Northern Lights Conference – Ottawa 2012

"Moving Toward a Reliable Northern Network"

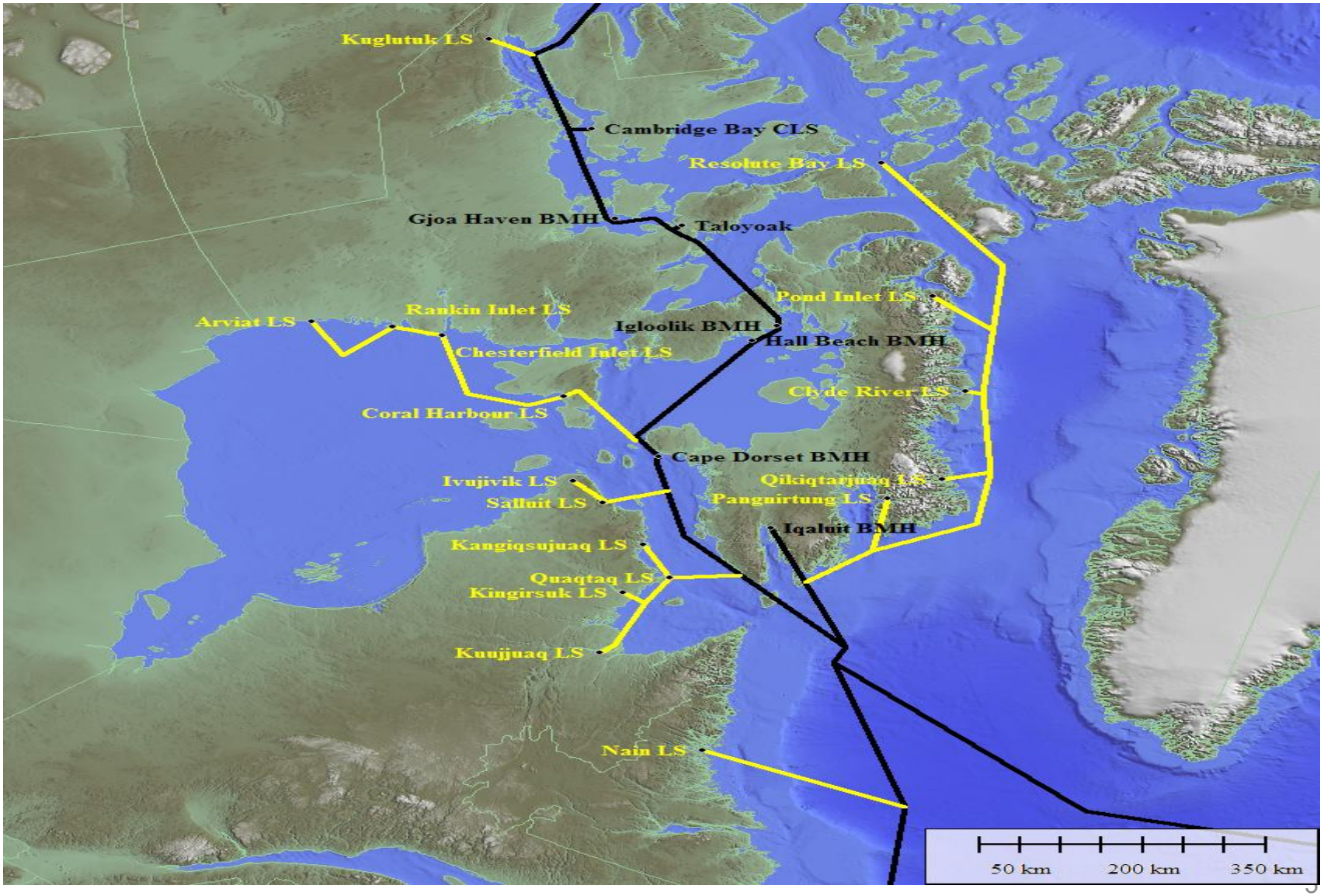
Why? Iqaluit had no Bandwidth October 6, 2011

