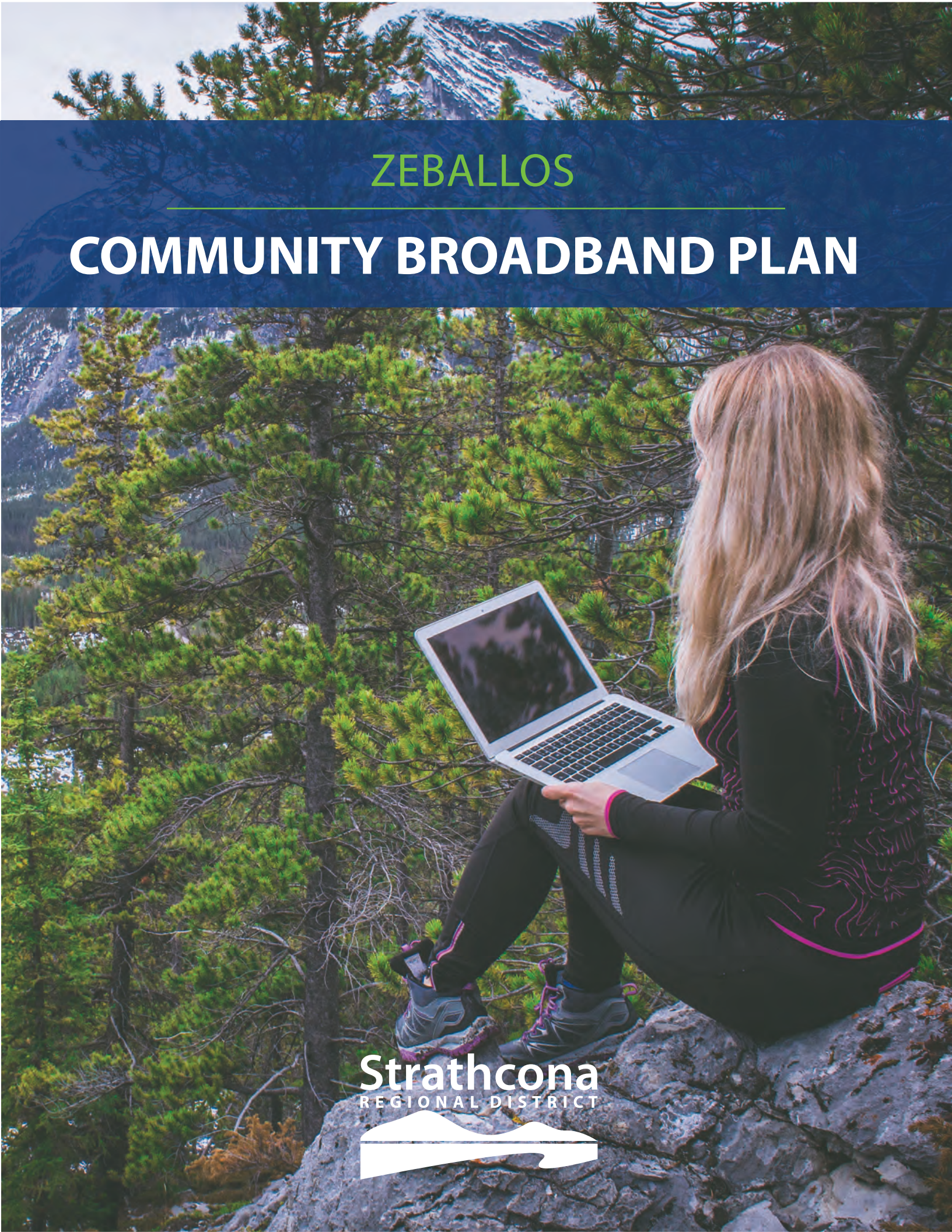


ZEBALLOS

COMMUNITY BROADBAND PLAN

Strathcona
REGIONAL DISTRICT

ABOUT ZEBALLOS

Nestled among towering forest-cloaked mountains, Zeballos sits at the head of Zeballos Inlet, gateway to Nootka Sound, world-famous for salmon fishing and kayaking opportunities.

Zeballos is a remote settlement approximately 190 kilometers NW of Campbell River, located on the far western side of Vancouver Island on the Ehattesaht Chinehkint First Nation territory with a population just over 100 people. The largest age cohort in Zeballos is 15 to 64 years old, comprising of 71.4% of the population. Seniors are the next most populous group, at 23.1%, and the remainder of residents are children. In Zeballos, the median age of the population is 52.8 years old. [1]

Zeballos is both a municipality and a member of the Strathcona Regional District (SRD).

Houses in Zeballos are less expensive than many other island communities. The median value of a home is $120,187.[1] The median monthly cost of home ownership is $352.[1] Median monthly cost is the total cost for a mortgage, property taxes, and the cost of electricity, heat, water, and other municipal services.

There is no or limited cell phone coverage in Zeballos and most residents rely on landlines. Cable, DSL, and wireless internet is available in Zeballos. An individual household can expect to pay between $40 and $130 per month, depending on desired speed and usage.[2] The Zeballos library also provides internet access during open hours. Though not all residents who work from home would utilize home phone and internet, some would.

In Zeballos, 10.5% of the workforce works from home. The median after-tax income of households in Zeballos is $34,240 – significantly lower than the provincial median income ($61,280). Despite relatively low income, Zeballos sees a high employment rate of 73.7% and a similarly high unemployment rate of 13.3%. In Zeballos and neighbouring communities; Ehatis and Kyuquot combined, about 50% of the population works part-time and/or part-year. [1]

Today logging is the mainstay of the Zeballos economy. An ice plant receives and processes a variety of fish through the year, which is shipped to markets throughout Vancouver Island and the mainland.

Zeballos is increasingly becoming a destination for travelers who are looking for the excitement of wilderness recreation activities and for those wishing to learn about and to delve into its gold mining past.

[1] Statistics Canada, Census 2016 – Zeballos (Village)
[2] FindInternet.ca (2019)

CONTENTS

Community Broadband Plan

Telecommunications Infrastructure Assessment

Prepared by:
Elaine Popove - Strathcona Regional District Communications Coordinator (May, 2020)

This project is made possible through funding provided by Island Coastal Economic Trust.

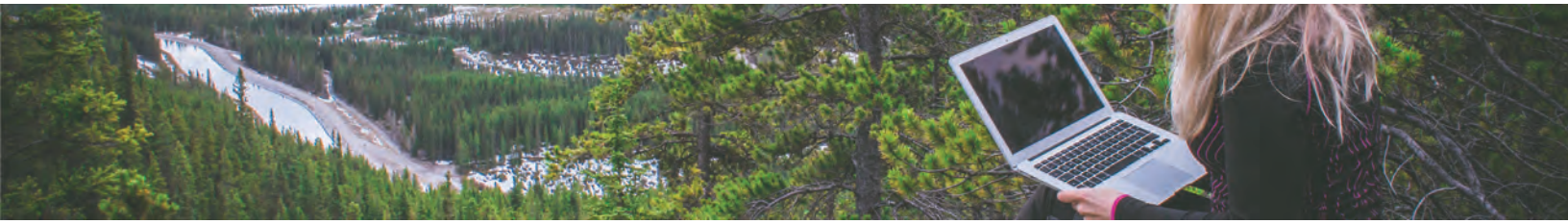
INTRODUCTION

The Strathcona Regional District (SRD) is a partnership of four electoral areas and five municipalities. These communities have relatively small populations and are often separated from each other by undulating landscapes and water.

