Rockland, Rockport and Owl's Head Broadband Plan and Network Designs

Submitted to:

The City of Rockland;
The Town Rockport; and
The Town of Owl's Head

Prepared by:

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Note:

Cost information included in the following report is an estimate based on recent quotes, historical data, certain assumptions about the project scope and approach, the regulatory environment and market conditions at a fixed point in time. Given these variables, we recommend updating the estimate as time passes, and allocating sufficient contingency to allow for inevitable but unpredictable changes in the cost environment if the project moves forward.

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Executive Summary

The City of Rockland, the Town of Rockport and the Town of Owl's Head jointly engaged Tilson to assess options for increasing broadband availability and accessibility in the region. The scope of the work included taking an inventory of current services, conducting a stakeholder survey, designing a fiber-to-the-premises (FTTP) network, developing cost estimates, reviewing business model options and analyzing the economic benefits of a FTTP broadband investment.

The key findings of the report are as follows:

1. Rockland and Rockport are relatively well served by internet service providers. There are five facilities-based service providers in the area, excluding mobile wireless carriers. Time Warner Cable (TWC) covers almost all of premises in the area – their largest coverage gap is in Owl's Head in the Ballyhac Road area. Downtown Rockland has the most service competition; all five retail providers -- TWC, FairPoint, GWI, Redzone and Lincolnville Communications Inc. -- provide services there. All the public schools and libraries in the municipalities have fiber-fed access via the Maine School and Library Network (MSLN).

2. Random survey results show property owners are supportive of a municipal role in improving broadband and the majority are willing to switch providers for a faster speed. They are also price sensitive, with a self-reported 14% willing to pay more than $75/month for service 10 – 100 times faster than their current service. This self-reported take rate correlates closely with the observed rate on the GWI Rockport network.

3. Time Warner dominates the retail internet service market with an estimated 70% market share. In the survey, Time Warner customers reported that their favorite service attribute was the ability to get internet, phone or TV on one bill. This attribute was more important than reliability, speed, price, and customer service. This consumer preference will be important in designing a compelling future service offering.

4. Assuming a 100% buildout to all locations, the projected average capital cost per premise is lowest in Rockland ($2497), followed by Owl's Head ($3364) and Rockport ($3976). The average cost is a function of density and the proportion of underground utilities. [1] Rockland has the highest density of buildings and lowest proportion of underground utilities. Rockport has the lowest building density, and highest proportion of utilities underground.

5. Tilson ran financial analyses on several network and operating models that would give all locations in each municipality equal access to an FTTP network. All of Tilson's scenarios required minimum take rates of 65%-75% in order to be cash-flow positive in five years. These minimum take rates do not factor into the potential upside of municipal savings on existing telecommunications services, or additional revenue from add-on services like voice, IPTV and wholesale fiber leases. They also exclude potential downside from seasonal pricing that may be

[1] Underground utilities are significantly more expensive to deploy underground than aerially.

needed to compete with incumbent offerings and the loss of any cable TV revenue sharing the municipalities may be getting from TWC.

6. A price point of $70/month for symmetric 1 Gbps service can be supported without a municipal subsidy for the "Town Wide Utility" network and operating model. The Town Wide Utility model that assumes universal coverage and 100% subscription.

7. A wholesale operating model will require either high take rates, or a municipal capital or operating subsidy to maintain a wholesale rate compatible with a $70/month retail price point. Tilson estimates that to achieve positive cash flow in five years and service debt with network revenues, a wholesale fiber solution will require take rates of 65% to 75%.[2] Take rates of this nature are not common in cable overbuild situations, such as planned here. Tilson believes that the network must break even at a much lower rate in order to remain feasible. This can only happen if network revenues are not necessary for servicing debt. Therefore, Tilson believes that any solution will require either private or public subsidy capital cost subsidy.

8. Tilson analyzed the potential economic benefits of a broadband investment using "benefits transfer method." The results suggest that the three Town region could see a total ten year increase in GDP output of between $42M and $169M. This represents a 1% to 4% improvement over the baseline scenario. Tilson expects this GDP increase to correlate with a $39M to $157M increase in wages in the region as well as a $3.9M to $15.7M increase in state and local tax revenue.

9. The next steps are for each municipality to clarify its most important goals, solicit information from potential service providers, funders and network operators,pick a target operating model, and solicit private partners.

There is unmet customer demand for broadband service in all three municipalities. Mostly this service gap reflects dissatisfaction with service quality and not lack of access to broadband. All three communities have the broadband offerings that are most commonly found in communities throughout the United States. If one or more communities wishes to pursue a fiber to the home solution, it will create regionally unique and nationally distinct model. However, the three towns are considered served by national standards and are therefore ineligible for most subsidy. Local public or private capital will be required to realize a network solution.

Furthermore, there is limited potential for the municipalities to enjoy any net revenue from these networks. For example, Rockport's revenue sharing model with GWI is almost certainly not scalable. There is very little cash flow potential in a low cost, fiber to the premise business model. If the municipalities elect to pursue fiber-based solutions, they will need to provide the capital and should expect little in the way of cash returns from network operations.

If the municipalities decide that the benefits of building out a fiber network are great enough to proceed, we recommend accepting the strong likelihood that they will need to explicitly create a

[2] Rockland's lower average cost base means a network in the City could support lower take rates or lower price points than the other towns while solving for a given outcome, like cash flow positive in five years.

sustainable revenue source, not rely on individual user choices to create one. If they proceed with developing a underlying network like the one that Rockport currently employs, this means funding a large portion of the municipal costs out of general revenue, not the fees generated by the network. Under this model municipalities may even wish to consider providing ISPs access to the network at nominal costs to stimulate usage and encourage lower retail prices. In the alternative, under a model that seeks to provide internet to everyone as a service of the municipality, this means understanding that this also needs to be funded out of general revenue or from non-optional user charges; the finances of the system likely cannot depend on voluntary sign-ups.

Regional Technology Goals

The objective of this study is to provide telecommunications solutions that match the communities'visions for themselves. The first stage of the engagement was to ascertain the project sponsors' understanding of those community visions. The project sponsors from each municipality shared several goals that they hoped to achieve with broadband improvements. All expressed a desire for a faster broadband offerings and greater choice in providers. Areas where the stakeholders differed included the threshold for speed improvement, the importance of open access, and the need for universal service. The goals below represent Tilson's understanding of each municipality's goals.

Rockport

Rockport has invested in a pilot fiber optic network that passes 70 premises throughout the central portion of the Town. This study was largely undertaken to explore the feasibility of expanding this network throughout the Town. Rockport is home to many sophisticated technology users as well as a vibrant and growing visual media industry. Many of the industry's users have represented to Town officials that they struggle to access either sufficient bandwidth for their applications or bandwidth at a desirable price. In addition to speed and universal access, the selectmen expressed a desire for reliability and maintenance responsiveness. In this context, reliability refers to the consistency of the connection. As with many internet users, the residents of Rockport experience reduction in real speed during periods of high bandwidth usage, such as the evening. They expressed a solution that mitigated this effect.

Beyond improving service, the Town of Rockport expressed two major goals to Tilson. First, providing seasonal and year round residents access to sufficient bandwidth to encourage telework. Year round residents wish to access sufficient bandwidth for many purposes. Second, providing low cost bandwidth to encourage small business growth, particularly in the creative sector. Rockport is home to Maine Media Workshop, which is a nationally recognized visual arts institution. The Town believes that a low cost, high bandwidth, low latency solution has the potential to catalyze growth in this sector. However, the Town's overarching goal is to obtain the telecommunications infrastructure necessary to promote economic growth for several decades.

Rockland

Rockland shares many of the community goals as Rockport and Owls Head. The City representatives see broadband as critical to fostering economic growth and creating a vibrant community for residents. However, the City has prioritized economic development as a goal above quality of place or universal access. The City views a broadband improvement as a tool to attract a greater density of technology companies to both its downtown and industrial parks. Some companies have already relocated to the City due to its proximity to the Three Ring Binder network. This network is discussed in greater detail in the asset inventory section. The network's fundamental value proposition is giving companies access to the low cost transport fiber and bandwidth. Rockland has already seen some small businesses take advantage of this infrastructure and wishes to incentivize more businesses to do so.

As with both Rockport and Owls Head, the City of Rockland expressed an interest in having greater control over its broadband infrastructure. This includes greater transparency into network operations and bandwidth usage. The City also expressed a desire for more responsive maintenance. High network uptime will be critical for attracting the type of business that the City envisions. One area where Rockland differed from Rockport is that the City does not see universal fiber access as a priority. While the City sees the merit of a universal solution, they are most focused on a targeted solution that boosts economic output.

Owls Head

Owls Head is a predominantly residential community with a substantial seasonal population. Most year round residents commute to the region's population centers. The Owls Head representatives expressed a desire in maintaining their Town's status as a great place to live. Universal access to quality broadband is a part of that status. The Town is currently served with Time Warner and FairPoint. These provide residents with the DOCSIS 3.0 and DSL services seen in most communities in the nation. The goal of this study for Owls Head is to assess the costs and operational potential of a significantly faster and more reliable solution The Town believes that such a solution may encourage in-migration and may allow seasonal residents to extend their stays to the region. As with Rockport, Owls Head believes that if seasonal residents stay in their Town for a longer period of time it will increase economic output.

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Broadband Inventory

This section details the assets and services of facilities-based carriers providing broadband service. FairPoint and Time Warner Cable (Time Warner) offer internet and voice service to almost all addresses in the Rockport, Rockland and Owl's Head area. Lincolnville Communications and GWI offer partial coverage for voice and internet service, and RedZone Wireless offers partial internet coverage. MaineCom and Maine Fiber Company are open access middle mile networks with fiber available in Rockland and Rockport on a wholesale basis.

Provider	Business Model	Broadband Technology	Target Market
Time Warner Cable	Cable Franchise	Hybrid Fiber Coax, DOCSIS 3.0 and FTTP	Residential and business
FairPoint	ILEC	DSL	Residential and business
GWI	CLEC	DSL, FTTP and Unlicensed Wireless (viaMid-Coast Internet)	Residential and business
LCI	CLEC	FTTP	Residential and business
RedZone	Wireless ISP	Wireless LTE	Residential and business
Maine Fiber Company	Dark Fiber Carrier	Dark Fiber	Long haul and local carriers
MaineCom	Dark Fiber Carrier	Dark Fiber	Carriers and businesses

Table 1: Summary Table of Service Providers and Offerings in the Area

The section below details service coverage and pricing by provider. Tilson obtained fiber and service information from the providers by a combination of visual inspection and discussions with the providers themselves. Retail pricing information was obtained either by calling on the phone, meeting with representatives of the company, or looking at websites. With the exception of Lincolnville Communications and RedZone, Tilson was not able to obtain business pricing.

Time Warner Cable

Time Warner Cable offers internet service, cable TV and voice in the municipalities as a franchised cable operator. In Maine, the franchises are granted by each municipality. Time Warner offers service to all addresses in the three municipalities, with a few exceptions. Their advertised service uses DOCSIS 3 hybrid fiber/coaxial cable network with speeds of up to 50 Mbps download, 5 Mbps upload to all addresses on its network. Actual speeds are determined by network configuration, data traffic congestion, and the condition of the copper facility.

Time Warner aggressively markets a joint bundle with TV and phone. The company purports to offer a seasonal hold for "about $10-$15/month," but the offer is not published, and the customer representative would not commit to a rate or timeframe until after the service was ordered.

Federal law allows franchising authorities to charge a cable operator a fee of up to a five percent gross TV revenue for the right to operate in a franchise area. Tilson does not know whether the Rockland, Rockport or Owl's Head franchise agreements stipulate those fees.

Rockland Exceptions to Coverage

Time Warner offers coverage to all the addresses in Rockland with the exception of the Thompson Street, Dodge Mountain and Bog Road areas, highlighted in purple below.

Figure 1: Time Warner Exceptions to Coverage in Rockland, Maine

Rockport Exceptions to Coverage

Time Warner offers coverage to all the addresses in Rockport.

Figure 2: Time Warner Exceptions to Coverage in Rockport, Maine

Owl's Head Exceptions to Coverage

Time Warner offers coverage to all the addresses in Owl's Head with the exception of the Ballyhac Road area, highlighted in purple below.

Figure 3: Time Warner Exceptions to Coverage in Owls Head, Maine

Time Warner Residential	Speeds (Mbps down/up)	Delivery Method	Monthly Price*	Notes
	2/1	hybrid fiber/coax	$14.99	
	6/1	hybrid fiber/coax	$29.99	
	15/1	hybrid fiber/coax	$34.99	
	20/2	hybrid fiber/coax	$44.99	
	30/5	hybrid fiber/coax	$54.99	includes home wi-fi
	50/5	hybrid fiber/coax	$64.99	includes home wi-fi

* All prices exclude an optional modem rental for $8/mo. Per TWC customer service, seasonal hold "about $10-$15/mo," can only be placed after install.

Source: http://www.timewarnercable.com/en/plans-packages/internet/internet-service-plans.html

Table 2: Time Warner's Residential Internet Access Pricing

FairPoint

FairPoint offers copper-based DSL to most or all addresses in the municipalities. FairPoint's website advertises speed tiers of up to 30Mbps, 15 Mbps and 4 Mbps, but Tilson was not able to obtain coverage maps or a pricing schedule. Provisioned and realized speeds are dependent on the copper route distance from FairPoint's Central Office or remote terminal, the gauge of the wire, and the condition of the copper infrastructure. Several calls to customer service yielded a highest available speed of 15 Mbps download near downtown Rockland, only. FairPoint offers a seasonal hold for any of their voice and internet packages for $8.95/month for up to six months.

In addition to DSL, FairPoint will supply copper-based Ethernet at speeds greater than DSL or fiber-based connections at speeds of up to 1 Gbps. Prices are not published, but it's likely that fiber-based services are priced and provisioned on a case-by-case basis.

FairPoint's visible above-ground fiber is shown in orange in the map below. Tilson believes that FairPoint uses this fiber for its backbone network, and to connect to fiber customers, including the Maine School and Library Network.

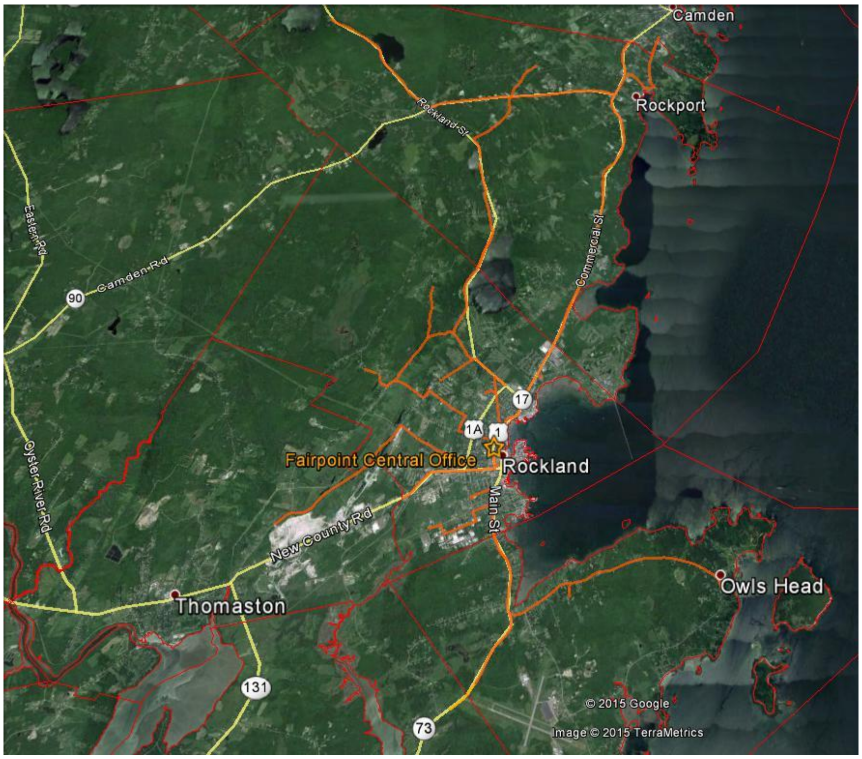

Figure 4: FairPoint's Aerial Fiber Network

Fairpoint Residential	Speeds (Mbps down/up)	Delivery Method	Monthly Price*	Notes
	0.768	dsl	$16.99	if bundled with phone
	3/1	dsl	$37.98	
	7/1	dsl	$35.99	after $13 discount ; 1 yr contract
	15/1	dsl	$42.99	after $13 discount ; 1 yr contract

* Seasonal Rate is $8.95 for up to 6 months for any package

Source: Tilson phone calls to Fairpoint customer service

Table 3: FairPoint's Residential Internet Access Pricing

Redzone

Redzone Wireless, based in Camden ME, offers a fixed wireless service to businesses and home users based on the LTE technology used by mobile wireless companies. The company has plans to deploy two sites in Q3 2015 that will offer service to users in Rockland and parts of Rockport.[3]

The company offers speeds ranging from 25 Mbps up/10 Mbps down to 5 Mbps up/1 Mbps down. Service coverage is determined by the tower location and local topography. The map below shows a large scale map of the mid-coast area, with Redzone's coverage area and computer-modeled signal strength. According to RedZone's signal propagation modeling, Rockland is projected to have strong coverage throughout most of its territory; Owl's Head will largely (but not completely) be left out of the coverage area; and Rockport, will have coverage along the coast and near the borders with Camden and Rockland. As with copper-based facilities, actual LTE speeds depends on obstructions, weather conditions, and other customer traffic.

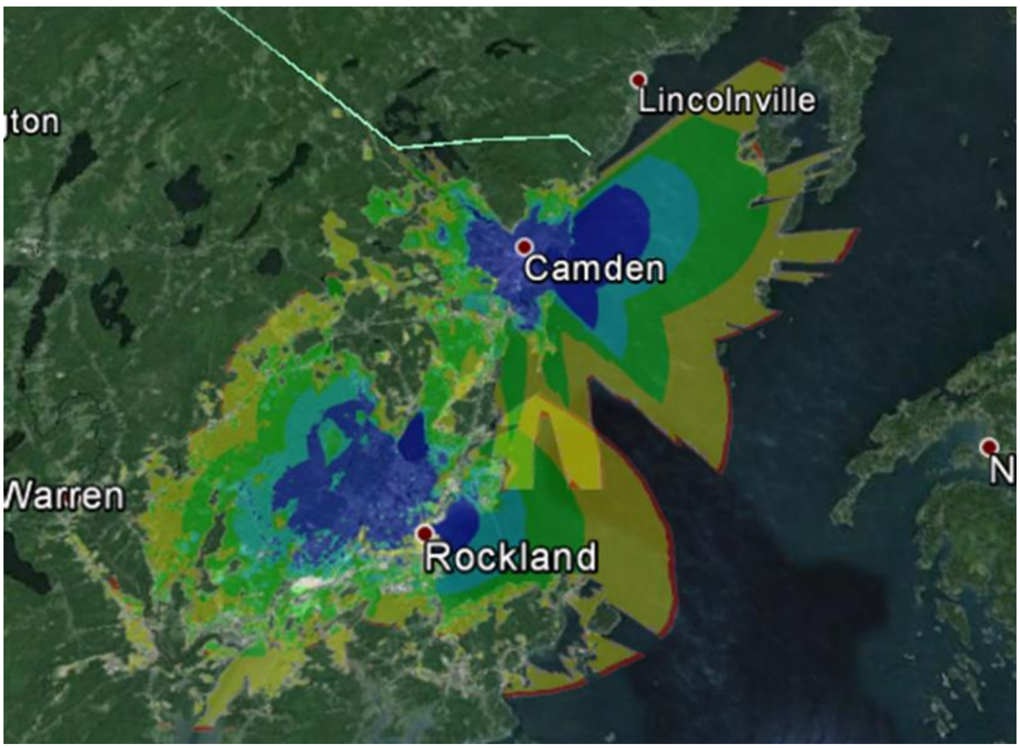

Figure 5: RedZone's Planned Mid-Coast Head Coverage

[3] Michael Forcillo, RedZone VP Sales, 7/28/2015

Speeds (Mbps down/up)	Delivery Method	Monthly Price	Notes
5/1	wireless LTE	$39.00	100 GB limit; no contract; includes wi-fi
10/1	wireless LTE	$25.00	pre-launch promotion; unlimited data; wi-fi
10/5	wireless LTE	$59.00	250 GB limit; no contract; includes wi-fi
25/10	wireless LTE	$89.00	unlimited data; no contract; includes wi-fi

Source: http://www.gwi.net/residential/high-speed-internet-service-in-maine/

Table 4:RedZone's Business and Residential Internet Access Pricing

GWI

GWI offers two types of service to businesses and home users in the area. In Rockport, GWI offers its Fastfiber internet access to users along the town-owned 1.5 mile network. Rockport's network currently passes 70 potential customers, and 10 of those customers have signed up for GWI's symmetrical 1 Gbps up/1 Gbps down service.[4]

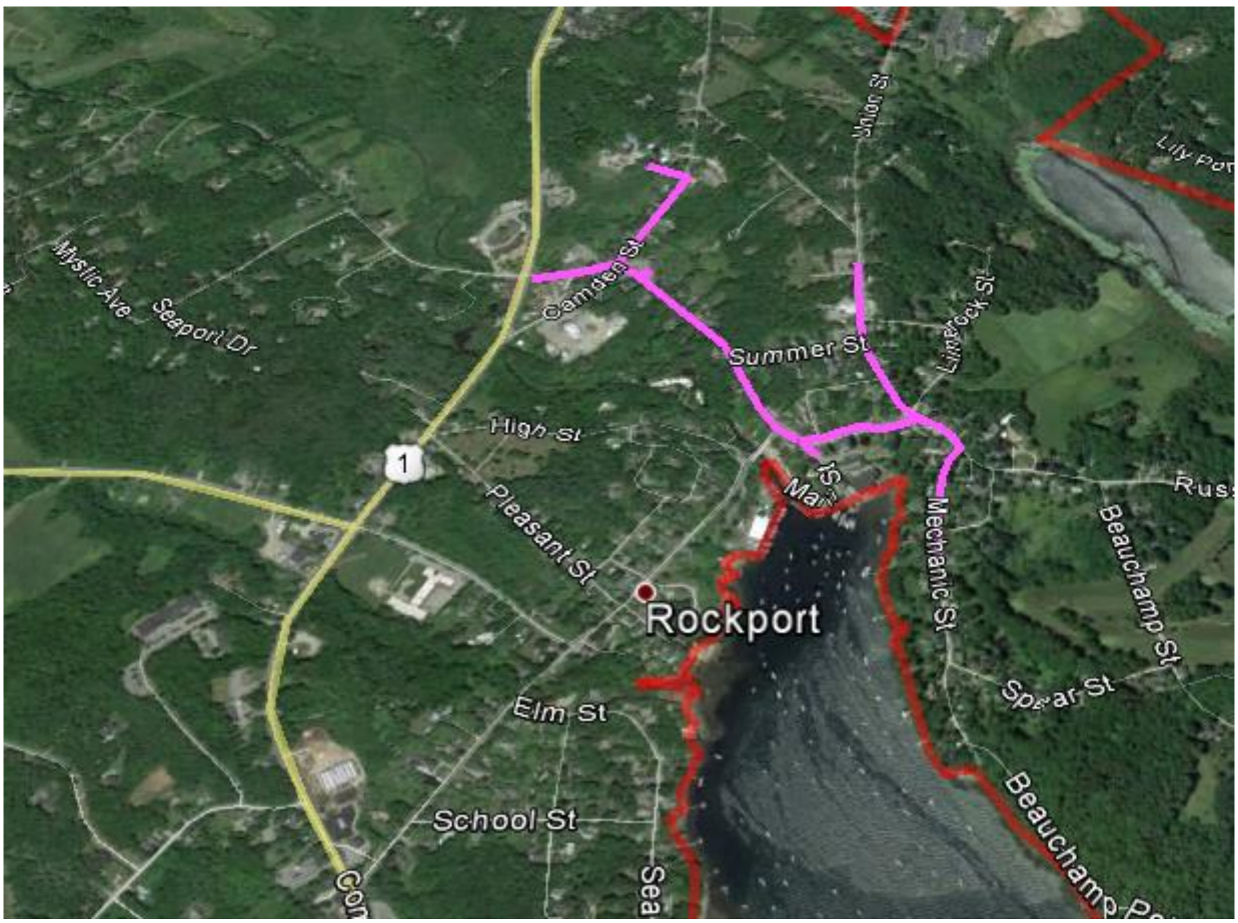

Figure 6: GWI Fastfiber Footprint in Rockport

[4] Conversation with Fletcher Kitteridge, 7/29/15. The 10 customer signups were done with very little marketing by GWI. Price is $100 installation, $69.95/month for up to 1 Gbps. Ulimited home phone is $10/month additional.

