Broadband Infrastructure Planning Report

EUPISD / EUPRPDC

September 30, 2020

CCG Consulting
Finley Engineering

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PROJECT DESCRIPTION

From the RFP, the project asked our team to supply the following:

Regional networks provide the foundational infrastructure on which to build past, present and future collaborations in our rural communities. Strategic partnerships between education and other anchor sectors are no longer optional for our communities to leverage the desired next generation network. The more rural your community is, the more partners necessary to meet the e- connectivity infrastructure requirements for research, education, healthcare, public safety, utility, agriculture, and overall economic development.

This project is a 3-County broadband planning initiative which will:

- *Develop a stakeholder team.*
- *Develop strategic partnerships from all sectors.*
- *Develop cost sharing arrangements.*
- *Identify organizational structure for implementation of the plan.*
- *Mapping of routes and locations for the fiber infrastructure, facilities and other equipment.*
- *Identification of costs to implement the plan.*

This is an opportunity for a coalition of interested stakeholders to lay the groundwork for a public fiber network that will connect communities in the three counties that constitute the Eastern Upper Peninsula. There is simply not an attractive return on investment for any single organization to meet this challenge alone. Strategic partnerships across all sectors public and private are required. However, this will take a significant amount of planning have the highest return on investment for our communities.

CCG Consulting and Finley Engineering were hired to:

- *Identify an organizational structure for implementation of the plan to maximize*
    - *Consultant to provide with EUPISD and EUPRPDC input*
        - *connectivity and return on investment for governing members and their community.*
        - *This organizational structure should implement best practices from relevant, comparable entities.*
        - *Should include officers' responsibilities, bylaws, term lengths.*
- *Develop cost sharing arrangements for infrastructure development.*
    - *Consultant to provide with EUPISD and EUPRPDC input*
        - *Cost sharing arrangements should reflect organizational budgets, projected network use, and the benefits of sharing costs amongst several stakeholders in a specific geographic area*
- *Provide digital maps and descriptions of routes and locations for the recommended leased and constructed fiber infrastructure, facilities, demarcation points and other equipment.*
    - *EUPISD and EUPRPDC to provide information to Consultant for inclusion into plan*
        - *Should reflect private demand as well as needs of private stakeholders*
- *Identifies costs to implement the plan.*
    - *EUPISD and EUPRPDC to provide information to Consultant for inclusion into plan*

- *Should include all costs, including costs of administration and management*

The finished plan should provide:

- *Alignment with previously created local, state, and national plans*
- *Cost/Benefit and ROI for each stakeholder*

The finished plan should also include:

- *Distilled Summary for our stakeholders, reflecting Cost/Benefit and ROI*
- *Logical next steps, for consortium and community partners*

Marketing materials including a pitch deck, using verbiage easily accessible to a lay audience

We believe this report is responsive to all the requirements identified in the goals and the project scope of work.

Executive Summary

CCG Consulting and our partner Finley Engineering submit this Broadband Infrastructure Planning Report that looks at the potential for building a middle-mile fiber network throughout Chippewa, Luce, and Mackinac Counties. This network would provide broadband services to anchor institutions in the area as well as provide a backbone fiber that could be used as the basis for anybody that wants to build fiber to homes and businesses in the three counties. This study contemplated bringing fiber to schools & libraries, health care facilities, Township government locations, the two area tribes, and to the key electric substations and other critical infrastructure operated by Cloverland Electric Cooperative.

The first phase of the study was an examination of the cost of building a fiber network to reach all of the locations served by the various entities. Finley Engineering worked with EUPISD, Cloverland Electric, and other stakeholders to compile a list of locations that should be included in the fiber network. Finley then drove the proposed network routes to look at the construction issues that would affect the cost of building a fiber network. Finley also worked closely with Cloverland Electric to understand the issues associated with building fiber on poles. Finally, Finley accommodated requests from EUPISD to create fiber rings for redundancy and to choose specific roads for fiber routes (when there was more than one option). Finley then created several different cost estimates that looked at different engineering scenarios.

With the Finley Engineering number in hand, CCG Consulting was able to create several versions of financial analysis to understand the financial parameters of building and operating the planned network. CCG has worked with many middle-mile networks and we think our estimated expenses for operating the network are realistic and achievable. Projecting the revenues that will support the network was more of a challenge because most of the revenue would come from the consortium members that collectively would own and manage the network. There is no industry-standard way of allocating the costs of the network between individual stakeholders, and so CCG looked at ways that other networks have allocated costs. The base study uses our best guess of how costs would be assigned to consortium members, but there are other ways to look at costs and revenues.

The financial studies produced a few findings that are important if a consortium is formed and decides to move forward. For example, the amount of grant funding needed to support the network looks to be larger than what was anticipated in early internal estimates made by EUPISD. It also looks like a consortium would not be able to support a lot of debt. Both of these results were due to higher-than-anticipated cost estimates for building the fiber network.

The report explores in detail the many issues that would be involved in creating a consortium and then governing the business. It can be challenging to create a consortium comprised of public entities, private non-profit entities, and for-profit entities. The report lays out the many issues that would have to be negotiated and resolved between consortium members in areas like funding the network, in deterring membership fees and ongoing revenues from consortium members, in assigning ownership shares between disparate members, and determining how issues are voted on.

The report finally makes specific recommendations. The primary recommendation is to wait to see who wins the FCC's RDOF grants that will be awarded in October. Those grants will award $50 - $60 million for somebody willing to build a last-mile broadband network in the three counties. Should somebody win that funding and build fiber, then the need for the consortium largely disappears. If the grant winner is

going to build some technology other than fiber, then the consortium idea should move forward. This report provides and outlines of how the consortium ought to proceed.

FINDINGS

Following are our primary finding:

The Fiber Network. As part of the project, we solicited a list of the endpoints that should be included in the fiber design. EUPISD provided the location of schools and libraries and also provided the locations of healthcare facilities and township facilities. We worked through EUPISD to understand locations that would serve the area tribes. Cloverland Electric Cooperative provided us with a list of the facilities they want to connect to a private fiber network. A network was designed that reaches to the many end-points on the network. As part of the design, we accommodated EUPISD thoughts on specific routes that were preferred and on issues like where to add redundant rings.

Fiber Network Design. Finley Engineering designed the network so that every end-point on the network could have a 1-gigabit connection, with the option to provide up to 10 gigabits of speed. The network design is complicated by the fact that we had to accommodate some fiber routes that are already leased today. This meant using electronics for these routes that pack the network traffic into only a few fibers. All new fiber was designed for each class of members with sufficient fiber to meet their needs today and into the future. There is also fiber in the network design that can accommodate future growth, adding new members to the coalition, or can accommodate using this network as the backbone to provide last-mile fiber-to-the-premise throughout the three counties.

The fiber network is designed to go on poles where other utilities are on poles but would be buried underground where other utilities are currently buried, or buried in places where that looks to be more cost effective than getting onto the poles. Most of the poles for the network are owned by Cloverland Electric Cooperative which provided feedback about the effort needed to use poles along specific routes. Finley Engineering also drove around the planned network routes to look at specific local conditions that needed to be considered in the network design.

Miles of Fiber Construction

The network would be a mix of leased fiber and newly built fiber (both aerial and buried construction). Finley identified the needed miles of new construction, and continued use of leased fiber as follows:

Aerial	299 miles
Buried	286 miles
Leased	141 miles
Total	526 miles

Asset Costs. Below is a summary of the cost of the needed assets to support each primary option that was studied. The three scenarios are:

- Strand and lash construction performed in the communications space with a conservatively high estimate of make-ready cost.

- Strand and lash construction performed in the communications space with a lower estimate of make-ready cost.
- Construction of the fiber network in the power space.

	High Make-Ready	Lower Make-Ready	In the Power Space
Fiber & Drops	$25,108,443	$22,666,236	$14,959,685
Electronics	$ 2,262,781	$ 2,262,781	$ 2,262,781
Huts	$ 1,427,500	$ 1,427,500	$ 1,427,500
Routers	$ 1,860,259	$ 1,860,259	$ 1,860,259
Operational Assets	$ 286,009	$ 286,009	$ 286,009
Total	$30,944,992	$28,487,525	$20,796,707

Operating Models. We identified three operating models that could work to provide a fiber solution for the schools and the other stakeholders. There are:

- The schools own the network and lease dark fiber or lit bandwidth to the other stakeholders.
- A consortium is created by the many stakeholders to tackle building and operating the network jointly.
- Somebody else builds the network and the schools and all of the other stakeholders purchase capacity from that new fiber network.

From a network design perspective, the first two options are nearly identical. This report concentrates on the second option of creating a consortium. However, it turns out that the third option could happen if somebody in the UP accepts the FCC grants being awarded this October and builds fiber. We are recommending that the project be put on temporary hold to see if somebody wins the federal grant funding and decides to build fiber throughout the three counties – because a new fiber network should be able to accommodate the schools and the other stakeholders.

Accommodating Other Stakeholders in the UP. The original premise behind this project is that a new fiber network ought to accommodate everybody in the UP that would benefit from fiber. For example, this network designed in this project would provide a great backbone for somebody who wants to build fiber-to-the-premise. The network would also be of interest to CLECs, other carriers, cellular companies, and any entity that might want to traverse the three counties with fiber to reach either the west end of the UP or up into Canada. The report looks at the kinds of products that would be sold to outside entities such as IRUs (long-term leases), dark fiber, and lit bandwidth products like virtual private networks (VPNs).

Our Approach to the Financial Analysis. Once we gathered all of the needed information, including the network cost estimates from Finley Engineering, CCG was able to create financial models that showed how a consortium might function from a financial basis. This was an informative undertaking because it allowed us to understand things like the likely amounts of grant funding needed to fund a network and the likely amounts of debt that the consortium could support. We used the following approach in estimating the revenues and costs for operating a new fiber network in the county:

- All analysis was done on an incremental basis, meaning that we considered only new revenues, new expenses, the cost of new assets that must be constructed or purchased, and the new cost of supporting debt.

- Our analysis assumed that the consortium members would be the schools & libraries, Cloverland Electric Cooperative, the medical facilities in the three counties, the various township governments, and the two local tribes.
- One of the hardest issues to resolve will be determining the share of the network cost that is assignable to any given consortium member. There are numerous ways that other consortiums have allocated costs between members and the report looks at the results of different allocation strategies.
- We then created a base model where layered on our best guess of how such an undertaking might be funded. This meant making assumptions for such things as the amount of grant funding, collecting membership from those joining the consortium, offering members the ability to pre-fund twenty years of the cost of using the network with a lump-sum long-term lease, and borrowing as much money as the consortium could afford to support.
- We then looked at other scenarios that kicked the tires on the base assumptions. For example, we looked to see what happened if no membership fees were collected.
- The financial models cover a 20-year period to match the expected term of the debt. The projections included financing costs for borrowing the money needed to build and launch the network.
- The forecasts include the assumption that some of the electronics along with working assets like vehicles would need to be replaced or upgraded during the 20 years.
- The estimates of operating expenses represent our best estimate of the actual cost of operating this network, based on our experience in working with other middle-mile fiber networks. Most operating expenses are adjusted for inflation at 2.5% per year.