Of the population of 44,000 residents, most reside within the City of Campbell River. Approximately 12,000 regional district residents live in rural and remote communities spread across a large geographic expanse of approximately 18,500 sq. kms that includes forested hills and alpine areas, islands and remote inlets.

Improved broadband connectivity for rural and remote communities has been a strategic priority of the SRD for several years. There is a significant gap between broadband service levels and affordability in urban areas versus rural areas in British Columbia (Connected Communities in BC, NDIT, 2018). Indeed, many communities within the SRD do not meet basic service levels, if they have any service at all.

Addressing this 'digital divide' will require intensive collaborative effort and multiple funding sources but the benefits are undeniable. It will increase the live-ability of rural and remote communities on Vancouver Island, enabling them to sustain their communities, attract investment and participate directly in social and economic initiatives.



PROJECT METHODOLOGY

The Community Broadband Plans (CBP) project methodology was founded on design principles set-out by Connected Communities BC, weaving together a combination of diverse skill-sets; technical network engineers with community facilitators. 7 communities within the regional district were visited throughout a 2 week block in June of 2019.

Presentations from guest speakers and videos showcasing possibilities for a digital future while gathering ideas from the community about their current state of use as well as plans for housing, economic, environmental and social developments took place.

Information was presented about the SRD's broadband initiatives including the Connected Coast project (V.Smith, SRD), broadband technology and the existing connectivity landscape (D.Sinclair, Driftwood Communications), Innovate BC inspiration (G. Truax, Innovation Island) and the provincial Connected Communities program (C. McCormick and J.Wilkins, Ministry of Citizens' Services). A video produced by Connected Communities, showcasing how improved connectivity has been useful in Haida Gwaii was also shown.

An open discussion followed and participants provided a great deal of information about the current state of connectivity in their community as well as how improved broadband might be utilized to address community challenges and opportunities.

DIGITAL ASPIRATIONS

A Community Broadband Plan forum was held on June 6th from 4:00 – 6:00 pm at the Town Hall in Zeballos. The forum was promoted as a 'Let's Connect' workshop advertised by posters hung in high traffic locations throughout the community and online via local social media channels and community websites.

The workshop was 2 hours in length with the first hour consisting of presentations, technical info and a Connected Communities video was featured while the second hour included an open forum.

How would improved broadband address community challenges and opportunities in Zeballos?

Provide Continuous Healthcare

- Access to a Doctor, get a prescription and fill it – all without leaving the community
- Limited Telehealth exists; need better connectivity and more programs
- Need real-time video without lag
- Speech therapy services are from a different school district - Port Hardy; creates a disconnect for service users

Still Feel Rural; but Not Isolated

- Youth learn together; online interaction among kids in different communities
- Increase perspectives and awareness of other points-of-view while learning and interacting online
- Need real-time without lag

Become a "Service BC" Community

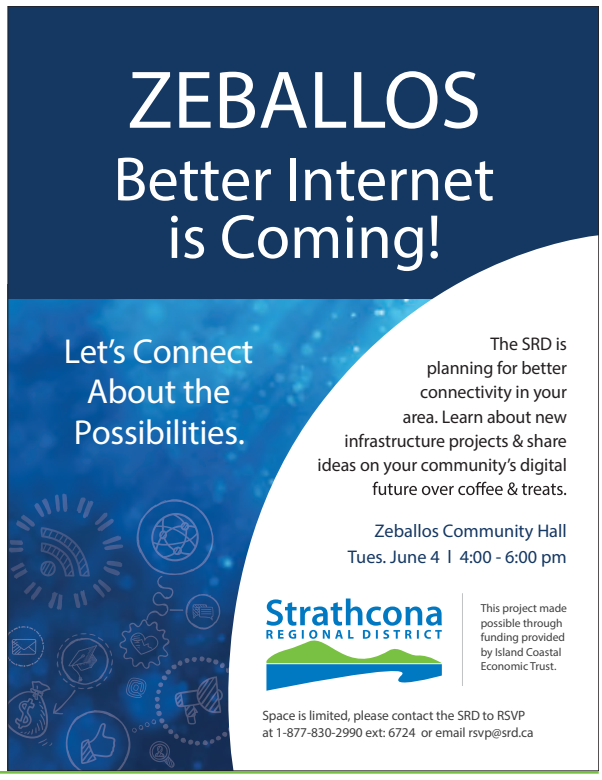
- Electronic access to services offered by Service BC
- Minimize travel out of town

Improve Community Identity

- Currently known as 'People of the Valley'
- 100 people in Zeballos vs 200 in the Valley
- Mostly fishers, visitors & loggers (seasonal)

Provide Remote Office Opportunities

- Currently not feasible due to bandwidth speeds



DIGITAL ASPIRATIONS (cont.)

Improve Collaboration & Joint Economic Development

- Regional focus
- First Nation growth plans; subdivisions happening
- More joint sustainability planning (with Zeballos, Kyuquot, Ehattesaht Chinehkint First Nation and Oclucje communities)

Improve Local Government Capacity

- Reduce reliance on Municipal Staff
- People go to municipal hall/staff to solve everyday problems that can be searched online. (For ex. Where can I get a flat tire repaired?)
- These requests take away from important matters which adds to a capacity issue
- Help the community plan ahead; Official Community Plan requires updating

Help Economy

- Opportunity for two people in a family to work
- Fish Farming
- Multi-use trail from Zeballos to Tahsis (idea stage)

Improve Regional Growth & Housing Shortage

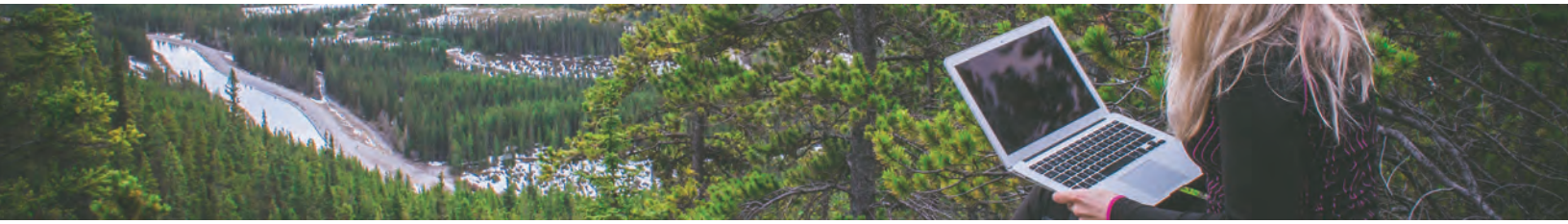
- Former residents aged-out, homes purchased as summer properties; empty part of the year
- RV parks filled with seasonal forestry workers; excluding tourists
- Lots of development in Ehatis Nation, local and regional growth imminent
- Demand for restaurants, hotels, stores - where will they all go
- Services anticipated to increase

Reduce Climate Change Impacts

- Less travel; is a good thing for climate change
- Currently it's an 8 - 9 hours road trip just to get groceries and household items which can potentially be purchased online

Improve Safety

- Need computers in fire trucks to gain access to information to make immediate decisions
- Dispatchers need to be able to track location and movement of emergency vehicles (fire trucks and ambulances) for support and safety of workers and patients
- Tsunami zone and notifications to make community less vulnerable
- Need cell service from Zeballos to Island Highway, as well as Fair Harbour



CONCLUSION

The information gathered from the Let's Connect CBP forums has created a unique snapshot of the community's digital readiness and aspirations.