Why ? The Rationale for Arctic Fibre

- Create a physically diverse 15,686 km. route from Japanese/Korean/Northern Chinese markets to Europe avoiding problematic Luzon Strait, South China Sea, Suez Canal and Mediterranean subsea issues.
- Reduce the physical routing risk from earthquakes in Western Pacific and Mediterranean as well as cable cuts or political unrest in the Suez Canal region.
- Eliminate the need for transAmerica or transSiberia terrestrial crossings and political/ security risk concerns of Asian and Middle Eastern carriers at U.S. Cable landing stations
- Provide the lowest latency route from Shanghai, South Korea and Japan to London 168 (ms) coveted by financial services clients and video-intensive services.
- Bridge the digital divide between Alaskan and Canadian Arctic communities and the south by displacing temperamental satellite feeds north of 64 degrees north.
- Provide virtually **unlimited bandwidth** for Alaskan and Canadian communities to address the many intra-territorial and federal issues identified in the *Arctic Communications Infrastructure Assessment*, including CHARs and CFB Cambridge Bay
- Satisfy 52% of Nunavut telecommunications demand; secondary network reaches 89%.

Where? Tokyo to NYC & London

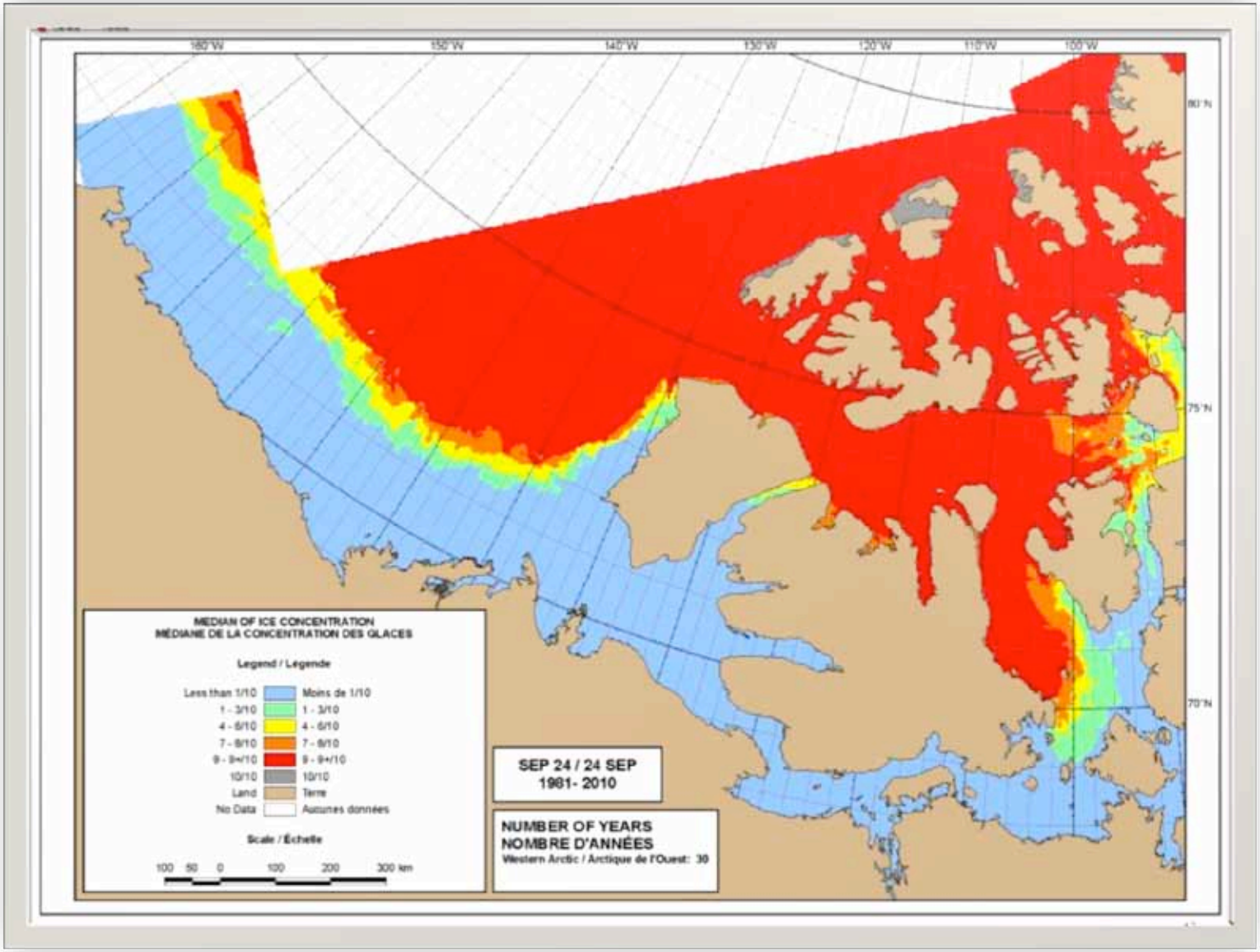
Primary and Secondary Networks



When? Past Arctic Telecommunications Efforts

- Original BT "Project Snowboard" subsea fibre proposals dating back to early 1980s were abandoned due to proliferation of transAtlantic and transPacific crossings."
- The Alaskan-based **ArcticLink** $1.2 billion project through the far North West Passage was promoted on the basis of U.S. Broadband stimulus funding ($350 million) which never materialized.
- **The Polarnet Project** is proposing a $860 million Russian-financed system (RUTACS) from Bude, UK through Murmansk, north across the Siberian Sea through the Bering Strait south into Vladivostok and south into Tokyo.
- **Arctic Fibre** is a $640 million Canadian-led initiative through the southern Canadian portion of the Northwest Passage to achieve economies of scale by providing bulk bandwidth between Northern Europe and Japan with the need to provide primary bandwidth to citizens in remote Arctic communities and to the Canadian Government.
- Any northern project requires profitable domestic demand because international commodity pricing across the transAtlantic-US-transAtlantic routes cannot support capital expenditure.