Key Financial Study Results. The assumptions used in creating the various business plans are included in Section II.C of the report. The results of the financial analysis are included in Section II.D of the report. A summary of the financial results is included in Exhibit I. Following are the key financial findings of our analysis.

- The project is going to require a significant amount of grant funding. We think this is higher than what EUPISD contemplated, which is mostly due to the cost of the fiber network being more expensive than anticipated. CCG has worked with Finley Engineering for many years and we've found that their network cost estimates are always a little conservatively high, on purpose, but that their estimates are generally thorough and accurate.
- The project will not support a lot of debt. The margins between anticipated revenues and expenses look to be enough to support perhaps $4.5 million in debt. This is another factor that pushes the funding towards the need for grants.
- The forecasts anticipate that there would be membership fees to join the consortium. This could be eliminated if you somehow found enough money to pay for the whole project, but otherwise, the membership fees jump-start the funding and creation of the consortium and the network.
- We considered an option where members could opt to pre-pay transport costs for 20-years with a lump-sum investment (IRU). This provides a major benefit to the project by lowering the amount of grant funding needed.

Funding Options. The study looks at a wide range of funding options that might be available to the consortium or its members. The financial analysis considers the possibility of partial funding with a bond from the schools along with commercial loans and discusses the issues associated with mixing different kinds of funding.

The report also discusses the current federal grants that are available that might benefit the project. Not discussed the grants that we don't yet know about. There has been a lot of talk in Congress increasing federal grants and loans to benefit rural broadband. All of the proposed plans include an emphasis on solving the homework gap by making it easier for students to connect to schools from home – and that should benefit the schools and make it easier to get grants for this kind of project. EUPISD should keep a close eye on what Congress does this year and next.

Governance. There is a long discussion in the report about issues of governance of a consortium. There is no one simple way to create a consortium made up of government entities and commercial entities, and that has members that differ drastically in size and in their ability to help support the funding and operations of a consortium network. The report discusses the many issues that will have to be resolved in creating a consortium in a way that is fair to all parties and yet that recognizes the big differences between members.

RECOMMENDED NEXT STEPS

Following is a list of recommendations that come from our analysis of the opportunity. Each of these recommendations is discussed in more detail in Section III.D. of the report.

Wait to see what Happens with the RDOF Grants

The FCC RDOF grants could award as much as $50 - $60 million to somebody willing to build last-mile fiber in the three counties. If Cloverland or some other entity accepts this grant money to build a fiber network, then the best option for the schools would be to lease dark fiber from that new network. The same would likely apply to all of the other potential consortium members. Everybody in the three counties would have access to fiber without having to contribute to building or owning a network.

If the winner of the RDOF grant is going to provide any technology other than fiber, then the project contemplated by this study would again become a priority. The RDOF grant process is slanted such that fiber builders will win the money, but if nobody proposes to build fiber in the counties, then the money would likely be awarded to build DSL, fixed wireless, or even to support satellite broadband – and none of these technologies provide the kind of bandwidth that the schools, Cloverland, and other potential consortium partners need.

It's also possible that somebody could win a grant to build fiber to only a portion of the three counties. In that case, the new fiber builder could provide part of the needed solution and a consortium still might make sense to build what's not covered by the RDOF grants.

The RDOF grants will be awarded this October. Once the winner of the grant is announced, if a fiber overbuilder wins the grant it ought to be fairly easy to determine the extent to which the RDOF grants provide the needed solution.

Determine the Governance and Organizational Issues

The report discusses governance and ownership issues at length in Section III.B. of the report. In section II.D CCG recommends a specific process for helping members to find answers to the many questions and different options that can be considered for the governance of this kind of network. Ultimately, the members who want to join the network are going to have to meet and slog through the many issues related to funding, voting, and operating the business to end up with a satisfactory governance structure. The report describes the issues that will need to be solved.

Investigate Some of the Financing Nuances

The schools currently have the ability to borrow up to $2.5 million from bonds that could be used for the project. However, the ideal funding structure would have the consortium borrowing more than that, and that likely means mixing bond funding and commercial bank funding for the project. CCG has identified some potential issues with mixing different kinds of financing that should be explored before any specific proposals are made to members. When mixing different sources of funding, the key issue to iron out is the willingness of different lenders to compromise on issues like the priority for payments of debt. We don't think it's too early to talk to potential lenders.

Consider Paring Back the Project

There are ways that the cost of the project could be reduced to be more affordable. This might include looking at some of the following ideas:

- There are a few fiber routes that could be eliminated to save money. The tradeoff for this would be a reduction of redundancy, but not functionality.
- You should explore the options to fiber swap with entities that are thinking of building east-to-west fiber across the counties.
- There are also likely ways to reduce the cost of the network electronics that are worth a more detailed dive into the design. Finley Engineering designed the network you asked for, but there may be options for rearranging rings and other changes that could save money without sacrificing overall functionality.

Consider Reaching out to Potential Consortium Members

We know that you've been waiting for this report to get more serious with potential consortium members. Unfortunately, the first recommendation above says you should wait to see who wins the RDOF grants for the three counties. This report has highlighted some issues that are probably worth sharing with prospective consortium members. For example, the report identifies the likely funding structure. The paper also discusses governance issues in detail. If the FCC's RDOF for the three counties goes to a fiber overbuilder. then this consortium project is not going to be needed. It's a judgment call if you want to start discussing these findings now with potential members or wait out the RDOF grant process first.

Consider Tackling the Project in Phases

It may be difficult to find sufficient grant funding to build the whole project you have in mind.

You should consider how you might instead proceed with smaller amounts of grant funding. For example, a smaller grant that might build fiber to connect a half dozen schools would mean that those schools could eliminate some of the leased transport they use today. If only one school on such a network can get fast broadband, then it could be shared with all.

There are likely to be some interesting grant opportunities over the next year or two, and many of those grants are going to favor solving the homework gap and funding better broadband for rural schools. You should keep abreast of these opportunities and build any fiber that you can. Every route of leased transport you can eliminate is a victory for the schools and would take another step towards getting the schools onto their own private network.

Be Persistent

If you are unable to build this entire network at one time, you need to be persistent, because it's a great goal. Even should somebody win the RDOF funding for the three counties to build fiber, there are likely going to be some fiber routes you'll need to build on your own. Don't get discouraged if you find partial solutions, because as long as you are persistent, you'll likely eventually achieve the goals you established in the RFP for this project.

I. Engineering Design and Cost

Finley Engineering performed an engineering analysis and prepared a cost estimate of the cost of building a regional middle-mile fiber network to connect various utility, healthcare, government, and tribal facilities throughout the Eastern Upper Peninsula of Michigan.

Study Parameters

Before looking at the specific network designs, we gathered information about the county locations that would be served by the network. The study area included a geodatabase of different categories of locations spread throughout Luce, Mackinac, and Chippewa Counties (a few locations were in Delta, Schoolcraft, Alger, and Marquette counties). Below is a breakdown of these locations

Township/Government	71
Tribal	18
Healthcare	15
Educational	49
Library	16
Utility (Electric)	51
Total	220

Basic Network Design

The network was designed to bring fiber to the entities listed above. Additionally, the network was sized to also allow for other entities like CLECs, cellular carriers, and others to use the network. Finally, the network would also hopefully act as a backbone network for any entity that wants to build fiber-to-the-premises in the region.

The network would be a mix of leased fiber and newly built fiber (both aerial and buried construction). Below is a breakdown of the estimated route miles required for the network.

Aerial	299 miles
Buried	286 miles
Leased	141 miles
Total	526 miles

These mileages were measured using various data sets including Michigan DOT road maps and databases, Cloverland Electric Cooperative pole and route data sets, and other information on existing fiber routes from existing providers.

Finley also drove and looked at most of the fiber routes along with EUPISD. That allowed us to see local conditions that would affect fiber construction costs.

The soil conditions in the area present a challenge for burying fiber underground. There is a mix of hard rock, marsh areas, and some looser soils. This makes for an expensive buried network build, and for this

reason we opted to utilize aerial construction on utility poles wherever possible. These routes where aerial construction is possible was determined using GIS data from Cloverland Electric's database.

Additionally, we were able to make a number of assumptions regarding make-ready and pole change-out costs related to an aerial fiber build. "Make-ready' is defined in more detail below. These costs were estimated on a per-mile and per pole basis using input from Cloverland data and staff.

We looked at two primary methods of aerial construction. First was standard strand and lash construction. This placed new fiber in the communications space on poles, which is in between the electric wires at the top and telephone and possible cable company wires at the bottom. With strand and lash construction, a 'strand' is first placed on the pole, which consists of a metal messenger wire. The fiber is then lashed to the messenger wire.

We also looked at All-Dielectric Self-Supporting (ADSS) construction. This method uses self-supporting fiber cable that doesn't include any metal. That allows placing the DSS fiber in the 'power space' near to existing power lines. The primary advantage of ADSS is that it drastically reduces the cost of make-ready and pole replacements. However, putting fiber in the power-space is not without its downsides. High voltage qualified technicians must be used to build and possibly maintain this network. The main hurdle would be convincing Cloverland Electric Cooperative to allow another entity to put a network in the power space – very few electric companies would allow this.

We also estimated the cost of burying fiber where that was necessary. These costs were influenced by various factors including soil conditions and rock. These costs were again estimated on a per-mile basis.

Following is a more detailed discussion of factors that affect the costs of building buried and aerial fiber.

Buried Fiber Basics

The cost and effort to bury fiber depends upon several major factors, described as follows:

Method of Construction. There are several methods used to bury fiber underground:

- Direct Buried. The lowest cost of burying fiber is to direct bury the fiber in the ground. One of the most common ways to do this is by using a heavy piece of equipment called a fiber plow that can 'plow' a shallow hole in the ground and push fiber into the hole created. This can also be done in residential neighborhoods where there are unpaved shoulders of roads, using smaller hand plows that can accomplish the same task. This technique is best used in circumstances where there are somewhat long runs of fiber to be buried, where the soil is soft enough to easily accommodate the plows, where there are not many rocks, and where there are not a lot of other buried utilities on the road such that the buried fiber is not likely to be disturbed after it's put into the ground. The fiber used for direct burying comes with a hardened outer coating that can stand up to the construction process and that is also toughened against easy fiber cuts.
- Trenching. Trenching is just what it sounds like – digging a trench and laying the fiber in the open trench. This is a common way to lay fiber on roads that are going to be undergoing a rebuild or repaving. This is also done in other cases where the soil is soft enough to be able to dig and refill trenches easily. Trenching can accommodate bare hardened fiber cable or also fiber in conduit.