GWI also offers DSL via electronics co-located FairPoint's central offices in Rockland and Camden. GWI offers two speeds of DSL: 20 Mbps down/1 Mbps up and 7 Mbps down/1 Mbps up. Provisioned and realized speeds are dependent on the copper route distance between FairPoint's Central Office and the customer, the gauge of the wire, and the condition of the copper infrastructure.
The graphic below shows absolute distances from the GWI's remote terminals -- generally speaking, GWI can provision both speeds within the shorter radii, and a maximum of 7 mpbs in the outer rings.

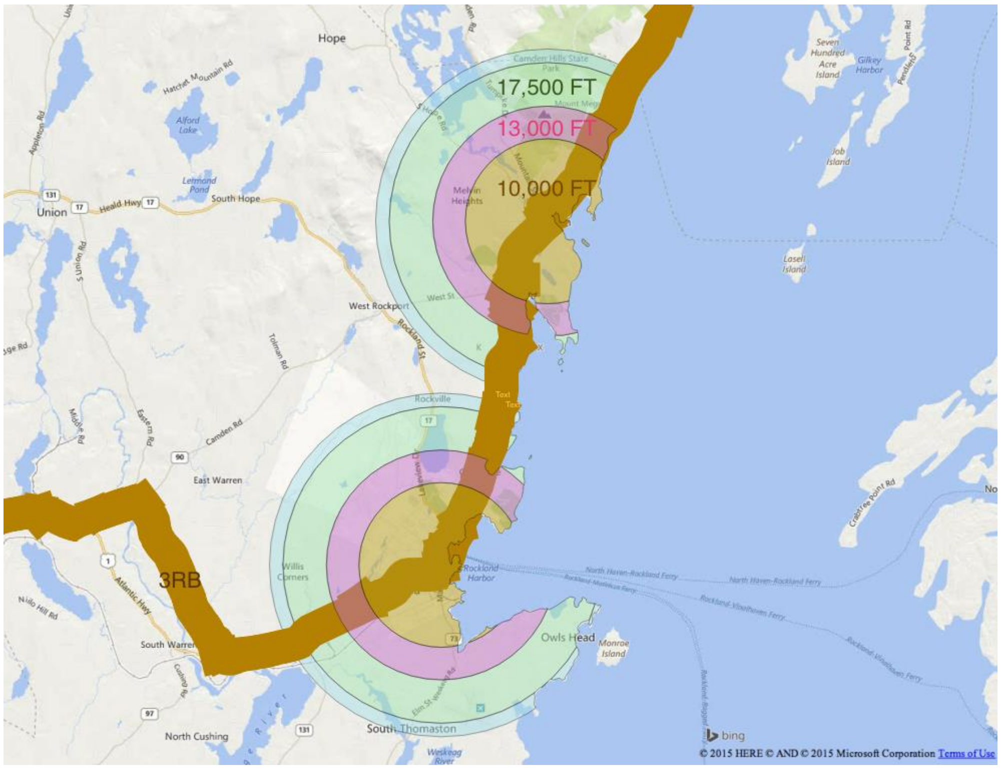

Figure 7: GWI DSL Footprint in Rockland, Rockport, and Owls Head

Speeds (Mbps down/up)	Delivery Method	Monthly Price	Notes
7/1	dsl	$46.95	
20/1	dsl	$49.95	
1,000/1,000	fiber	$69.95	available to 70 premises on Rockport fiber

Source: http://www.gwi.net/residential/high-speed-internet-service-in-maine/

Table 5: GWI's Residential Internet Access Pricing

Lincolnville Communications Incorporated

Lincolnville Communications Incorporated (LCI), a subsidiary of Lincolnville Telephone Company, is a competitive local exchange carrier with about 24 miles of visible fiber in Rockport and Rockland. LCI offers fiber-based internet access, voice and IPTV service to business and residential customers. Published internet access speeds are from 6 Mbps up/6 Mbps down to 50 Mbps up/50 Mbps down.

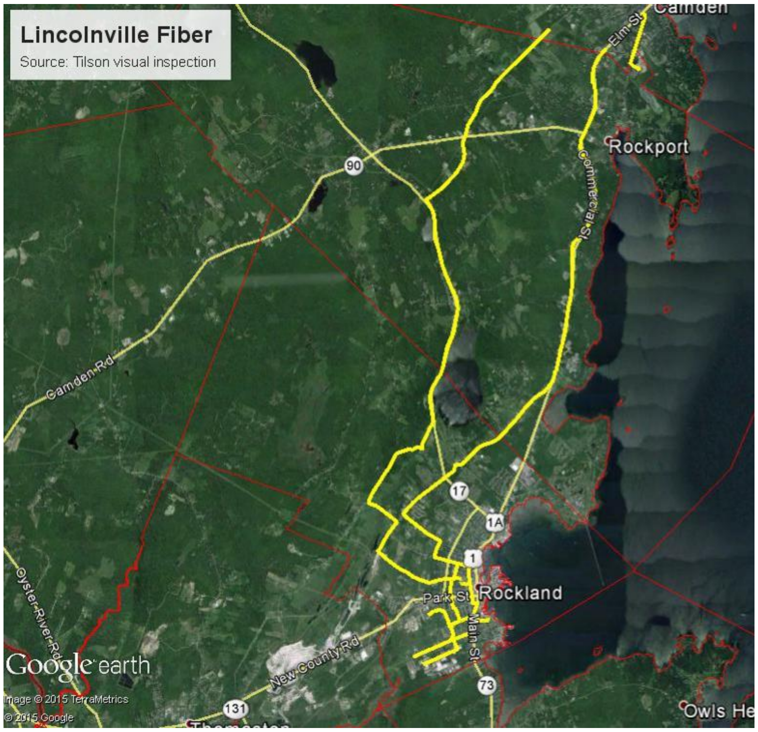

Figure 8: LCI's Fiber Footprint

Speeds (Mbps down/up)	Delivery Method	Monthly Price	Notes
6/6	fiber	$47.95	
10/10	fiber	$57.95	
15/15	fiber	$79.95	
20/20	fiber	$99.95	
30/30	fiber	$149.95	
50/50	fiber	$189.95	

Source: marketing materials supplied by Lincolnville Telecom

Table 6: Lincolnville's Business Internet Access

Maine School and Library Network

The Maine School and Library Network (MSLN) provides fiber-based internet access to over 950 schools and libraries in Maine, and has fiber access to nine of the twelve schools and libraries in the three town area. Fiber access to the remaining three is expected to be on-line by year end 2015.[5]

Maine School and Library Network (MSLN) Service by Location

Building	Town	Download Mbps	Upload Mbps	Access Provider
MID-COAST SCHOOL OF TECHNOLOGY	Rockland	100	100	Fairpoint
OCEAN SIDE HIGH SCHOOL EAST	Rockland	100	100	TWC
OPPORTUNITIES ALTERNATIVE SCHOOL*	Rockland	1,000	1,000	MFC
ROCKLAND DISTRICT MIDDLE SCH	Rockland	100	100	TWC
ROCKLAND PUBLIC LIBRARY*	Rockland	1,000	1,000	MFC
SOUTH ELEMENTARY SCHOOL	Rockland	100	100	TWC
ASHWOOD-WALDORF SCHOOL	Rockport	100	100	Fairpoint
CAMDEN HILLS REGIONAL HIGH SCHOOL	Rockport	700	700	TWC
ROCKPORT ELEMENTARY SCHOOL WEST*	Rockport	1,000	1,000	MFC
ROCKPORT PUBLIC LIBRARY	Rockport	1,000	1,000	MFC
OWLS HEAD CENTRAL ELEM SCHOOL	Owl's Head	100	100	TWC
OWLS HEAD VILLAGE LIB ASSOC	Owl's Head	100	100	Fairpoint

Source: Maine School and Library Network

* Expected online in 4Q 2015

Table 7: Maine School and Library Network Locations

Most libraries in Maine have a wi-fi router that offers free broadband access to the public inside and nearby the library.

The MSLN is limited to school and library access, and does not provide service for other types of locations.

[5] Tilson is project managing the MSLN fiber builds for the Maine Fiber Company.

Maine Fiber Company

The Maine Fiber Company (MFC) owns the Three Ring Binder, which is an open-access dark fiber network supporting telecommunications service providers, internet service providers (ISP), the public sector, and enterprise business customers.

The MSLN and GWI are known users of the Three Ring Binder for their network backbone, and in some cases they may use it to distribute traffic to end users. The Three Ring Binder connects to several strategic telecommunications hubs, like FairPoint Central Offices, and therefore is likely to be seen as a valuable asset to any potential future service provider.

Figure 9: Maine Fiber Company's Three Ring Binder Footprint

MaineCom

MaineCom is a subsidiary of Iberdrola USA, and builds and maintains dark fiber networks in the power space of utility poles. In Rockport and Rockland, MaineCom has about 18 miles of fiber that was originally deployed as a redundant ring connecting MBNA sites in the area. MaineCom is not a service provider, and their network is optimized for wholesale users or sophisticated retail users that light the network with their own electronics.

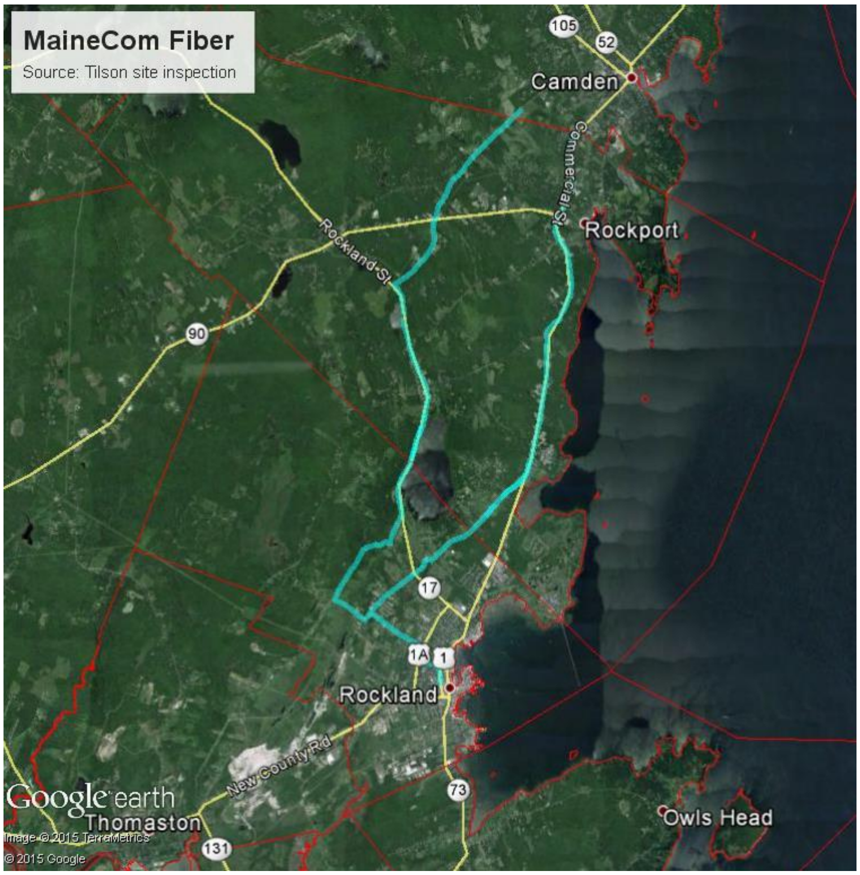

Figure 10: MaineCom Fiber Footprint

Stakeholder Survey

Methodology

Tilson conducted a stakeholder survey by mailing out 1197 paper surveys to randomly selected addresses obtained from each municipality's tax assessment database. Surveys were mailed to property owners' registered mailing addresses, which in some cases were out-of-state. Recipients of the mailed-in survey had the option of filling out a paper-copy or going to a specified Survey Monkey web-address and filling out a survey online. All of the responses received, whether recorded manually or online, will be described as "Random" survey results in this report.[6]

In addition, Tilson provided a separate Survey Monkey web address, with an identical survey, that residents could optionally fill out. These results were collected and recorded separately, and will be described as "Non-Random" in this analysis.

With the exception of some direct comparisons between Random and Non-Random responses, all analysis in this report were conducted on Random responses.

Survey Response Rates

The Random survey an average response rate of 35%, with results broken out below. Not all respondents identified their municipality in the survey, which meant that their answers could not be used in the municipal-level analysis of the data. However, their responses were useful for analysis of answers by other factors, such as seasonal and year-round status.

Response Summary - All Sources

	Rockland			Rockport			Owl's Head			No Town ID'd	Total		
	Sent	Rec'd	%	Sent	Rec'd	%	Sent	Rec'd	%	Rec'd	Sent	Rec'd	%
Random survey:	425	85	20%	425	135	32%	347	126	36%	78	1197	424	35%
Non-random survey:		69			198			37		49		353	

Tilson sent 199 surveys to business property owners across the three municipalities, and of the 340 Random responses to "Do you own or manage a business in Rockport, Rockland, or Owls Head?" only 28 responded "Yes." Because of this small business owner response pool, combined with the fact that that it was not clear whether respondents were answering from a residential or business user perspective, Tilson did not break out the results by affirmative answers to "Do you own or manage a business in Rockport, Rockland or Owl's Head."

Response Summary - Number Owning or Managing a Business In. . .

	Rockland	Rockport	Owl's Head	Total
	"Yes"	"Yes"	"Yes"	"Yes"
Random survey:	4	18	6	28

[6] Technically, the survey was a random sample of property owners and did not cover renters residing in the municipalities.

Non-Random vs. Random Sample Results

Tilson filtered survey questions on survey responses for the opt-in web survey (Non-Random), and compared them with the Random results. On key questions of current satisfaction with current internet service, interest in changing internet service providers, willingness to pay for faster internet service, and the role of municipal government in internet service, random responses were more satisfied with the status quo, less likely to pay for faster internet service, and less supportive in municipal government taking a role in improving internet service. As a result, Tilson used only the 424 random survey responses received for the purposes of this analysis.

Average Scores for Random and Non-Randomly Polled Respondents				
	Satisfaction with Internet Service (1-10)	Interest in Changing Internet Providers (1-5)	Willingness to Pay More for Faster Service (1-5)	Support for Municipal Government Role* (1-5)
Random	6.3	3.9	2.4	4.3
Non-Random	5.5	4.5	3.0	3.6

* How much do you support municipal government working to improve Internet service? 1= not at all interested; 5 = very interested

Figure 11: Average Scores for Random vs. Non-Random Responses

Current Internet Service

The internet service market is dominated by Time Warner Cable in the Rockland, Rockport, Owl's Head area. FairPoint and GWI follow as distant second and third in market share. FairPoint and GWI control a relatively larger share of the market in Rockland because their service is based on DSL technology, which is distance-sensitive to the Rockland-based remote terminal locations. Tilson believes that GWI's area customer base is served primarily with DSL services and a mixture of former Mid-Coast Internet wireless and Rockport fiber customers. Lincolnville Communications, Inc. was not listed in the survey, and accounted for one "Other" write-in.

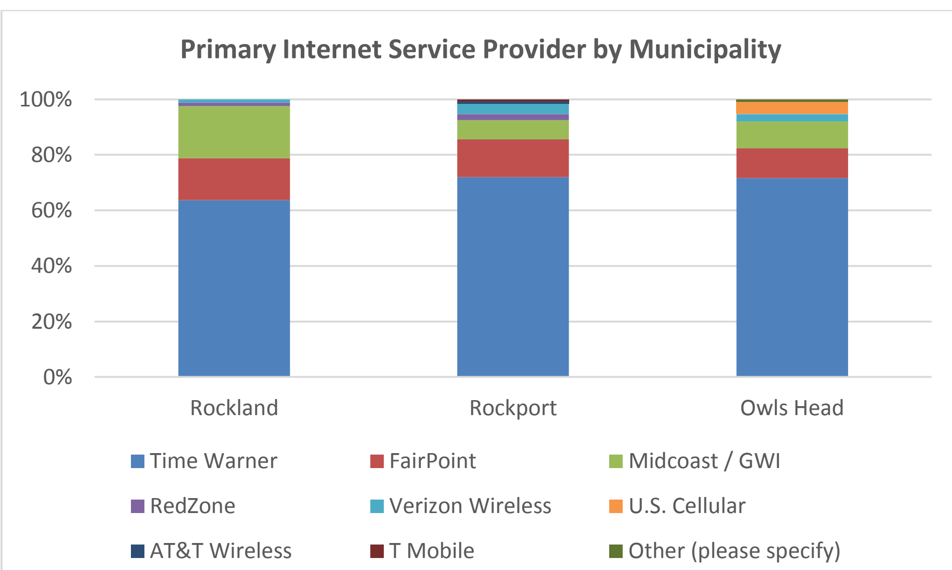

Figure 12: Primary Internet Service Provider by Municipality

Customer Satisfaction by Service Provider

Tilson had enough responses for the top three market suppliers – Time Warner, FairPoint, and GWI – to gather meaningful data on customer satisfaction. Per Figure 13 below, GWI had the average customer satisfaction, followed by Time Warner and FairPoint. There were not enough responses for the other providers to provide meaningful conclusions.

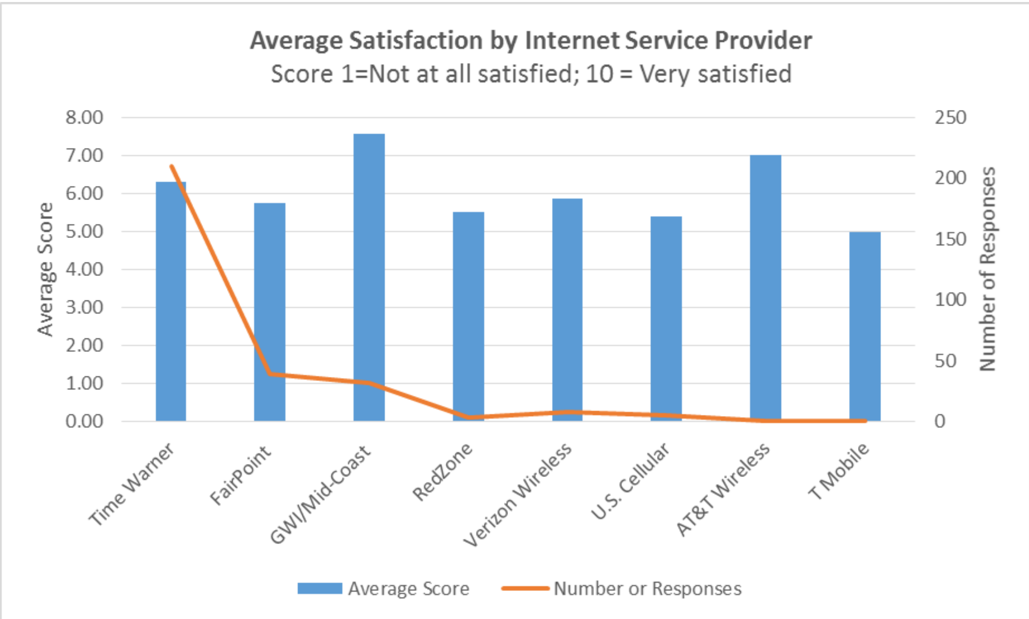

Figure 13: Average Customer Satisfaction by Internet Service Provider

The survey yielded valuable insights to specific consumer feelings about their service providers. Most notably is that Timer Warner customers were pleased with getting bundled service, but were unhappy with the price. It is possible that the price dissatisfaction was related to the price of the bundle, rather than just the internet service aspect.[7] FairPoint customers were happy with the reliability of their DSL service, but unhappy with the speed, which tops out at 15, 7 or 3 Mbps download depending on location. GWI customers were happy with the Biddeford-based company's customer service, but also unhappy with the speeds they are able to get over DSL, which tops out at 20 or 7 Mbps depending on location.

[7] The inflation adjusted cost of cable TV rose over 131% between 1998 and 2103. The average TV portion of cable bills in 2013 was $64.41. http://www.ibtimes.com/cable-bills-rising-amid-comcast-twc-merger-scrutiny-fcc-media-bureau-report-shows-pay-tv-1587304

With what aspect of your current Internet service are you most happy?			
Answer Options	Time Warner	FairPoint	Midcoast / GWI
How fast the service is	36	1	3
How reliable the service is	50	11	7
The price of the service	20	7	4
The customer service provided by the company	18	5	12
The ability to get Internet and phone or TV services on one bill	60	4	2
I am very happy with all aspects of my current Internet service	22	8	1
Other (please specify)	12	4	4
answered question	*218*	*40*	*33*
With what aspect of your current Internet service are you least happy?			
How fast the service is	41	13	11
How reliable the service is	29	10	4
The price of the service	98	6	6
The customer service provided by the company	15	4	1
I can't get Internet and phone or TV services on one bill	0	0	0
I am not at all happy with any aspect of my current Internet service	22	3	7
Other (please specify)	13	4	5
answered question	*218*	*40*	*34*

Figure 14: Service Likes and Dislikes by Internet Service Provider

Estimated Monthly Spend on Internet Access

Tilson asked respondents to estimate how much money they spent on monthly internet service. The majority of respondents (78%) indicated that they pay less than $75/month for internet service; 46% estimate they pay less than $50/month. Tilson received several comments that this was difficult to do based on the providers' service bundling, and some written responses seemed to indicate that respondents were answering for how many hours a month they spent on the internet. Therefore, Tilson does not believe this data to be highly reliable.[8]

[8] The all-inclusive bundled price and the possibility that some respondents entered their business pricing may explain for some of the higher data points on monthly spend.

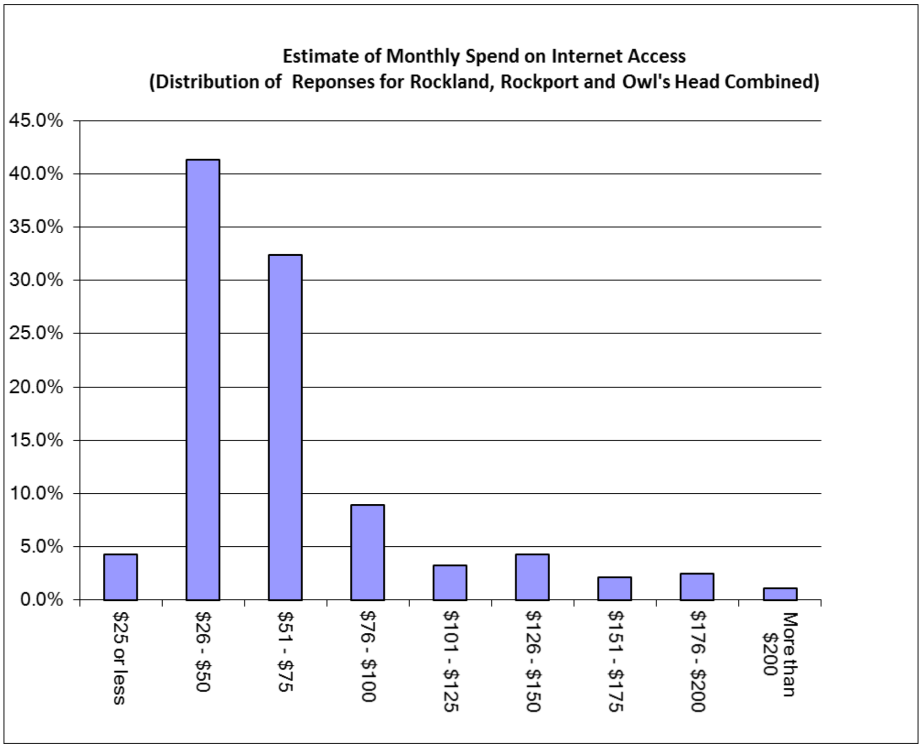

Figure 15: Estimated Monthly Spend for Internet Access

Attitudes towards Switching Providers

Satisfaction with current service providers gives some indication about users' willingness to switch vendors. Figure 16 shows the distribution, on a scale of 1 to 10, of respondents in all municipalities across all providers. Users appear to be generally satisfied, with a majority scoring their provider between 6 and 10. However, according to the Institute for Customer Service, customers that rate a service provider at less than eight are often willing to switch if an alternate offering is available.[9] Sixty five percent (65%) of all respondents were in this category, scoring their provider between 1 and 7.

[9] Institute of Customer Service. *UK Customer Satisfaction Index.* July 2015.