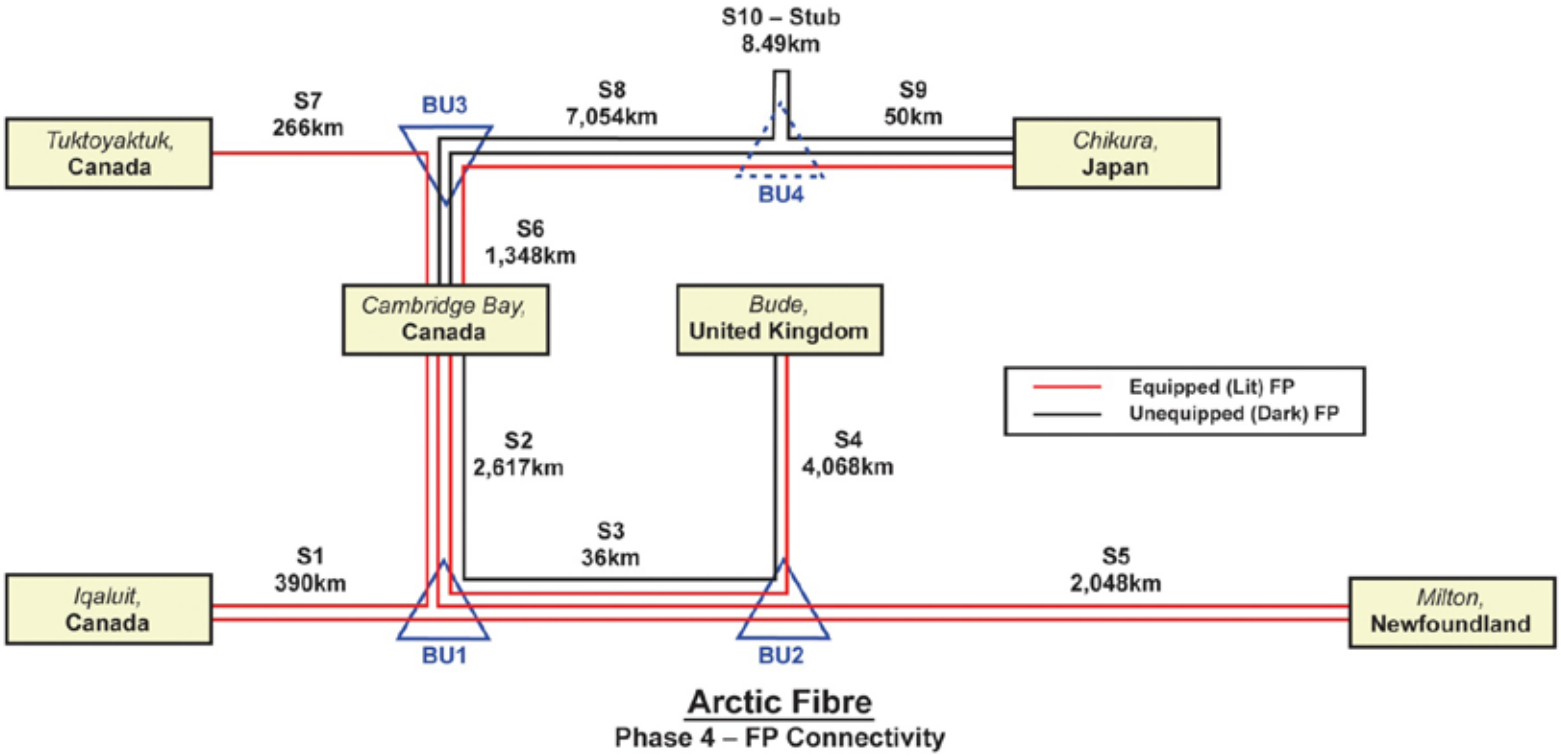
When? As Mother Nature permits!



When? Lay Cable When the Sun Still Shines!

- Along most of the Northwest Passage (southern route) route, the sun shines 24/7 from early June to late July. The ice now melts long enough for Arctic Fibre to have an ice-free window from August 20th until October 5th either side of the Boothia Peninsula.
- Global warming has shrunk polar ice cap to point by 40% from 1968-2010.
- Ice thickness in Arctic Fibre's marine routing reaches maximum 2.6m thickness vs. 3.2m in 1971.
- **ArcticLink** routing through northern portion of the Northwest Passage crosses permanent polar ice cap and would require icebreakers.
- Siberian ice now melts sufficiently to enable **Polarnet** Project installation: concerns exist about ice ridge damage to cable in shallow Siberian waters.
- In 2003 Tyco built SSOTS 2,800 km from Norway to **Svalbard** Islands (78 N) without incident or subsequent technical issues.
- In 2009 **Tele-Greenland** constructed Newfoundland-Greenland segment to Nuuk (64N). No issues in "Iceberg Alley" but iceberg incident within Nuuk, Greenland harbour being rectified with horizontal drilling.
- Offshore pipelines buried off Alaska North Slope for decades without incident.