- Boring. Boring is generally the most expensive construction method. The process utilizes digging 'potholes' which are holes 4 – 5 foot deep. Once the hold has been dug, a drill is inserted into the hole and then bores horizontally at the appropriate depth for the fiber. In towns, it's typical that fiber is buried at some specified depth such as 3 or 4 feet below the surface, in order to make sure it doesn't interfere with other existing utilities. The bores can be 'aimed' by an operator to keep at the specified depth and also to reach from the trench to the desired other end of the connection. The drill creates a hole through which an empty conduit can be 'pulled'. Once the conduit is in place, the contractor will refill the pothole and restore the surface to an acceptable condition as close as possible to what was there before the hole.

  Once a run of the conduit is in place, a contractor will pull or push fiber through the conduit. There are numerous techniques to get the fiber through the conduit, and factors like the size of the fibers and the expected length of fiber pull between potholes will dictate the best method to use.

Factors that Affect Cost. There are several factors that impact the cost of buried construction:

- Type of Soil / Substrate. Some kinds of soil are easier to construct in, so the type of soil will impact each of the construction methods. Substrate refers to a more solid earth that lies under existing streets and roads. The soil would under roads is often compacted before paving and also often is supplemented with various substances to firm up the substrate so that it will last longer.
- Rock. The presence of rock is generally the most important determinant for cost. By rock, we're referring to natural rocky conditions that exist under the surface. We're not referring to the presence of rocks in the soil, which are referred to in buried construction as cobble, but of solid native natural rock. There are places where rock is barely below the surface and other places like Iowa farmland where it's fifteen feet deep. It's nearly impossible to trench through rock and boring through rock can easily be ten times more expensive than boring through normal substrate.
- Groundwater. Constructing fiber in places where the groundwater level is just barely below the surface can add to cost. For example, it's not easy to trench or dig potholes where any hole instantly fills up with water.
- Normal Construction Impediments. Most forms of buried construction have to pause to find a safe way around impediments like driveways and intersections. The greater the number of such impediments, the higher the cost of construction.
- Larger Barriers. It's often costly to cross barriers like rivers and streams, railroad crossings, interstate highway ramps, etc. The extra cost sometimes comes from high fees associated with gaining the permission needed to build through these areas. Sometimes it exceedingly difficult to get permission to place fiber on an existing bridge, and for short distances, it's sometimes faster and cheaper to drill under a stream or place high poles and pass over a stream rather than wait for a bridge crossing.

Aerial Fiber Basics.

There are several factors that can determine the cost of constructing aerial fiber. The primary factors that affect aerial construction costs include:

- Construction Method. There are several ways to build fiber on poles that can affect the cost.
  - Lashing onto Messenger Wire. The most common way to build fiber is to first hang a metal 'messenger' wire on the poles and then follow by lashing fiber onto the messenger wire.

The messenger serves as a stiff and strong base for the fiber to keep it from swaying in storms and to eliminate too much sagging that would interfere with other wires on a pole.

- Self-supporting Fiber. There is fiber that is built strongly enough to support itself without the messenger wire. Such fiber is most useful when the distance between poles is not too great.
- Microduct. It's possible to hang small conduits on poles that would allow pulling several fibers through the conduit. One of the constraints on this method is the combined weight of the microduct and the fiber combined, and any issues associated with increased wind resistance from a conduit compared to fiber. Pole owners insist that anything hung on their poles will be safe during storms and won't allow adding too much weight to poles (which matters the most during windstorms).
- Building in the Power Space. Most fiber is hung on poles in the 'communications space, which in most places means putting the fiber between existing telephone company wires and cable company wires. It's possible to instead place fiber in the power space, meaning at the top of the pole with the power lines. This is often the easiest construction method because there are no issues of spacing with existing wires from other utilities. But building in the power space requires permission from the electric utility (and many don't allow this). It also means that construction contractors have to be certified to work in high voltage areas. This also means that any technicians that tough the fiber once it's built have to be certified to work in this space.

- Make-Ready. The most important aspect of building onto poles is something that the industry calls make-ready. There are national electric codes that define the spacing between the wires of different utilities. In rural areas, most poles will already be carrying electric wires and telephone wires. There also could be existing fiber on some roads that is used for some purpose other than serving households and businesses.

  The national electric codes include two important requirements that can affect the cost of getting onto poles. There must be sufficient space between the different providers on a pole. For example, a new fiber must be at least 18 inches above the wire below it. There are also minimum clearance rules for the lowest that any cable can be above ground for the safety of those beneath the pole. These rules are in place to provide safety for technicians that work on cables during and after storm damage.

  When there is not sufficient room for a new wire, then an industry practice called make-ready is invoked. Make-ready is the process of moving the existing wires on poles, as needed, to make room for new wire. The make-ready can be somewhat simple, such as moving an existing wire by a few inches, or it can be major, such as having to move all of the wires on a pole or possibly even replacing the pole with a taller one.

  Make-ready is expensive for two reasons. First, the new attacher must pay to make all the needed changes, even if the old wires were out of specification. Second, there can be big time delays while other wire-owners make their changes to make room. Make-ready can be so expensive that in some cases it's cheaper to bury a fiber rather than to deal with the cost and delays doing the make-ready to be able to add a new fiber.

One-Touch Make-Ready. The FCC passed new rules that went into effect in May of 2019 that should make it easier to get onto poles. The new rules apply only in the thirty states that follow FCC pole attachment rules, and Michigan is not one of those states. The make-ready rules are still listed below, because it's likely that the state either will adopt something similar or might even adopt the federal rules.

The most significant change in the rules is a new classification of poles as either simple or complex make-ready. The order defines how to make this classification. In real-life practice, the new attacher will suggest this determination, although it could get overturned by the pole owner.

There are streamlined new rules and timelines for completing the make-ready on simple poles. If the pole owner is unwilling to commit to fixing simple poles in the needed time frame, then the new attacher can make the changes after properly notifying the pole owner. The new attacher is free to rearrange any existing wires as needed, again after having properly notified all the parties. These new rules eliminate situations where a pole owner refuses to cooperate with a new attacher, as happened in a few cities where AT&T fought Google Fiber. Something to consider is that the rules require using a make-ready contractor that has been pre-approved by the pole owner – but there are ways around this in some circumstances.

These new rules can mean a big improvement in the construction schedule where the needed changes are for simple poles. That would be poles where wires need to be moved to make room for the new attacher. However, the new rules are not necessarily faster for complex poles. Those are poles where the make-ready could cause damage to existing wires or where the old pole must be replaced. The make-ready process for complex poles has always been slow. The new rules tighten up time frames a little, but the time required to get onto a complex pole can still take a long time.

For complex poles, the process will still allow the existing wire owners to work sequentially – meaning that they can invite each existing company on the poles to do their own work, one company at a time. This coordination must be scheduled by the pole owner. The process could still take six months even if done perfectly. The new rules don't seem to provide a solution for when the pole owner or the existing attachers drag their feet on complex poles. Other than some slightly improved timelines, the work on complex poles looks to still be as dreadful and slow as the old make-ready rules.

Electronics Design

We consulted with EUPISD and discussed the network requirements for them and other stakeholders in the project. Each EUPISD network client would have different and varying security concerns for their network. These needs vary from group to group and different entities will likely want to operate separate networks with the ability to scale in the future.

The entities using the fiber can be provided with separate fiber paths in two ways. The easiest is to allocate a specific number of fibers to each group of entities – fiber for the schools, fibers for Cloverland Electric, etc.

However, it's not possible to provide physically separated fibers through the network do the presence of remaining leased fibers. The constructed routes of fibers provide for enough fibers for each entity on the network, but on leased routes, all of the broadband traffic will need to be compressed to fit within the two or four leased fibers. The presence of the lease fiber routes added significant cost to the electronics on the network as the traffic moved between leased fibers where the signal is forced into a few fibers and new fiber where traffic is separated.

Another complication added to the network design was a desire to create redundancy whenever possible. In a fiber network with no redundancy, a single fiber cut will kill traffic from passing through the network. On a network of this length, it would be normal to expect a few fiber cuts every year from entities doing excavations under or near to roads. That means that the network could go dark several times per year, for an indeterminate length of time until the fiber is repaired.

Redundancy is added to the networks by adding fiber 'rings' These are circular routes that are equipped with self-healing electronics. That means that if the fiber is cut, then any traffic that is blocked by the cut would be automatically rerouted to go around the ring in the other direction. Finley got feedback from EUPISD for the number and locations od desired redundant rings. It must be noted, though, that adding the rings adds to the cost of the electronics. It's a trade-off that most network owners will choose when it's possible to provide a high-reliability network.

When the network traffic must be crammed into just a few fibers on the leased routes, one of the most common ways to do this is through the use of DWDM (Dense Wave Division Multiplexing) technology. DWDM is an optical multiplexing technology used to increase bandwidth over existing or new fiber networks. DWDM architecture is based on a simple concept – instead of transmitting a single signal using a single light wavelength, the technology transmits multiple signals, each with a different light wavelength. Each wavelength provides a separate data path, unaffected by other signals on the fiber. Depending on the channel spacing, a 100 GHz set of electronics could provide up to 80 separate communications channels.

Another method often used to place multiple data paths onto a single fiber pair involves using a technology called VLAN (Virtual Local Area Network). This technology is best described as creating individual tunnels within a larger data path.

After consulting with EUPISD and their needs the decision was made to implement a combination of the two technologies. DWDM technology is used on leased fibers to provide bandwidth on separate data paths. With each of those data paths, there is the option to create VPNs to separate different entities. For example, VPNs could be used to separate traffic between different libraries or different city halls.

This would give the network operator the option to separate bandwidth by light wave or by VPN within light waves. This provides total network security. With wavelength separation, it's impossible for one wavelength of light to bleed into another. VLANs electronically create the equivalent separation as if each signal was on a separate wire. Network segmentation with VLANs creates a collection of isolated networks within the network. When properly configured, VLAN segmentation severely hinders access to system attacks. VLANs reduce packet-sniffing capabilities by outsiders and reduce the risk of packet interception. Only authorized end-users can "see" the data in the VLAN that is intended for them. There would be no mixing in the network of traffic between different entities.