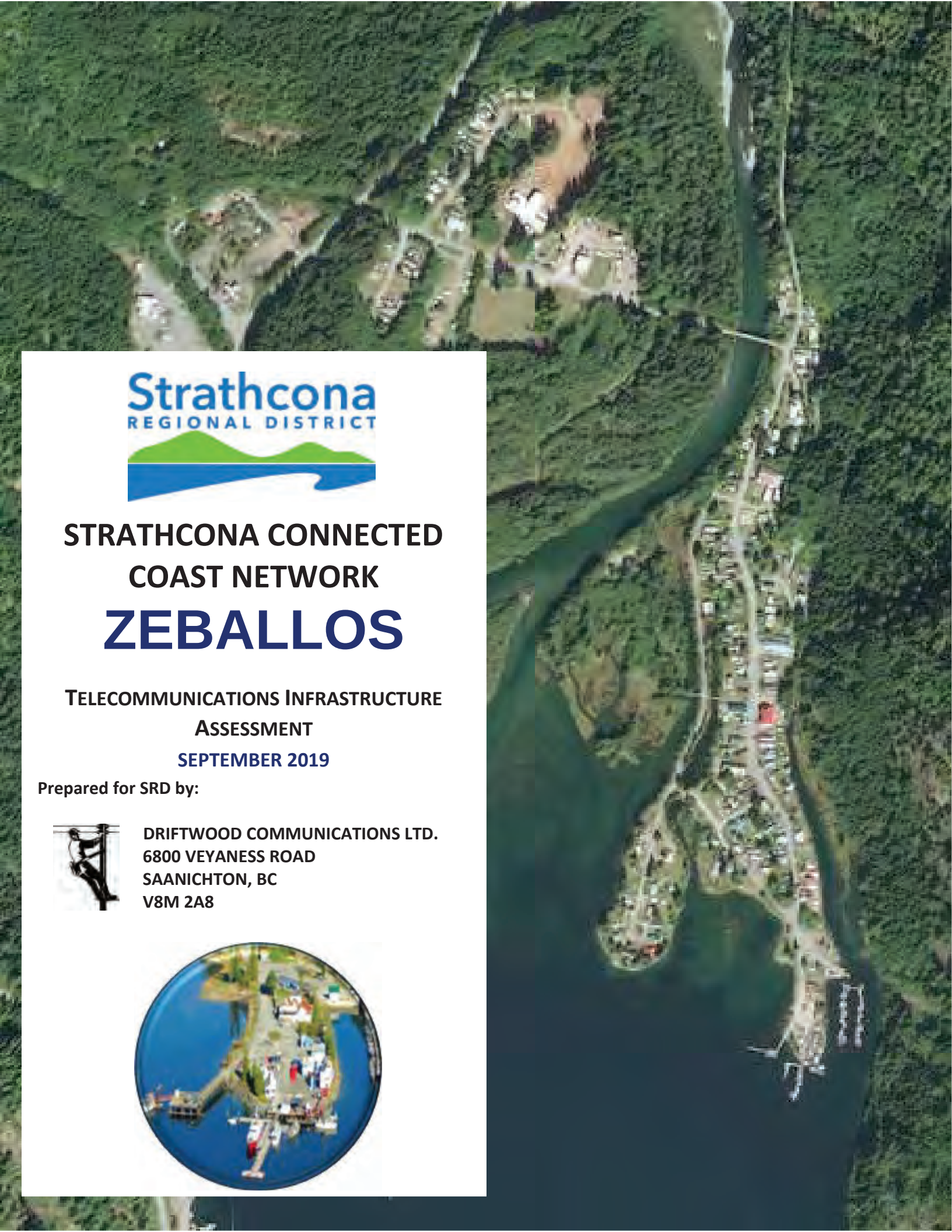
The world is increasingly 'online' bringing opportunities for information exchange, social connection, improved service delivery and income generating opportunities along with it. In the Regional District, improved connectivity will allow residents in rural and remote communities access to essential services, participation in the modern economy and civic life.

New economic development opportunities will allow residents to work remotely and participate on e-commerce and online business development. Access to phone and internet services is necessary for reasons related explicitly to health – including access to health and emergency services and opportunities for telehealth – but also to meet other needs as aforementioned. Improved internet connectivity will also significantly enhance the ability to take part in civic and social participation, education and professional development, improve connection to friends and family, and entertainment, among others.

For some residents, this can mean the difference between staying and improving the capacity in local communities versus having to move or board elsewhere which can be prohibitive.

This snapshot will be provided to last-mile broadband infrastructure solution designers to develop a plan based on the community snapshot along with analysis of the community's topography, climate, housing density, location of key institutions.

In this way, the infrastructure is informed by the community aspirations amongst other important technical considerations.



Strathcona REGIONAL DISTRICT

STRATHCONA CONNECTED COAST NETWORK

ZEBALLOS

TELECOMMUNICATIONS INFRASTRUCTURE ASSESSMENT

SEPTEMBER 2019

Prepared for SRD by:

DRIFTWOOD COMMUNICATIONS LTD.
6800 VEYANESS ROAD
SAANICHTON, BC
V8M 2A8

Purpose of study and methodology

The SRD engaged Driftwood Communications to provide an understanding of the current connectivity landscape in Zeballos and to investigate any improvements required to last-mile infrastructure in order to better serve the community. Suggestions for last-mile improvements must consider the proposed new high-speed capacity link being planned for Zeballos through Connected Coast project, as well as responding to the community's digital aspirations.

Methodology

A visit to Zeballos was completed on Tuesday, June 4th, 2019

A general survey of the area was conducted to identify:

- the proposed fibre landing location
- existing utility infrastructures, conditions and capacities
- existing ISP infrastructure
- potential anchor tenant locations
- potential opportunities

Interviews with the local ISP were undertaken to further understand their existing capabilities and where the gaps exist to achieve the targeted service levels.

A representative from Driftwood participated in a community Let's Connect forum in Zeballos on June 4th. The purpose of the forum was to share the Connected Coast plan and what benefits it could bring to the community. Driftwood delivered a presentation of the various types of technologies that could potentially be deployed to provide these services. The open forum also provided the important opportunity for community members to share any concerns they may have had about any particular delivery method or any specific need within their community.

Observations and information gathered was then analyzed by our staff to determine what potential options could best meet the objectives of providing the desired service levels to the community.