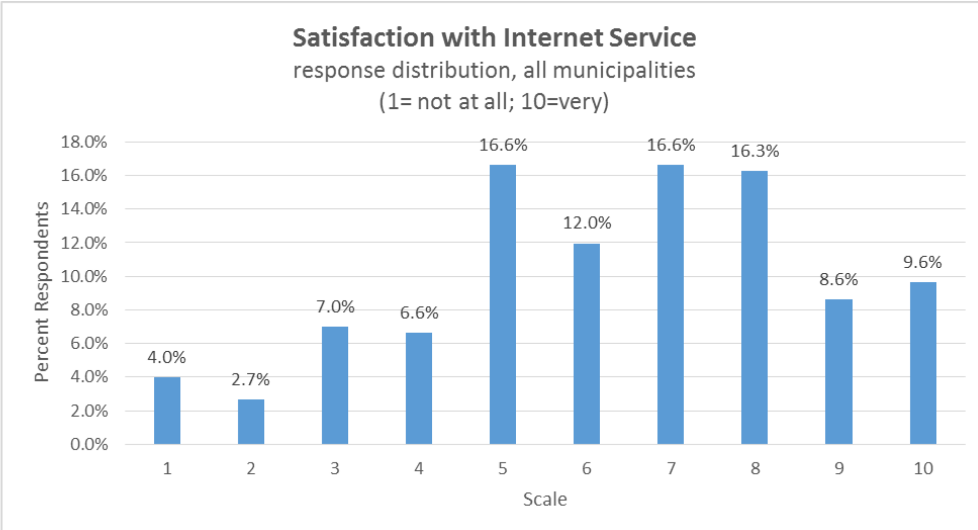

Figure 16: Overall Satisfaction with Internet Service Provider, All Municipalities

Tilson's survey asked respondents "Imagine that you had the opportunity to purchase a new level of Internet service that offered faster speed, and that the new service was offered by an Internet service provider other than one that you currently use. On a scale of 1 to 5, how interested would you be in changing your Internet service provider?" Interestingly, 69%, 66%, and 56% of respondents, respectfully in Rockland, Rockport and Owl's Head responded with strong interest by rating a 4 or a 5.

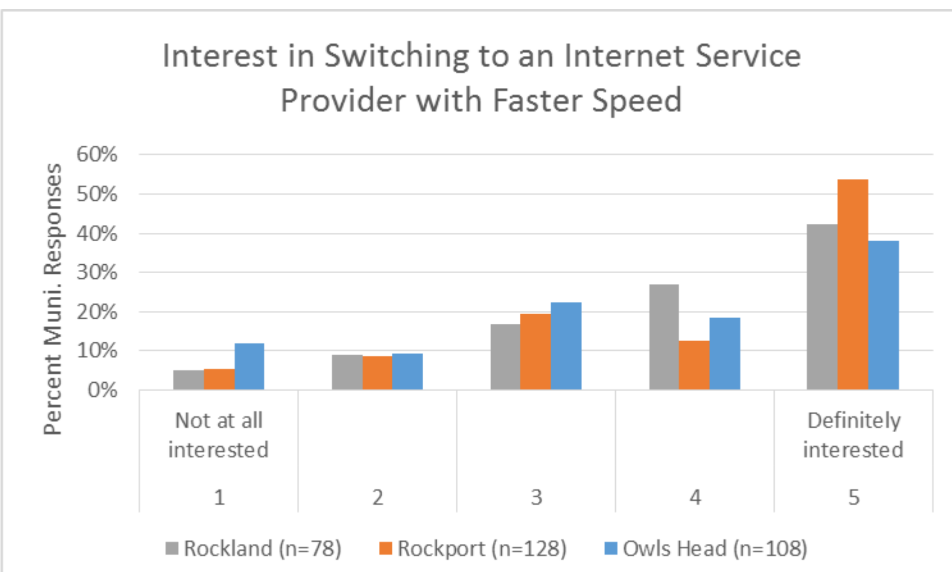

Figure 17: Interest in Switching to a Service Provider with Faster Speed

The product attribute most important to consumers, in addition to performance, is price. Tilson tested users' perceived willingness to pay for a faster product by asking "How much would you be willing to pay for Internet service ten(10) to one hundred (100) times faster than is currently available at this location." The responses were similar across municipalities, and correlated closely to known data about the adoption rates of GWI's 1 Gbps service in Rockport. Notably, between 34% and 48% of all respondents are willing to pay up to $45/month for faster internet service. Willingness to pay over $75/month ranges between $12% and 15%, and the 15% of Rockport respondents that indicated they would be willing to pay this amount correlates closely to the 14% of eligible users that have subscribed to GWI's $70/month 1 Gbps service.[10]

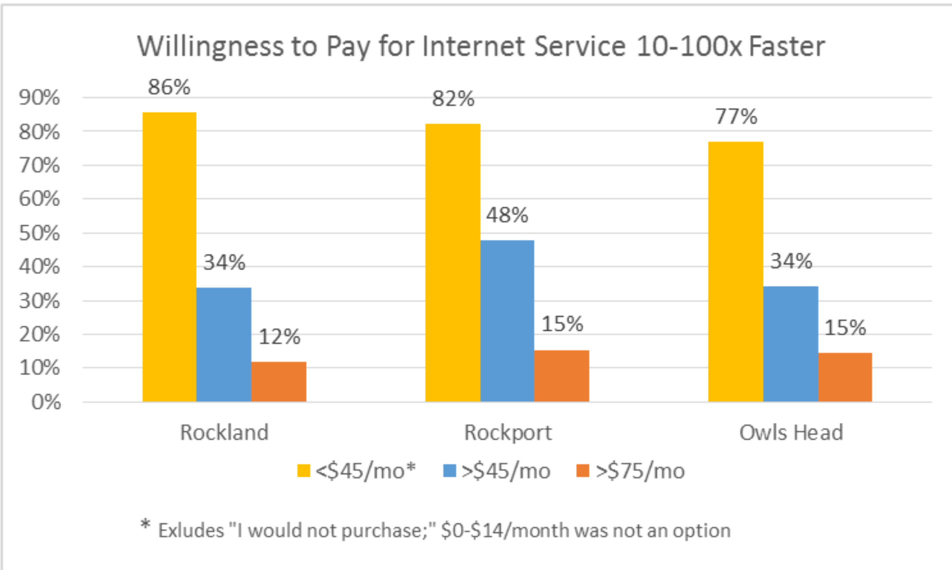

Figure 18: Monthly Willingness to Pay for Faster Internet Service

Seasonal respondents expressed a similar willingness to pay for internet service than full time residents in the $46->$160/month range, with a difference in attitudes about getting service at all, and willingness to pay the lowest $15-$45 price point. Seasonal residents appear more likely to "cut the cord" for voice and more likely to use FairPoint as a voice provider. (See Figures 19 and 20 below). Tilson believes that seasonal residents are more likely to use FairPoint as a provider is because the company offers attractive, simple seasonal pricing.[11]

[10] Per Colin Haley of GWI, 10 of 70 buildings passed by the Rockport municipal network subscribe to GWI's 1 Gbps service. It is Tilson's understanding that there are no other providers on that network at this time.

[11] FairPoint offers a seasonal hold of any of its voice and internet bundles for $8.95/month for up to six months. Source: Tilson conversation with FairPoint customer service

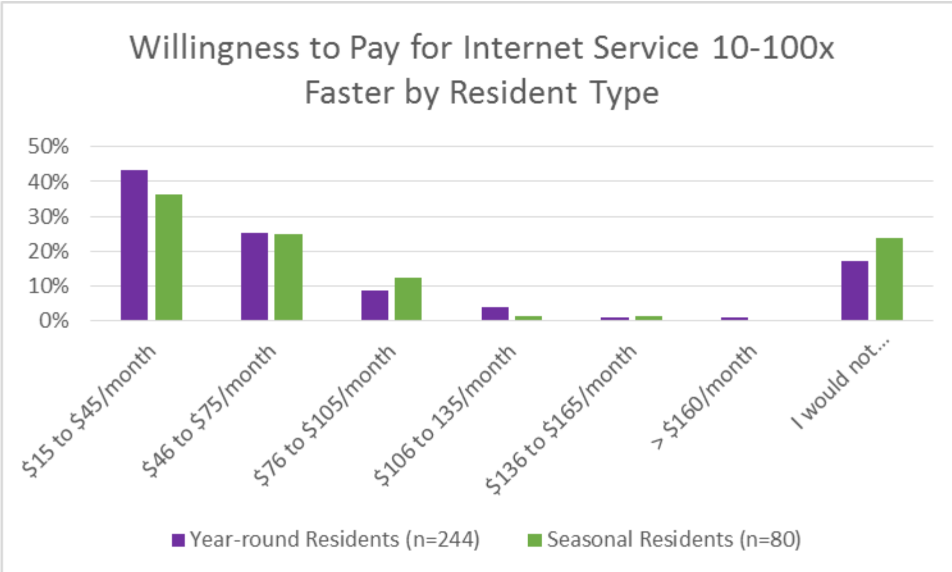

Figure 19: Monthly Willingness to Pay for Faster Internet Service by Resident Type

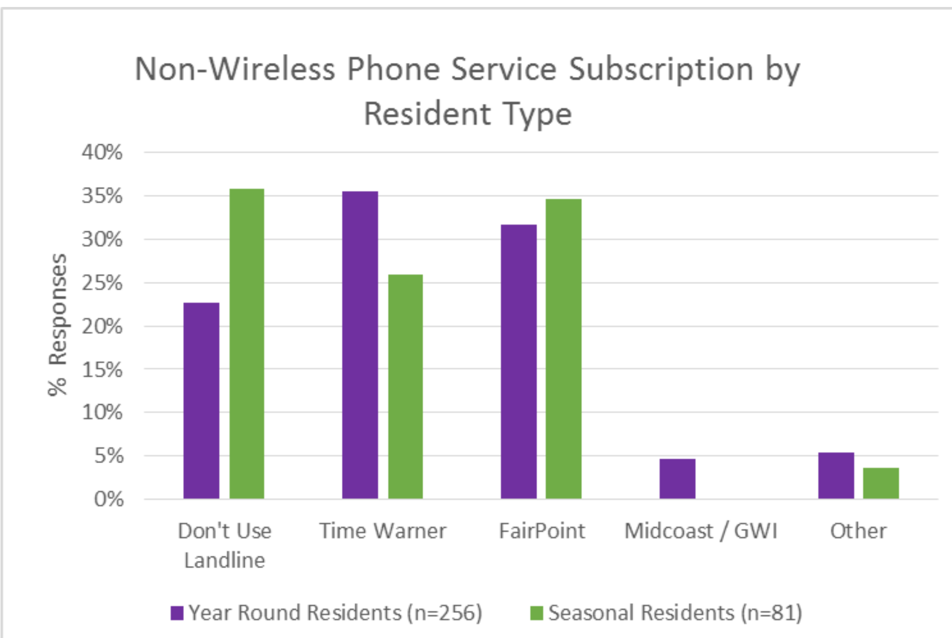

Figure 20: Non-Wireless Phone Subscription by Provider/No Provider

Attitudes about Government's Role

Generally speaking, property owners in all three municipalities are supportive of government's role in improving internet access. In Rockland, Rockport and Owl's Head, 52%, 62% and 57% of respondents answered a 4 or 5 to "How much do you support municipal government working to improve internet service." There was no notable difference between full time and seasonal residents. (See Figure 21 and Figure 22). The survey did not poll willingness to fund municipal government via property taxes.

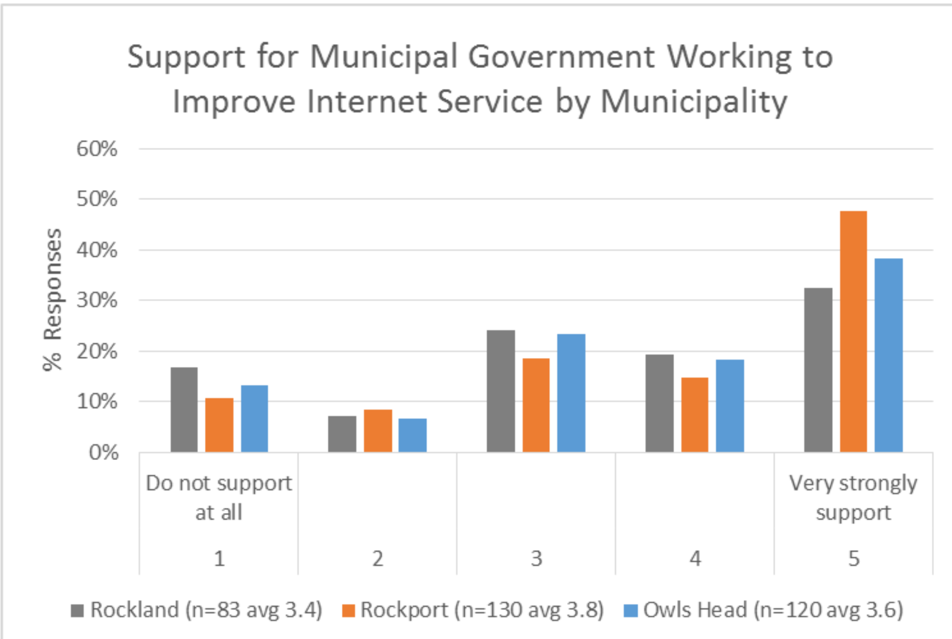

Figure 21: Support for Municipal Government Role by Municipality

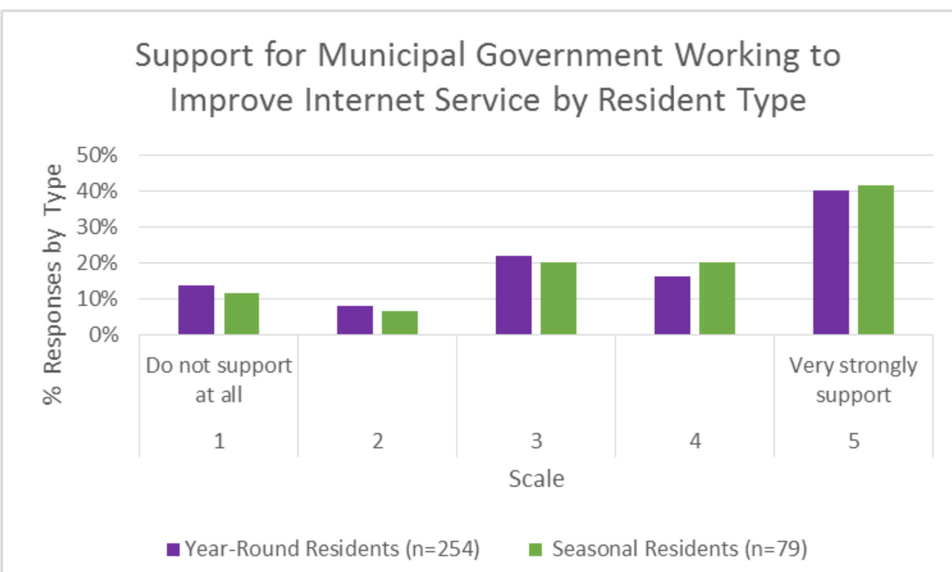

Figure 22: Support for Municipal Government Role by Resident Type

Stakeholder Survey Conclusions

- The majority of polled property owners were willing to switch providers, but were price sensitive;
- Questions about willingness to pay assumed a straight trade in internet service provider, and did not factor in savings from bundling voice or substituting over-the-top video programming for cable TV;
- There is strong support among seasonal and full time residents in all communities for the role of municipal government in improving internet access;
- Consumers like getting internet access, phone and TV on one bill. A municipal network's ability to provide all three will likely important to attracting subscribers;
- Seasonal residents are less likely to have landline phone service and more likely to use FairPoint than Time Warner for voice.   If the preference for FairPoint is due to seasonal pricing, the lack of a seasonal offering may hinder any competing provider's ability to win over seasonal subscribers.

Telecom Service Gap

All three municipalities are served by the set of broadband offerings commonly found throughout the country. They have abundant fiber assets and carriers willing to provide those to select business and limited residential locations. The gap is not about the existence of these assets. Rather, the service gap pertains to the access to these assets. Each municipality wishes to deploy a solution that would set it apart from the marketplace, give it a competitive edge, and lay the ground work for 21st century technological applications. Customer dissatisfaction with the most common broadband offerings is prevalent both in terms of price and quality. Complaints about quality reference service center responsiveness, deviation between advertised and realized speeds, and price. All three municipalities aspire to have next generation telecommunications infrastructure at the lowest possible prices.

Fiber Design and Capital Cost Estimate

To support the Towns' consideration of a broadband improvement project, Tilson prepared a high-level design and cost estimate for a fiber-to-the premise (FTTP) buildout in each of the three towns. This design involved reviewing the roads, building locations, and utility pole infrastructure and laying out fiber routes capable of connecting each premise to a central aggregation point with a glass fiber optic strand, as well as key necessary equipment used to send and receive optical communications through the fiber ("light" the fiber). Fiber optic networks are the current state of the art for communications networks to fixed (non-mobile) locations, offering the greatest level of capacity, reliability, and opportunity to be upgraded for additional capacity in the future.

Should the Towns proceed to the development of a network, they should expect to go through a more detailed engineering design and specification for the network. It may be possible at that time to identify savings over this estimate. It is also possible that a more detailed design process will identify additional costs, although we have prepared this estimate conservatively, and we believe that to be an unlikely scenario.

General Parameters

The design presented is based on a "home run" fiber architecture. In this type of design, the objective is to provide the ability to connect each premise back to a central aggregation point with a dedicated optical strand of glass fiber, approximately the thickness of a human hair, through which light is modulated for communication. A home-run design produces cables that contain large numbers of individual strands in close to the aggregation point, and generally fewer strands at the more distant points in the served area.[12] A home-run architecture is flexible and the most readily adaptable to a range of today's fiber transmission technologies, and future upgrade possibilities.

For convenience, a fiber optic local access network may be thought of conceptually as having three general divisions: the *pass*, the *drop* and the *network electronics*. The pass is that part of physical fiber network that connects to the central aggregation point and passes along the road or other right-of-way by the users. The drop is that part of the fiber network between the passing cable and the user premises. The optical strands in the drop cable interconnect with some of the strands in the cable of the pass to provide a continuous path between a premise and the aggregation point.[13]

The drop and the pass are *dark*, meaning they are a physical medium waiting to transmit a signal, analogous to the way an electric line isa physical medium waiting to transmit electricity until it is connected to a power source. Fiber optic cable, however, transmits light not electricity. In the local access network, electronic equipment is placed at the aggregation point, or node, to generate and receive the light that travels through the optic strands.[14] At each user premise a paired set of electronic equipment is placed to do the same thing. When this is done, the fiber is *lit*.

[12] Although larger strand-count cables are more costly than lower strand-count cables, the cost is an incremental one; much of the cost of building a fiber network is incurred by constructing a cable of any size.

[13] In the design presented here, these interconnections are facilitated by "multiport service terminals" placed periodically in line with the fiber optic cable of the pass.

[14] The design presented assumes that any electronics in the local access network are Active Ethernet, one of the two major standards most commonly deployed in local fiber networks in the U.S. today. The other is Gigabit Passive Optical Networking (GPON). GPON relies on multiple premises sharing access to a single wavelength of light, which

The node also provides a point at which the local access network (or *last mile*) can be interconnected with other fiber networks that aggregate and transport traffic regionally (the *middle-mile*) to interconnect with other networks.

Like the way that the entity that owns and maintains a local electric distribution network may be the same or different than the entity generating the electricity it carries, the entity owning and maintaining a dark fiber network may be the same or different than the entity owning and maintaining the electronics to light it (although most commonly they are the same). In the current Rockport model, the Town owns only the pass; it is a dark fiber owner. GWI leases access to the pass and is responsible both for building and owning the drop and the electronics to light the fiber network. The fiber design and cost estimate presented here contains all three divisions: the pass, the drop, and the electronics. We also estimate the cost savings that might be obtained by constructing some parts but not others.

Fiber Design

Figures 24-35 show a series of images representing the fiber designs in each town. Accompanying this report the Towns are receiving a copy of these designs in a KMZ (Google Earth) format. Town designs are independent of each other. However, if more than one neighboring Town decides to proceed with a project, they may wish to consider design alternatives that do not treat the town boundaries as the hard edges that they were in this exercise. Each Town's design covers the entire town;[15] Rockland and Owl's Head are broken up into three phases that reflect a likely construction schedule and municipal policy considerations.[16] The phases are sequential; Phases II and III cannot be built without Phase I and in some cases, Phase III cannot be built without Phase II. Each design assumes single main aggregation point in each town. Orange lines are reserved for underground segments, regardless of the strand count in the underground segment.

typically travels some length along a single optical strand before being passively split on to multiple strands serving multiple individual premises. Active Ethernet dedicates the wavelengths in a strand to the communication between the actively-powered electronics at a node and a single distant point. Active Ethernet requires a home-run fiber design. GPON does not, although it can deployed on one.

[15] Rockland's design does not include a segment of Route 90 in the northern corner of the City that can only be reached through other towns.

[16] Owls Head's Phase I includes the Ballyhac Road area, a high priority area because it contains locations that currently have no broadband service. Rockland's Phase I includes a ring connecting City and school anchor institution locations, which may create opportunities to help fund a project, and key downtown areas identified by the City as top priority.