The network design was implemented using a system of routers and transport equipment with MPLS technology and DWDM filters. MPLS is the acronym for Multi-Protocol Label Switching, which is a mechanism for routing traffic within a network. MPLS works in conjunction with the Internet Protocol (IP) and its routing protocols, such as the Interior Gateway Protocol (IGP). The network implements MPLS LSPs (Label Switched Path) to create the needed VPNs. The network will be able to support a wide array of transport protocols and traffic types including IPv4, IPv6, ATM, frame relay, etc.

MPLS operates at a layer that is generally considered to lie between the traditional definitions of OSI Layer 2 (data link layer) and Layer 3 (network layer), and thus is often referred to as a layer 2.5 protocol.

In a pure IP network, the shortest path to a destination is chosen even when the path becomes congested. The MPLS network will consider network congestion and will choose the shortest path that has room for the packets. The network operator can override the automatic routing protocols and can define their preferred constraints by specifying link attributes and special requirements for tunnels to route (or not to route) over links with certain attributes.

The MPLS software in the network design for routers and switching equipment initially provide 100-gigabit paths in both directions in the network. The equipment chosen would allow for purchasing an additional 100-gigabit to upgrade to 200-gigabits in each direction, without a change of equipment.

Another network technology included in the design is ROADM (Reconfigurable Optical Add-Drop Multiplexer). This equipment allows EUPISD the ability to remotely switch traffic from a DWDM system at the wavelength layer. ROADMs are used in applications where traffic patterns are not fully known or might change frequently, and this flexibility lowers the cost compared to an automatically dynamic network. This allows EUPISD to plan bandwidth assignment as they are needed, and not spend a large amount of time during the initial deployment of the network. The configuration can be changed on the fly using ROADM without disrupting traffic that is already on the network.

Each hut site in the network will be equipped with a router or switch feeding each direction of traffic flow. Initially, these routers have the port count and processing power to serve 24 – 1/10G traffic flows with seven equipped with 10G SFP's. Future software upgrades and SFP purchases will give the system the ability to add eight 25-gigabit and two 100-gigabit ports at each site.

At the Customer Location

Subscriber NID's (Network Interface Devices) are designed as a mix of fixed broadband capability to provide either 1 gigabit capability or 10 gigabit capability, depending on the location. For example, schools that can be expected to use more than 1 gigabit of bandwidth were provided with a 10 gigabit NID. A water tower or city hall in a township might be provided with a 1 gigabit unit.

Fiber Drops

To connect a location to the fiber network, a fiber drop is built from the street to connect to the outside of a customer premise building. The customer drop is a two-fiber cable which is fusion spliced to a single fiber of the main line cable. These splices are housed in a splice case that is sized for each location

depending upon the needs of a given location. For instance, a school complex might have a larger drop wire to allow for a different connection to different buildings.

Conclusion

It is Finley's opinion that the cost of electronics is high. It's possible that a different mix of DWDM, VLAN's, and dark fiber strands could be used to achieve the same network capabilities at a lower cost. This is mostly due to two issues. First is the need to pass the traffic through different leased routes, needed electronics to compress the fiber signs to fit within only a few fibers. There is also additional electronics cost created to provide multiple redundant rings. We think there might be ways to save some money on the design, but this would require some detailed engineering and would best be coupled by determining the exact bandwidth requirements at each location. This couldn't be done until the exact make-up of a consortium is determined – but is something that could be done before electronics are purchased.

II. FINANCIAL PROJECTIONS

This section of the report looks at the detailed assumptions that were made in creating a final projection for building and operating the new network. The business plan assumptions represent our best estimate of the operating characteristics of such a business. As a firm, CCG consults to hundreds of communications entities that provide rural broadband – including other middle-mile networks like this one. We believe that the financial results shown in these models are representative of similar operations elsewhere and we believe our assumptions are realistic.

The primary goal of the business models is to look at the various scenarios from the perspective of a new fiber network owned and operated by a non-profit entity. The most natural such entity to launch this business would be the Eastern Upper Peninsula Intermediate School District (EUPISD), although it would be possible, once constructed to migrate the operations and ownership of the network to some other entity.

A. Operating Models / Business Case

All scenarios under consideration start with the premise that all of the schools and libraries will act as a consortium to work to find a facility-based broadband solution for connecting schools and for providing big bandwidth. For ease in the following discussion, this consortium will be referred to as 'schools'.

In looking around the country at other similar consortiums, we were able to identify three different operating models that could be used for finding a long-term facility-based solution. Following is a description of each operating model, following by a lit of pros and cons for each. These pros and cons are written from the perspective of the schools – other entities might see something listed as a pro to instead by a con.

Option 1 – the schools own the network and all other users of the network lease fiber or bandwidth from the schools. From a governance perspective, this is not a consortium and everybody except the schools would be customers of the network.

Under this scenario, the schools would raise all of the money needed to fund and build the network. This scenario might still ask come entities to buy pre-paid IRUs to cover transport costs over 20-years.

Pros for Option 1

- Fastest Path to Network Completion. Under this scenario, the schools would be able to fund and build the network without having to deal with any other parties as 'partners'. Any other party that wants to use the fiber network would do so through some long-term lease of dark fiber or purchase of lit fiber. Without partners, the Schools would be free to pursue whatever path seems the most sensible in terms of financing the network, getting the network constructed, and operating the network after it's been built. The schools could use preferred vendors and could choose a construction schedule that best fits the school year schedule.

- Might not Require Building the Whole Network at Once. The 'network' consists of three major components: the fiber backbones that connect the various regions of the network; the fiber spurs and drops that reach from the backbone to individual schools or to other end-points to reach other

parties, and the electronics needed to light the network and provide the needed bandwidth. If the schools proceed to build the network before all of the potential partners have agreed to use the network, then there could be savings from not building spurs and providing electronics for members that aren't ready to use the network. The schools will likely want to build the fiber backbone at the start of the project, including any paths that create redundancy. But spurs wouldn't have to be added until somebody is ready to pay to use them.

- Schools Have Full Operational Control. The schools would have full operational control of the network and of the processes for operating it. The schools could unilaterally make decisions to change the way things are done without having to negotiate with other partners. With that said, the schools will have to adhere to any contractual arrangements with other parties that have purchased long-term use of the network. But the schools would have the freedom to change day-to-day aspects of operating the network. For instance, the schools could: unilaterally decide to add another school to the network, could decide the change the vendor that is providing Internet connectivity, could add employees or outsource existing functions – all without having to notify and negotiate with other parties.

- Schools Could Choose Who to Allow on the Network. Network owners are not generally required to sell access to everybody who asks to use the network. The schools could reject selling access to anybody they prefer not to share the network with. I don't know who that might be, but in most regions, there are a few bad actors that don't want to follow the rules – and the schools would be free to decline relationships.

- Avoids the Issues of a Failed Partnership. Unfortunately, a significant number of telecom partnerships don't last. Anybody entering into a partnership between different types of entities – such as government entities and commercial entities – must be realistic in recognizing that different types of entities might have different ideas on how to operate a partnership and differing needs on how the business is functioning. If the schools are the only owner of the network, there are no partners to deal with.

- Possibility of Big Future Savings. To the extent that there is borrowing to help pay for the networks, the schools would see a windfall at the future point in time when the debt is retired. The schools can also benefit from any profits driven by selling dark fiber or lit services to entities like CLECs, cellular carriers, or others.

- Schools Get to Set the Priorities. If the schools are the sole owner of the network, they can set the priorities when fixing network outages. As an example, if the priority was to restore service to high schools before elementary schools you could do things the way you prefer. With that said, there would likely be contracts with external dark fiber customers that might demand other priorities – and cash penalties for not meeting service recovery deadlines.

- Takes Best Advantage of Grants and Funding Available to Schools and Government Entities. A network owned by a commercial company might not be eligible for the same types and amounts of grants that might be available to a school network. For example, right now as in the middle of the COVID-19 pandemic there are numerous kinds of funding being made available to schools. To the extent this carries into 2021 this could help this project.

Cons for Option 1

- On Your Own for Financing. Partnering with a strong business like Cloverland would make it easier to obtain the needed funding.

- The Schools Would have to Cover Operational Shortfalls. If the schools are the sole owners, they would also have to solely cover any operational cash shortfalls. That is often a hard thing to do in a government environment – but the bills for operating the network have to be paid if expenses exceed revenues. Ideally, the schools would create a rainy-day fund as part of the funding for this network to protect against shortfalls.

- Might Miss out on Strategic Partnership Benefits. In a consortium it's not unusual for different members to contribute in the areas of their expertise. For example, one entity might keep the books and process cash flows; another member might manage or employ the technicians who take care of the network; another member might coordinate and manage all external vendor relationships. It's also somewhat normal for consortium members to charge the consortium for labor at 'cost', without a profit mark-up. Every consortium member then benefits by overall lower costs for operating the network business.

- Might Miss out on Revenue / Profit Opportunities. A consortium that contains non-government members might be more attuned to finding revenue opportunities from outside entities that might want to use the network. For example, a partnership with commercial members might push the consortium to pursue revenue opportunities that a network owned only by the schools might not consider or might not even know about. For example, there might be substantial opportunity to sell access to cell sites or provide bandwidth to entities that want to traverse the network.

  Middle-mile networks sometimes find ways to generate significant revenues from opportunities outside of consortium members. Such revenues can be used to offset operating expenses or could be dispersed to consortium members as a dividend. It's even conceivable that if enough external revenues are generated that somebody would make an offer to buy the network, meaning a big windfall for the network owners. The network owners would still be able to use the network through some long-term lease but would gain a unique benefit through a cash infusion from a network sale.

- All Operational Issues are the Sole Responsibility of the Schools. Every aspect of operating the network would fall to the schools. While some aspects of operating the network can be outsourced, every good and bad thing about the network ends up back on the plate of the schools – that includes outsourced relationships that may not be working to your satisfaction.

- Schools on the Hook for Maintenance / Disaster Costs. A potentially big downside is that a sole owner would be totally responsible for repairing any major damage to the network. We know that happens, as witnessed by the big ice storm that hit the UP this winter. The good news is that fiber is less susceptible to storm damage than other kinds of wires on poles – but a big storm can still inflict major damage. The is no way to insure against such damages – insurance companies won't

fiber insure networks. One of the operational and financial issues in deciding to move forward is how to deal with the threat of major damage.

Option 2 – A true consortium is created with the schools and other key entities in the UP.

Note that ownership is different than governance. If a consortium is created, the ownership could be shared between consortium members or else the network could still be owned by the schools or some subset of members yet governed by the consortium.

