

NBNCBC Regional Middle Mile

Backbone Fiber Project

Segments #3 & #4

Feasibility Analysis

By

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Overview

The **NBNCBC Regional Middle Mile Backbone Fiber Project Segments #3 and #4** feasibility analysis was designed and estimated during May/June 2016 based on a request and information received from the North Bay North Coast Broadband Consortium. The intent is to provide an order of magnitude investment level with sufficient detail regarding the specific routes to develop a realistic and workable plan for providing high-speed digital connectivity between 22 North Bay and North Coast communities. It is based on a field survey conditions assessment, satellite mapping for distances, routing, equipment locating and experience regarding design and cost estimating. Industry standards and current outside plant standard methods were used both to develop the potential design and complete a “budgetary” cost estimate.

The architecture is point to point based with fiber nodes providing access to the backbone fiber route and regeneration, added regeneration points between as required and access locations for testing and future taps as development and public needs occur. The plant is underground with an extra duct for future proof design, maximum reliability and economic scalability. It utilizes a collapsed ring, diverse tube topology to guard against outages and physical disruption. Duplicate electronic and photonic equipment also provide for real time back-up facilities. Finally, emergency electrical power is included with zero emissions, hydrogen generation. This design provides seamless, full redundancy against network failure.

Public rights-of-way are used wherever possible to avoid private land costs and difficulties. Waterways and drainage ditches are avoided for cost and environmental reasons. Further, two construction methods are estimated, off-set trenching and directional boring, depending on relative route congestion, expected soil conditions and service point frequency. The objective is to lower these costs which represent the largest portion of the project. Aerial construction is neither practicable, cost effective or advisable due to large redwood trees throughout, severe coastal winds, esthetics, and the lack of existing aerial routes along these rights of way.

This Network cost projection includes construction, equipment, capital leases related to equipment installations, detailed engineering, permit and environmental factors. It is based on value-engineering design standards which are intended to lower initial investment. These include minimum facility depths, less growth capacity, shorter life equipment, higher designed utilization and additional planned placements for expansion. Fiber leases are based on industry standard costs and are capitalized forward. Electronics are based on Calix at the edge and Cyan for core cost efficiency. Connection costs are separated from

premise passed costs as the former may be strategically deployed on a demand basis. The total capital estimate for segments #3 (39.2 miles) and #4 (219.4 miles) is \$68.1 million.

(1)

Acknowledgement

This estimate represents a high-level, averaged set of computations to determine a “budgetary” estimate of project costs. It is not intended as a bid or quote for purposes of securing labor/material or establishing any contract. Detailed engineering/estimating will be required to determine the specifics of any such binding agreements.

Assumptions and Inclusions

- 1) Amounts and computations are for underground facilities and equipment along the general Hwy 101 corridor north of Santa Rosa to S/O Fortuna (segment #4) and along Highways 37, 29 and 12 (segment #3) Novato to Suisun City. Surface streets are used whenever practicable to avoid State highways. Construction on full freeway is not proposed.
- 2) County roads and streets are assumed build-able with proper encroachment permits, inspection and provisions for traffic control planning.
- 3) Waterways and ditches are not used. Numerous crossings of the Eel and Russian Rivers as well as creeks and streams (segment #4) are involved. Seventy-seven such crossings range from 75 feet to .65 miles. Most are steel beam or poured concrete without ducts due to age and lack of demand. Conduit crossings require conduit attachment. Four major slue crossings are involved in segment #3. They range from 300 feet to .65 miles. All will require conduit attachment and are priced accordingly.
- 4) The middle mile network is a drop and insert design for maximum accessibility, flexibility and efficiency. Equipment maybe relocated

demand fluctuates and move by location.

- 5) All plant is subsurface with splice and service boxes placed in non-traffic locations . Nodes are contained in small service huts.

(2)

- 6) General operating costs (provisioning, maintenance, software upgrades, electricity etc.) are not included.
- 9) All remote powered equipment is equipped with emergency hydrogen Generators..
- 10) Average underground construction cost elements include:
 - a) Structure – 1.25” Cndt/17x30 Serv Boxes/3’x4’ Spl Vaults
 - b) Excavation – Trenching 4”x36”/Boring 4”at Min 30”
 - c) Cable – FO Dielectric – (72 Fiber)
 - e) Average Cost Trench \$32/Ft (Exc Mat)
 - f) Average Cost Bore - \$38/Ft (Exc Mat)

(3)

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Segments # 3 and # 4

Feasibility Estimate Worksheet

June 10, 2016

Segment	Routes	Miles	Plow	Bore	Trench	Micro	Aerial	Towers	Prmts/Env	Engr/PM	Regen	Fiber Hubs	Lease	Mat/Lab	Bridges/RR	Total	Locations
#4	Surface Streets	107.2	NA	\$ 10,776,920	\$4,709,250	NA	NA	NA	\$97,400	\$337,500	\$385,000	\$730,000	NA	\$4,519,260	\$188,500	\$21,743,830	SR to Cloverdale - Frontage Rds/Old Rewood Hwy
	Hwy 101	112.2	NA	\$16,966,884	\$8,312,448	NA	NA	NA	\$204,100	\$562,725	\$385,000	\$825,000	\$542,809	\$4,730,604	\$675,000	\$33,204,570	Richardson Grove Const - Close Redwood Trees
	Total	219.4	NA	\$27,743,804	\$13,021,698	NA	NA	NA	\$301,500	\$900,225	\$770,000	\$1,555,000	\$542,809	\$9,249,863	\$863,500	\$54,948,399	
#3	Surface Streets	20.3	NA	\$1,286,208	\$2,587,728	NA	NA	NA	\$22,480	\$90,000	\$55,000	\$360,000	NA	\$837,417	\$121,000	\$5,359,833	Vallejo to Suisun City - Hwy's 29 & 12 & Cordelia
	Hwy 37	18.9	NA	\$5,508,765	\$775,296	NA	NA	NA	\$46,936	\$118,875	\$55,000	\$90,000	\$302,886	\$778,233	\$90,000	\$7,765,991	Includes Mat & Duct to Novato Train Station
	Total	39.2	NA	\$6,794,973	\$3,363,024	NA	NA	NA	\$69,416	\$208,875	\$110,000	\$450,000	\$302,886	\$1,615,650	\$211,000	\$13,125,824	
Totals		258.6	NA	\$34,538,777	\$16,384,722	NA	NA	NA	\$370,916	\$1,109,100	\$880,000	\$2,005,000	\$845,695	\$10,865,513	\$1,074,500	\$68,074,224	
	(4) (5)												(1)	(2)	(3)		
Segment #4	Airport Rd & SMART Tracks N Santa Rosa to Hwy 36 S/O Fortuna								Notes	(1)	SMART 20 yr Cap Duct	Lease to Santa Rosa & Novato Stations					
										(2)	72 Fiber - 2/1.42 1.25" Duct - 200 17"x30" Pull Boxes						
Segment #3	Hwy 37 Navato to Suisun City									(3)	77 Bridges Seg #4 & 19 Bridges Seg #3						
										(4)	Seg #3 Includes Hwys 12 & 29 - End Pt North Suisun City						
										(5)	Seg #4 Full Fwy Portions are Avoided for Construction						

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