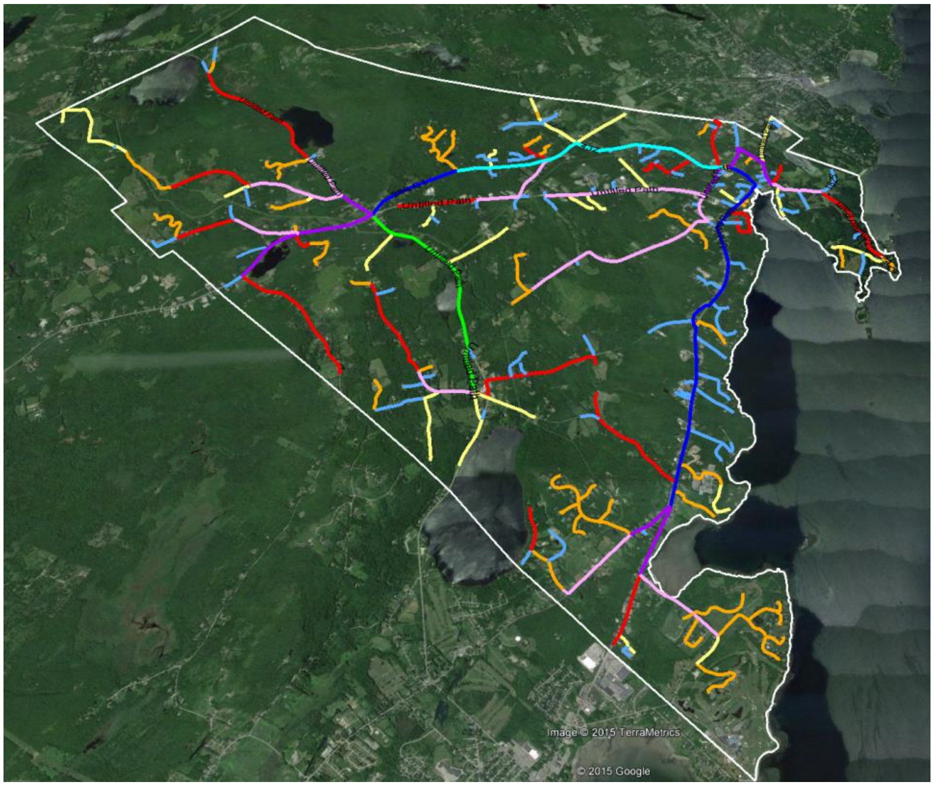

Figure 24: Rockport

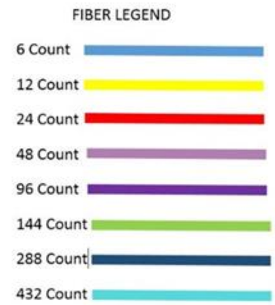

Figure 23: Fiber Legend

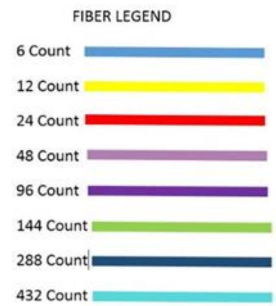

Figure 5: Rockland Phase I

Figure 6: Rockland Phase II

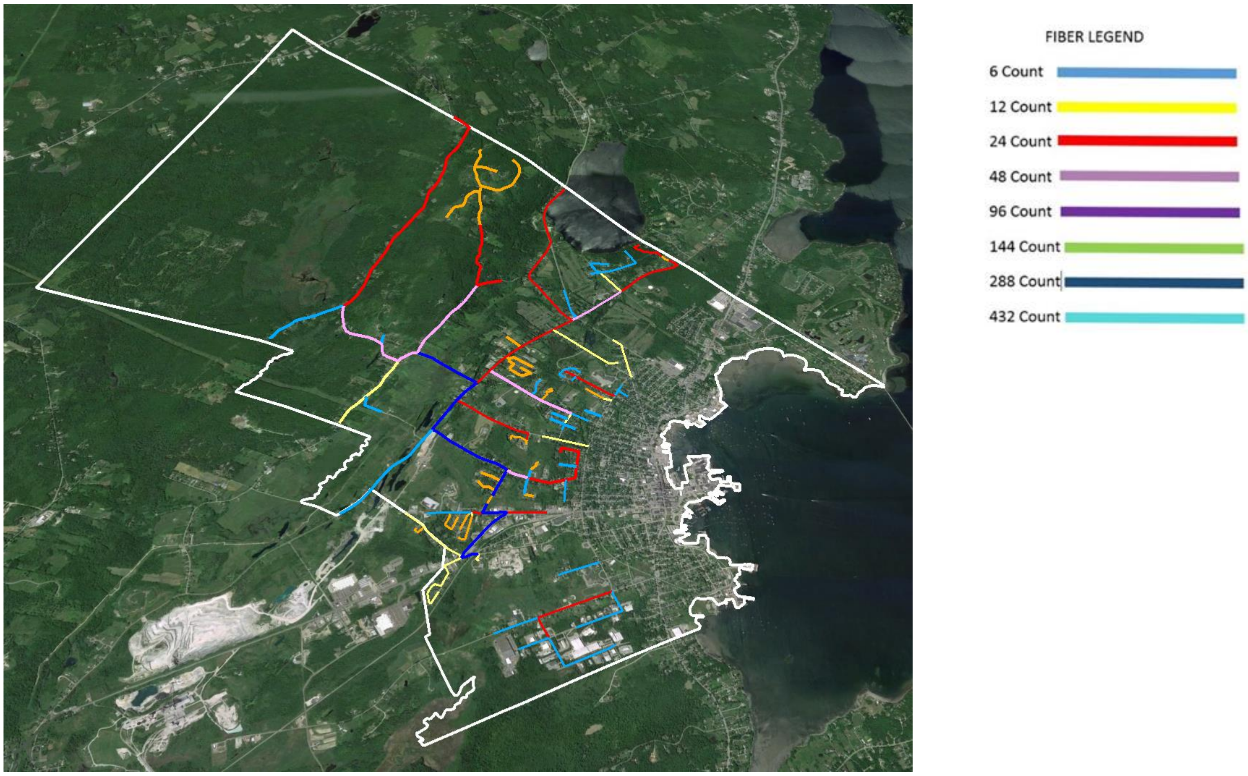

Figure27: Rockland Phase III

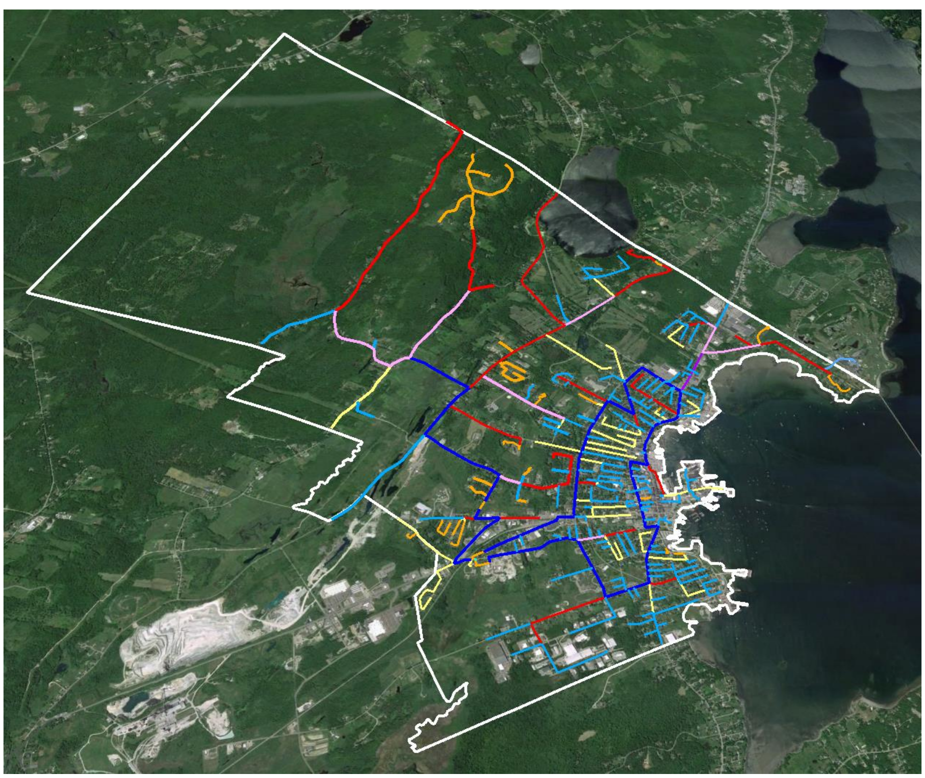

Figure 24: Rockland All Phases

TILSON

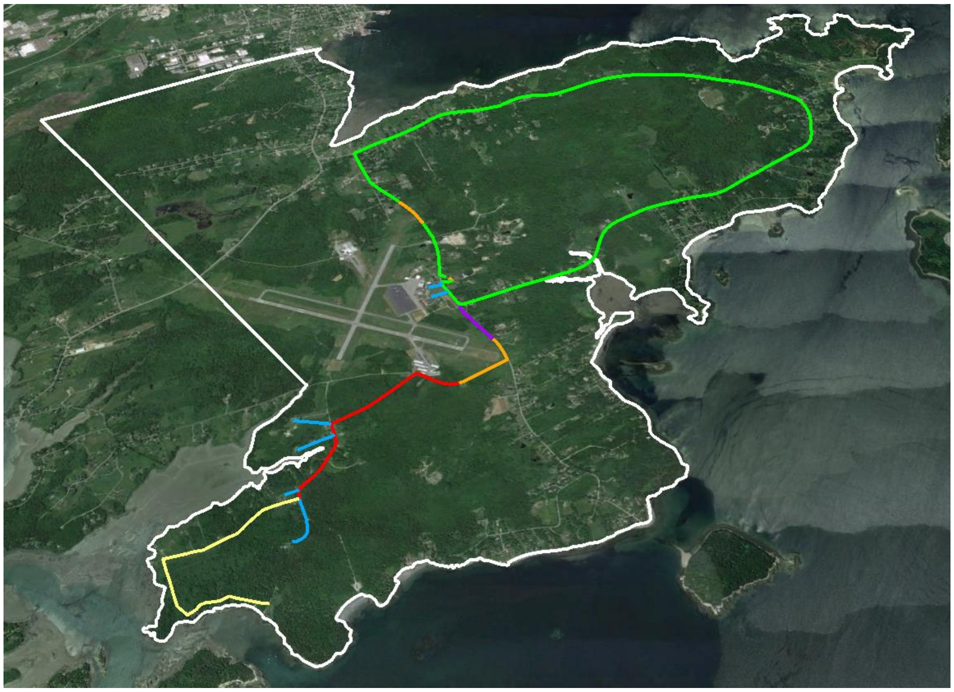

Figure 25: Owls Head Phase I

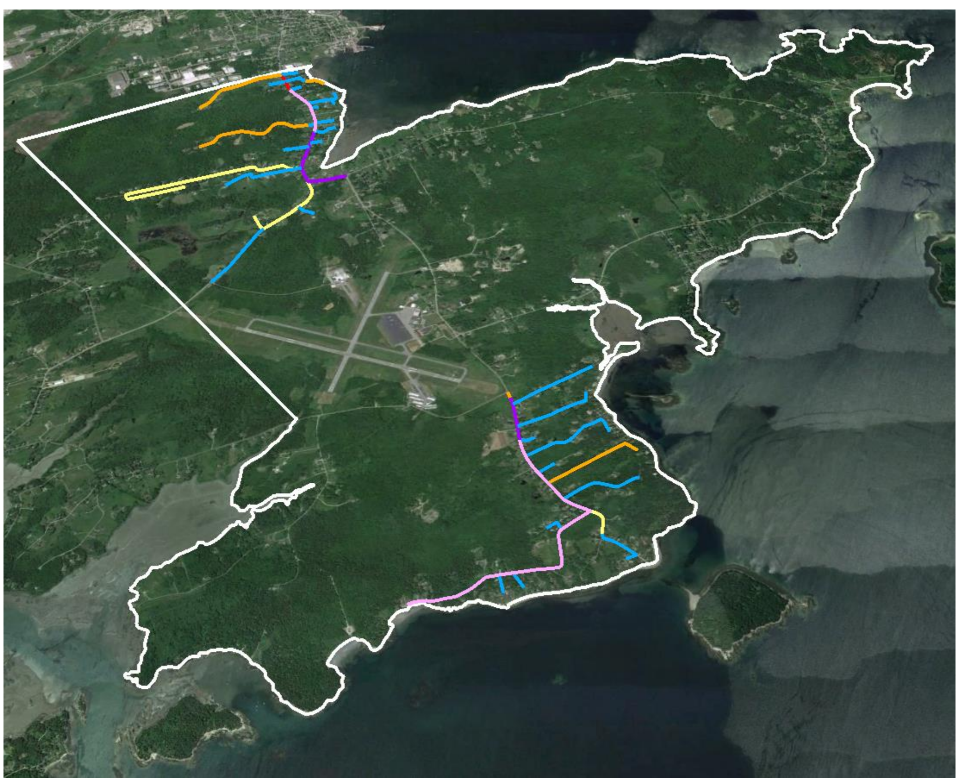

Figure 30: Owls Head Phase II

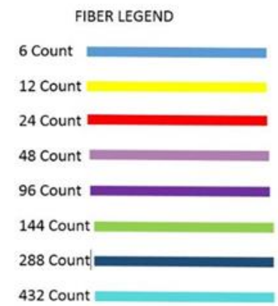

Figure 1: Owls Head Phase III

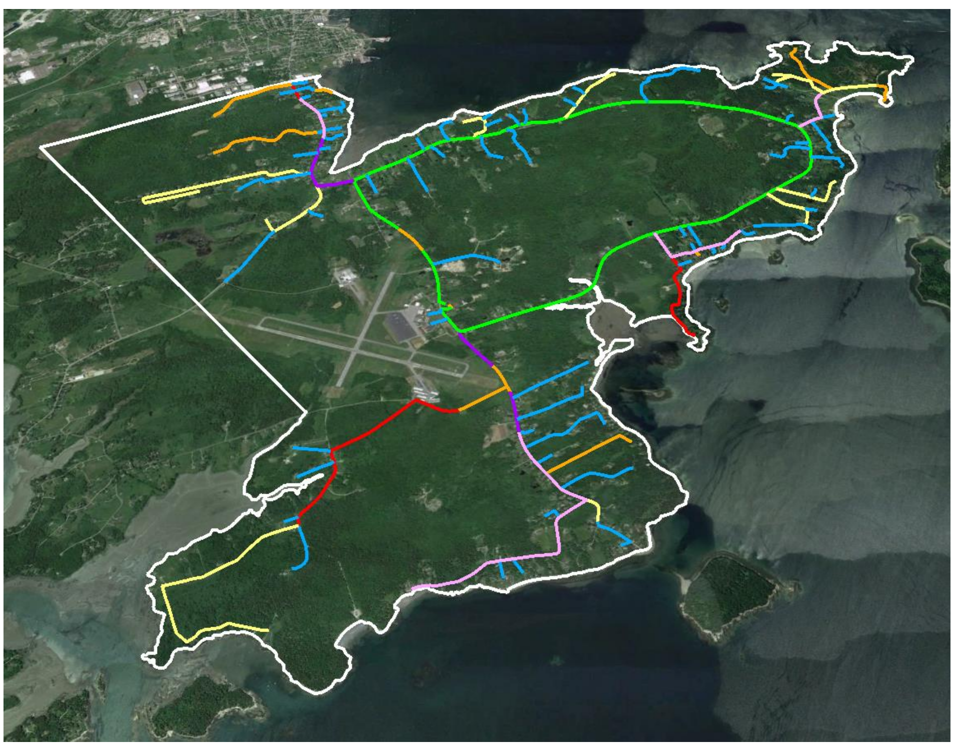

Figure 32: Owls Head All Phases

Capital Cost Estimates

Based on the design presented, we have prepared capital cost estimates for the design by segment. These base case estimates begin with the assumption that the network will reach all premises identified, and will include the pass, drop, and electronics. This estimate serves as a high water mark and also is an input to analysis of the "Town Wide Utility" financial model.[17]

	Total	%	Rockport	Rockland Phase 1	Rockland Phase 2	Rockland Phase 3	Rockland Combined	Owls Head Phase 1	Owls Head Phase 2	Owls Head Phase 3	Owls Head Combined
Miles	151.18		71.62	5.78	18.09	26.25	50.12	9.81	10.19	9.44	29.44
% underground	26.01%		18.33%	3.95%	3.49%	15.92%	10.05%	6.14%	16.24%	7.72%	10.14%
Maximum Subscribers	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
Maximum Passes	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
	Cost		**Cost**	**Cost**	**Cost**	**Cost**	**Cost**	**Cost**	**Cost**	**Cost**	**Cost**
Fiber Network Pass	$ 8,747,015	47%	$ 4,315,893	$ 378,524	$ 984,982	$ 1,561,279	$ 2,924,785	$ 469,420	$ 572,850	$ 464,067	$ 1,506,337
Pole Applications and Make-Ready	*$ 1,377,001*	*7%*	*$ 595,875*	*$ 58,486*	*$ 184,725*	*$ 266,502*	*$ 509,712*	*$ 94,315*	*$ 87,946*	*$ 89,153*	*$ 271,414*
Fiber and Other Materials	*$ 2,395,832*	*13%*	*$ 1,124,526*	*$ 152,448*	*$ 313,401*	*$ 394,818*	*$ 860,667*	*$ 147,436*	*$ 137,943*	*$ 125,259*	*$ 410,639*
Construction (Labor)	*$ 4,974,183*	*27%*	*$ 2,595,492*	*$ 167,591*	*$ 486,856*	*$ 899,960*	*$ 1,554,406*	*$ 227,668*	*$ 346,961*	*$ 249,655*	*$ 824,284*
Drops	$ 3,262,350	17%	$ 1,088,724	$ 228,774	$ 790,608	$ 654,108	$ 1,673,490	$ 116,298	$ 205,842	$ 177,996	$ 500,136
Fiber and Other Materials	*$ 717,000*	*4%*	*$ 239,280*	*$ 50,280*	*$ 173,760*	*$ 143,760*	*$ 367,800*	*$ 25,560*	*$ 45,240*	*$ 39,120*	*$ 109,920*
Construction (Labor)	*$ 2,545,350*	*14%*	*$ 849,444*	*$ 178,494*	*$ 616,848*	*$ 510,348*	*$ 1,305,690*	*$ 90,738*	*$ 160,602*	*$ 138,876*	*$ 390,216*
Engineering and Project Management	$ 601,563	3%	$ 275,595	$ 27,687	$ 88,296	$ 112,825	$ 228,808	$ 25,472	$ 40,605	$ 31,082	$ 97,160
Traffic Control	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Local Network Electronics	$ 3,618,100	19%	$ 1,213,396	$ 254,276	$ 865,952	$ 708,802	$ 1,829,030	$ 140,282	$ 231,118	$ 204,274	$ 575,674
Taxes	$ 811,451	4%	$ 344,680	$ 44,463	$ 136,492	$ 151,851	$ 332,806	$ 37,574	$ 52,521	$ 43,871	$ 133,965
Contingency	$ 1,622,903	9%	$ 689,361	$ 88,926	$ 272,984	$ 303,701	$ 665,611	$ 75,147	$ 105,042	$ 87,742	$ 267,931
Total	**$ 18,663,382**		**$ 7,927,649**	**$ 1,022,650**	**$ 3,139,314**	**$ 3,492,566**	**$ 7,654,530**	**$ 864,193**	**$ 1,207,978**	**$ 1,009,032**	**$ 3,081,203**
$/Mile	*$ 123,453*		*$ 110,694*	*$ 176,929*	*$ 173,539*	*$ 133,050*	*$ 152,724*	*$ 88,093*	*$ 118,545*	*$ 106,889*	*$ 104,660*
$/Sub	*$ 3,124*		*$ 3,976*	*$ 2,441*	*$ 2,168*	*$ 2,915*	*$ 2,497*	*$ 4,057*	*$ 3,204*	*$ 3,095*	*$ 3,364*

Table 8: Base Case Utility Model CapEx by Phase and Municipality

[17] The Town Wide Utility model assumes that the network reaches every premise in town, and subscription is 100%, similar to a water or sewer utility. It is discussed further in the "Operating Models and Pro-Forma Financials" section.

	Rockport		
	Totals		Proportion
Miles		104.44	
% underground		18.23%	
Subscribers		2,648	
		$	%
Fiber Network Pass	$	4,315,893	54.44%
Pole Applications and Make-Ready	*$*	*595,875*	*7.52%*
Fiber and Other Materials	*$*	*1,124,526*	*14.18%*
Construction (Labor)	*$*	*2,595,492*	*32.74%*
Drops	$	1,088,724	13.73%
Fiber and Other Materials	*$*	*239,280*	*3.02%*
Construction (Labor)	*$*	*849,444*	*10.71%*
Engineering and Project Management	$	275,595	3.48%
Local Network Electronics	$	1,213,396	15.31%
Taxes	$	344,680	4.35%
Contingency	$	689,361	8.70%
Total	**$**	**7,927,649**	
$/Mile	*$*	*75,908*	
$/Sub	*$*	*2,994*	

Table 9 through Table 11 provide break-out results for each Town. Of the three, Rockport has a relatively higher cost per subscriber for the system, at a lower density of subscribers than Rockland and a greater amount of underground construction than Owls Head. Rockland has the highest cost per mile to construct, but this is owing to its relatively higher density of subscribers; on a per-subscriber basis it has the lowest estimated capital cost, and a lower overall estimated capital cost than Rockport, despite having about 50% more subscribers.

These tables also break down the estimate by major cost category.[18] For all the communities, the cost of the pass is the highest cost, although in differing proportions. In Owls Head and Rockport, the pass represents about half of the total estimated cost; in Rockland it is less than 40%. Drops and electronics represent a greater percentage of Rockland's costs, owing again to its higher density of subscribers per mile.

[18] In these tables margins are included in the categories, instead of being broken out separately.

	Total	%	Rockport	Rockland Phase 1	Rockland Phase 2	Rockland Phase 3	Rockland Combined	Owls Head Phase 1	Owls Head Phase 2	Owls Head Phase 3	Owls Head Combined
Miles	151.18		71.62	5.78	18.09	26.25	50.12	9.81	10.19	9.44	29.44
% underground	26.01%		18.33%	3.95%	3.49%	15.92%	10.05%	6.14%	16.24%	7.72%	10.14%
Maximum Subscribers	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
Maximum Passes	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
	Cost		**Cost**	Cost	Cost	Cost	**Cost**	Cost	Cost	Cost	**Cost**
Fiber Network Pass	$ 8,747,015	47%	$ 4,315,893	$ 378,524	$ 984,982	$ 1,561,279	$ 2,924,785	$ 469,420	$ 572,850	$ 464,067	$ 1,506,337
Pole Applications and Make-Ready	*$ 1,377,001*	*7%*	*$ 595,875*	*$ 58,486*	*$ 184,725*	*$ 266,502*	*$ 509,712*	*$ 94,315*	*$ 87,946*	*$ 89,153*	*$ 271,414*
Fiber and Other Materials	*$ 2,395,832*	*13%*	*$ 1,124,526*	*$ 152,448*	*$ 313,401*	*$ 394,818*	*$ 860,667*	*$ 147,436*	*$ 137,943*	*$ 125,259*	*$ 410,639*
Construction (Labor)	*$ 4,974,183*	*27%*	*$ 2,595,492*	*$ 167,591*	*$ 486,856*	*$ 899,960*	*$ 1,554,406*	*$ 227,668*	*$ 346,961*	*$ 249,655*	*$ 824,284*
Drops	$ 3,262,350	17%	$ 1,088,724	$ 228,774	$ 790,608	$ 654,108	$ 1,673,490	$ 116,298	$ 205,842	$ 177,996	$ 500,136
Fiber and Other Materials	*$ 717,000*	*4%*	*$ 239,280*	*$ 50,280*	*$ 173,760*	*$ 143,760*	*$ 367,800*	*$ 25,560*	*$ 45,240*	*$ 39,120*	*$ 109,920*
Construction (Labor)	*$ 2,545,350*	*14%*	*$ 849,444*	*$ 178,494*	*$ 616,848*	*$ 510,348*	*$ 1,305,690*	*$ 90,738*	*$ 160,602*	*$ 138,876*	*$ 390,216*
Engineering and Project Management	$ 601,563	3%	$ 275,595	$ 27,687	$ 88,296	$ 112,825	$ 228,808	$ 25,472	$ 40,605	$ 31,082	$ 97,160
Traffic Control	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Other	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Local Network Electronics	$ 3,618,100	19%	$ 1,213,396	$ 254,276	$ 865,952	$ 708,802	$ 1,829,030	$ 140,282	$ 231,118	$ 204,274	$ 575,674
Taxes	$ 811,451	4%	$ 344,680	$ 44,463	$ 136,492	$ 151,851	$ 332,806	$ 37,574	$ 52,521	$ 43,871	$ 133,965
Contingency	$ 1,622,903	9%	$ 689,361	$ 88,926	$ 272,984	$ 303,701	$ 665,611	$ 75,147	$ 105,042	$ 87,742	$ 267,931
Total	**$ 18,663,382**		**$ 7,927,649**	**$ 1,022,650**	**$ 3,139,314**	**$ 3,492,566**	**$ 7,654,530**	**$ 864,193**	**$ 1,207,978**	**$ 1,009,032**	**$ 3,081,203**
$/Mile	*$ 123,453*		*$ 110,694*	*$ 176,929*	*$ 173,539*	*$ 133,050*	*$ 152,724*	*$ 88,093*	*$ 118,545*	*$ 106,889*	*$ 104,660*
$/Sub	*$ 3,124*		*$ 3,976*	*$ 2,441*	*$ 2,168*	*$ 2,915*	*$ 2,497*	*$ 4,057*	*$ 3,204*	*$ 3,095*	*$ 3,364*

Table 8: Base Case Utility Model CapEx by Phase and Municipality

	Rockport	
	Totals	**Proportion**
Miles	104.44	
% underground	18.23%	
Subscribers	2,648	
	$	**%**
Fiber Network Pass	$ 4,315,893	54.44%
Pole Applications and Make-Ready	*$ 595,875*	*7.52%*
Fiber and Other Materials	*$ 1,124,526*	*14.18%*
Construction (Labor)	*$ 2,595,492*	*32.74%*
Drops	$ 1,088,724	13.73%
Fiber and Other Materials	*$ 239,280*	*3.02%*
Construction (Labor)	*$ 849,444*	*10.71%*
Engineering and Project Management	$ 275,595	3.48%
Local Network Electronics	$ 1,213,396	15.31%
Taxes	$ 344,680	4.35%
Contingency	$ 689,361	8.70%
Total	**$ 7,927,649**	
$/Mile	*$ 75,908*	
$/Sub	*$ 2,994*	

Table 9: Base Case Utility Model CapEx, Rockport

	Rockland					
	Phases I, II, and III		**Phases I and II**		**Phase I**	
Miles	50.12		23.87		5.78	
% underground	10.05%		3.60%		3.95%	
Subscribers	3,065		1,867		419	
	$	**%**	**$**	**%**	**Cost**	**%**
Fiber Network Pass	$ 2,924,785	38.21%	$ 1,363,506	32.76%	$ 378,524	37.01%
Pole Applications and Make-Ready	*$ 509,712*	*6.66%*	*$ 243,210*	*5.84%*	*$ 58,486*	*5.72%*
Fiber and Other Materials	*$ 860,667*	*11.24%*	*$ 465,849*	*11.19%*	*$ 152,448*	*14.91%*
Construction (Labor)	*$ 1,554,406*	*20.31%*	*$ 654,446*	*15.72%*	*$ 167,591*	*16.39%*
Drops	$ 1,673,490	21.86%	$ 1,019,382	24.49%	$ 228,774	22.37%
Fiber and Other Materials	*$ 367,800*	*4.80%*	*$ 224,040*	*5.38%*	*$ 50,280*	*4.92%*
Construction (Labor)	*$ 1,305,690*	*17.06%*	*$ 795,342*	*19.11%*	*$ 178,494*	*17.45%*
Engineering and Project Management	$ 228,808	2.99%	$ 115,983	2.79%	$ 27,687	2.71%
Local Network Electronics	$ 1,829,030	23.89%	$ 1,120,228	26.92%	$ 254,276	24.86%
Taxes	$ 332,806	4.35%	$ 180,955	4.35%	$ 44,463	4.35%
Contingency	$ 665,611	8.70%	$ 361,910	8.70%	$ 88,926	8.70%
Total	**$ 7,654,530**		**$ 4,161,964**		**$ 1,022,650**	
$/Mile	*$ 152,724*		*$ 174,360*		*$ 176,929*	
$/Sub	*$ 2,497*		*$ 2,229*		*$ 2,441*	
% of total capital cost	100.00%		54.37%		13.36%	
% of total subscribers	100.00%		60.91%		13.67%	