Connected Coast Submarine Fibre Routes

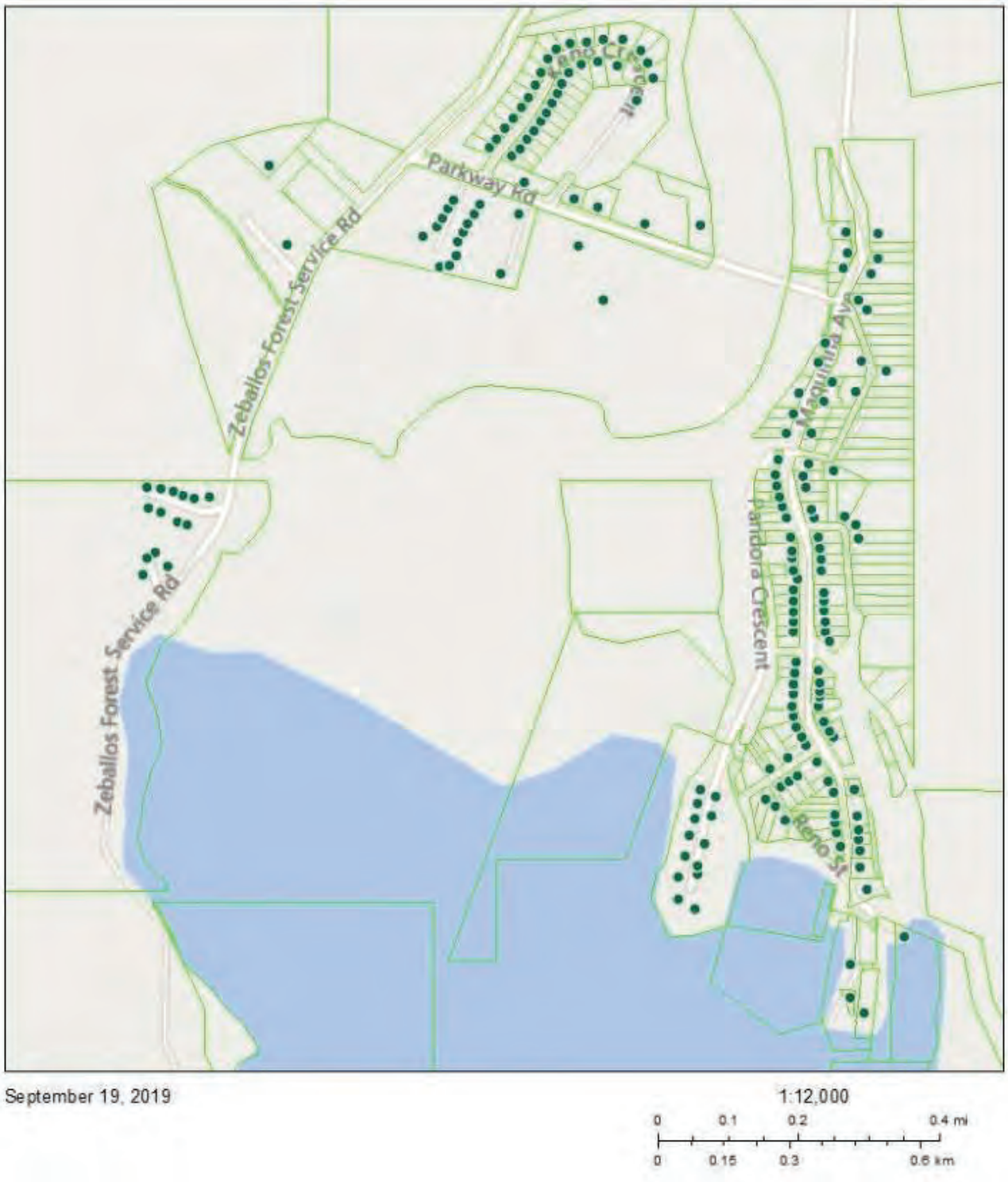
Connected Coast - Proposed backbone submarine fibre path and landing points
(Estimated Completion 2021)
Green = Main Submarine Fibre Red = Branch Submarine Fibre to inland communities

Proposed Submarine Landing location

Connected Coast Terrestrial Fibre Routes

Connected Coast submarine fibre landing site at Zeballos and terrestrial fibre build
Red Line = Submarine Fibre Yellow Line = Terrestrial Fibre

Population & Address Density



● **ADDRESS LOCATION**

Description	Quantity	Source
Population	107	Village of Zeballos 2019 Annual Report
Addresses	179	Address BC
Estimated Buildings	149	2019 Google Earth – Manual Count
Report Number Used	164	Average of addresses & buildings viewed

Site Visit Observations

Utility Service Provider	Services
RECNS - Ragged Edge Community Network Society	Wi-Fi Internet
Xplornet	Satellite Television and internet services
TELUS	Landline Telephone
BCHydro	Electricity

Existing Support Structures

Utilities in the community are provided via a Joint Venture aerial pole network owned by BCHydro and TELUS. It appears that many poles have been upgraded in recent years with those viewed to be in good to excellent condition. The presence of a Coaxial Cable Network was also identified; this is an abandoned system, no longer operating.

Existing Wireless Structures

The existing ISP RECNS offers internet services through a WIFI network consisting of towers and building mounted masts with WIFI antennas.

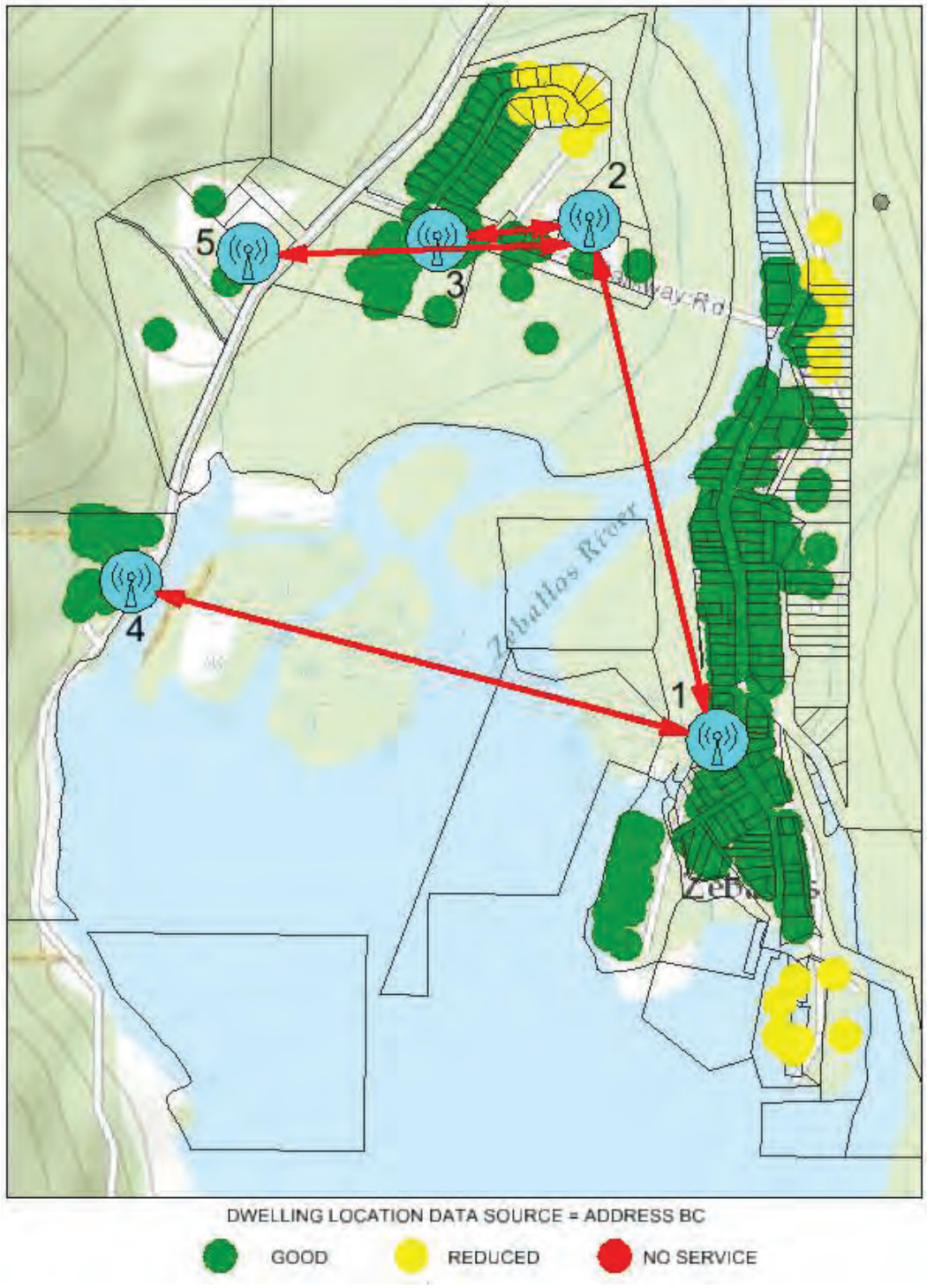
#1 - Fire Hall - RECNS Wi-Fi ISP Location and Tower