Network Schematic



When? Phase One RFS November 2013

When? Entire Network RFS November 2014

How? Over Engineer for Highest Risk Factor

How? Arctic Challenges and Risk Mitigation

Challenge	Scope	Risk Mitigation
Icebergs	Greenland icebergs 80-170m deep	Routing is 600-3500 m deep in Davis Strait
		Ice Scour study integral part of marine survey
		Burial to 3m where required
		Deepwater approach to Milton CLS
		Satellite monitoring of bergs
Bergy Bits	Smaller icebergs (depth to 20M) can scour	Choose deepest routing > 50m depth
	seabed to 1.0-1.5 m	Burial in all prone waters <40m depth
		Avoid nearshore ridges, shoulders
		Double-armored fibre in ice-prone waters
		Rock armour where appropriate
Ridge Ice Scouring	Ice ridges to 18 m deep, scour depth 1.2m	Select deepest routing > 50m depth
(bummocks)		Burial in all prone waters <40m depth
		Choose wind-protected shore approaches
		Rock armour where appropriate
Ice Covering	Approx 37% route ice-covered >5 months	Enlist icebreaker support with ROV capability
(seasonal)		Utilize Canadian Ice Survey, C-CORE data
		Minimize ice-covered route
CLS Approaches	Landing at Cambridge Bay CLS	Choose deepest routing > 50m depth
	Approaches at Taloyoak, Boothia Ithmus	Horozontal drilling to 40 m
		Duplicate, disparate shore approaches

How? Risk Mitigation continued

Remote Spur Breaks	Between 11-14 Arctic community spurs	Utilize deepwater Bus and spurs
		Distinct fibre pair from express routes
		Horozontal drilling to 40 m depth
		No service to vulnerable communities
Electrical Supply	Lacklustre, spikey supply in remote hamlets	End feed from Tokyo, Cambridge Bay, Bude
		DND multiple backups at Cambridge Bay
		Insulate festoon system from express
Amplifier Failure	34 %subsea plant inaccesible 7 months p.a.	Ensure amplifer spacing is adequate
		Minimize spur amplifiers
		Employ flexible OADM design
		Utilize proven technology
Maintenance Interval	34 %subsea plant inaccesible 7 months p.a.	Over design and over build
		Join Pacific and Atlantic mtce associations
		Enlist icebreaker support with ROV capability
		Adapt local shallow-hulled vessel for repairs
Other Physical Threats	Trawling	Little trawling in ice prone Arctic
	Anchorages	Proactive charting and communications
		Establish "No Anchor" zones
		Proactive Canadian Coast Guard program
	Seismic	Install BU offshore Japan for China link
		Take wider SE approach to Japan fault zone
		Few seismic issues in Arctic
	Pipelines	Avoidance or burial where appropriate
		Learn from Beaufort experience

Ice Scour Risk and Mitigation											
Region	Length	Seabed Depth			Ice	Ridge	Maximum	Margin	Scour	Risk	Ice
	km	Shallow	Deep	Average	bergs	Ice	Keel	(Shallow-	Depth	Level	Bound
		(m)	(m)	(m)			(m)	Keel) (m)	(m)		(weeks)
NORTH PACIFIC/BERING SEA	5,803	n.a	n.a	n.a	No	No	0	n.a.	0.0	Low	0
BERING STRAIT/CHUKCHI SEA	982	42	65	45	No	Yes	12	30	1.0	Low	20
ALASKA NORTH SLOPE	879	200	1850	500	No	Yes	27	173	0.8	Low	32
BEAUFORT SEA (CANADA)	213	221	1830	340	No	Yes	30	191	1.0	Low	31
ADMUNSEN SEA/CORONATION GULF	1,052	120	567	310	No	Yes	16	104	0.3	Low	32
SPENCE BAY/CAMBRIDGE BAY	627	24	100	50	No	Yes	10	14	0.3	High	38
BOOTHIA GULF	592	41	260	70	No	Yes	8	33	0.5	Moderate	44
FOXE BASIN	688	40	210	125	No	Yes	10	30	0.6	Low	38
HUDSON STRAIT	890	165	650	250	Limited	Yes	40	125	3.0	Moderate	26
NORTH ATLANTIC	4,189	600	3800	1800	Yes	No	540	60	4.0	Low	0
LABRADOR SEA/NEWFOUNDLAND	1,787	155	3620	2800	Yes	Limited	70	85	1.0	Low	0

What? Network Design and Connectivity

•**Three** intercontinental **pairs** with **80** wavelengths at **40** Gbps = **9.6 terabits** total capacity, upgradeable to 100G. Additional festoon pair with similar capacity 80x40Gbps=3.2 terabits.