Table 10: Base Case Utility Model CapEx by Phase, Rockland

	Owls Head					
	Phases I, II, and III		**Phases I and II**		**Phase I**	
Miles	29.44		20.00		9.81	
% underground	10.14%		11.29%		6.14%	
Subscribers	916		590		213	
	$	**%**	**$**	**%**	**Cost**	**%**
Fiber Network Pass	$ 1,506,337	48.89%	$ 1,042,270	50.30%	$ 469,420	54.32%
Pole Applications and Make-Ready	*$ 271,414*	*8.81%*	*$ 182,261*	*8.80%*	*$ 94,315*	*10.91%*
Fiber and Other Materials	*$ 410,639*	*13.33%*	*$ 285,380*	*13.77%*	*$ 147,436*	*17.06%*
Construction (Labor)	*$ 824,284*	*26.75%*	*$ 574,629*	*27.73%*	*$ 227,668*	*26.34%*
Drops	$ 500,136	16.23%	$ 322,140	15.55%	$ 116,298	13.46%
Fiber and Other Materials	*$ 109,920*	*3.57%*	*$ 70,800*	*3.42%*	*$ 25,560*	*2.96%*
Construction (Labor)	*$ 390,216*	*12.66%*	*$ 251,340*	*12.13%*	*$ 90,738*	*10.50%*
Engineering and Project Management	$ 97,160	3.15%	$ 66,078	3.19%	$ 25,472	2.95%
Local Network Electronics	$ 575,674	18.68%	$ 371,400	17.92%	$ 140,282	16.23%
Taxes	$ 133,965	4.35%	$ 90,094	4.35%	$ 37,574	4.35%
Contingency	$ 267,931	8.70%	$ 180,189	8.70%	$ 75,147	8.70%
Total	**$ 3,081,203**		**$ 2,072,171**		**$ 864,193**	
$/Mile	*$ 104,660*		*$ 103,609*		*$ 88,093*	
$/Sub	*$ 3,364*		*$ 3,512*		*$ 4,057*	
% of total capital cost	100.00%		67.25%		28.05%	
% of total subscribers	100.00%		64.41%		23.25%	

Table 11: Base Case Utility Model CapEx by Phase, Owls Head

Table 12 presents capital cost estimates for the three Towns combined if a number of strategies were to be employed to limit the total capital costs. These strategies were all modeled under the most generous assumptions about take-rates examined in the analysis of the "Underlying Network," (i.e. it was assumed that a large majority but not all premises would eventually take service). It is important to note, even where these strategies may limit capital costs, they have important business case implications, which are more fully discussed in the Business Model 2: Underlying Network Strategies section. These strategies include the following:

- **Limiting drops and electronics to premises served**. This strategy had only a minor effect on overall capital costs, and it actually *increased* estimated costs at the relatively high subscribership levels assumed, due to the higher cost of performing installations after the main construction project was completed.
- **No electronics.** Implementing this strategy would mean constructing a "dark" network. The ISP(s) providing service over the network would need to supply the electronics necessary to serve customers on the network. This produced estimated savings across the three-Town total of about 1/3 over the base estimate. GWI is currently supplying the electronics in the Rockport municipal fiber network.
- **No drops.** Eliminating drops from the project produced a smaller but still substantial savings compared to eliminating the electronics. This essentially replicates the current Rockport model.
- **Limited underground.** Underground construction is frequently more expensive than aerial construction on utility poles. The base design assumed all underground construction would require installing new underground conduit. Eliminating underground construction except in areas where necessary to connect two parts of the network where there are no poles reduces the average cost to reach subscribers. It also, however, not all premises can be reached, as poles are not available in some parts of the towns.

Taken together, these strategies could reduce the total capital cost estimate by more than half of the base estimate. A more detailed break-out by Town and phase after applying all of these strategies to the estimate is shown in Appendix A. .

	Base Estimate: all premises served; all costs included	75% of premises served; only served premises receive drops & electronics	No electronics; 75% of premises served; only served premises receive drops	No drops and no electronics	No electronics and limited underground; 75% of premises served; only served premises receive drops	No electronics, no drops and limited underground
Maximum Subscribers	5,975	4,483	4,483	4,483	4,483	4,483
Maximum Passes	5,975	5,975	5,975	5,975	5,975	5,975
Fiber Network Pass	$ 8,747,015	$ 8,747,015	$ 8,747,015	$ 8,747,015	$ 6,664,031	$ 6,664,031
Pole Applications and Make-Ready	*$ 1,377,001*	*$ 1,377,001*	*$ 1,377,001*	*$ 1,377,001*	*$ 1,377,001*	*$ 1,377,001*
Fiber and Other Materials	*$ 2,395,832*	*$ 2,395,832*	*$ 2,395,832*	*$ 2,395,832*	*$ 2,230,597*	*$ 2,230,597*
Construction (Labor)	*$ 4,974,183*	*$ 4,974,183*	*$ 4,974,183*	*$ 4,974,183*	*$ 3,056,433*	*$ 3,056,433*
Drops (Materials and Labor)	$ 3,262,350	$ 2,391,851	$ 2,394,665	$ -	$ 1,973,625	$ -
Engineering and Project Management	$ 601,563	$ 397,935	$ 397,935	$ 397,935	$ 244,515	$ 244,515
Local Network Electronics	$ 3,618,100	$ 4,874,086	$ -	$ -	$ -	$ -
Taxes	$ 811,451	$ 820,544	$ 576,981	$ 457,247	$ 444,109	$ 345,427
Contingency	$ 1,622,903	$ 1,641,089	$ 1,153,961	$ 914,495	$ 888,217	$ 690,855
Total	**$ 18,663,382**	**$ 18,872,520**	**$ 13,270,557**	**$ 10,516,692**	**$ 10,214,496**	**$ 7,944,827**
$/Mile	*$ 123,453*	*$ 124,837*	*$ 87,781*	*$ 69,565*	*$ 67,566*	*$ 52,553*
$/Sub	*$ 3,124*	*$ 4,210*	*$ 2,960*	*$ 2,346*	*$ 2,278*	*$ 1,772*

Table 12: CapEx All Phases, All Municipalities, by Base Case Utility Model and Underlying Network Model Cost Savings Strategy

Operating Models and Pro-Forma Financials

Business Model 1: Town-Wide Utility

This model assumes that the Town(s) build out the fiber optic network to the entire town, and procure internet service from an ISP, who operates the network for a fee and delivers service to every connected premise. Under this model, there is no question or uncertainty about how many users sign up for service; all premises passed are connected, and all premises pay (whether they might choose to on their own or not). For the sake of analysis, we have assumed that each premise pays a required monthly service fee. However, the Town(s) could choose from a number of variant revenue models, including simply raising all or part of the required revenues from general revenues.

Key Assumptions

Service Offering. This model assumes a simplified, flat monthly service offering for all residential, business, and institutional users of $70/mo. for 1 Gbps internet service only with no seasonal offering. Of course, it would be possible to also deliver enhanced services, such as telephone, or different tiers of internet service at different price points for different users, but for the sake of presenting a "base case" scenario with fewer variables, these options are excluded. It would also be possible under this general business model to provide wholesale transport services or dark fiber for users who want service from other service providers or need more specialized services. Again, however, these options have been excluded for the sake of simplicity.

Capital Costs. This model assumes that the Towns will take on all components of the local access network: fiber passing each premise (aerial and underground where necessary), drops to every premise (aerial and underground where necessary), and the electronics to light up the network. These are all required elements to deliver the total service that this option contemplates.

Financing. This model assumes all capital costs will be financed over a 20 year period at an interest rate of 3.5%, with a 2% cost of borrowing. Interest earned for cash on hand is assumed to be 0.5%

Construction Schedule. The model assumes that all premises are connected as the network is constructed, and the network begins to add users prior to the full construction of the network. It is assumed that each project would launch service ("Year 1, Month 1") after about 50% of the Town's Phase I premises are built-out in and connected in a pre-launch construction period, and that Phase I projects would be complete 6 months after launch ("Month 6"), that Phase II project would start adding users beginning in Month 1 and ending in Month 12, and that Phase III projects would start adding users beginning in Month 1 and ending in Month 18.

Underlying Network Operating Costs. This model assumes that the network will require maintenance and repair expenses equal to 2% of the capital costs of the network.[19] Pole license fees are assumed to be $25/year/pole. A single general management expense of $50,000 per year is assumed, regardless of the number of towns or phases in the project. Expenses are assumed to increase by 3% per year, except pole rates, which are not assumed to increase.

Internet Service Operating Costs. To provide internet service over the network, the model assumes the following operating cost categories: the costs to engage and ISP to operate the network and deliver service are structured as a bandwidth cost (the cost to obtain a certain amount of wholesale commodity Internet service to the network, that all users will share) and a "base cost" to serve, structured as a flat monthly per-user fee to the ISP, intended to reflect all other costs to serve users. The base cost to serve is assumed to be $20/month/user, increasing at an annual rate of 3%. Bandwidth is assumed to cost $3.50 per Mb per month, with an assumed price decrease of 15% per year in this price. The model assumes the system will purchase at least 1 Mb of bandwidth capacity per user, rounded up to full 1Gb increments, and that the amount of bandwidth purchased per user will increase at rate of 20% per year.[20]

Although the model assumes this cost structure, in reality there are a variety of potential alternative ways to structure such an arrangement, and these alternatives often emerge in the process of soliciting and negotiating with an ISP. This structure has been chosen as a general representative for modeling purposes to facilitate discussion and analysis. The fact that the market for these types of agreements is young and that an arrangement between the Town(s) and an ISP might be structured a number of different ways creates greater uncertainty about the correct values for these costs, especially the base

[19] Repair costs in particular tend to be "lumpy," and may vary greatly from period to period. Since the timing of these costs is impossible to predict, the model assumes that a fixed amount is incurred every month. As a practical matter, we would expect the Town(s) to utilize a variety of techniques, such as accruing maintenance and repair funds over time, entering into fixed-price agreements with vendors, and/or insuring against large repair events.

[20] Obviously the assumption that users will have 1 Gb service and the system will procure at least 1 Mb of internet bandwidth per user for the entire system means that there is oversubscription. Oversubscription is normal in an ISP's network, and can be done because at any given moment, only a fraction of users are likely to be calling on the system to provide them with the full capacity of their connection (or even any of it). More robust users, like major business or enterprise locations, and wholesale customers, are likely to have a more consistently high level of use and require services with lower oversubscription ratios (or no oversubscription at all). These types of services have higher costs and come with higher prices than those contemplated here. These higher-level services could be provided, but are assumed to be outside this base case analysis.

cost to serve. Actual values could well differ significantly. However, we believe the assumed values to be relatively conservative, and more likely to overestimate true costs than underestimate them.

Capital Costs

Taken together as a whole, the estimated capital cost for all three phases for the three towns under this model is $18,663,382, $7,927,649 in Rockport, $7,654,530 in Rockland, and $3,081,203 for Owls Head. A more complete discussion and analysis of capital costs for the project is contained in the *Fiber Design and Capital Cost Estimate* section. This analysis assumes that the Towns would bear the entire capital cost of the local network (including drops and the electronics), and recover all of this cost in the form of a user fee. There are some advantages to this assumption, including the ability to borrow for a long term at rates that are likely lower than they would be for private parties. However, if a lower total municipal bond amount were desirable, a possible variant could involve dividing some capital costs with a private partner ISP, in return for a higher monthly fee (which could be at least partially offset by the Town's lower debt service).

Cash Flow

Table 13 through Table 16 show five years of projected cash flows under the stated assumptions for this model, both for the individual Towns and for the project on a combined basis. In this scenario, the project is able to achieve a solid positive net income fairly rapidly, generating an estimated $5.1 million positive net income, with the largest portion of this (about 2/3) attributable to Rockland. Revenues under this model are a simple function of the total subscribers times the single $70 monthly fee per user. Operating expenses are approximately double the level of debt service required.

Rockport, Rockland, and Owls Head Combined--All Phases

	Years				
	1	2	3	4	5
Average # of Subscribers	2,771	5,581	5,975	5,975	5,975
Revenue	$2,327,990	$4,688,320	$5,019,000	$5,019,000	$5,019,000
Operating Expenses	$1,335,350	$2,246,715	$2,402,380	$2,451,129	$2,493,329
Net Operating Revenue	**$992,640**	**$2,441,605**	**$2,616,620**	**$2,567,871**	**$2,525,671**
Debt Service	$676,515	$1,345,205	$1,345,205	$1,345,205	$1,345,205
Net Income	**$316,125**	**$1,096,400**	**$1,271,415**	**$1,222,666**	**$1,180,466**
Cumulative Net Income	*$316,125*	*$1,412,525*	*$2,683,940*	*$3,906,606*	*$5,087,073*

Table 13: Base Case Utility Cash Flow Pro-Forma, All Municipalities

Rockport Only

	Years				
	1	2	3	4	5
Average # of Subscribers	915	1,759	1,994	1,994	1,994
Revenue	$768,740	$1,477,560	$1,674,960	$1,674,960	$1,674,960
Operating Expenses	$527,487	$809,272	$897,976	$922,385	$920,367
Net Operating Revenue	**$241,253**	**$668,288**	**$776,984**	**$752,575**	**$754,593**
Debt Service	$283,815	$564,347	$564,347	$564,347	$564,347
Net Income	**($42,562)**	**$103,941**	**$212,637**	**$188,228**	**$190,246**
Cumulative Net Income	*($42,562)*	*$61,379*	*$274,016*	*$462,244*	*$652,489*

Table 14: Base Case Utility Cash Flow Pro-Forma, Rockport

Rockland Only--All Phases

	Years				
	1	2	3	4	5
Average # of Subscribers	1,384	2,940	3,065	3,065	3,065
Revenue	$1,162,560	$2,469,810	$2,574,600	$2,574,600	$2,574,600
Operating Expenses	$659,347	$1,150,016	$1,208,700	$1,232,186	$1,252,780
Net Operating Revenue	**$503,213**	**$1,319,794**	**$1,365,900**	**$1,342,414**	**$1,321,820**
Debt Service	$282,030	$560,798	$560,798	$560,798	$560,798
Net Income	**$221,183**	**$758,996**	**$805,103**	**$781,616**	**$761,022**
Cumulative Net Income	*$221,183*	*$980,179*	*$1,785,282*	*$2,566,898*	*$3,327,920*

Table 15: Base Case Utility Cash Flow Pro-Forma, Rockland

Owls Head Only--All Phases

	Years				
	1	2	3	4	5
Average # of Subscribers	472	882	916	916	916
Revenue	$396,690	$740,950	$769,440	$769,440	$769,440
Operating Expenses	$290,516	$401,137	$420,001	$429,045	$439,309
Net Operating Revenue	**$106,174**	**$339,813**	**$349,439**	**$340,395**	**$330,131**
Debt Service	$110,670	$220,060	$220,060	$220,060	$220,060
Net Income	**($4,496)**	**$119,753**	**$129,379**	**$120,335**	**$110,071**
Cumulative Net Income	*($4,496)*	*$115,257*	*$244,636*	*$364,971*	*$475,042*

Table 16: Base Case Utility Cash Flow Pro-Forma, Owls Head

Operating Expenses

Table 17 breaks out the estimated operating expenses by major cost categories. Once up and running, variable costs dominate, especially the base cost (per user) to serve. As a practical matter, although calculated for purposes of this exercise as a variable per user cost, it might be structured in an agreement with an ISP in a number of ways, including as a fixed fee or a percentage of revenue (if a more variable fee structure were adopted on the revenue side). Also, as mentioned in the Key Assumptions, the true cost of this line item is somewhat uncertain unless or until the Town(s) solicit and negotiate an agreement with an ISP. A breakout of operating expenses by municipality is in Appendix B

Rockport, Rockland, and Owls Head Combined Estimated Operating Expenses

	Year									
	1		**2**	**0**	**3**	**0**	**4**	**0**	**5**	**0**
	Cost	**%**	**Cost**	**%**	**Cost**	**%**	**Cost**	**%**	**Cost**	**%**
Fixed Costs	*$544,210*	*40.75%*	*$ 545,710*	*24.29%*	*$ 547,255*	*22.78%*	*$ 548,846*	*22.39%*	*$ 550,485*	*22.08%*
Management and Overhead	$ 50,000	3.74%	$ 51,500	2.29%	$ 53,045	2.21%	$ 54,636	2.23%	$ 56,275	2.26%
Maintenance and Repair	$ 373,268	27.95%	$ 373,268	16.61%	$ 373,268	15.54%	$ 373,268	15.23%	$ 373,268	14.97%
Pole Attachment Costs	$ 120,942	9.06%	$ 120,942	5.38%	$ 120,942	5.03%	$ 120,942	4.93%	$ 120,942	4.85%
Variable Costs	*$ 791,140*	*59.25%*	*$ 1,701,006*	*75.71%*	*$ 1,855,126*	*77.22%*	*$ 1,902,283*	*77.61%*	*$ 1,942,844*	*77.92%*
Base Cost to Serve	$ 665,140	49.81%	$ 1,379,706	61.41%	$ 1,521,331	63.33%	$ 1,566,971	63.93%	$ 1,613,980	64.73%
Bandwidth	$ 126,000	9.44%	$ 321,300	14.30%	$ 333,795	13.89%	$ 335,312	13.68%	$ 328,864	13.19%
Total	**$1,335,350**		**$ 2,246,715**		**$ 2,402,380**		**$ 2,451,129**		**$ 2,493,329**	

Table 17: Base Case Utility Operating Expense Estimates, All Municipalities

Discussion

The Utility model produces a high likelihood of a positive business case for all three municipalities, albeit at the cost of removing individual residents' and business' choice about whether to use and pay for the system. Rockland appears to have the best stand-alone business case among the group, followed by Owls Head. The municipalities with the strongest positive cash flows could most likely support a service with a lower price per user than the $70/month assumption across all three municipalities.

Business Model 2: Underlying Network Strategies

This model assumes that the Town(s) build out the fiber optic network to the entire town, and lease connections between individual premises and a central aggregation point to one or more ISP on a wholesale basis, similar to the current arrangement in Rockport. The ISP(s) sell retail service directly to users that choose to subscribe.

There are a number of different levels of infrastructure that the Town(s) could consider providing. It can provide a dark fiber facility consisting of either the drop and the pass, or only the pass (as in the current Rockport model), or it can provide the drop, the pass and the electronics in the local access network. The fewer of these items that it provides, the more of them that the serving ISP must provide, which will affect the rate that the Town could expect to charge for each connection. As was discussed in the section on capital costs, each of these options has a different estimated capital cost, which also impacts the financial projections.

In order to narrow these options, we examined a range of capital cost assumptions and produced a five-year cash flow analysis for each, based on the a model that included all project parts of all three towns on a combined basis. Each capital cost was paired with a different assumed rate that the Town(s) would charge the ISP, depending on whether the network provided only the pass, the pass and the drop, or both and also the electronics for the local access network. Some scenarios also included limiting the amount of underground construction in the project, which affected both the capital cost and the number of subscribers. The remaining variables were held constant in all scenarios, and the most promising scenario has been selected for a more in-depth analysis.

It is important to note that not all assumptions made in this analysis are necessarily realistic or likely, in particular with regard to the amount charged to the ISP and subscriber take rates, which are two of the most important variables. Instead, the process used was to identify a set of assumptions under which the project eventually became cash-flow positive, and then examine how likely (or unlikely) those assumptions might be to come to pass in the real world.

Key Assumptions

Service Offering. This analysis assumed a simplified, flat monthly service rate charged by the Towns to the ISP for each connection between the user location and the central aggregation point. When the model assumed that the Towns built out the drop, pass, and electronics, the rate was assumed to be $40/month/premise served. When the model assumed that the Towns built the drop and the pass, the rate was assumed to be $30/month/premise. And when the model assumed that the Towns built only the pass, the rate was assumed to be $20/month/premise. The model also assumed that the ISP paid a $50 nonrecurring charge to the Town when a premise was connected to the network.

Take Rates. In this model, residents and businesses may choose to become customers of an ISP using the fiber network or not, so it is necessary to make assumptions about how many may do so. This analysis assumed that 10% of premises passed by the fiber at launch would be customers, 25% at the end of year 1, 40% at the end of year 2, 55% at the end of year 3, 65% at the end of year 4, and 75% at the end of year five. These levels, especially those in the out years, should be considered high. However, take rates at this level were necessary to produce results with positive cash flows.
Choice to sign up or not also means choices to leave, and turnover from events like moves. The assumed customer churn rate was 2% per month. Winbacks (the percentage of locations formerly served that return to the network) were set at 10% of formerly served locations per month.

Construction Schedule. The model assumes that all premises are connected as the network is constructed, and the network begins to add users prior to the full construction of the network. It is assumed that each project would launch service ("Year 1, Month 1") after about 50% of the Town's Phase I premises are built-out in and connected in a pre-launch construction period, and that Phase I construction would be complete 6 months after launch ("Month 6"), with all Phase I units on-line by Month 12. Phase II projects would start adding users beginning in Month 1 and ending in Month 12, and that Phase III projects would start adding users beginning in Month 1 and ending in Month 18.

Financing. This model assumes all capital costs will be financed over a 20 year period at an interest rate of 3.5%, with a 2% cost of borrowing. It is assumed that a bond is issued 12 months prior to "Month 1" and that the 20 year repayment period is preceded by 24-month interest-only initial period. Interest earned for cash on hand is assumed to be 0.5%

Underlying Network Operating Costs. This model assumes that the network will require maintenance and repair expenses equal to 2% of the capital costs of the network.[21] Pole license fees are assumed to be $25/year/pole. A single general management expense of $50,000 per year is assumed, regardless of the number of towns or phases in the project. Expenses are assumed to increase by 3% per year, except pole rates, which are not assumed to increase.

Internet Service Operating Costs. Under this model, the ISP(s), not the Towns are responsible for all operating costs for providing internet service over the network. This includes bandwidth and all costs to acquire customers, provide technical support and customer service, billing, and collection.

Cost Savings Strategy	Corresponding Cap Ex, Op Ex and Revenue Assumptions		
	Change in Network Design	Take Rate*	$/Month Network Charge
1	Drops only built to subscribers	75%	40
2	Drops only built to subscribers; no electronics	75%	30
3	No drops (pass only); no electronics.	75%	20
4	Drops only built to subscribers; no electronics; limited underground construction.	75%	30
5	No drops (pass only) ; no electronics; limited underground construction.	75%	20
	* Achieved by end of year 5. Affects Cap Ex and Op Ex for incremental builds; affects Revenue with $/month network charge		

Table 18: Cost-Saving Strategies Summary

Cash Flow

Under all of the variations of service offering assumptions examined, *cash flows for a project that included all three towns and all phases only turned positive when assumed take rates reached high levels (between 65% and 75%).* Assuming as we did that it would take a number of years to reach these take

[21] Repair costs in particular tend to be "lumpy," and may vary greatly from period to period. Since the timing of these costs is impossible to predict, the model assumes that a fixed amount is incurred every month. As a practical matter, we would expect the Town(s) to utilize a variety of techniques, such as accruing maintenance and repair funds over time, entering into fixed-price agreements with vendors, and/or insuring against large repair events.

rate levels meant that under all the scenarios tested, the project would have a significant cumulative five-year deficit at the end of the five year period. As a practical matter, this means that under this model the project would not quickly be financially self-sustaining (and might not ever be, if actual take rates were lower than we modeled in these examples). That would mean the project would require a subsidy to be sustained. Table 19 through Table 23 show the cash flow outputs for five scenarios reflecting five sets of assumptions about the level of capital investment and prices charged to the ISP:

- The Towns build the drop, the pass, and the electronics and charge the ISP $40/month per subscriber location.
- The Towns build the drop and the pass and charge the ISP $30/month per subscriber location.
- The Towns build the drop only and charge the ISP $20/month per subscriber location.
- The Towns build the drop and the pass and charge the ISP $30/month per subscriber location, with only limited underground construction.
- The Towns build the drop only and charge the ISP $20/month per subscriber location, with only limited underground construction.