We urge caution against having ownership spread between different kinds of entities. Any such effort will complicate any efforts to finance the network. Consider a simple example where a network was owned jointly between the schools and the various townships. In such an arrangement, the townships would have to be a party to any borrowing activity. That means that lenders would expect to look at the books and records of every owner of the network as part of approving a loan to the consortium. Not only does this make the borrowing process unnecessarily complicated, but any member that is having financial problems could impact the borrowing capacity or drive up the interest rates on any borrowing. It is much cleaner to create a consortium where the schools alone, or perhaps a few consortium members are the 'owners' of the network. That would step giving other major stakeholders a say in the operations of the network.

This is the scenario that is the basis for our analysis. Our financial analysis isn't specific about the ownership of the network (and it doesn't have to be). The financial analysis does assume contributions to the consortium in the form of membership fees that help to get the network started – but those fees don't have to denote ownership.

If there are any non-government entities in the consortium, such as Cloverland Electric Cooperative, then the venture would be considered to be a Public / Private Partnership (PPP) since there would be both government and for-profit members in the consortium. Many of the pros and cons of this scenario are due to the inherent nature of PPPs.

Pros for Option 2

- Brings All Major Stakeholders into the Process of Finding Solutions. There are a lot of positives from bringing as many stakeholders as possible into solving the issue of poor middle-mile fiber in the UP.

- Might Bring the Widest Options for Finding Grant Funding. Each of the different consortium members has access to different kinds of grants that might be leveraged to help pay for construction or future expansion of the network.

- Focuses the Consortium to Bring Wider Solutions than Just the Schools Network. A wider membership will push the consortium to use the fiber to address more than just the Schools network and the Cloverland power network needs. That is a big plus for the UP, not necessarily a big plus for the schools.

Cons for Option 2

- Financing Could be Slow and Complicated. If financing requires contributions and or pledges from a wide variety of consortium members, then the financing process becomes complicated and will take a long time.

  For example, if up-front payments or irrevocable pledges are needed from townships, the whole financing process will take a long time. Funding gets complicated in the area of pledging to guarantee any debt funding. Some members of a larger consortium might be unable to make such guarantees – which can sink the deal for everybody else. Providing loan guarantees is often the biggest issue in getting funded.

- The Schools Might Find Themselves to be Minority Owners. If there are enough members of a consortium, then any set of entities might not have majority control of the consortium. That would lead to unpredictable long-term dynamics that the schools might not like.

  It's not hard to imagine scenarios the schools might not like. For example, the majority of the consortium might vote to expand the last mile network and the schools might not like the idea of funding such an expansion.

  On the flip side, if a consortium is created where the schools have a guaranteed majority – then other entities might not want to join.

  The bottom line is that there will likely be politics and unforeseen dynamics in the creation and operation of the consortium if there is no clear majority owner.

- Commercial and Government Entities Often Have Different Long-term Goals and Visions. Commercial and government entities often have a hard time working together over the long-term. For example, commercial entities can become exasperated over the slow decision-making process for government entities. CCG has seen consortiums get paralyzed or even fall apart if members start to disagree on issues. Commercial consortiums generally deal with this by allowing members to sell their shares and leave the consortium – that's not so easily done when government entities are in the consortium.

- Dealing with Future Shortfalls / Cash-calls Will be a Problem. Options 1 & 3 are scenarios where one entity or one group like the schools has total financial responsibility for the network. With a wider consortium membership, issues like asking members to contribute cash due to an operating deficit or to make repairs after a storm will become a problem is some consortium members are unable to contribute.

  Dealing with the need for future debt also can be a big problem. Consider the example that a new school is built somewhere that requires an expensive fiber-built to add to the network. Even should the majority of the consortium decide that adding the school should be done, there could be consortium members that are unwilling or unable to contribute or who are unwilling to pledge to any new debt needed to expand. A larger consortium can become unmanageable if some members disagree with consortium decisions.

- Might be Impossible to Get Tax-Free Funding. In many cases, municipal bonds can't be used to fund any project that provides sizable financial benefits to commercial for-profit entities. There are several potential partners in the consortium that are for-profit entities. The presence of commercial entities in a consortium might create a problem for issuing tax-free bonds, which are one of the funding mechanisms available to the schools. It would be possible to use taxable bonds, but those generally carry a much higher interest rate.

  This could also be an issue with some kinds of government grants or loan guarantees. This will be something that must be considered when trying to finance the network.

Option 3 – The Schools lease a long-term IRU for fiber on a network owned by somebody else.

The easiest example of how this might work would be if somebody like Cloverland or perhaps an ISP owned the network – something that is discussed in more detail elsewhere in this report. We did not create a financial model for this scenario. It's likely that if another entity owns this particular network they would do so as part of some larger venture, such as providing last-mile fiber to homes and businesses. That sort of enterprise has significantly different operating characteristics than the school-owned fiber network.

Pros for Option 3

- Could be Functionally Identical to Option 1. If the schools were able to lease dark fiber from somebody else's network this might be functionally identical to how the schools would operate on its own network.

- Is the Simplest Scenario for the Schools. The schools could get all of the desired functionality of owning a fiber network but none of the operational or financial responsibilities and hassles. This is the simplest scenario in terms of the responsibility of the school consortium.

- Could Save Money Immediately. If the Schools are not the network owners and are only leasing dark fibers, it could possible to save money on day one compared to what is spent today for network transport. If the schools build and own a network it's more likely that it's going to cost you something similar to what is spent today for transport, at least until the financing on the network is retired in the future.

- Schools Wouldn't be Involved in Financing. Other than signing a long-term lease for dark fiber, the schools would have no responsibilities or roles in the funding somebody else's network.

- Eliminates Most Operational Concerns. If the schools don't own the network, there would be no role or responsibility for operating the network. There could still be a school consortium that would deal with issues like field fiber repeaters or maintaining electronics at each school – but the schools are already doing that today through EUPISD.

- Schools Would Have no Liability for Major Network Problems. The owner would have full financial and operational responsibility for handling big events like network damage during

disasters. The Schools are interested in how and when outages are fixed, but your only role in such events would be as a customer.

- Avoids the Issues of a Failed Partnership. Just like with Option 1, there is no partnership and all of the governance issues involved with partnerships don't apply to this scenario. The schools could still have a consortium to decide on how to operate the leased dark fibers, but that would be the only role of the consortium.

Cons for Option 3

- Might Not Meet the Preferred Schedule. The schools would not likely get the network built and activated on the preferred schedule. It would not be unusual in a large network for another builder to build in phases, meaning different schools would transition to the network at different times. Ultimately, the schools would get the desired network, but the transition could be hard to plan since all aspects of the construction processes are not in your control.

- Schools Might Not Get the Desired Priority. The schools already know today that they don't get priority during network outages on routes that are leased today. Even if the schools got quality of service (QoS) and outage repairs guaranteed in a dark fiber lease, the schools would still likely not get priority in big network outages.

- Schools Wouldn't Share in any Upsides on the Network. One of the benefits of network ownership is the opportunity to eventually benefit from revenues generated by the network. (But the flip side is true that owners also have to cover operational losses).

B. Services Considered

Following is a discussion of the various products, services or other arrangement drive revenues to cover the long-term operating of the fiber network.

IRU – Indefeasible Right of Use

An IRU is a hybrid type of property interest in communications facilities – it's something between outright ownership and a leasehold. The IRU concept was developed in the 1960s as a means to provide regulated international record carriers (e.g., telegraph companies) with an alternative to leasing capacity in monopoly-owned transoceanic communications cables. The payments for IRUs were deemed by the FCC to be a capital investment for regulated ratemaking purposes, which allowed regulated carriers to include IRU revenues when calculating regulated rates of return.

Although the original regulatory rationale for the creation of IRUs is long past, IRUs continue to be a standard way to characterize interests in fiber optic cables. Typically, an IRU provides the IRU holder with a non-terminable right to use dark fiber for long periods, like twenty years, in some cases can get perpetual use for the life of the fiber.

Most IRUs have been structured so that the IRU holder pays an upfront fee for the use of the fiber over the IRU term. At the end of the contract term, the IRU expires and the holder has no more legal interest

in the fiber. During the term of the IRU, the holder typically is responsible for a pro-rata share of ordinary and extraordinary maintenance costs and repairs.

The structures of IRUs versus leases have become blurred over the years and some IRUs allow for payment for the use of fiber over time – in which case it would probably be reasonable to call such an arrangement a lease other than an IRU – but the two terms are often interchangeable.

From a legal perspective, IRUs often closely resemble a capital lease, which is a lease over time that also implies some ownership rights. In this project, those lines are easily crossed. For example, if a stakeholder purchased an IRU from the consortium, but also had a place as a voting member of the consortium, a court would likely consider that party to be an owner if that ever came into question. These kinds of legal issues matter most when a fiber network ends up being disposed of or sold in a regular sale or in something like a bankruptcy restructuring. It's highly advisable for this project that these long-term legal ramifications be recognized and captured in the IRU so that a future court doesn't undo the original intent of the IRU.

How the transaction is characterized is also important for the IRU holder from the perspective of how their interest in the fiber network is characterized for accounting and taxation purposes. The characterization of an IRU can be quite complex if ever challenged by a tax authority. As an example, while schools and libraries pay no income taxes, it might be possible for a local government to apply a property or related tax on the assets covered by an IRU.

When this document refers to an arrangement as an IRU, this could also mean a lease – and for purposes of this report, those two things mean the same thing.

There are fairly standard terms included in most IRUs for fiber, including:

- A definition of the rights of the IRU holder to touch the fiber hanging on poles. IRU holders typically are not allowed to touch a fiber network but are given access to the fiber at defined meet point. An IRU document generally defines all aspects of fiber access and related issues.
- Quality of Service expectations. The IRU holder is likely to expect defined repair intervals for fiber cuts. This often comes with monetary penalties (in the form of daily credits) if the fiber is out of service. This could be less restrictive if an IRU holder is also considered as a partner or owner.
- A description of annual fees for maintenance, including a description of how fees are calculated.

Wholesale Bandwidth Products

Wholesale bandwidth products are those sold to carriers or large business customers. Such products can be a major source of revenue on a middle-mile network.

There is one interesting scenario that needs to be considered in the financial forecasts, and in the business plan in general. One of the intended uses for this network is to provide connectivity to anchor institutions and large business customers in the various communities. There is also the hope that this network will provide the middle-mile needed to provide connectivity to ISPs that want to build and operate last-mile retail networks.

Consider what happens if no ISP wants to join the consortium by being a member or by buying an IRU to use the whole network. ISPs often prefer to pay for access on a case-by-case basis only where they have

found paying customers. This might mean the consortium can best support the communities by offering dark fiber by the mile to reach specified locations on the network or lit bandwidth services.