#5 - First Nation Tower connected with RECNS

#2 - RECNS Building Mount Antennas Parkway Road

#3 - RECNS Building Mount Antennas RV Park Parkway Road

RECNS – Service Levels



Information Provided by local ISP

RECNS NETWORK - ——— - General Service Area	
1	30m Tower and Equipment at the Fire Department location
2	Building Mounted Mast Located on Parkway Road
3	Building mounted mast located on building in RV Park on Parkway Road
4	Building mounted mast (No Photo Available)
5	30m Tower and Equipment on the First Nations land

Existing TELUS Structures

Micro-wave Receiver/Transmitter point that is part of the same network that feeds to Kyuquot. Limited TELUS fibre exists on the pole line that serves locations including the Ambulance station and Health office.

Along the pole line TELUS has copper cables that are providing a land-based telephone system to the residents.

We also noted they have fibre routed on the strand however it was not determined their exact destinations.

TELUS provides internet service bandwidth via fibre on the pole line, this is fed to the local ISP – RECNS.

TELUS fibre and fibre splice on Parkway Road

TELUS Microwave Site on Maquninna Avenue just north of the firehall

Existing Connectivity

Presently there are two Internet service options for the community of Zeballos.

1. Wi-Fi Internet through the community based RECNS

   Connectivity for RECNS is currently provided through TELUS' existing microwave network system.

   TELUS currently provides a 30 Mbps input connection in place.

   There is an upgrade in progress that will increase the current input connection to 100 Mbps.

Package	
Download	25 Mbps
Upload	12 Mbps

Actual WIFI service levels are subject to several conditions that will have a varying impact for each customer location and the subsequent actual speeds both up and down experienced.

2. Satellite internet through Xplornet
   up to 25 Mbps

Packages	**SAT 5**	**SAT 10**	**SAT 25**
Download	5 Mbps	10 Mbps	25 Mbps
Upload	1 Mbps	1 Mbps	1 Mbps

Satellite signals are also subject to weather conditions that will cause periods of degradation in service levels

Delivery Methods Comparisons

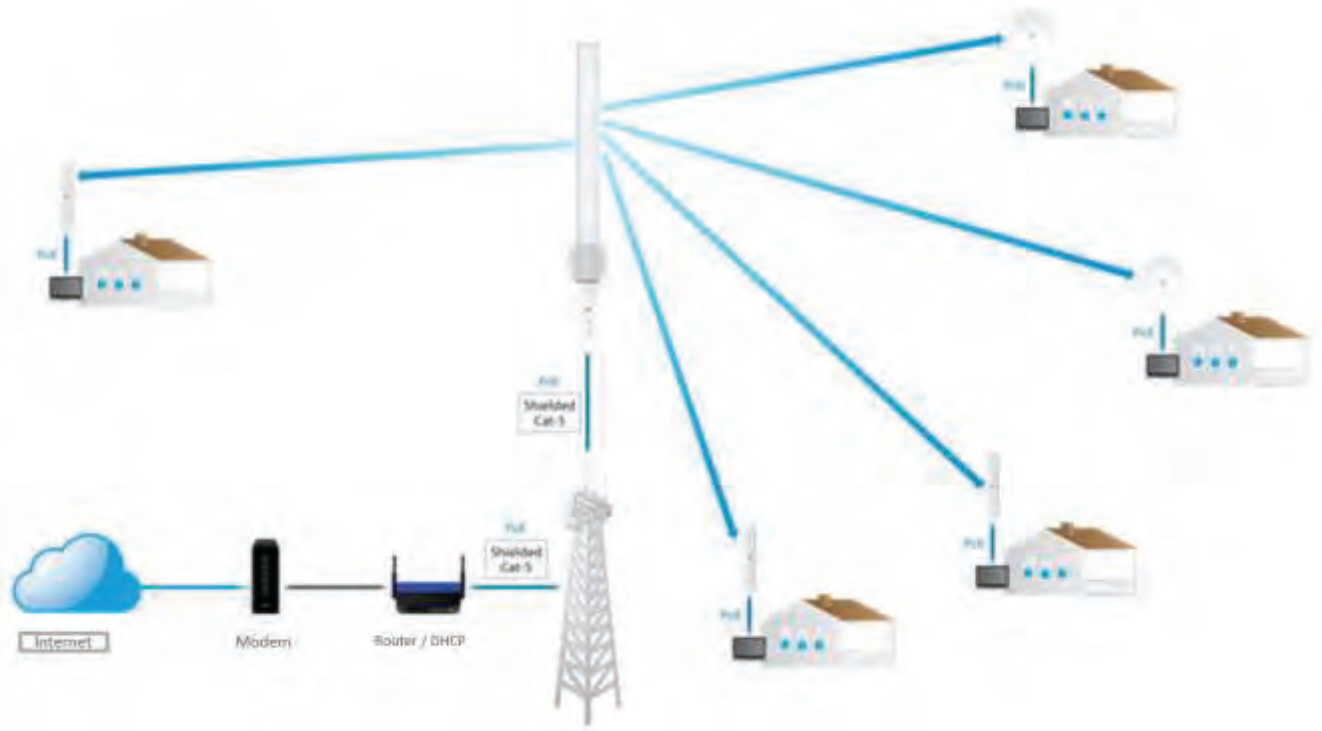
	F.T.T.H. Fibre to the Home	HFC or Coaxial Cable Network	WIFI Wireless Network	Satellite
Current Industry Offerings	Download/Upload 940 Mbps / 940 Mbps	Download/Upload 1Gbps / 125Mbps	Download/Upload 25 Gbps / 12 Mbps	Download/Upload 25Mbps / 1Mbps
Future Planned Offerings	Virtually Unlimited	10 Gbps/10Gbps	Unknown	Unknown
Build Costs	High	Medium	Low	Low
Construction	Aerial &/or underground fibre placement, splicing, drops to buildings, building wiring and transceiver installation	Aerial &/or underground coax &/or fibre placement, splicing, outdoor active & passive installation, drops to buildings, building wiring and transceiver installation	Single &/or multiple towers &/or building mounted transceiver installation, user building external antenna (if required) building wiring and transceiver installation	Mount dish antenna at a location that provides line of sight to satellite. Could be building, pole or tower. Wiring to building, building wiring and appliance installation
Maintenance	Very Low Typically, once the fibre has been installed there is little to no maintenance other that unpredicted damage or forced relocation.	Medium to High Requires ongoing maintenance of outside active electronics, battery maintenance	Low Requires tower safety maintenance, repairs to unpredicted damage and electronic equipment failures	Low Dish antenna may move or be pushed out of alignment, unpredicted damage or electronic equipment failure
Vulnerabilities	Direct damage from exterior forces such as tree falling, auto accident, cut by excavator etc... water infiltration into a splice.	Direct damage, electronics failure, power outages	Direct damage electronics failure	Direct damage electronics failure
Service Impacting	Fibre break, electronic device failure, water in splice location	Fibre or coaxial cable break, electronic equipment failure, extended power outage	Anything that impedes the line of sight will impact the service quality i.e. rain, snow, fog, obstructions such as tree and buildings, other WIFI signals interference	Anything that impedes the line of sight will impact the service quality i.e. rain, snow, fog, obstructions such as tree and buildings.

