Enhanced Network Upgrade (Option 2 plus new fibre builds)
Primary network upgrade CAPEX costs	\$622,680,444	\$765,001,125	\$2,178,014,035	\$651,085,607
Incremental access network CAPEX	\$16,077,108	\$16,077,108	\$16,077,108	\$16,077,108
Required financial incentive**	\$547,225,182	\$709,376,053	\$1,956,273,320	\$685,746,509
Household subsidies (2016-2023)		\$35,386,472		
Average annual subsidy		\$4,423,308		
Year 2023 broadband penetration (1.5 Mbps+)		94.5%		
Year 2023 ultra-broadband penetration (9 Mbps+)		75.1%		
Year 2013 broadband ARPU		\$60.00		
Year 2023 ARPU (before subsidies)		\$97.25		

Social and Economic Analysis: Methodology



Consequences of Enduring Limited Connectivity

- The critical need for connectivity in the Territories as well as the significant social and economic consequences of current lack of connectivity on specific user groups are detailed in Chapters 2 and 4.
- Going forward - in the absence of connectivity improvements - these impacts will be ever more pronounced including:
 - Reduced economic growth;
 - Lower territorial tax base;
 - Stagnant or lower household income and fewer jobs;
 - Impeded competitiveness and business development of the Territories relative to southern Canada;
 - Reduced ability to attract new capital into critical resource and transportation projects;
 - Overall negative effect on quality of life, while improvements are made in the rest of Canada; and,
 - Significantly reduced ability to attract and retain talented workers and their families, characterized by an even more unstable workforce.

Economic Impact Summary

Territory	Type of Impact	2016-2023
Yukon	GDP	\$174.9 million
	Employment (Min.-Max.)	68-220
	Fiscal Impacts	\$9.86 million
	Consumer Surplus	\$51.6 million
Northwest Territories	GDP	\$294.2 million
	Employment (Min.-Max.)	109-238
	Fiscal Impacts	\$22.3 million
	Consumer Surplus	\$55.8 million
Nunavut	GDP	\$133.1 million
	Employment (Min.-Max.)	72-178
	Fiscal Impacts	\$5.45 million
	Consumer Surplus	\$26.4 million

Broadband Implementation Task Force: Key Activities

1. Broadband Implementation Task Force: 1.1 – 1.2 Joint Federal and Pan-Territorial Mandate

2. Project Gating Committee

2.1 Clarify financing

2.2 Clarify operational model

2.1.1 Determine public sector matching funds

2.2.1 Establish criteria

2.1.2 Determine role of public sector anchor tenants

2.2.2 – 2.2.4 Preliminary consultations

2.2.5 Milestone: Satisfy Project Gating Requirements and Proceed to Implementation

3. Implementation Committee

3.1 Engagement

3.2-3.3 Selection Advisory

3.1.1 – 3.1.4 Market intelligence (RFI)

3.2.1 Manage RFP (RFEI, RFQ)

3.1.5 – 3.1.8 Community outreach

3.3.1- 3.3.3 Provide technical assessment

3.3.4. Milestone: Select Winning Proposal and Proceed to Regional Project Commencement

4. Oversight Committee

4.1 Regulatory context

4.2 Long term evaluation

4.1.1 Clarify role of subsidy

4.2.1-4.2.4 Evaluation frameworks

4.1.2 Determine role of consumer incentives

4.2.5 Synthesis and reporting

Broadband Implementation Task Force:

Recommendation 1: Establish a high level Broadband Implementation Task Force.

The key roles of the Task Force would be to:

- Clarify joint federal and pan-territorial funding commitments and preferences; And provide guidance in the application and adaptation of strategy;
- Direct implementation and stakeholder engagement activities around **regional projects** and pan-territorial concerns;
- Provide continuity and corporate memory, financial and governance oversight and reporting back to government and other stakeholders on matters critical to the joint federal and pan-territorial mandate.

To achieve accessible, affordable, adequate and adaptable communications infrastructure in the three Territories.

Broadband Implementation Task Force:

Task Force Representation and Leadership:

Federal roles

- By size of northern staff and program needs, e.g.,
 - AANDC
 - RCMP
 - DND/JTFN
- By strategic role, e.g.,
 - CanNor, Shared Services
- By historic policy role and funding envelope, e.g.,
 - Industry Canada

Territorial roles

- By embeddedness in project regions:
 - GYT
 - GNWT
 - GNT
- By technical competence, e.g.,
 - Community Services (YT), Tech Service Centre (NWT), CGS (NT)
- By program needs
 - health, education, corporate

Let territories lead regional projects, but share strategic resources, communicate needs, and report back to the TF at large... We suggest the NCIS-WG as a prototype for the TF

Conclusions & Recommendations

- **Minimum service standard of 9 Mbps recommended based on User Needs Analysis across various user groups.**
- **Sustainable financial model for enhanced connectivity created based on network models including:**
 - \$765 million (baseline model focusing on upgrades)
 - \$651 million (alternative model assuming existence of fibre new projects)
- **Economic and socio-economic benefits of enhanced bandwidth:**
 - **GDP total:** \$602.2 million (impact for all Territories)
 - **Fiscal Impacts:** \$37.61 million (impact for all Territories)
- **Practical 'way forward' pathways have been mapped for implementation and engagement of stakeholders, with corresponding financing required.**
- **The infrastructure and costing model is robust and interactive and should be updated periodically in light of changes in technology, applications, and cost.**

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