There is likely to be a demand for this kind of product in any case. For example, it would not be unusual for large ISPs like AT&T or Verizon to want to use the fiber to only reach a handful of specific customers. There also might arise the opportunity to sell bandwidth to cell sites or some other specialized application. In such cases, the carrier seeking a connection is not going to be interested in buying the use of a whole fiber – they just want to purchase the bandwidth they want at the locations they want to serve.

Following is a more detailed description of these wholesale products that might be sold by the consortium:

Dark Fiber. This involves selling a fiber that is not connected to electronics. The ISP buying the dark fiber is responsible for providing and operating the electronics necessary to use the fiber. Dark fiber might be sold by the mile of fiber, or else by a set fee per dark fiber connection. Most middle-mile network owners are leery about selling more than a small amount of dark fiber because each fiber that is used in this manner is no longer usable for other purposes. It would not be unusual, for example, for multiple carriers to be interested in dark fiber on the same routes, but nowhere else in the network. For example, there might be multiple entities that would want a path to traverse east and west through the service area, or perhaps north to reach Canada.

We've seen middle-mile networks that have sold so much dark fiber that they run out of fiber capacity for their own use of the network – which means there has to be more fiber construction to add fiber to the routes that are oversold.

Dark fiber agreements might be similar to the IRU agreement described above but on a smaller scale. Dark fiber customers generally are expected to pay a pro-rate share of maintenance costs. They often want Quality of Service guarantees.

Lit Transport / Dedicated Bandwidth. Lit transport would mean selling bandwidth between two or more defined end-points on the network. For example, the consortium might only sell transport to connect to certain established hub sites that contain enough space for the collocation needed to hand the transport to a customer.

There are numerous ways to price and sell transport bandwidth. Carriers buying large bandwidth connections might prefer to buy a 'lambda', which is an entire path of bandwidth between to lasers. Modern backbone electronics use different wavelengths of light to increase the capacity of a fiber. A lamda involves selling a full separate wavelength of bandwidth.

The other typical way to sell transport is by selling a fixed amount of bandwidth using a Virtual Private Network (VPN). A VPN is an encrypted data path between two points on the network, done in such a way that none of the bandwidth is shared or can be accessed by any other users on the network. VPNs might be sold as 1-Gbps, 5-Gbps, or 10-Gbps data paths.

Lit transport is also typically sold between two specific points on the network, meaning that the fee might have two components. One component would be a fee for the bandwidth with a second fee to define the use of the physical network, usually expressed in terms of the miles between the end-points of the service.

Shared Bandwidth. There are customers willing to use shared bandwidth pipes that mix traffic from different customers. Such bandwidth is still encrypted so that users can't see other traffic. But the bandwidth in these connections is not guaranteed. A carrier would buy transport with speeds up to 10 Gbps, rather than a pipe guaranteed to be at that speed. These products generally cost significantly less than dedicated bandwidth.

Collocation. Collocation is selling space for carriers to place electronics to enable them to interface with the network. A customer would want to collocate at the locations where the two parties will interface with transport routes or dark fiber connections. Collocation often has multiple fees. There is usually one fee to sell floor space, meaning the amount of area required by a carrier's equipment. There is also often a space to compensate for power consumption, which can be generic or could be metered by customer.

C. Financial Assumptions

Incremental Analysis

It's important to note that all of the financial projections were done on an incremental basis. This means that the studies only consider new revenues, new expenses, and new expected capital costs. This is the most common way that businesses of all sorts look at potential new ventures since the incremental analysis answers the question of whether any new business venture will be able to generate enough revenue to cover the costs.

It's important to understand what an incremental analysis shows and does not show. An incremental analysis is basically a cash flow analysis. It looks at the money spent to launch and operate a new venture and compares those costs to the revenues that might be generated from the venture.

An incremental analysis is not the same as a prediction of what the accounting books of a new venture might look like. For example, if this new business was absorbed in the existing EUPISD operations, the operating aspects of this network would get buried within the existing EUPISD books. In rolling this into EUPISD, the allocation of joint and common expenses within the entity would change and some of those overheads would get layered onto this new effort. The classic textbook example of this is that some of the existing cost of the general manager of EUPISD would be allocated to the venture in the accounting books. However, the cost of the salary of the existing general manager is not considered in an incremental analysis since that salary is already being paid by the existing business. If these studies were to show an allocation of the general manager, then they would not properly show the net impact of entering this new line of business.

Timing

Timing is critical to any business plan. The schools would be under a lot of pressure to get this new network built quickly. That need would have to be balanced against the harsh construction condition in the UP in the winter. We have used the assumption that it would take two construction seasons to build this new network. A lot of the first year would be used for engineering and for pole make-ready since a lot of construction can't proceed rapidly until those two tasks are completed.

Following are the major milestones as predicted by these forecasts:

- Financing. All forecasts assume that the financing is available in January 2021. This is an illustrative date only and could be changed to any other future date. Financing, in this case, means that all grants, bonds, loans, membership fees from members, and upfront payments for long-term IRUs are all completed and in place at the financing date. CCG has a lot of horror stories about networks that were launched without all of the financings in place and which then had major problems when they didn't receive the last pieces of funding.
- Construction. Engineering is assumed to start immediately after launch, with construction taking two construction seasons.

Network Capital Costs

The telecom industry uses the term capital costs to describe is the industry term for the cost of assets required to operate the business. The capital expenditures predicted in these models reflect the results of the engineering analysis completed by Finley Engineering and described in Section II of this report.

Below is a summary of the specific capital assets needed for each base scenario. Finley looked at two different construction methods and also looked at a low and a high level of make-ready costs.

Capital for broadband networks includes several broad categories of equipment including fiber cable, electronics for lighting the backbone network and customers, and huts or small buildings. In addition to capital needed for the network, there are operational capital costs predicted in the projections for assets like furniture, buildings, computers, vehicles, tools, inventory and spares, and capitalized software.

Finley Engineering always tries to be realistic, but a little conservative, in making capital estimates, so that hopefully the actual cost of construction will be something lower than our projections. However, it is important to remember that the engineering used to make these estimates is high-level. The detailed engineering needed to be more precise is expensive and would involve having an engineer examine every foot of every road that would carry the fiber network. That kind of engineering is generally not done until a project is ready for construction. Finley engineering did look at the general conditions that will affect construction costs and spend several days riding the entire path of the proposed network. Finley has made many of these high-level estimates over the years and knows that this level of engineering is generally good enough to assess if a project is worth further consideration.

Following is the capital required for three different scenarios. These costs represent the capital expended by the end of the second year of construction, by which time most of the member locations on the network will have been connected.

The three scenarios are:

- Strand and lash construction performed in the communications space with a conservatively high estimate of make-ready cost. (this was described in Section II of the report.
- Strand and lash construction performed in the communications space with a lower level estimate of make-ready cost.
- Construction of the fiber network in the power space.

	High Make-Ready	Lower Make-Ready	In the Power Space
Fiber & Drops	$25,108,443	$22,666,236	$14,959,685
Electronics	$ 2,262,781	$ 2,262,781	$ 2,262,781
Huts	$ 1,427,500	$ 1,427,500	$ 1,427,500
Routers	$ 1,860,259	$ 1,860,259	$ 1,860,259
Operational Assets	$ 286,009	$ 286,009	$ 286,009
Total	$30,944,992	$28,487,525	$20,796,707

'Make-ready' is described in Section II of the report, and is the effort required to prepare utility poles to accept new fiber construction. Many of the poles in the UP are old and would have to be replaced to make room for an additional fiber added to the communications space. Many other poles require significant effort to rearrange the existing wires on utility poles to make room for adding a new fiber. Most, but not all make-ready can be avoided by constructing fiber in the power space.

From a practical perspective, the project can't be built in the power space if the schools or the consortium finance and own the fiber network. The majority of the poles in this study are owned by the Cloverland Electric Cooperative. Like almost every electric utility in the country, Cloverland would not allow another entity to build and own a fiber network that is close to the power lines. The company would only consider using the power space for a fiber network owned and controlled by the cooperative. There are several concerns with having somebody else's fiber near to the electric lines. First is safety, and Cloverland only allows technicians that are qualified to work near high voltage to be near to the electric lines. An even bigger concern is the issues that occur when trying to fix wires after storm damage – electric companies don't want unqualified technicians getting close to damaged and open power lines that often exist after a storm.

This project did not ask us to look at a scenario where somebody other than the consortium builds and owns the network, so we haven't created a financial scenario for this option. But we know that consortium members would have far less risk, and likely lower costs if somebody else builds and owns a fiber network. This will be discussed more in the recommendation section of the report.

Asset Retirement and Replacement. The forecasts anticipate that assets will wear out over time and have to be replaced. There should be no need to replace fiber during the time period covered by the study, but other assets like vehicles, computers, and some of the electronics would be expected to be replaced during the time frame covered by the analysis. We've shown these retirements as a way to recognize that there will be future capital costs required to replace assets.

Revenue Assumptions

Following is a discussion of the revenue assumptions made in the forecasts:

The revenues for the consortium are likely to come from the following sources:

- Broadband transport sold to consortium members
- Some portion of network maintenance funded by consortium members

- Consortium membership fees.
- Carrier-class bandwidth or transport products sold to CLECs, cellular carriers, and others.
- Collocation to charge for floor space and power for anybody that wants to put electronics in the consortium space.

Consortium Member Transport

The primary revenue for the network will be broadband transport provided to consortium members. The fiber network will allow consortium members to have a large-bandwidth connection provided to all of their locations. This represents a big step-up in bandwidth for anchor institutions and others in the UP.

At this early planning stage, there is no way to know which entities might join a consortium. For purposes of this study we included the following entities in the consortium:

- Schools and Libraries. Every school and library would have access to gigabit fiber at the same price that they are paying today for less bandwidth.
- Townships. Townships would get fiber connection to their facilities including locations like city halls, fire stations, water pumping stations, and any other critical government locations.
- Healthcare. All rural healthcare facilities would be connected to fiber broadband.
- Local Indian Tribes.[1] There are two local Indian Tribes that might join the consortium – the Bay Mills Indian Community and the Sault Ste. Marie Tribe of Chippewa Indians.
- Cloverland Electric Cooperative. This is the local power company that is customer-owned. They would use fiber broadband to connect to substations and other critical infrastructure as a first step towards implementing a smart grid.