Construction Methods Comparison

	Advantages	Disadvantages
Aerial Leased	• Widely available • Can be several potential leasers • Not responsible for structure or its maintenance costs • Construction costs generally lower than underground	• Open to weather & traffic • More susceptible to service interruption due to damage • Approval to use required • Ongoing lease costs
Aerial Built & Owned	• No leasing cost	• Rarely done as there are usually poles already on both sides of road or little desire by local government to approve if not already there • Expensive to build • Structure maintenance costs • Approval to construct is required • Taxable asset cost
Underground Leased	• Commonly available • Less susceptible to weather • Not responsible for structure maintenance costs • Construction cost comparable to slightly higher than aerial leased	• Available capacity issues more likely • Approval to use required • Ongoing lease costs
Underground Built & Owned	• Less susceptible to weather	• More costly • Approval to construct is required • Structure maintenance costs • Taxable asset cost
Submarine	• Provides connectivity where no other viable or cost-effective option is available	• Expensive • Approval to construct is required
Towers	• Fewer locations • Less Infrastructure overall	• Unpopular to public • Land availability challenging • Land leasing cost • High construction cost • Approval to construct is required

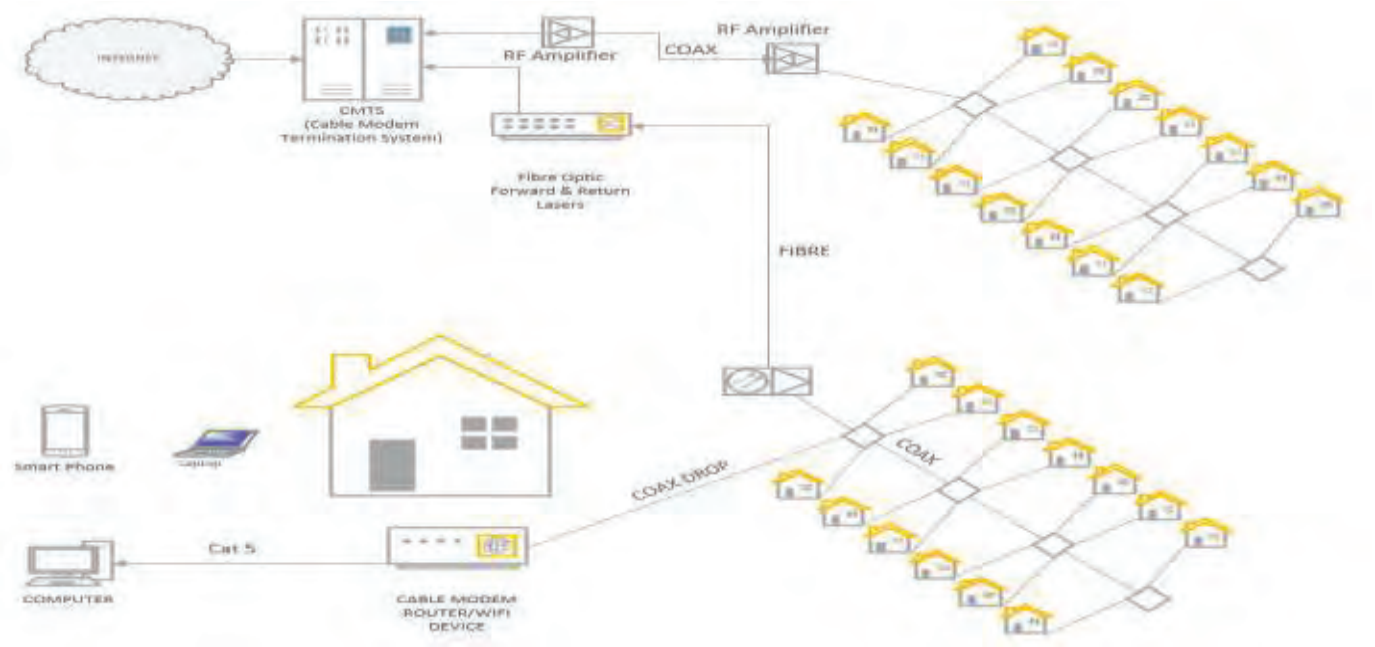
WIFI Network Example

Wireless WIFI



PtMP (Point to Multi Point) links are used routinely to serve up to 100 locations from a single Access Point. There are many approaches to providing PtMP services. This example is the simplest, using a single Ubiquiti radio with an omnidirectional antenna to create a bridged network. Clearly, a more complex approach is often desired, one that uses multiple Ubiquiti radios with sector antennas along with a fully routed (rather than bridged) configuration.

Broadband Coaxial Cable Network Example



Coaxial cable system technologies continue to evolve at a rapid pace. With the latest version being developed to provide 1Gbps up and 1 Gbps down connections. This method requires customers to be service via coaxial cables connected to a local area fibre node with no additional amplifiers.

Today there are two basic methods of design.