The capital cost assumptions for these five scenarios correspond to the capital cost assumptions for the five non-base estimate scenarios presented in the Capital Cost estimate section.

Strategy 1: Towns build the drop, the pass, and the electronics and charges the ISP $40/month
Rockport, Rockland, and Owls Head Combined--All Phases

	Years				
	1	2	3	4	5
Average Subscribers	571	1,863	2,876	3,610	4,208
Revenue	$280,750	$965,350	$1,435,220	$1,770,670	$2,056,230
Operating Expenses	$548,392	$549,892	$551,437	$553,029	$554,668
Net Operating Revenue	**($267,642)**	**$415,458**	**$883,783**	**$1,217,641**	**$1,501,562**
Debt Service	$674,373	$1,340,946	$1,340,946	$1,340,946	$1,340,946
Net Income (without opera	**($942,015)**	**($925,488)**	**($457,163)**	**($123,304)**	**$160,616**
Cumulative	*($942,015)*	*($1,867,503)*	*($2,324,666)*	*($2,447,971)*	*($2,287,354)*

Table 19: Cost Saving Strategy 1

Strategy 2: Towns build the drop and the pass and charges the ISP $30/month Rockport, Rockland, and Owls Head Combined--All Phases					
	Years				
	1	2	3	4	5
Average Subscribers	571	1,863	2,876	3,610	4,208
Revenue	$223,540	$741,750	$1,090,140	$1,337,490	$1,551,260
Operating Expenses	$436,353	$437,853	$439,398	$440,989	$442,629
Net Operating Revenue	**($212,813)**	**$303,897**	**$650,742**	**$896,501**	**$1,108,631**
Debt Service	$474,453	$943,418	$943,418	$943,418	$943,418
Net Income (without opera	**($687,266)**	**($639,521)**	**($292,676)**	**($46,918)**	**$165,213**
Cumulative	*($687,266)*	*($1,326,787)*	*($1,619,464)*	*($1,666,381)*	*($1,501,168)*

Table 20: Cost Saving Strategy 2

Strategy 3: Towns build the pass only and charge the ISP $20/month per subscriber Rockport, Rockland, and Owls Head Combined--All Phases					
	Years				
	1	2	3	4	5
Average Subscribers	571	1,863	2,876	3,610	4,208
Revenue	$166,330	$518,150	$745,060	$904,310	$1,046,290
Operating Expenses	$381,276	$382,776	$384,321	$385,912	$387,551
Net Operating Revenue	**($214,946)**	**$135,374**	**$360,739**	**$518,398**	**$658,739**
Debt Service	$375,921	$747,494	$747,494	$747,494	$747,494
Net Income (without opera	**($590,867)**	**($612,120)**	**($386,755)**	**($229,096)**	**($88,755)**
Cumulative	*($590,867)*	*($1,202,986)*	*($1,589,741)*	*($1,818,837)*	*($1,907,592)*

Table 21: Cost Saving Strategy 3

Strategy 4: Towns build the drop and the pass and charge the ISP $30/month. Llimited underground construction Rockport, Rockland, and Owls Head Combined--All Phases					
	Years				
	1	2	3	4	5
Average Subscribers	571	1,863	2,876	3,610	4,208
Revenue	$223,540	$741,750	$1,090,140	$1,337,490	$1,551,260
Operating Expenses	$375,232	$376,732	$378,277	$379,868	$381,507
Net Operating Revenue	**($151,692)**	**$365,018**	**$711,863**	**$957,622**	**$1,169,753**
Debt Service	$365,211	$726,198	$726,198	$726,198	$726,198
Net Income (without operating subsidy	**($516,903)**	**($361,180)**	**($14,335)**	**$231,424**	**$443,555**
Cumulative	*($516,903)*	*($878,082)*	*($892,417)*	*($660,993)*	*($217,438)*

Table 22: Cost Saving Strategy 4

Strategy 5: Towns build the pass only and charges the ISP $20/month. Limited underground construction Rockport, Rockland, and Owls Head Combined--All Phases					
	Years				
	1	2	3	4	5
Average Subscribers	571	1,863	2,876	3,610	4,208
Revenue	$166,330	$518,150	$745,060	$904,310	$1,046,290
Operating Expenses	$329,838	$331,338	$332,883	$334,475	$336,114
Net Operating Revenue	**($163,508)**	**$186,812**	**$412,177**	**$569,835**	**$710,176**
Debt Service	$284,172	$565,057	$565,057	$565,057	$565,057
Net Income (without operating subsidy	**($447,680)**	**($378,246)**	**($152,881)**	**$4,778**	**$145,119**
Cumulative	*($447,680)*	*($825,926)*	*($978,807)*	*($974,028)*	*($828,909)*

Table 23: Cost Saving Strategy 5

Of these, Strategy 4 -- limited underground construction, drops to subscribers only, ISP owns network electronics – with accompanying assumptions of 75% take rate and $30/month/subscriber revenue from the ISP -- -- showed the best performance. Tilson broke out the pro-forma cash flow a summary for each municipality under these set of assumptions in Appendix C.

Although the first stage of the analysis presented here considers the modeled cash flow from the three Towns together on an aggregated basis, it is possible to say that generally on an individual Town basis, when each Town borrows for the cost of the infrastructure within its own borders (i.e. the total capital cost is not divided on an averaged pro-rate basis), Rockland has the strongest financial results for a given set of take rates and prices due to its greater density and ubiquity of aerial utilities.

Operating Expenses

Operating expenses under this model are essentially assumed to be fixed, tied to the extent and cost of the network, not its utilization rates, and composed of three major components: maintenance and repair, pole licenses, and general management. Appendix D provides estimated operating costs for the project on a three-town basis, and each Town on a stand-alone basis. On a combined basis, maintenance and repair is the largest cost component. However, general management is a larger component for smaller single-Town projects, pointing to some economies of scale that could be available in a multi-town collaboration.

Discussion

This analysis indicates that a model dependent on voluntary sign-ups is likely to run at a deficit in the three Towns unless sufficiently high-take rates are achieved. There are good reasons to be skeptical that the take-rates seen in this analysis are even attainable. These kinds of take rates are more typical of communities that have no broadband alternatives. However, Rockport, Rockland, and Owls Head have cable, DSL, and some wireless alternatives in the communities, and the Towns should expect incumbents to respond to any new network with cuts in prices, promotions, bundles, or improvements in service to hold on to customers. There is precedent for a new entrant gaining significant market share. Google Fiber's Kansas City Missouri network currently holds a 75% take rate in middle and upper class neighborhoods. The country's first municipal gigabit network, Chatanooga EPB, has worked for over five years to gain a 40% take rate in the face of cable and telecom competition. Verizon's FTTH product, FiOS enjoys take rates in the 30% to 40% range after deployment. [22] While survey results indicate support among many potential users for a new service alternative, they also provide a basis to believe that many might also not switch at the $70/month price point currently charged by GWI for services delivered over the fiber facilities it leases from the Town of Rockport. Lastly, while it is still early in the life of the original Rockport project, take-rates on that project so far are not close to the level that this analysis suggests would be necessary to make additional phases financially self-sustaining.

Furthermore, to achieve positive cash flows, the model assumed wholesale rates that were substantially *higher* than rates Rockport currently is receiving from GWI.[23] Any assumption that the Town(s) could successfully charge higher rates for access to their network would need to be tested before proceeding; it is not a certainty. There is also no guarantee that the wholesale rates assumed here would be compatible with the $70/month price point currently offered by GWI. If the Town(s) charged even higher wholesale prices than those presented here, it would mean lower take rates would be needed to financially support the network. But at some point higher wholesale prices would lead to higher retail prices (which would make it harder to achieve the targeted take rate) or a lack of participation by ISPs.

Even if a system like the one modeled here were to run at a deficit, the Town(s) could of course choose to operate it on a subsidized basis. To the extent, however, the Town(s) were to depend on a self-funded network, this model requires take-rates and/or wholesale prices that they could struggle to achieve. Furthermore, this analysis did not assume a marketing budget on the part of the Town(s); marketing would be the responsibility of the ISP(s) who used it. However, the financial success of the network would greatly depend on the effectiveness of the marketing by the ISPs.

Finally, it is worth noting that the hurdle for Rockland is substantially different than the other two Towns. Rockland's single-Town cash flow produced positive cash flow at about the 55% take rate level, while cash flows were not positive in the other two Towns individually at even the 75% take rate level.

An Alternative Approach

The preceding analysis in this section assumes that the Town(s) would attempt to recover their capital costs through wholesale rates charged to ISPs. Obviously, the greater the wholesale rate charged, the greater the retail rate that would be necessary to support the service—making it less likely that the network would be used by large numbers of residents and businesses. An alternative framework is to simply view the fiber network as basic infrastructure funded by general revenue and encourage its use by providing access at no or a nominal cost.[24] Under this framework it is still important for the Town to understand its cost of debt to finance the network and its operating costs, but revenue is not an objective and factors little in the analysis. Instead the focus is on the costs relative the Town budget. Table 24 highlights only the cost elements of the Strategy 4 detailed above.

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[22] Bernstein Research, 2014. Accessed at: http://stopthecap.com/2014/05/06/uh-oh-time-warner-cable-att-google-fiber-winning-75-of-customers-in-kansas-city/

[23] Although many of the scenarios examined also included more network components (drops and/or electronics) than currently offered by the Rockport network, it is unclear whether ISPs would perceive the difference in rates to be commensurate with the increase in value.

[24] Reduced cost-access could be offered generally to any ISP (seeking to enable competition and relying on competition or the threat of competition to drive down retail prices), or only to ISPs who agree to benefits like a reduced rate for Town residents.

	Rockport	Rockland	Owls Head	Combined
Expected Annual Debt Service*	$315,892	$280,399	$129,906	$726,198
Expected Annual Opex*	$197,699	$170,573	$111,460	$376,732
Total	**$513,591**	**$450,972**	**$241,367**	**$1,102,930**
* at Year 2, after competion of network build-out, assuming all Phases				

Table 24: Debt and Operating Expenses Only, Cost Saving Strategy 4

Economic Impact in Rockport, Rockland, and Owls Head

Broadband investment can have a dramatic effect on economic development. Among other effects, broadband enhances efficiency and productivity of firms, facilitates commerce, attracts jobs, increases consumer options, and saves residents money.

In the absence of conducting an extensive survey of spending trends in the three municipality region of Rockport, Owls Head, and Rockland (ROR) over the past ten years, it is impossible to precisely estimate the economic product of the region alone. Tilson used the economic data of Bangor, Maine as a corollary. Bangor shares many of the same characteristics of ROR.

Tilson employed the "value transfer method" in its analysis. This approach borrows from the research contained in peer reviewed studies of the economic impact of broadband and applying local data to the same models. Tilson first gathered census data for the three municipalities and the Bureau of Economic Analysis data for Bangor to establish the economic baseline. Those estimates were then run through economic models that forecast the impact of new broadband infrastructure on gross domestic product (GDP), job creation, and enhancing consumer well-being in the three municipality region. Tilson believes that developing universally-available, world class broadband infrastructure here has the potential to add $170 million to the region's GDP over ten years.

This figure is open to debate, however, a large increase in broadband penetration usually results in a significant increase in output. In a study of 22 Organization for Economic Cooperation and Development (OECD) member countries, Koutroumpis et al. (2009) found that an increase in broadband penetration of 10 percent added 0.25 percent to GDP growth on average.[25] In a similar study, Czernich et al. (2009) found that an increase in broadband penetration of 10 percent added 0.73 percent to GDP growth on average.[26]

Impact on GDP

Tilson's economic modeling examined the effect of an investment in broadband on the region's baseline GDP through three different increases of speed: 1) An increase of 1.5 times the current speeds; 2) a doubling of speed; and 3) a quadrupling of speed. By 2020, the investment in a regional broadband

[25] Koutroumpis, P. 2009. The Economic Impact of Broadband on Growth: A Simultaneous Approach. *Telecommunications Policy.* Vol: 33, Pages 471-485.

[26] Czernich, N., Falck, O., Kretschmer, T & Woessman, L. 2009. Broadband Infrastructure and Economic Growth. *The Economic Journal.* Vol: 121, Pages: 505-532.

network would equate to an increase in GDP of $7.2 million over the baseline for the 50% speed increase; $14.7 million if Internet speeds were to double, and an additional $29.8 million in additional GDP over baseline by 2020 if Internet speeds were to quadruple.

Put into terms of capital cost input versus GDP increase. If the three municipalities invested in universal fiber service for their constituents, the capital cost of the buildout would be recouped by 2021 through GDP growth. The table below outlines the ten year aggregate GDP benefit of a broadband investment for the three communities.

Speed Improvement	Ten Year Total GDP Rockport	Rockland	Owls Head
1.5X	11,453	24,795	5,434
2X	23,022	49,839	10,923
4X	46,509	100,685	22,067

Impact on Job Creation, Wages, and Tax Revenues

Assessing the impact of an investment in broadband on job creation in the area, the gains over the next few years are modest, with 200 jobs created by 2020 assuming a quadrupling in Internet speeds. More significantly, an increase in wages with a 1.5 times increase in Internet speeds leads to over $2.8 million in wages by 2020, a $5.6 million increase in wages with a doubling in Internet speeds, and a $11.3 million increase in wages with a quadrupling of Internet speeds over the next five years. These increases equate to $131,700 in additional sales taxes, over $400,000 in increased property taxes, and just over $385,000 in increased state income taxes for a total of over $390,000 in additional total state and local tax revenue by 2020. The total below shows the ten year increase in wages by municipality.

Speed Increase	Wages - Ten Year Total Rockport	Rockland	Owls Head
1.5X	10,613,727	22,977,285	5,035,943
2X	21,334,226	46,185,716	10,122,546
4X	43,099,868	93,305,390	20,449,787

The increase in total state and local tax revenues over the ten year period represent $16.5 million if average realized speed doubles. This is greater than the capital cost of the Phase I buildouts for all three towns. The table below shows the ten year tax improvement for each of the participating municipalities from a major broadband investment that achieves a doubling of speed.

Speed Increase	Taxes Ten Year Total Rockport	Rockland	Owls Head
Sales	1,551,595	3,358,994	736,192
Property	1,508,495	3,265,689	715,743
State Income	1,465,396	3,172,383	695,293
Total	4,525,486	9,797,066	2,147,228

Impact on Consumer Surplus

Broadband investments improve consumer wellbeing. Consumers are not necessarily better off just because economic output increases. An increase in GDP just means that they are spending more. That being said, broadband access empowers consumers to both pay less for goods than they otherwise would have purchased and to purchase goods and services that were not available before. An example of this is with regard to streaming video, which enables almost limitless viewing for little to no cost. Without this streaming capability, consumers would pay more to rent films and/or subscribe to satellite television. In the economic lexicon this phenomenon is known as "consumer surplus".

For the purposes of this exercise, consumer surplus is defined as the amount that consumers benefit from purchasing a product for a price that is less than what they would be willing to pay. In a study of 40 million U.S. households with access to broadband, Greenstein and McDevitt (2009) found that broadband access increased consumer surplus by between $120 and $167.50 per household, per year.[27] Assuming that all three Towns see a major broadband improvement from a future project, Tilson estimates the total improvement in consumer surplus to range from $8.9 million to $12.4 million. The table below outlines the range in improvement for each municipality.

Estimate	Consumer Surplus Ten Year Total Rockport	Rockland	Owls Head	Total
Low	3,168,000	1,570,676	232,984	8,902,080
Mid	3,795,000	1,881,539	279,096	10,663,950
High	4,422,000	2,192,402	325,207	12,425,820

Economic Impact of Broadband Investment

Recent studies regarding the economic impact of broadband investment have revealed a connection between increased broadband availability and economic performance. Research by Professor Sudip Bhattacharjee, Associate Professor at the University Of Connecticut School Of Business evaluated this connection.[28]

The research, based on five years of data from 169 towns in the state of Connecticut from 2009-2013, used the following methodology: It took raw data regarding demographics, occupation, broadband, and

[27] Greenstein, S. and McDevitt, R. 2009. The Broadband Bonus: Accounting for Broadband Internet Impact on U.S. GDP. NBER Working Paper No. 14758.

[28] Bhattacharjee, Sudip, Presentation: "The Economic Impact of Gig Networks", Yale School of Management. May 4, 2015.

housing from various public sources (CERC (Ct. Economic Resources Center)), DOL, and FCC), identified key variable economic benefits assessing the impact of broadband, including per capita income, median housing price, and the number of business units to estimate the economic benefit for Connecticut towns and grouped and ranked the towns based on the benefit achieved.

The research summarized the impact of broadband, finding that five years after each 1 Mbps increase in internet speed (up to 60 Mbps) resulted in the following average economic gains:

Factor	Result
Unemployment Rate	Drops by .08%
Bachelor Degree Rate	Increases by .42%
Median Household Income	Increases by $570
Average Home Value	Increases by $3,200
Assisted Housing Unit	Decreases by 200

In the research, the average economic benefit by town cluster was as follows: impact of broadband was highest in industrial areas and major population centers, followed by small towns, office centers and commercial areas, and the impact was the lowest in rural communities, traditional towns, and residential and industrial mixed areas.[29]

Business Models and Lessons from Other Projects

Tilson examined several municipalities' experiences in studying the various permutations of business models available for addressing the Town's service needs, both immediately, and moving forward. Among the examples surveyed, several threshold areas such as network funding, structures, ownership, operation, tax payment, risk, revenue, and fiber use were explored in an effort to learn about the successes and shortcomings of each structure in an effort to recommend a structure which aligns best with the Town of Bar Harbor's goals.

Example Public Broadband Projects

There is more than one way to structure a publicly-supported broadband project[30], including a number of different ways in involve private sector partners and/or service providers in the project. The examples in this section are illustrative, but far from exhaustive. Projects can vary according to several dimensions but three of the most important are:

- **Capital cost funding and construction responsibilities**. Municipalities or other public entities may pay for the capital entire cost of a network that they wish to see and often build that network. In the alternative they may limit themselves to paying for parts of a network, and seek out opportunities for private parties to contribute to capital costs that remain. Often (but not

[29] Id. at slide 12.
[30] The specific entity may take a variety of forms, including a municipal department or utility, a special-purpose authority, or even a private non-profit chartered with a public purpose.

always) the degree of public ownership of a network will be correlated with the degree of public funding. This section addresses examples where there is at least partial public ownership.[31]

- **Financing mechanisms.** Major public broadband projects often involve some degree of borrowing to more quickly raise the capital for the project. This borrowing may be structured, for example, as a bond, loan or capital lease. In some cases, this borrowing has been backed only by revenues generated by the project that is financed. In other cases, public entities have pledged other revenue sources, or even their general revenues to back borrowing for a project. Some projects have received state or federal grants, and some public projects build out incrementally using internally-generated revenue.
- **Operational responsibility**. In a number of notable examples, cities who have built networks have essentially entered the broadband business as service providers in their communities. In other examples, the public entity seeks out one or more private providers to do this, through a variety of mechanisms, such as a contracting for a network operator/service provider, providing wholesale services, or leasing out the underlying network elements to service providers.

Another dimension of publicly-supported broadband projects is "open access." This term, however, does not necessarily mean the same thing from project to project. There isn't a universally-held definition of the term by those who use it. To some, it may mean something close to "net neutrality," or a commitment to allow treat legal content on the internet in a nondiscriminatory manner regardless of who is producing it. In other cases, it is used to indicate that the network is available for use by competing internet service providers (ISPs). This, too, may be practiced at a variety of levels. On some nominally "open" networks, the term signals at least a nominal willingness by the network owner and/or operator to consider wholesale agreements with other ISPs, but in fact the operator of the network provides service to all or nearly all of the users directly. In other cases, the term indicates that the network operator primarily acts as a wholesaler to retail ISPs. In still other cases, the network is "open" as the physical level, and broadband service providers can lease basic network elements, like fiber strands between points on the network to use to create their own local networks.

FastRoads, (Keene, NH)

Ownership/Operation

The FastRoads network in Keene, New Hampshire is owned and operated by a single-member LLC, FastRoads, LLC, in which the Monadnock Economic Development Corporation (MEDC), which is a private non-profit economic development entity, is the sole member.[32] MEDC works closely with the Town of Keene, and they are a quasi-public 501(c)(3) organization. In this example, MEDC was approached by the Town to oversee the construction of the network and to be the recipient of grant money used to fund construction of the network. When MEDC assumed this role, it hired the executive director and technical engineer for FastRoads and oversaw contracts.

Funding

The funding for FastRoads came primarily from a National Telecommunications and Information Administration (NTIA) Broadband Technology Opportunities Program (BTOP) grant (70%). The remainder

[31] Grants and loans to private providers who build out networks that are then privately owned are certainly tools that public entities do use in many instances, but they are tools of a different type than this section discusses.

[32] Information for this section was gathered from phone interview with FastRoads personnel.

was borrowed by FastRoads and guaranteed by the MEDC. In addition, some private investment money in the form of royalty financing was secured as well. The New Hampshire Business Finance Authority provided additional funding and an Economic Development Administration grant from another part of the state rounded out the funding totaling $2.4 Million.

Operating Costs

In terms of costs associated with the network, the City of Keene charges FastRoads, LLC to use the city's conduit (lease) and the city taxes FastRoads in addition to this lease charge.

Operating Risk

MEDC assumes the operational risk from managing the network as the sole shareholder in FastRoads LLC.

Revenue

Service providers pay a portion of their revenue to the network in exchange for use of the network. The amount or percentage of this revenue is based on the type of service, with lower percentages paid by service providers who use the network for limited hours (i.e. a computer backup service), and larger percentages paid by ISP's which use the network heavily during daytime hours. Revenue from the project goes to FastRoads, LLC and this revenue is currently applied against expenses. At present time, revenue is offsetting expenses at a breakeven level and in the event of any shortfall, these are made up by MEDC.

Access

The FastRoads fiber network is an open network, so anyone able to find an ISP connect agreement can use the network.

Note

Since its development, the FastRoads network has struggled with operational losses and frequently struggles to service debt..

Leverett, MA

Ownership/Operation

In the case of Leverett, the Town owns this town-wide fiber-to-the-home (FTTH) network and the town-created Municipal Light Plant (MLP) entity (with a separate budget) is the custodian of the network. This network is operated by Crocker Communications. While Crocker as service provider collects service costs, MLP also performs a range of responsibilities in terms of network operations, and MLP assumes the financial risk of operations.

Funding
The Leverett, Massachusetts network is an example of a FTTH municipal network which was constructed with funding from tax-backed municipal bonds. While the Leverett network does rely on subscriber revenue, it is only to the extent necessary to pay for ongoing maintenance costs.[33]

Operating Costs
MLP assumes the financial risk of operations for this town-owned network.

Operating Risk
The town-created MLP, which has a separate budget both performs a number of network operations responsibilities and also assumes the financial risk of operations as well.

Revenue
As referenced above, the Leverett network relies on subscriber revenue, but only to offset ongoing maintenance costs.

Access
One hundred percent of homes and businesses in Leverett we given the choice to connect to the network. Leverett has reserved the right to limit access to the network to Leverett residents and businesses only, and it is not an open access network. The town of Leverett chose one Internet Service Provider (ISP) through an RFP process to provide services to subscribers.

Chattanooga, TN

Ownership/Operation
Chattanooga's FTTH broadband fiber network is a model of a successful municipally owned and operated fiber network, with the Chattanooga Electric Power Board (EPB) performing the range of network operations responsibilities and assuming the financial risk of operations as well.

Funding
The City of Chattanooga, Tennessee, undertook to improve broadband access for its citizens through its municipally-owned power utility, the Chattanooga Electric Power Board (EPB). One of the primary advantages of this structure for Chattanooga was that it significantly reduced the cost of constructing the network through lower make ready expenditures. Similar to the previous municipalities mentioned in this section, Chattanooga also used municipal bonds to provide funding for constructing its 170,000-service location, 8,000 mile network. The total project cost of the EPB network was approximately $340 million, with $111 million funded through a federal American Recovery and Reinvestment Act (ARRA) grant from the Department of Energy. The remaining cost of the network was funded through the City's passing of a $229 million municipal bond to provide matching funds. The structure of the loan involved

[33]There are a number of municipal networks for which construction of these networks was funded by revenue-backed bonds. Networks built by revenue bonds are susceptible to financial pressure if these municipalities fail to gain enough subscribers. Failure to make debt payments resulting from undersubscription is a leading cause of failure among municipally owned networks.