It's possible that there could be other entities interested in joining the consortium. The most likely candidates would be one or more of the regional CLECs or ISPs that sell broadband and other services in the UP. For this analysis, we didn't include these entities. First, many of the end-points on the network are going to locations where the CLECs can't provide services, like the schools. Second, the ISPs could gain to all members of the consortium like the townships or the tribes by collocating and meeting the network at any one location rather than joining the consortium – they can gain many of the benefits of using the network without joining the consortium. A CLEC might still be interested in joining the consortium network if they have plans to build last-mile fiber in different parts of the area – the consortium network would reach all of the populated corners of the three counties. But even then, it might be cheaper for a CLEC to buy just the transport they need rather than to pay to be a full consortium member.

If other entities joined the consortium, then the cost to use the network would be reduced for other consortium members. But that works in the opposite direction as well – the costs increase to members if only a subset of the entities we are projecting join the consortium. CCG has worked to form other consortiums in the past and the process invariably involves extra members joining or expected members deciding to drop out of the process – and nobody knows the final cost to be a consortium member until the final consortium members are final.

This study anticipates that the consortium would allow for two ways for members to pay for transport across the network for the 20-year term:

[1] https://www.saulttribe.com/ and http://www.baymills.org/

- A 20-year IRU paid in a lump sum at the beginning of the project, or
- Payments paid monthly, quarterly, or annually for 20 years. These monthly payments would be more expensive than the rates offered to those that accept the lump-sum IRU to recognize the time value of money.

Offering the two options is likely going to be a necessity because there are potential consortium members that could not easily pre-pay for 20-years of transport. The consortium is hoping that at least some members elect the up-front IRU because the money raised that way would reduce the size of grants needed to make the project work. One of the biggest benefits of this concept is that members are guaranteed the price of broadband transport for the next 20 years. It's likely that member transport payments could be reduced after the end of 20 years.

The 20-year IRU was chosen for our analysis to coincide with the likely term of debt used to help finance the network. The term of IRUs and periodic payments is another item that the consortium members would have to decide.

From a practical and financial perspective, the two options are similar. If a consortium member pre-pays transport, then the needed amounts of grants and loans become lower. But if a member pays over 20 years, those payments can be used to secure and service debt payments.

The following are the assumptions made in the base study for how the various groups of members would decide to pay to join the network. These assignments are arbitrary, and below is our reasoning for the assumptions we made.:

- CCG assumed that the schools and libraries will pay over twenty years at the same rates they pay for transport today. Since most of this money comes from the FCC's E-Rate program, there is no easy option for the schools and libraries to pre-fund an IRU.
- We assumed that half of the Townships would opt to pay a lump sum while the rest would choose to make payments over 20 years.
- We assumed that healthcare facilities would elect to pay over 20 years.
- We assumed the two tribes would elect to pay an upfront lump-sum payment.
- We assumed that Cloverland Electric Cooperative would elect to pay an upfront lump-sum payment.

We also looked at the impact if nobody elects a lump-sum IRU.

Allocation of Network Costs to Members

In order to create the transport payments expected from members, it was necessarily to somehow allocate asset costs to each group of members. This means trying to determine what portion of the network is used by each member. Realistically, there is no easy way to determine network costs by member. Some sections of the network are comprised of fiber rings that carry traffic for all members of the consortium and carry traffic to and from other parts of the network. Some spur routes only reach a few remote connection points used by a handful of members. Some routes were created mostly to provide redundancy.

There are four different sets of asset costs that need to be allocated to members: the fiber, the core network electronics, electronics at the end-point user of the network, and fiber drops to reach each end-point user of the network.

Following are some of the ways that we looked at how to assign the cost of fiber to the groups of members:

Allocation by Endpoints. This is a simple allocation that assigns the cost of the fiber network based upon the number of endpoints used by each group of members. Following are the results of that analysis using the highest network cost as estimated by Finley Engineering:

	End Points	Fiber Costs
Schools & Libraries	65	$ 6,638,327
Cloverland	51	$ 5,208,533
Townships	71	$ 7,251,055
Healthcare	15	$ 1,531,922
Tribes	18	$ 1,838,306
Total	220	$22,468,183

Allocation by Analysis. The above approach was the simplest, and the following is the most complex. This analysis allocated each individual fiber route according to the end-points served by the route. As can be seen by a simple comparison, the results of this method assign cost a lot differently than using end-points. Assigning by analysis tends to assign the biggest costs to locations on the longest spurs that are furthest from the core network.

	Fiber Costs
Schools & Libraries	$ 3,347,379
Cloverland	$ 6,657,303
Townships	$ 4,588,634
Healthcare	$ 2,690,910
Tribes	$ 5,183,957
Total	$22,468,183

Negotiated Allocation. CCG has worked with consortiums in the past and it's not uncommon to negotiate ownership of the network based upon factors like the ability to contribute and pay for the network. CCG has no crystal ball and the following allocations are completely arbitrary - the consortium might negotiate something drastically different. But there is some reasoning behind the allocations.

The large assignment to the schools is based upon the schools' willingness to own and operate the network. Allocating the most costs to the schools would justify giving the schools the most say in the operation of the network.

The allocation to Cloverland is based upon the willingness of Cloverland to join the consortium rather than build a network for their own use. Finley calculated that Cloverland could build this same network in the power space for around $15 million. The metric that most carriers use in the industry when considering construction rather than IRU if the cost of an IRU is set at 60% or more

of the cost of construction. If the cost of the IRU is too high, a carrier will strongly consider building a route. The allocation below sets the cost assigned to Cloverland at roughly 60% of the cost of Cloverland building in the power space.

The allocations to the townships, healthcare, and tribes are significantly smaller than assignments based upon end-points or analysis – and largely reflect the ability of these entities to pay for the network. These lower cost assignments recognize the reality of creating a consortium of unequal members. Some of the potential members of this consortium would probably not be able to join if they were required to pay their fully allocated share of the network costs. Entities like small rural health clinics or some of the townships might not be able to afford to pay the full share of membership.

The larger consortium members like the schools collectively or Cloverland would need to decide if they want to subsidize smaller entities to join the consortium. There are good social reasons for bringing fiber to all of the entities listed as potential members – the benefits to the whole UP are significant. And there is a good financial incentive to have smaller members pay what they can afford to join the consortium – because anything collected from smaller members helps to lower the cost to the larger entities. What likely is not going to be possible is to expect some of the smaller entities in the consortium to pay a full ownership share.

This means that if a consortium is formed there are like to be negotiations to figure out how to pay for the network. CCG's analysis shows that collecting membership fees and ongoing transport fees are both good ways to make the consortium work. But our analysis doesn't make any judgment about how much each member pays – only what is paid collectively.

It's highly likely that the results of negotiations in creating a consortium would be materially different than what this analysis assumes. Real-life considerations would enter into the process. For example, if one of the tribes or one of the health care facilities had access to grant funding, they might pay a higher membership than others as they brought the grant money into the financing. I would anticipate a process where every potential member would assess how much they could pay up-front or on an ongoing basis, and this would be added together to see if it's enough money to make the project work. I know that doesn't give any kind of assurance to somebody reading this report about whether a consortium could work – but that is the exact process that I've seen other consortiums use when deciding if the group can collectively make a project work.

There is a different way to think about the consortium in relationship to Cloverland and the schools. Both of these entities really want this fiber network for the operational benefit it brings. It's conceivable that the two parties could decide to build this network together and to not form a wider consortium. If you start from that premise, then both Cloverland and the schools benefit by anything extra that other members might contribute. These two entities ought to be willing to negotiate to allow in smaller members at whatever level of contribution they can bring.

For purposes of analysis, CCG used the following allocations of costs to members – completely arbitrary, but in the range of what I think is realistic.

	Percentage	Fiber Costs
Schools & Libraries	50%	$11,234,092
Cloverland	40%	$ 8,987,273
Townships	7%	$ 1,123,409
Healthcare	2%	$ 449,364
Tribes	5%	$ 674,045
Total	100%	$22,468,183

Mixing Allocation Methods. It's possible to combine the various allocation methods. The following example shows an allocation where the rings are allocated by the negotiated amounts and the fiber spurs are negotiated by analysis by route. This might make sense since the rings carry everybody's traffic.

	Rings	Distribution	Total
Schools & Libraries	$ 3,458,531	$ 1,510,035	$ 4,968,566
Cloverland	$ 2,766,824	$ 4,711,880	$ 7,478,704
Townships	$ 345,853	$ 2,751,289	$ 3.097,142
Healthcare	$ 138,341	$ 2,222,567	$ 2,360,908
Tribes	$ 207,512	$ 4,355,350	$ 4,562,862
Total	$ 6,917,061	$15,551,121	$22,468,182

The discussion above highlights one of the biggest challenges of forming a consortium. Invariably, potential consortium members differ in their ability or willingness to pay to join the consortium. Some consortiums have dealt with this question by excluding members who can't pay their fair share of the network. But this particular network is different. The concept for this network is to bring fiber to the key anchor institutions in the UP. The members in the coalition directly benefit from the network, but so do all of the local constituents and users of each coalition member. Since this project would benefit almost everybody in the UP, then potential coalition members are going to have to work hard at this and likely compromise to make this work.

In the base analysis done for this feasibility study, CCG used the negotiated fiber allocations from above. Our experience tells us that the various consortium members will negotiate such that every member pays as much as they can realistically afford and that the rest of the network will have to be funding with grants or revenues from some other source. There was no expectation in the RFP that the network could be fully funded by members without some outside help.

Finally, CCG allocated the other three sets of costs using end-points on the network. That seems like the fairest allocation for several reasons. That seems like the only sensible way to allocate the fiber drops and electronics at each end-point. CCG allocated the core electronics by end-point using the logic that these costs benefit everybody equally. But these amounts could also be distributed in some other negotiated way.

Following are the remaining assets allocated to members using end points on the network:

	Drops	Core Electronics	End Point Electronics
Schools & Libraries	$ 33,691	$ 596,335	$ 72,214
Cloverland	$ 26,434	$ 467,894	$ 56,660
Townships	$ 36,801	$ 651,381	$ 78,880
Healthcare	$ 7,775	$ 137,616	$ 16,665
Tribes	$ 9,330	$ 165,139	$ 19,998
Total	$114,030	$2,018,364	$244,416

How Does This Translate to Consortium Members?

The point of the above exercise of allocating costs is to define the amount that each group of members should contribute to help pay for the network. CCG is sure that if this consortium is formed that the actual assignment of costs by type of member will be quite different than what we have assumed, and that's okay. It doesn't make a lot of difference to the consortium as a whole if costs are shifted between members. The goal is to raise as much money from members as possible to make the project feasible. The higher the member contributions, the lower the needed grants and loans.