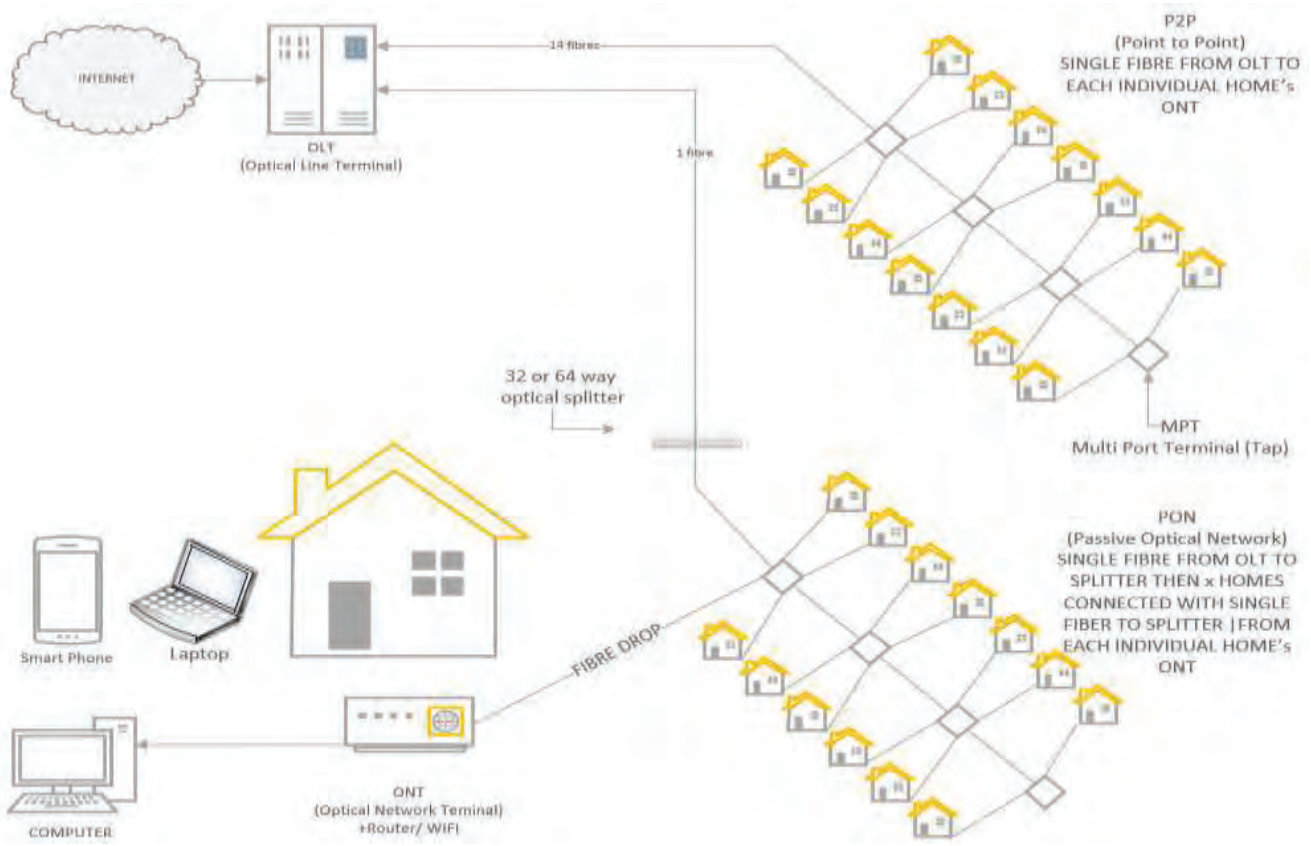
1. A coaxial cable only system with amplifiers placed at intervals to extend the area serviced. For the delivery of internet only services this method would work well in a smaller community with a few hundred customers.

2. With the addition of Fibre optic nodes placed closer to the customers the design now allows for segmentation of groups of customers. In addition to higher quality service and greater reliability it also results in increased internet connection speeds.

F.T.T.H. (Fibre to the Home) Network Example

An optical line terminal (OLT) is the endpoint hardware device in a passive optical network (PON). An OLT has two primary functions: Converting the standard signals used by a FiOS service provider to the frequency and framing used by the PON system.

ONT stands for Optical Network Terminal. The ONT connects to the optical fibre cable.
It connects to your router via a LAN / ethernet cable and translates light signals from the fibre optic line into electronic signals that your router can read



Potential Solution Option 1 – RECNS connects to SRD service

With the Connected Coast terrestrial fibre in place as outlined, all that would be required would be a fibre drop connection to the RECNS router located at the firehall.

The connection of their existing network to the SRD system would result in an immediate improvement in customer internet service levels.

It would be necessary for RECNS to undertake upgrades to their existing network to meet or exceed the Federal Government objectives of 50 Mbps down / 10 Mbps up.

ISP COST ESTIMATE[ii]

Quantity	Description	Unit Cost	Line Total
6	New Network Radio Transceivers	$20k Each	$120,000
100	Customer Premise Transceivers	$500 Each	$50,000
		TOTAL	$170,000

An extensive detailed sight survey and design would be necessary to construct the best network. A simple desktop evaluation for the purpose of this report shows some possible changes to the existing WIFI network and probable outcomes for service levels.

Location overview for wireless installations (2.4 and 5GHz Combined)

In order to facilitate a stronger network design, one option would be to leverage the planned SRD terrestrial fibre to create fibre feeds from the firehall origination site to several of the transceiver locations as shown below. This will allow more of the available bandwidth to be utilized by customers and subsequently increase service levels to 60 Mbps up and 60 Mbps down as well as increased reliability.

Location	Bandwidth Input	Configuration	# of CPE's (60up/60down)	Connectivity
Firehall (1 & 2)	3.0 Gbps	2 x 90 degree / 6 x Rocket	28	Fibre
School (3)	2.5 Gbps	3 x 10db Omni / 3 x Rocket	22	Fibre
Band Office (4)	1.0 Gbps	1 x 10dB Omni / 1 x Rocket	8	Fibre
AP Lodge (5)	1.0 Gbps	1 x 10dB Omni / 1 x Rocket	8	Radio
Marina (6)	2.0 Gbps	1 x 10dB Omni / 1 x Rocket	8	Fibre
Pandora (7)	2.0 Gbps	1 x 10dB Omni / 1 x Rocket	8	Radio
Cedar Inn (8)	1.0 Gbps	1 x 10dB Omni / 1 x Rocket	8	Fibre

Radio served locations would require a mounting structure such as a building or free-standing tower.

Rocket AC5 + 2.4GHz and 5Ghz

OMNI 10db (AMO-5G10, AMO-2G10)

CPE EQUIPMENT

The CPE (Customer Premise Equipment) is selected from the above units. This will be selected on a case by case basis depending on the available signal quality and the necessity for spectrum re-use and efficiency. Most customers will be using the NanoStation AC mounted to the outside of their buildings with a small WIFI router on the inside to allow for the use of smart phones, tablets and smart TV's without running cables.

We estimate the cost to be somewhere between $166,000 to $210,000
This would include design and engineering, building antenna mounts, AP's, antennas, CPE (customer premise equipment), routers, switches, installation, fibre material & placement to the two additional designated locations.

Potential Solution Option 2 - New Fibre To The Home network build

This option would involve undertaking a Flex NAP fibre build to all residential, commercial and government buildings in Zeballos.

Corning Cable Systems Flex NAP™ System provides a cost-effective method of deploying optical fiber in outside plant distribution networks at speeds several times faster than traditional field installations. The Flex NAP System utilizes standard optical fiber cables upon which network access points are pre-installed at customer-specified locations along the length of the cable. The cable and network access points are tested and shipped as a complete distribution cable/terminal system.

This option would offer a complete future proof service directly to all members of the community and greatly exceed the Federal Government's internet service objectives.

Cost Estimate[iii]

	Customers[iv]	Cost Per Address	Route Meters	Cost Per Meter	Total
Low Make-Ready	164	$2,146.10	5,028	$70.00	$351,960.00
Medium Make-Ready	164	$2,529.33	5,028	$82.50	$414,810.00
High Make-Ready	164	$2,851.24	5,028	$93.00	$467,604.00

There are many variables that will impact the final cost of these types of projects including the condition and capacity of existing infrastructure. A complete engineering and permitting application process and tendering of construction would be required to ascertain a true final cost.