EPB's electric division lending EPB's cable/internet division sufficient funds, with the loan being repaid using revenue generated from network subscriptions.[34]

Operating Costs
These are assumed by the EPB, as it serves as the network ISP.

Operating Risk
The operating risk for the network is also assumed by EPB as the network ISP.

Revenue
The revenue for the Chattanooga network comes from subscribers to the network.

Access
Only Chattanooga EPB operates over their network. Access is closed to other competition.

Burlington Telecom

Ownership/Operation
Burlington Telecom is a department of the City of Burlington, Vermont and is 100% municipally owned and operated.

Funding
Originally funded through a capital lease, this network was refinanced in an effort to expand the money available.

Operating Costs
While the original intent of the City was for network operations to be funded not by general revenue (taxpayer dollars) but instead by project revenue, Burlington Telecom ran out of money and used $17 million from the City Treasury department to support network operations.

Operating Risk
Burlington Telecom shouldered the operating risk associated with the network.

Revenue
Burlington Telecom has struggled to remain solvent and suffered extended operating losses. It failed to repay the loan from the City Treasury. Burlington Telecom has settled a suit levied against it by its commercial lender, CitiLeasing. Burlington Telecom assumed additional debt to retire the settlement liability.[35]

Access
The Burlington Telecom network is promoted as an open access network.

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[34] Information regarding EPB's network was obtained in a phone interview with Danna Bailey, EPB's Vice President of Corporate Communications (baileydk@epb.net).
[35] Information gathered from interview with Chris Campbell, former director of the Vermont Telecommunications Authority.

CityNet (Santa Monica, CA)

Ownership/Operation
CityNet is currently a 10Gbps network in the city of Santa Monica, California, spawned by the City's need to reduce its data access costs.[36] After forming a task force evaluating several different approaches, Santa Monica decided to pursue an institutional fiber network in 1998. The first step in developing its fiber network was for Santa Monica to lease an institutional fiber network from the local cable TV operator. That network connected 43 city buildings as well as school and college facilities.

Funding
When it leased the institutional network, the City funded the network construction but shared the operations and maintenance costs with the local school district and college. The operational cost savings derived from this shared cost approach reduced the combined telecom costs by $500,000 per year shortly after the network went live in 2002. From here, the City utilized the savings to build its own 10 Gbps municipal fiber network, from which it began leasing its excess dark fiber to local businesses. Because of low monthly fees, these businesses were willing to fund the cost of building fiber from the backbone to their buildings. In this manner, Santa Monica's network was extended at no cost to the city. In 2009, the city made an additional investment in the network in an effort to provide lower cost bandwidth to small businesses in the area. It did this by leasing a fiber connection to a major colocation center in Los Angeles, 15 miles away and getting transport from a service provider.

Operating Costs/Risk
As noted above, initially the operations and maintenance costs were shared by Santa Monica with the local school district and college.

Revenue
City Net's revenue is $300,000 per year, which is adequate to fund network operations and maintenance while also supporting a network of 27 WiFi hot spots throughout Santa Monica. The city used its nearly $200,000 in remaining capital funds as a revolving capital improvement project account. This account funds construction for network expansion, which is repaid by customers as the network continues to expand to their premises.

Access
While the city provides internet access directly, it also makes the network available to third-party providers on an open-access basis.

Note
CityNet's requirement that customers pay for their own connections slows the growth of the network, but short of receiving a stimulus grant, CityNet will continue a policy of expanding based on demand alone.

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[36] http://www.bbpmag.com/MuniPortal/EditorsChoice/0511editorschoice.php

South Portland, ME

Ownership/Operation

The City of South Portland is working with the ISP GWI, and GWI will own and operate the fiber network.

Funding

GWI constructed this 1 Gbps fiber to the home (FTTH) network connected to the Maine Three Ring Binder.[37] The project construction cost was approximately $170,000, with $150,000 of this cost covered by a one-time, $150,000 lease payment to connect City-owned facilities to the network. The remaining $20,000 was invested by the ISP.[38] Customers would be signed up for the service during the construction phase with installation fees waived for early sign-ups.

Operating Costs/Risk

The operating costs and operating risk of the network will be assumed by GWI as the network owner.

Revenue

The City's arrangement with the ISP will allow it to drop a $2,000/month lease cost which it had for its previous fiber network provider, and after installation, the City and the ISP will share in five percent of the revenue of business and residential customers who sign up for the network.[39]

Access

The ISP which owns this network is providing the fiber on an open-access basis, thus opening the door to competition from other service providers.[40]

Rockport, ME

Ownership/Operation

Owned by the Town of Rockport, GWI operates the network, contracting with customers for the actual service.[41]

Funding

For the Town of Rockport, Maine's 1.6 mile fiber project, cost of installing the network was estimated at $60,000, half of which came from the University of Maine's Networkmaine program and private investment from local business, and half of which came from a Town of Rockport tax increment financing (TIF) tool.[42]

Operating Costs/Risk

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[37] http://www.pressherald.com/2014/09/22/super-fast-internet-coming-to-parts-of-south-portland/

[38] Id.

[39]http://bangordailynews.com/2014/09/22/business/gwi-beats-out-maine-fiber-co-for-south-portland-municipal-fiber-contract/)

[40] Id.

[41] http://www.wcsh6.com/story/news/local/2014/08/11/rockport-builds-municipal-owned-internet/13922981/.

[42] http://www.muninetworks.org/content/rockport-builds-maine%E2%80%99s-first-municipal-network.

Similar to the City of South Portland, Rockport's network is one in which the municipality only funds the capital investment for the fiber and does not fund the capital investment for the equipment. In addition, the Town does not have any significant operating expense or responsibility. Instead ISP's are responsible for providing and operating the network's equipment.

Revenue
The revenue model employed in Rockport is the subscriber-based revenue model, with a percentage of monthly subscriber costs for the network going to the Town to pay off the original investment.

Access
The Rockport network is an open access network. It is currently available to users and providers able to connect along its roughly 1.5 mile route.

Key Lessons Learned

The experience of prior publicly-supported projects provides lessons for municipalities or other public entities that are considering new broadband projects today. Some of these lessons learn would be applicable for any broadband project, public, or private. This section discusses a range of these factors that any new project should consider.

Know your objective(s)

A clear, well-defined objective or limited set of key objectives will help any project better navigate its trade-offs and recognize its opportunities. For example, many projects are built out in stages as a way to stretch out their capital costs. Sometimes, a project can face a choice between a network build-out that reaches many but not all of the homes, businesses, and institutions in a targeted area, or a comprehensive build-out that is more expensive in the short run, but perhaps less expensive in the long run—but only if reaching all premises in the area is the project's objective! Clarity will help projects navigate this and other similar trade-offs.

Look for Ways to Build Multiple Value Streams from the Same Investment

Many municipalities who have built broadband networks for their entire communities started by leveraging expenditures that they were already making or investments that could be at least partially justified by other city operation. Cities with utility operations are prime examples of this, with opportunities to leverage operational support systems and staff, as well as investments in communications infrastructure for smart grid or other utility system data and control. Other examples include re-directing expenditures already made to purchase telecommunications services for city offices or schools. These can be "anchor tenants" on a network. Unfortunately, in too many public bodies, a "silo" approach is the default.

In building a network, there are opportunities to build in flexibility for multiple use cases (and multiple potential funding streams) that can be squandered unless the project is designed and operated thoughtfully. For example, a fiber network can not only be a means of delivering broadband to homes and businesses—it can also serve wholesale dark fiber applications like connecting wireless towers to base stations, connecting schools and libraries to the MSLN, and supporting data-intensive private and government users.

Carefully Consider Risks

No broadband project is risk-free. That said, it is possible to mitigate or minimize inevitable risks, and choose the risks that you are best able to tolerate or control. Following are a list of key categories of risks. For each category, it is important to ask: (i) "Do we understand the risk?" (ii) "What is our level of exposure?" and (iii) "Do we have the means to mitigate or avoid it?"

- **Cost risk.** In some cases, projects costs more to build and/or operate than originally forecasted. Many of the other forms of risk can cause or exacerbate this risk. It is important to understand how conservative your cost assumptions are, and the impact of potentially higher costs. It is also important to understand who bears the risk of higher costs. Failure to understand cost risks can lead to public entities committing to projects that are financially brittle, unraveling under financial stress.
- **Execution risk.** This risk speaks to the capacity of organizations to manage and perform the tasks they are called upon to do. It can come into play at either the construction phase or the operational phase. Successful public broadband projects often have these organizations doing those parts of the project that are like activities that they already do successfully.[43]
- **Technology risks.** Telecommunications is a field subject to rapid technology change. This represents the risk of making technology choices that turn out to be wrong or just more quickly made obsolete than they can be paid off. Not all types of telecommunications infrastructure, however, is equally subject to technology risk. Electronic equipment in wireless, fiber and other wired networks tends to become obsolete much more rapidly than some of the "hard" infrastructure, like fiber optic cable, poles, conduit, and towers.
- **Market risks**. Any project that relies on broadband users to voluntarily sign up for service faces market risk, especially if those user have other choices for service. In some cases, public organizations developing broadband projects do so in areas without any broadband service. In these cases, there hasn't been a private business case and the risk is often centered on whether there is enough demand available to support any business case. In many other cases, however, public broadband projects were launched in areas with incumbent broadband providers with objectives to provide improved broadband services, or lower prices, or competitive choice. These incumbent providers usually do not sit still, but may lower prices or improve services in an effort to retain market share. While some communities consider these to be good outcomes, if a public project has a business case that depends on market assumptions that are no longer valid, or never were in the first place, the result can be unsustainable. Strategies for mitigating this risk are discussed below.
- **Political / regulatory risk.** Public entities exist in a political and legal context. Successful projects have had a supportive (or at least sufficiently supportive) political and regulatory environment, and one with support that is deep enough to endure requests to stop, limit, or otherwise constrain public organization's involvement in broadband projects. In some cases, the political and regulatory environment may be favorable to some activities but not others. A

[43] For example, many of the cities delivering broadband as a municipal ISP were previously providing another utility service, such as electricity.

common constraint is limiting projects to unserved areas (which can be defined in a variety of ways). On the other hand, regulations may not necessarily be favorable *enough* to new market entrants (public or private) to facilitate quick and cost-effective projects. Rules for relatively quick and inexpensive access to utility poles, conduits, or rights-of-way are key example, as they are an important factor in every fiber project.

Understand Demand

The level of demand among users for service on a new network is a key factor in determining the success of a project. This includes its financial success, but obviously a network that has limited users also has in some sense limited benefits.

The ability to achieve sufficient demand is a key predictor of financial success. It isn't just the total number of users that matter. It also means having users who will pay enough for services to offset the operating expenses for providing the services, as well as the cost of required debt service from the construction of the network. Some projects can be caught in a bind between the need to charge rates high enough to cover costs and low enough to meet public policy objectives for price and affordability. It is important to determine if rates that are required of a public project are in fact subsidy rates, and if so, where that subsidy is coming from.

Different projects have approached this question in different ways. Some do careful prior assessments of demand, sign up anchor users in advance and/or use presubscription campaigns among residents and only build to where there is sufficient user demand and revenue to financially support a project.

Others, committed to a town-wide build-out have pledged general tax revenues as necessary to fund their projects, or created other non-by passable charges on all residents. In essence, these project create de facto 100% subscription level levels, although at the cost of charging people and organizations regardless of their use of the network.

Target the Negative Outcomes You Most Want to Avoid

With thought and careful planning, it is possible to reduce the likelihood that a public broadband project will fail to meet key objectives. However, sometimes common goals for public projects come into conflict, and having a clear set of priorities will help you choose. For example, here are three objectives that a municipal or other public project might have:

1. Minimize any negative impact on taxes.
2. Minimize any impact on credit rating or credit reputation.
3. Minimize likelihood that a non-monetary objective (like extending improved broadband to all parts of the city) is missed.

It is not likely possible to optimize all three. For example, a city borrows using a revenue bond to fund a broadband project and it wants to cover the whole city. Hopefully it has a positive business case, has estimated costs well, understands its market accurately, and executes strongly. But if project revenues aren't sufficient to cover the costs of a project, it has to choose. If the project isn't yet finished, it might be able to limit the project build-out to the most profitable areas, impacting its coverage objective. It could make up the difference in the bond using general revenue, impacting its tax objective. Or it could negotiate with the bondholders or default, impacting its credit objective.[44]

Look for Alignment in Public-Private Partnerships

Increasingly, some companies are willing to form Public-Private Partnerships (PPPs) with public entities on broadband projects. These PPPs can have advantages. They can bring operational expertise into a project. They can help create economies of scale for smaller projects by leveraging an existing business' operation. And they provide a means for sharing risk and reward with a private partner.

If you are considering a PPP, it is important to look for a strong alignment of interests. PPP agreements are often long-term agreements. It is important to understand why the private partner's long-term interests on important items like coverage, upgrades in service, and pricing are more or less aligned with the outcomes you want to see. PPP always involve surrendering some amount of control to the private parties. If basic interests, while not necessarily the same, are not generally aligned, the objectives of the project can begin to drift away from the reasons that the project was important to the public partner. Strong contracts, while very important, aren't a substitute for alignment of interests. Enforcing contract language on an under-performing party can be time-consuming and expensive, and it can put a cloud over the project that is the subject of the PPP.

Finally, be wary of PPP agreements that are favorable to a fault in the direction of the public entity. A private party that discovers that it can't make money will be less motivated and cooperative.

Business Model Options

There are a number of different business model structures available to the Town as it decides how it would like to proceed. The various types of models have been detailed and there are successful and unsuccessful examples of each type. The following table provides a summary of each permutation of business model available, and the differing structures of each as the Town makes an informed choice moving forward.

[44] In the example given, it may be possible to take other steps to mitigate adverse outcomes for all three objectives, but usually only by giving on some other objective, such as contracting with a private partner to take on the financial exposure for delivering and operating the project within defined financial parameters. That is likely to impact other aspects of the project that the public entity may value more or less than what it is gaining, such as contracted cost or degree of control over the network.

Type	Electric Company	Municipally Owned	Public-Private Partnership
Examples	Leverett MA, Chattanooga (EPB), Lafayette LA,	Burlington Telecom	Santa Monica (CityNet) Rockport South Portland FastRoads Cable TV Franchises
Network Ownership	Town-owned Utility	Municipality	Municipality or Non-Profit 501(c)(3) or ISP
Network Operation	Town-owned Utility	Municipality	Muncipality, Non-Profit, or ISP
Funding	Municipal Bonds	Capital Lease	NTIA/BTOP/EDA grants; Private investment; Municipality
Operating Costs	Town-owned Utility	Project Revenue (subscriber)	501(c)(3); Municipality shared with local institutions; ISP
Operating Risk	Town-owned Utility	Municipality	Municipality or 501(c)(3)
Revenue	Subscriber Revenue	Subscriber Revenue	ISP service providers pay LLC; Subscriber revenue shared between ISP and Municipality

Table 25: Business Model Options

Conclusion

The three municipalities approached Tilson to study the feasibility of major broadband expansions that would give residents and small businesses access to the fastest possible bandwidth at the lowest possible prices. The survey indicated significant customer support for exploring solutions to prevalent customer dissatisfaction. The only technology capable of meetings the speed and reliability requirements of the municipality is fiber optic cable under either an active or passive configuration. The financing structure most conductive to keeping prices low and the network solvent is a municipal or private subsidy. The business model(s) most likely to succeed involve the municipality owning the assets and committing to pay for them, without depending on voluntary sign-ups. If the municipalities choose to undertake this investment, they should do so with little expectation of revenue from network operations (unless they impose charges on premises passed that cannot be avoided by voluntary choice). If the municipalities lease access to providers at on a wholesale basis, they should be prepared to do so an insignificant rate that does not recoup the cost of the network. The goal of this investment is to foster community and economic development, not to gain revenue for the municipal coffers.

The potential economic benefits of an investment of this nature are significant in terms of GDP improvement, wage growth, job creation, and consumer wellbeing. There are numerous risks to operating a municipal ISP, however. These risks can be mitigated through a number of means. The next step for the Towns will be to decide upon whether to move forward with a solution. If the decision to process is made, the next step is to select a business model that can achieve the desired outcome either internally or through negotiations with private providers. In parallel, the municipality must determine its financing strategy. The key decision is whether to utilize public funds or private, philanthropic funds.

Operating Model Recommendations

Rockport and Owls Head

The analysis presented in this report suggests that achieving a very high take rate is essential to the financial success of a fiber project in these communities; in the alternative, if these communities choose to go forward with a project that relies on voluntary sign-ups, they should be prepared for the very real possibility that the project will require a subsidy.

On the other side of the equation, this analysis suggests that a project covering all of the town can be sustained financially if all homes and businesses pay the equivalent of the $70/month currently paid by GWI customers on the Rockport fiber, a fiber project. However, this obviously removes individual users' choice about whether or not to participate. This price is an excellent price for gigabit-class residential service, although for many residents it does not necessarily represent any savings, only an improvement in service.[45] If network capital or operating costs can be brought down below the estimates presented, a lower price may be possible.

Taken together, however, these two points suggest that if either of these Towns take on the construction of a Town-wide fiber network (or even a network in a part of either Town), it will require a broad commitment to pay for the network. The Town may make in essence an aggregated purchase of ultra-fast broadband on behalf of its residents and property-owners, offer it to all, and require all to pay (equally, or according to some other distribution).   Or it may build a network, allow only users to pay a fee, but face the real possibility of shortfalls that will need to be made up by taxpayers (some or many of whom may be non-users). Since it is likely that all taxpayers will contribute, it may make sense to ensure that all residents and property owners have the opportunity to benefit if either Town commits to a project.

Rockland

The fact that Rockland would likely have a lower cost per user to build a fiber network suggests a greater range of potential operating models. A system in Rockland would be able to be self-sustaining at lower take rates or lower price points than in either of the other two communities. Rockland could take one of the options outlined above for construction of a Town-wide network. If it did so in as part of a "Model

[45] This is not to say that there are not *any* users who could save money over their current bundle of communications services, especially if opportunities for substituting other currently bundled services are included. However, clearly there are broadband services offered in the area that cost less than $70/mo.

1" type offering, there is a real possibility that it could achieve actual cost savings for many more users, even while offering higher speeds.

Rockland might also begin in much more a more limited way than building a City-wide network, such as is represented by the "Phase I" project, a core ring linking municipal and school buildings and key downtown locations. It could solicit interest from ISPs and offer wholesale access to dark fiber (like Rockport has done). This model would come at a substantially lower capital cost. The take-rate hurdle for financial self-sustainability would be lower in Rockland for this type of model and the subsidy lower would be lower if the take-rate hurdle was not cleared. Use of the core fiber for intra-municipal communications could partially offset the costs.

The existence of this core fiber network could provide the basis for building incrementally off of it neighborhood by neighborhood after proving a minimum required level of demand in the neighborhood (See the discussion of presubscription models below.) Given the lower take rate levels required in Rockland to generate positive business cases, it is more likely that such a hurdle could be cleared to justify payback on a City or even private capital extension of fiber into neighborhoods off of the core network.

Presubscription

Presubscription is a technique for lowering investment risk when building out a fiber network, especially the risk that a project will not achieve required take rates. Therefore, it is something that any of the Towns should consider if they adopt an approach where sign-up is voluntary.

Essentially, a presubscription campaign divides a community into areas or neighborhoods. In each area a cost to serve the area is generated and a required level of adoption by users to generate a positive business case is calculated. This target level of subscription is publicized, and interested users are asked to sign up in advance—and encourage neighbors to do so as well. (A number of web-based platforms are currently available to manage this process.) Users may be asked to sign a contract and often pay a modest refundable deposit. If the target rate is reached, the project gets built. If the demand is not there, the neighborhood is not built.

Presubscription can be used to test whether expected demand is really there and avoid building fiber where the municipality will need to support financially. It is also a tool that can justify the investment of private, not public funds to build out the neighborhood.

Presubscription is not relevant where the Town has made a decision to build out an area and rely on non-voluntary payments. A Town may also choose for social reasons to build out (and subsidize) areas that can't reach targeted thresholds (for example, low income neighborhoods).

Underground Construction

Underground construction costs were a significant factor in increasing estimated capital costs, especially in Rockport. As presented here, underground construction was modelled as fairly binary—it was included or not. Eliminating underground construction costs meant dropping some residents and businesses from the project entirely. However, in reality there would be policies that the Towns could adopt that are not so binary. A common approach to locations that have a substantially higher cost to reach (such as underground construction or very long driveways), is to create a "standard" cost to serve a location. Locations that greatly exceed the standard are required to contribute to the capital costs to reach the location, but receive a credit against that amount representing a "standard" cost.

Next Steps

Clarify the Most Important Goals

The information in this report should inform municipal officials' thinking about whether to proceed with a project, but there are a number of questions that the information alone cannot resolve. Several key questions to answer include:

- Is the demand and support in each municipality sufficient to proceed?
- Are the municipalities willing to subsidize the cost of the network from general revenue, or do they need users to cover its costs?
- Is it more important to limit the capital costs of a project or to reach every premise?
- Is the City or Town willing to make an aggregated broadband purchase for all businesses and residences, or does it want a more limited role?

Solicit Information from Potential ISPs, Funders, and Network Operators

Input from potential ISP or network operator partners is important if a municipality wants to consider any form of public-private partnership. A prudent next step would be to solicit information from these parties through informal means, a formal RFI, or a combination of both. If any of the Towns wishes to catalyze a project, but limit its capital costs, soliciting information from potential funders who can supplement the Town's capital is also important. This can be done in combination with and can help refine the Towns' choices in the next step, picking a target operating model.

Pick a Target Operating Model

This analysis presents characteristics of two major types of operating models with some possible variations. Under one the Town essentially builds a complete local access network and hire an operator to deliver services over it. Under the other, the Town builds elements of a fiber network and leases access to that network to ISPs who deliver service over it. Each of these options might be further refined based on the Town's preferences. Although the Towns need not make a final choice of operating model immediately, selecting a preferred option will allow further analysis to be developed and targeted.

The Towns should identify whether they would like to invest in developing a multi-town project (perhaps one that could be extended beyond the three), or pursue individual projects.

Solicit Private Partners

Should any of the Towns choose to move forward with a fiber project, working with one or more private partners to build, operate, and/or deliver services over the network will be important. Peer communities have typically sought out partners for these roles through the development of a structured solicitation.