•AFI-1 and AFI-2 are two express fibre pairs from Tokyo-London without terrestrial landings with AF-3 being express pair between Tokyo and Newfoundland (with onward connection to New York City).

•AFI-4 (in the same cable sheath) will be festoon system with spurs to:

Alaska – Gambell, Nome, Point Hope, Wainwright, Barrow, Prud

Canada–Tuktoyaktuk, Cambridge Bay, Goja Haven, Taloyoak, Igloolik, Hall Beach, Cape Dorset, Iqaluit

•Arctic spurs segregated electronically and electrically so express backbone survives any nearshore incidents. Duplicate, but geographically-separate landing approaches at Cambridge Bay and Taloyoak dramatically reduce prospect of backbone network failure.

•Cable landing points in Bude, United Kingdom and Chikura, Japan facilitate access to other international and domestic networks in Europe and North Asia.

•Offshore BU stub SE of Japan will eventually connect to Chongming (Shanghai) and reduce seismic risk.

• Eventual mesh ring connected through Tuktoyaktuk, NWT and Prudhoe Bay, Alaska will provide terrestrial links to North American networks.

Project Economics

- No government subsidy required on backbone network; just carrier commitments and government bandwidth lease at CFB Cambridge Bay, CHARs and Inuvik Space Station. International carriers absorb significant portion of Canadian costs.
- Nine times bandwidth for same outlay as satellite expenditure.
- Secondary Network will require government capex contribution or subsidy.

Project Summary

Segment	Start Point	End Point	Capital Cost	Revenue Reqm't	Gov't or Car Funding Rec
Primary Network					
One	Milton, NL	Iqaluit, NU	$67.3	$12.2	$0.0
Two	Segment One UBU	Cambridge Bay, NU	$134.6	$23.0	$0.0
Three	Cambridge Bay, NU	Tuktoyaktuk, NT	$67.2	$12.1	$0.0
		Canadian Total	**$269.1**	**$47.3**	**$0.0**
Four (East & West)	Frobisher Bay-UK	Tuk-Alaska-Japan	$306.3	$55.9	$0.0
		Primary Total	**$575.4**	**$103.2**	**$0.0**
Secondary Network					
Five	Segment One UBU	Nain, NL	$13.5	$2.3	$2.3
Six	Segment Two UBU	Kuujjuaq, QC	$45.4	$8.5	$8.5
Seven	Segment Two UBU	Arviat, NU	$47.9	$9.3	$9.3
Eight (main)	Frobisher Bay UBU	Pond Inlet NU	$54.6	$9.6	$9.6
Eight (extension)	Pond Inlet NU	Resolute Bay, NU	$30.6	$5.5	$5.5
		Secondary Total	**$192.0**	**$35.2**	**$35.2**

Who? Corporate Structure and Governance

•Arctic Fibre Inc. is incorporated within Province of Ontario, Canada to hold assets within Canada and its territorial waters to comply with Telecommunications Act foreign ownership restrictions.

• International segments will be owned by Bermudian or Barbados company to facilitate low-tax treatment.

•Hybrid ownership consisting of Canadian financial institutions, pension funds, territorial development corporations and management. International carriers permitted to own IRUs or minority equity interest.

Current Board includes:

Chairman – The Hon. James Farley QC, Counsel to McCarthy Tetrault, has extensive telecommunications experience both as an investor to fibre projects and as a bankruptcy court judge.

President – Douglas Cunningham, has 40 years telecom investment experience and has launched or financed such projects as TeleBermuda, GlobeNet Communications, Antilles Crossing, TeleBarbados and TeleCayman and North Atlantic Fibre.

Director – Jim Meenan, is a former President of AT&T Canada, CFO of AT&T Long Distance and until recently was a Director of 360 networks.

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