There are several factors that have a direct impact on the construction costs for a specific project and are unpredictable.

I. Make-Ready
   a. Condition of existing poles and need for remediation or replacement
   b. Capacity of existing strand and need for replacement or new additional strand placement
   c. Adequate anchoring and need for replacement or additional anchoring
   d. Easement agreements with landowners for additional anchors that extend into private property
   e. Engineering and application costs

II. Mobilization/demobilization – cost is increased for remote areas relative to the contractor's home base and local per diem rates. Other factors may be transportation costs such as ferry or barge costs to get equipment and materials to the build site.

Access Agreements

An access agreement will need to be signed with either BCHydro or TELUS to build and maintain an aerial network. These access agreements come with annual lease costs and responsibilities including construction standards and maintenance aspects.

BCHydro	Master Service Agreement
TELUS	Support Structure Agreement

BCHydro Support Structure Rental Fees

(These rates were not available at the time of this report)

TELUS Support Structure Annual Lease Fees[v]

TELUS General Tariff – CRTC-21461			
Structure Type	**Tariff Rate**	**Estimated Usage**	**Annual Fees**
Monthly Pole Rental Rate	$1.61	103	$ 1,989.96
Monthly Strand Rental Rate (per 30 Meters)	$0.43	5028	$ 864.82
		Total	$ 2,854.78

It should be noted that the existing coaxial cable represents a consumption of existing capacity and potentially it could be removed as part of make-ready costs. This may be a more cost-effective option over the building of an additional strand to provide the necessary capacity.

SPECIAL NOTE:

Part of the scope of the SRD project is the placement of terrestrial fibre along a common route for a portion of the FTTH build, perhaps a joint project would be possible.

Opportunity for a shared build

When we compare the proposed SRD Terrestrial fibre build and the route required for a FTTH build there is a 41% common path as seen here in the diagram.

The **GREEN** line represents the proposed SRD terrestrial fibre build. This route is common to a FTTH build. The **BLUE** represents the additional fibre route required for a FTTH service for the entire community. **RED** markers indicate SRD objective service locations.

Description	Route Meters	Pole Contacts
FTTH Total Route Meters	5028	103
SRD Terrestrial Fibre Route Meters	2038	49
Common Route Percentages	41%	48%

Potential Solution Option 3 – Existing abandoned coaxial network

The GREEN line represents the observed path and service area of what appears to be appeared to be an existing coaxial cable network on TELUS support structure which may be available for purchase.

A complete survey of the existing cable and equipment is beyond the scope of this report. However, a detailed survey could ascertain what would be required in terms of upgrading and extensions to provide connectivity to all potential customers.

Steps to achieve

- TELUS must be willing to sell the asset
- A Support Structure Agreement would have to be signed with TELUS
- A complete survey of the outside plant network & equipment
- A headend would need to be constructed with network equipment and a connection to the SRD Fibre
- A DOCSIS cable modem would be required at each customer location
- Determination of what would be required to upgrade, and extend where necessary and activate

This solution would fulfill and exceed the delivery of the Federal Government's service requirements. However, Estimating costs currently is not possible as there are too many unknowns and variables.

A point to consider with this option is that coaxial cable systems require ongoing maintenance by qualified personnel that would most likely not be available locally. This would most certainly impact reliability and annual operating costs.

Conclusions

[vi]	OPTION 1	OPTION 2	OPTION 3
	EXISTING WIFI ISP WITH UPGRADES[vii]	FTTH	REBUILD COAXIAL SYSTEM
Downstream Data	~60 Mbps	1000 Mbps typical depending on available backhaul	>600 Mbps with latest Docsis equipment
Upstream Data	~60 Mbps	1000 Mbps	>30 Mbps
Reliability	Good	Excellent (wind, storms, car accidents)	Excellent (wind, storms, car accident)
Maintenance Requirement	Low	Low	Medium
Operating Costs	Low	Low	Medium
Quality of Service	Good	Excellent	Excellent

Providing a connection from the Connected Coast to the existing WIFI Internet Service Provider with the addition of a full site survey and design with the latest technology upgrades to their network will most certainly provide an immediate significant improvement and would achieve the desired 50/10 service objective. In addition it has the benefit of an ISP that is already operating and has support staff to maintain the system.

With additional transceiver locations and connections to most of these sites with fibre, we believe even greater service levels could be achieved.

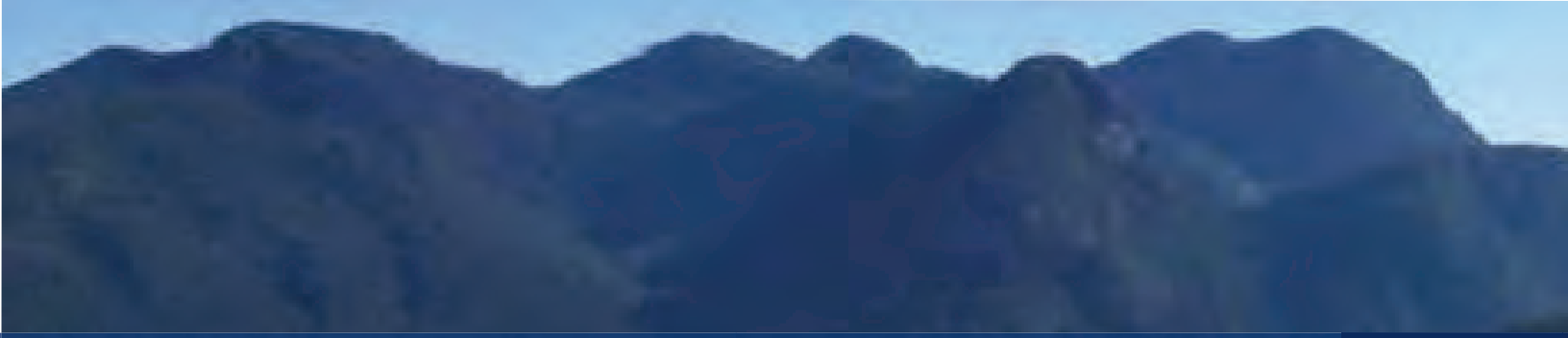
The strongest option that would best serve the community of Zeballos for today and well into the foreseeable future without the requirement for upgrading and minimal maintenance would be a Flex Nap Fibre system.

Although there is a higher upfront capital cost this is strongly outweighed by the long-term future capabilities. In addition, as the fibre cable network itself is completely passive there is practically zero maintenance other than damage from unforeseen events such as a tree falling on a line and breaking it.

Every connected resident would experience the same high level of service regardless of where they are in the community with service levels comparable to any large Canadian urban centre.

References

[i] **Extranet Website**
[ii] **Estimate provided by ISP contact**
[iii] **Numbers derived in part from actual 2019 build in progress**
[iv] **The average between Address BC addresses & Google 2019 Building count – adjusted to compensate for empty lots**
[v] **TELUS website September 2019**
[vi] **WIFI & Data Rates information provided by High Pro Computer Consulting**
[vii] **As we have not been provided the details of their upgrade plans, we have assumed based on the cost provided that the Mbps shown would be achievable.**



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ZEBALLOS
Community Broadband Plan

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