Appendices

Appendix A: Capital Cost – Estimates for Each Savings Strategy by Town and Phase

	Total	%	Rockport	Rockland Phase 1	Rockland Phase 2	Rockland Phase 3	Rockland Combined	Owls Head Phase 1	Owls Head Phase 2	Owls Head Phase 3	Owls Head Combined
Miles	151.18		71.62	5.78	18.09	26.25	50.12	9.81	10.19	9.44	29.44
% underground	14%		18%	4%	3%	16%	10%	6%	16%	8%	10%
Maximum Subscribers	4,483		1,496	314	1,086	899	2,299	160	283	245	688
Maximum Passes	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
-	Cost		Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost
Fiber Network Pass	$ 8,747,015	46%	$ 4,315,893	$ 378,524	$ 984,982	$ 1,561,279	$ 2,924,785	$ 469,420	$ 572,850	$ 464,067	$ 1,506,337
Pole Applications and Make-Ready	*$ 1,377,001*	*7%*	*$ 595,875*	*$ 58,486*	*$ 184,725*	*$ 266,502*	*$ 509,712*	*$ 94,315*	*$ 87,946*	*$ 89,153*	*$ 271,414*
Drops (Materials and Labor)	*$ 2,395,832*	*13%*	*$ 1,124,526*	*$ 152,448*	*$ 313,401*	*$ 394,818*	*$ 860,667*	*$ 147,436*	*$ 137,943*	*$ 125,259*	*$ 410,639*
Fiber and Other Materials	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Construction (Labor)	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Engineering and Project Management	$ 397,935	2%	$ 207,639	$ 13,407	$ 38,948	$ 71,997	$ 124,352	$ 18,213	$ 27,757	$ 19,972	$ 65,943
Local Network Electronics	$ 4,874,086	26%	$ 1,621,020	$ 346,965	$ 1,168,437	$ 960,810	$ 2,476,213	$ 185,112	$ 313,208	$ 278,534	$ 776,853
Taxes	$ 820,544	4%	$ 347,147	$ 45,281	$ 138,670	$ 153,774	$ 337,725	$ 37,816	$ 53,198	$ 44,658	$ 135,672
Contingency	$ 1,641,089	9%	$ 694,294	$ 90,562	$ 277,340	$ 307,548	$ 675,450	$ 75,633	$ 106,397	$ 89,316	$ 271,345
Total	**$ 18,872,520**		**$ 7,984,384**	**$ 1,041,460**	**$ 3,189,412**	**$ 3,536,798**	**$ 7,767,670**	**$ 869,775**	**$ 1,223,560**	**$ 1,027,131**	**$ 3,120,466**
$/Mile	*$ 124,837*		*$ 111,487*	*$ 180,183*	*$ 176,308*	*$ 134,735*	*$ 154,981*	*$ 88,662*	*$ 120,075*	*$ 108,806*	*$ 105,994*
$/Sub	*$ 4,210*		*$ 5,337*	*$ 3,317*	*$ 2,937*	*$ 3,934*	*$ 3,379*	*$ 5,436*	*$ 4,324*	*$ 4,192*	*$ 4,536*

CapEx All Phases, All Municipalities, Town Provides Lit Network; Build-As-You-Go, 75% Take Rate

	Total	%	Rockport	Rockland Phase 1	Rockland Phase 2	Rockland Phase 3	Rockland Combined	Owls Head Phase 1	Owls Head Phase 2	Owls Head Phase 3	Owls Head Combined
Miles	151.18		71.62	5.78	18.09	26.25	50.12	9.81	10.19	9.44	29.44
% underground	14%		18%	4%	3%	16%	10%	6%	16%	8%	10%
Maximum Subscribers	4,483		1,496	314	1,086	899	2,299	160	283	245	688
Maximum Passes	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
-	Cost		Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost	Cost
Fiber Network Pass	$ 8,747,015	66%	$ 4,315,893	$ 378,524	$ 984,982	$ 1,561,279	$ 2,924,785	$ 469,420	$ 572,850	$ 464,067	$ 1,506,337
Pole Applications and Make-Ready	*$ 1,377,001*	*10%*	*$ 595,875*	*$ 58,486*	*$ 184,725*	*$ 266,502*	*$ 509,712*	*$ 94,315*	*$ 87,946*	*$ 89,153*	*$ 271,414*
Drops (Materials and Labor)	*$ 2,395,832*	*18%*	*$ 1,124,526*	*$ 152,448*	*$ 313,401*	*$ 394,818*	*$ 860,667*	*$ 147,436*	*$ 137,943*	*$ 125,259*	*$ 410,639*
Fiber and Other Materials	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Construction (Labor)	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Engineering and Project Management	$ 397,935	3%	$ 207,639	$ 13,407	$ 38,948	$ 71,997	$ 124,352	$ 18,213	$ 27,757	$ 19,972	$ 65,943
Local Network Electronics	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Taxes	$ 576,981	4%	$ 266,148	$ 27,991	$ 80,248	$ 105,733	$ 213,973	$ 28,590	$ 37,538	$ 30,731	$ 96,859
Contingency	$ 1,153,961	9%	$ 532,297	$ 55,983	$ 160,497	$ 211,467	$ 427,946	$ 57,181	$ 75,076	$ 61,462	$ 193,719
Total	**$ 13,270,557**		**$ 6,121,413**	**$ 643,800**	**$ 1,845,710**	**$ 2,431,866**	**$ 4,921,376**	**$ 657,579**	**$ 863,371**	**$ 706,818**	**$ 2,227,768**
$/Mile	*$ 87,781*		*$ 85,474*	*$ 111,384*	*$ 102,029*	*$ 92,643*	*$ 98,192*	*$ 67,032*	*$ 84,727*	*$ 74,875*	*$ 75,671*
$/Sub	*$ 2,960*		*$ 4,092*	*$ 2,050*	*$ 1,700*	*$ 2,705*	*$ 2,141*	*$ 4,110*	*$ 3,051*	*$ 2,885*	*$ 3,238*

CapEx All Phases, All Municipalities, ISP Lights Network; Build-As-You-Go, 75% Take Rate

	Total	%	Rockport	Rockland Phase 1	Rockland Phase 2	Rockland Phase 3	Rockland Combined	Owls Head Phase 1	Owls Head Phase 2	Owls Head Phase 3	Owls Head Combined
Miles	151.18		71.62	5.78	18.09	26.25	50.12	9.81	10.19	9.44	29.44
% underground	14%		18%	4%	3%	16%	10%	6%	16%	8%	10%
Maximum Subscribers	4,483		1,496	314	1,086	899	2,299	160	283	245	688
Maximum Passes	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
-	**Cost**		**Cost**	Cost	Cost	Cost	**Cost**	Cost	Cost	Cost	**Cost**
Fiber Network Pass	$ 8,747,015	83%	$ 4,315,893	$ 378,524	$ 984,982	$ 1,561,279	$ 2,924,785	$ 469,420	$ 572,850	$ 464,067	$ 1,506,337
Pole Applications and Make-Ready	*$ 1,377,001*	*13%*	*$ 595,875*	*$ 58,486*	*$ 184,725*	*$ 266,502*	*$ 509,712*	*$ 94,315*	*$ 87,946*	*$ 89,153*	*$ 271,414*
Drops (Materials and Labor)	*$ 2,395,832*	*23%*	*$ 1,124,526*	*$ 152,448*	*$ 313,401*	*$ 394,818*	*$ 860,667*	*$ 147,436*	*$ 137,943*	*$ 125,259*	*$ 410,639*
Fiber and Other Materials	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Construction (Labor)	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Engineering and Project Management	$ 397,935	4%	$ 207,639	$ 13,407	$ 38,948	$ 71,997	$ 124,352	$ 18,213	$ 27,757	$ 19,972	$ 65,943
Local Network Electronics	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Taxes	$ 457,247	4%	$ 226,177	$ 19,597	$ 51,197	$ 81,664	$ 152,457	$ 24,382	$ 30,030	$ 24,202	$ 78,614
Contingency	$ 914,495	9%	$ 452,353	$ 39,193	$ 102,393	$ 163,328	$ 304,914	$ 48,763	$ 60,061	$ 48,404	$ 157,228
Total	**$ 10,516,692**		**$ 5,202,062**	**$ 450,721**	**$ 1,177,520**	**$ 1,878,267**	**$ 3,506,508**	**$ 560,778**	**$ 690,698**	**$ 556,645**	**$ 1,808,122**
$/Mile	*$ 69,565*		*$ 72,637*	*$ 77,979*	*$ 65,092*	*$ 71,553*	*$ 69,962*	*$ 57,164*	*$ 67,782*	*$ 58,967*	*$ 61,417*
$/Sub	*$ 2,346*		*$ 3,477*	*$ 1,435*	*$ 1,084*	*$ 2,089*	*$ 1,525*	*$ 3,505*	*$ 2,441*	*$ 2,272*	*$ 2,628*

CapEx All Phases, All Municipalities, No Drops or Electronics (Current Rockport Model with Full Underground)

	Total	%	Rockport	Rockland Phase 1	Rockland Phase 2	Rockland Phase 3	Rockland Combined	Owls Head Phase 1	Owls Head Phase 2	Owls Head Phase 3	Owls Head Combined
Miles	151.18		71.62	5.78	18.09	26.25	50.12	9.81	10.19	9.44	29.44
% underground	14%		18%	4%	3%	16%	10%	6%	16%	8%	10%
Maximum Subscribers	4,483		1,496	314	1,086	899	2,299	160	283	245	688
Maximum Passes	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
-	**Cost**		**Cost**	Cost	Cost	Cost	**Cost**	Cost	Cost	Cost	**Cost**
Fiber Network Pass	$ 6,664,031	65%	$ 3,089,801	$ 350,750	$ 911,233	$ 1,076,007	$ 2,337,990	$ 469,420	$ 386,212	$ 380,607	$ 1,236,240
Pole Applications and Make-Ready	*$ 1,377,001*	*13%*	*$ 595,875*	*$ 58,486*	*$ 184,725*	*$ 266,502*	*$ 509,712*	*$ 94,315*	*$ 87,946*	*$ 89,153*	*$ 271,414*
Drops (Materials and Labor)	*$ 2,230,597*	*22%*	*$ 1,034,603*	*$ 148,717*	*$ 305,684*	*$ 351,616*	*$ 806,018*	*$ 147,436*	*$ 123,699*	*$ 118,840*	*$ 389,976*
Fiber and Other Materials	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Construction (Labor)	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Engineering and Project Management	$ 244,515	2%	$ 116,746	$ 11,484	$ 33,666	$ 36,631	$ 81,781	$ 18,213	$ 13,965	$ 13,809	$ 45,988
Local Network Electronics	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Taxes	$ 444,109	4%	$ 193,271	$ 25,030	$ 71,189	$ 75,469	$ 171,689	$ 27,850	$ 26,196	$ 25,102	$ 79,149
Contingency	$ 888,217	9%	$ 386,542	$ 50,061	$ 142,377	$ 150,939	$ 343,377	$ 55,701	$ 52,393	$ 50,204	$ 158,298
Total	**$ 10,214,496**		**$ 4,445,235**	**$ 575,700**	**$ 1,637,340**	**$ 1,735,796**	**$ 3,948,836**	**$ 640,559**	**$ 602,517**	**$ 577,348**	**$ 1,820,424**
$/Mile	*$ 67,566*		*$ 62,069*	*$ 99,602*	*$ 90,511*	*$ 66,126*	*$ 78,788*	*$ 65,297*	*$ 59,128*	*$ 61,160*	*$ 61,835*
$/Sub	*$ 2,278*		*$ 2,971*	*$ 1,833*	*$ 1,508*	*$ 1,931*	*$ 1,718*	*$ 4,003*	*$ 2,129*	*$ 2,357*	*$ 2,646*

CapEx All Phases, All Municipalities, Limited Underground,ISP Provides Lit Network; Build-As-You-Go, 75% Take Rate

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	Total	%	Rockport	Rockland Phase 1	Rockland Phase 2	Rockland Phase 3	Rockland Combined	Owls Head Phase 1	Owls Head Phase 2	Owls Head Phase 3	Owls Head Combined
Miles	151.18		71.62	5.78	18.09	26.25	50.12	9.81	10.19	9.44	29.44
% underground	14%		18%	4%	3%	16%	10%	6%	16%	8%	10%
Maximum Subscribers	4,483		1,496	314	1,086	899	2,299	160	283	245	688
Maximum Passes	5,975		1,994	419	1,448	1,198	3,065	213	377	326	916
-	**Cost**		**Cost**	Cost	Cost	Cost	**Cost**	Cost	Cost	Cost	**Cost**
Fiber Network Pass	$ 6,664,031	84%	$ 3,089,801	$ 350,750	$ 911,233	$ 1,076,007	$ 2,337,990	$ 469,420	$ 386,212	$ 380,607	$ 1,236,240
Pole Applications and Make-Ready	*$ 1,377,001*	*17%*	*$ 595,875*	*$ 58,486*	*$ 184,725*	*$ 266,502*	*$ 509,712*	*$ 94,315*	*$ 87,946*	*$ 89,153*	*$ 271,414*
Drops (Materials and Labor)	*$ 2,230,597*	*28%*	*$ 1,034,603*	*$ 148,717*	*$ 305,684*	*$ 351,616*	*$ 806,018*	*$ 147,436*	*$ 123,699*	*$ 118,840*	*$ 389,976*
Fiber and Other Materials	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Construction (Labor)	*$ -*		*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*	*$ -*
Engineering and Project Management	$ 244,515	3%	$ 116,746	$ 11,484	$ 33,666	$ 36,631	$ 81,781	$ 18,213	$ 13,965	$ 13,809	$ 45,988
Local Network Electronics	$ -	0%	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Taxes	$ 345,427	4%	$ 160,327	$ 18,112	$ 47,245	$ 55,632	$ 120,989	$ 24,382	$ 20,009	$ 19,721	$ 64,111
Contingency	$ 690,855	9%	$ 320,655	$ 36,223	$ 94,490	$ 111,264	$ 241,977	$ 48,763	$ 40,018	$ 39,442	$ 128,223
Total	**$ 7,944,827**		**$ 3,687,529**	**$ 416,568**	**$ 1,086,634**	**$ 1,279,534**	**$ 2,782,736**	**$ 560,778**	**$ 460,204**	**$ 453,579**	**$ 1,474,562**
$/Mile	*$ 52,553*		*$ 51,489*	*$ 72,071*	*$ 60,068*	*$ 48,744*	*$ 55,521*	*$ 57,164*	*$ 45,162*	*$ 48,049*	*$ 50,087*
$/Sub	*$ 1,772*		*$ 2,465*	*$ 1,327*	*$ 1,001*	*$ 1,423*	*$ 1,210*	*$ 3,505*	*$ 1,626*	*$ 1,851*	*$ 2,143*

CapEx All Phases, All Municipalities, No Drops or Electronics (Current Rockport Model with Limited Underground)

Appendix B: Town Wide Utility Model Operating Expenses by Municipality

Rockport Estimated Operating Expenses

	Year									
	1		2		3		4		5	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Fixed Costs	*$265,847*	*50.40%*	*$ 267,347*	*33.04%*	*$ 268,892*	*29.94%*	*$ 270,483*	*29.32%*	*$ 272,122*	*29.57%*
Management and Overhead	$ 50,000	9.48%	$ 51,500	6.36%	$ 53,045	5.91%	$ 54,636	5.92%	$ 56,275	6.11%
Maintenance and Repair	$ 158,553	30.06%	$ 158,553	19.59%	$ 158,553	17.66%	$ 158,553	17.19%	$ 158,553	17.23%
Pole Attachment Costs	$ 57,294	10.86%	$ 57,294	7.08%	$ 57,294	6.38%	$ 57,294	6.21%	$ 57,294	6.23%
Variable Costs	*$ 261,640*	*49.60%*	*$ 541,925*	*66.96%*	*$ 629,084*	*70.06%*	*$ 651,902*	*70.68%*	*$ 648,245*	*70.43%*
Base Cost to Serve	$ 219,640	41.64%	$ 434,825	53.73%	$ 507,704	56.54%	$ 522,935	56.69%	$ 538,623	58.52%
Bandwidth	$ 42,000	7.96%	$ 107,100	13.23%	$ 121,380	13.52%	$ 128,966	13.98%	$ 109,621	11.91%
Total	**$ 527,487**		**$ 809,272**		**$ 897,976**		**$ 922,385**		**$ 920,367**	

Town Wide Utility OpEx for Rockport

Rockland Estimated Operating Expenses

	Year									
	1		2		3		4		5	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Fixed Costs	*$243,187*	*36.88%*	*$ 244,687*	*21.28%*	*$ 246,232*	*20.37%*	*$ 247,823*	*20.11%*	*$ 249,462*	*19.91%*
Management and Overhead	$ 50,000	7.58%	$ 51,500	4.48%	$ 53,045	4.39%	$ 54,636	4.43%	$ 56,275	4.49%
Maintenance and Repair	$ 153,091	23.22%	$ 153,091	13.31%	$ 153,091	12.67%	$ 153,091	12.42%	$ 153,091	12.22%
Pole Attachment Costs	$ 40,096	6.08%	$ 40,096	3.49%	$ 40,096	3.32%	$ 40,096	3.25%	$ 40,096	3.20%
Variable Costs	*$ 416,160*	*63.12%*	*$ 905,330*	*78.72%*	*$ 962,468*	*79.63%*	*$ 984,363*	*79.89%*	*$ 1,003,318*	*80.09%*
Base Cost to Serve	$ 332,160	50.38%	$ 726,830	63.20%	$ 780,398	64.57%	$ 803,810	65.23%	$ 827,924	66.09%
Bandwidth	$ 84,000	12.74%	$ 178,500	15.52%	$ 182,070	15.06%	$ 180,553	14.65%	$ 175,394	14.00%
Total	**$ 659,347**		**$ 1,150,016**		**$ 1,208,700**		**$ 1,232,186**		**$ 1,252,780**	

Town Wide Utility OpEx for Rockland

Owls Head Estimated Operating Expenses

	Year									
	1		2		3		4		5	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Fixed Costs	*$135,176*	*46.53%*	*$ 136,676*	*34.07%*	*$ 138,221*	*32.91%*	*$ 139,812*	*32.59%*	*$ 141,452*	*32.20%*
Management and Overhead	$ 50,000	17.21%	$ 51,500	12.84%	$ 53,045	12.63%	$ 54,636	12.73%	$ 56,275	12.81%
Maintenance and Repair	$ 61,624	21.21%	$ 61,624	15.36%	$ 61,624	14.67%	$ 61,624	14.36%	$ 61,624	14.03%
Pole Attachment Costs	$ 23,552	8.11%	$ 23,552	5.87%	$ 23,552	5.61%	$ 23,552	5.49%	$ 23,552	5.36%
Variable Costs	*$ 155,340*	*53.47%*	*$ 264,461*	*65.93%*	*$ 281,780*	*67.09%*	*$ 289,232*	*67.41%*	*$ 297,858*	*67.80%*
Base Cost to Serve	$ 113,340	39.01%	$ 218,051	54.36%	$ 233,228	55.53%	$ 240,225	55.99%	$ 247,432	56.32%
Bandwidth	$ 42,000	14.46%	$ 46,410	11.57%	$ 48,552	11.56%	$ 49,007	11.42%	$ 50,426	11.48%
Total	**$ 290,516**		**$ 401,137**		**$ 420,001**		**$ 429,045**		**$ 439,309**	

Town Wide Utility OpEx for Owl’s Head

Appendix C: Cost Saving Strategy 4—Cash Flow

Pro-Forma and Operating Expenses
Revenue Assumptions: 75% Take Rate and $30/Month/Subscriber Revenue

Towns build the drop and the pass and charge the ISP $30/month per subscriber location, with only limited underground construction
Rockport--All Phases

	Years				
	1	2	3	4	5
Average Subscribers	183	589	960	1,205	1,404
Revenue	$85,225	$236,670	$364,030	$446,350	$517,690
Operating Expenses	$196,199	$197,699	$199,244	$200,835	$202,474
Net Operating Revenue	**($110,974)**	**$38,971**	**$164,786**	**$245,515**	**$315,216**
Debt Service	$158,865	$315,892	$315,892	$315,892	$315,892
Net Income (without operating subsidy)	**($269,839)**	**($276,921)**	**($151,106)**	**($70,377)**	**($677)**
Cumulative	*($269,839)*	*($546,760)*	*($697,866)*	*($768,243)*	*($768,920)*

Cost Saving Strategy 4 – Limited Underground, Drops to Subscribers Only, ISP Owns Network Electronics, 75% -- Rockport

Towns build the drop and the pass and charge the ISP $30/month per subscriber location
Rockland Combined--All Phases

	Years				
	1	2	3	4	5
Average Subscribers	294	980	1,475	1,852	2,159
Revenue	$138,315	$388,940	$559,000	$686,040	$795,920
Operating Expenses	$169,073	$170,573	$172,118	$173,709	$175,348
Net Operating Revenue	**($30,758)**	**$218,367**	**$386,882**	**$512,331**	**$620,572**
Debt Service	$141,015	$280,399	$280,399	$280,399	$280,399
Net Income (without operating subsidy)	**($171,773)**	**($62,032)**	**$106,483**	**$231,932**	**$340,173**
Cumulative	*($171,773)*	*($233,804)*	*($127,321)*	*$104,611*	*$444,784*

Cost Saving Strategy 4 – Limited Underground, Drops to Subscribers Only, ISP Owns Network Electronics, 75% Take Rate – Rockland

Towns build the drop and the pass and charge the ISP $30/month per subscriber location, with only limited underground construction
Owls Head--All Phases

	Years				
	1	2	3	4	5
Average Subscribers	94	294	441	553	645
Revenue	$0	$116,140	$167,110	$205,100	$237,650
Operating Expenses	$109,960	$111,460	$113,005	$114,597	$116,236
Net Operating Revenue	**($109,960)**	**$4,680**	**$54,105**	**$90,503**	**$121,414**
Debt Service	$65,331	$129,906	$129,906	$129,906	$129,906
Net Income (without operating subsidy)	**($175,291)**	**($125,227)**	**($75,802)**	**($39,403)**	**($8,492)**
Cumulative	*($175,291)*	*($300,518)*	*($376,320)*	*($415,723)*	*($424,216)*

Cost Saving Strategy 4 – Limited Underground, Drops to Subscribers Only, ISP Owns Network Electronics, 75% Take Rate – Owl's Head

Appendix D: Cost Saving Strategy 4—Operating Expense Breakout

Towns build the drop and the pass and charge the ISP $30/month per subscriber location, with only limited underground construction

Estimated Operating Expenses Rockport, Rockland, and Owls Head All Phases

	Year									
	1		2		3		4		5	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Fixed Costs	*$375,232*		*$ 376,732*		*$ 378,277*		*$ 379,868*		*$ 381,507*	
Management and Overhead	$ 50,000	13.33%	$ 51,500	13.67%	$ 53,045	14.02%	$ 54,636	14.38%	$ 56,275	14.75%
Maintenance and Repair	$ 204,290	54.44%	$ 204,290	54.23%	$ 204,290	54.01%	$ 204,290	53.78%	$ 204,290	53.55%
Pole Attachment Costs	$ 120,942	32.23%	$ 120,942	32.10%	$ 120,942	31.97%	$ 120,942	31.84%	$ 120,942	31.70%
Total	**$ 375,232**		**$ 376,732**		**$ 378,277**		**$ 379,868**		**$ 381,507**	

Cost Saving Strategy 4 – Operating Expense Summary – All Municipalities

Towns build the drop and the pass and charge the ISP $30/month per subscriber location, with only limited underground construction

Estimated Operating Expenses Rockport All Phases

	Year									
	1		2		3		4		5	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Fixed Costs	*$ 196,199*		*$ 197,699*		*$ 199,244*		*$ 200,835*		*$ 202,474*	
Management and Overhead	$ 50,000	25.48%	$ 51,500	26.05%	$ 53,045	26.62%	$ 54,636	27.20%	$ 56,275	27.79%
Maintenance and Repair	$ 88,905	45.31%	$ 88,905	44.97%	$ 88,905	44.62%	$ 88,905	44.27%	$ 88,905	43.91%
Pole Attachment Costs	$ 57,294	29.20%	$ 57,294	28.98%	$ 57,294	28.76%	$ 57,294	28.53%	$ 57,294	28.30%
Total	**$ 196,199**		**$ 197,699**		**$ 199,244**		**$ 200,835**		**$ 202,474**	

Cost Saving Strategy 4 – Operating Expenses - Rockport

Towns build the drop and the pass and charge the ISP $30/month per subscriber location, with only limited underground construction

Estimated Operating Expenses Rockland All Phases

	Year									
	1		2		3		4		5	
	Cost	%	Cost	%	Cost	%	Cost	%	Cost	%
Fixed Costs	*$ 169,073*		*$ 170,573*		*$ 172,118*		*$ 173,709*		*$ 175,348*	
Management and Overhead	$ 50,000	29.57%	$ 51,500	30.19%	$ 53,045	30.82%	$ 54,636	31.45%	$ 56,275	32.09%
Maintenance and Repair	$ 78,977	46.71%	$ 78,977	46.30%	$ 78,977	45.89%	$ 78,977	45.46%	$ 78,977	45.04%
Pole Attachment Costs	$ 40,096	23.72%	$ 40,096	23.51%	$ 40,096	23.30%	$ 40,096	23.08%	$ 40,096	22.87%
Total	**$ 169,073**		**$ 170,573**		**$ 172,118**		**$ 173,709**		**$ 175,348**	

Operating Expenses Strategy 4 — Rockland

Towns build the drop and the pass and charge the ISP $30/month per subscriber location, with only limited underground construction

Estimated Operating Expenses Owls Head All Phases

	Year									
	1		2		3		4		5	
	Cost	**%**	**Cost**	**%**	**Cost**	**%**	**Cost**	**%**	**Cost**	**%**
Fixed Costs	*$ 109,960*		*$ 111,460*		*$ 113,005*		*$ 114,597*		*$ 116,236*	
Management and Overhead	$ 50,000	45.47%	$ 51,500	46.20%	$ 53,045	46.94%	$ 54,636	47.68%	$ 56,275	48.41%
Maintenance and Repair	$ 36,408	33.11%	$ 36,408	32.66%	$ 36,408	32.22%	$ 36,408	31.77%	$ 36,408	31.32%
Pole Attachment Costs	$ 23,552	21.42%	$ 23,552	21.13%	$ 23,552	20.84%	$ 23,552	20.55%	$ 23,552	20.26%
Total	**$ 109,960**		**$ 111,460**		**$ 113,005**		**$ 114,597**		**$ 116,236**	

Cost Saving Strategy 4 – Operating Expenses – Owl's Head