It's clear that every consortium member would benefit by being connected to a world-class fiber network. This provides for as much bandwidth as members need to operate, and further locks in cost for broadband over the next twenty years. There is also a good chance that the cost of broadband could drop of the network attracts more external revenues than projected by the conservative forecasts used in this analysis.

Following is a summary of the assumptions made for each member group of the consortium.

Schools and Libraries

We've assumed that the schools and libraries will continue to pay the same amount for transport that they paid in 2019. This funding is mostly provided by the E-Rate Schools and Libraries Fund of the FCC's Universal Service Fund. The schools can also benefit the consortium if they take on the responsibility, through EUPISD for operating the network. Finally, the schools might befit the consortium by borrowing bond money that is currently available to them.

As long as the E-Rate program continues to provide similar subsidies, it would be fair for the schools to absorb a larger share of the network cots than what might be allocated to them using other allocation methods.

Cloverland

We've assumed that Cloverland would elect to contribute a lump sum IRU at the beginning of the project that would pay for transport on the network for the next twenty years. That IRU is set to

equal the assets allocated to Cloverland, at $9,895,431. In this study that amount was determined by using 60% of the cost for Cloverland to build the same network using the power space.

This might sound unfair to Cloverland, but they are one of the few entities in the group that are financially able to pay more than an allocated share of the network cost. As mentioned above, Cloverland and the schools probably would get the most functional network if the two entities built the network together without creating a wider coalition. But both Cloverland and the schools benefit if smaller entities are allowed into the consortium at whatever level of contribution each can afford.

Townships

We've assumed that half of the townships would elect to use a lump sum IRU and the rest would elect to make monthly or annual payments to the consortium over 20 years. In the models, that lump sum payment is set at $87,969 per township. The townships could instead elect to make an annual payment of $6,598 per year for 20 years. This annual payment has been increased to recognize the time value of money for the consortium.

Healthcare

We've assumed that each healthcare facility would elect to pay an annual fee rather than prepay using an IRU. In the models that payment is set at $2,965per year for 20 years. This annual payment has been increased to recognize the time value of money for the consortium.

This is the one group that is hardest to predict. For example, some of the health care facilities might have access to grants that would allow them to pay a higher membership fee and perhaps to pre-pay the IRU. It's also possible that a few of the larger facilities could afford to pay more than the smaller ones, and so this group might allocate costs differently between per entity behind the scenes.

Tribes

We've assumed that each tribe would elect to make the annual payments rather than pay a 20-year IRU up-front. This would be set at $29,158 per tribe per year.

It's also possible that the tribes might opt to make the lump-sum payments. Tribes currently have access to several grant opportunities for broadband that are not as easily available for other entities, and they might be able to leverage these grants to help pay for the network with upfront contributions.

Consortium Membership Fees

We've also assumed that members would pay a one-time membership fee to join the consortium. This money would be used to seed the funding for the consortium and would likely to be paid, at least partially, before the other funding for the consortium is in place.

CCG set the fees somewhat arbitrarily, based roughly on the ongoing transport costs described above. Membership fees are something that clearly would have to be negotiated. Membership fees paid up-front are one of the best tools for making up the difference between what is needed to build the network and what is available from grants.

The membership fees assumed in the model are as follows:

Cloverland	$250,000
Townships	$ 50,000 per township
Healthcare	$ 25,000 per facility
Tribes	$ 50,000 per tribe
Schools & Libraries	$ 10,000 per school and library

Consortium Maintenance Fees

In the forecasts, we assumed that 50% of the annual maintenance costs would be allocated and billed to members. The 50% is an arbitrary allocation, in this kind of consortium it would be normal to add maintenance cots on top of transport costs. For example, every fiber IRU we've ever seen includes one fee for using the fiber as well as an ongoing maintenance fee that usually is increased by inflation.

Large Broadband Products

There are other entities in the UP that are likely users of the network, but which we have assumed are not consortium members. This includes CLECs and other carriers like cellular providers. There are several active CLECs in the UP which would want to use this new network. For example, these CLECs would likely be the entities providing bandwidth, voice services, and similar products and services to the consortium members. A CLEC could gain access to the consortium members by establishing a point of presence with the consortium and by collocating electronics to make a connection to consortium members. One of the benefits of being a consortium member is that connection can be made in this manner to outside service providers at any location that is acceptable to both the CLEC and to the technical staff of the consortium.

CLECs and carriers are also likely going to want to buy access on the network to reach businesses or other locations that are not consortium members.

- For example, the consortium network will reach deep into each township to serve the local government locations. CLECs might wish to buy transport and build their own fiber in townships to reach business districts or residential neighborhoods.
- There are likely a few businesses in the UP that are part of larger corporations that buy all of their telecom products from one nationwide provider like AT&T, Verizon, Zayo, or Level 3. These large carriers might buy transport to reach those customers (and would today be buying these connections from the incumbent telco).
- It's likely that cellular carriers and others might want to buy transport to reach cellular towners.
- We know there are already carriers and other entities like Merit Networks that would consider buying transport to cross from east to west in the UP.

- One of the goals of building the network is to push fiber deep into the eastern UP to hopefully lure ISPs to build last-mile fiber to reach residents and businesses.

We described the kinds of products that CLECs and carriers buy earlier in this section. That includes products like dark fiber and lit bandwidth using VPNs. CLECs and carriers would also have to pay to collocate and interact with the consortium network.

The forecasted amounts for these revenues are purposefully low. The forecasted revenues start at $11,000 in the second year of the network and grow to around $375,000 annually by the twentieth year of the network operation. We find it likely that the opportunity over time if much greater than this. We don't like making high estimates for these types of revenues since that could provide a false sense of security about the risks of building this network. If revenues are higher than shown in these projections the consortium members could use excess cash to lower transport cost payments, to reimburse the original membership fees, or even to distribute as dividends.

There is a unique new opportunity that could benefit the consortium. The FCC has been contemplating creating a $9 billion grant program to provide for better rural cellular coverage. The new grant program has been named the 5G Fund. It now looks like these grants will be awarded sometime in 2021. It might be possible to partner with any cellular carrier that wins these grants for the UP to help them reach rural cell sites. That could provide additional up-front funding for building the network. It would be silly for the cellular carriers to pay for and build some of the same fiber routes that are desired by this potential consortium.

Expense Assumptions

Expenses are the recurring costs of operating the new network once it's built. CCG strives when creating financial projections to be conservatively high with expense estimates. The good news is that it's often less costly for an existing service entity like the EUPISD to pick up the needed functions than what is shown in these projections.

As mentioned earlier, expenses are estimated on an incremental basis, meaning that the models only consider new expenses that would be needed to launch this new fiber network. As an example, the work needed for the EUPISD to continue to get E-Rate funding from the schools would roughly be the same before and after the new network, so none of the cost of that, or similar functions are included in the analysis.

The primary incremental new expense assumptions are as follows:

Employees: Labor is generally one of the largest expenses of operating a broadband network. The models assume that EUPISD will need to hire additional staff to take care of the new network and to deal with the new consortium members. The study assumes salaries at market rates with an annual 2.5% inflation increase for all positions. We've assumed that the benefit loading is 45% of the basic annual salary. That would cover payroll taxes and other taxes like workers' compensation, as well as employee benefits.

We estimate that the new effort associated with the fiber network would require the following employees:

Customer Liaison: We assumed one new position. This is a new position that would work with other consortium members for everything related to providing connectivity to the new locations on the fiber network. This position would also work with the various carriers and other parties interested in using the new network.

Install/Repair Technician: We've assumed that EUPISD would add two technicians in trucks that would maintain the fiber network and who would respond to trouble calls. The technicians would maintain network electronics in addition to fiber-related issues.

It would be possible for EUPISD to instead outsource these two positions to somebody like Cloverland or one of the CLECs in the area. We think the projected costs for these two positions would be sufficient to cover the cost if this was done internally with employees or externally with a maintenance agreement.

The scenarios all assume that other people needed to operate the business will be covered by existing staff. That might include such functions as a general manager, accountants, etc.

We assumed that construction contractors will build the fiber network. It would be possible for the two technicians to make some, or even all of the customer installation, in which case there would be some savings from the projected cost of fiber drops and customer electronics shown in the projections.

Start-Up Costs: To be conservative we have included $200,000 of start-up costs to cover things like consultants, engineers, grant filings, and other one-time costs associated with launching the new network. We don't know specifically what costs you'll incur, but we know that every new venture like this one incurs these kinds of one-time costs.

Maintenance Expenses: There are a few new maintenance expenses we predict the new network will incur. These include:

- Vehicle expenses to maintain the vehicles required for the field technicians.
- Computer expenses to support the computers used by employees.
- Tools and equipment expenses.
- Power expenses to provide electricity to the network.
- General maintenance and repair of the outside plant network and the electronics to repair damaged or nonfunctional electronics.
- Pole attachments for connecting the fiber network to existing utility poles.
- Maintenance agreements on the electronics and routers.

Software Maintenance: Both the network routers and the fiber electronics include operational software, and the consortium will need to pay annual fees to maintain this software.

Taxes: We've assumed that the consortium is not subject to income and other taxes by virtue of being a non-profit entity. There may be some taxes and fees that must be billed to consortium members. We have not included any taxes in our forecasts since we assume that such taxes would be collected from members and sent to the tax authorities on the member's behalf.

Overhead Expenses: The forecasts don't include any overhead expenses after the two years of the network launch. We assume that taking on the fiber network and a few employees would not increase the overall overheads of EUPISD.

Depreciation and Amortization Expense: The forecasts include both depreciation and amortization expense. These are the expenses recognized by writing off assets over their expected accounting lives. For example, the depreciation rate for a vehicle is 20% per year (is written off over 5 years). The cost of a new vehicle is then depreciated monthly to write off the asset over the 5 years, or 60 months. All hard assets are depreciated except land. Depreciation rates are set according to the expected life of the assets—something that is usually determined to comply with IRS rules and accounting standard practices. Soft assets like software are instead amortized, using the same process as depreciation.

D. Financial Results

It is never easy to summarize the results of complicated business plans to make them understandable to the nonfinancial layperson. In the following summary are some key results of each study scenario that we think best allows a comparison of the results between scenarios. Our analysis focuses mainly on cash generated, to find scenarios that always remain cash positive. If the consortium runs out of cash it would either require cash infusion from members or else have to borrow the needed funds. The goal is to devise scenarios that don't trigger such events.

The way to measure profitability in a new business is going to differ according to the structure of the business. Government-operated businesses like this one generally measures success by the ability of the business to generate enough cash to operate without ongoing subsidies. For-profit businesses instead define success by measuring net income or some other traditional measure of profitability.

One important feature of the forecasts is to note that there is an assumed $1 million 'rainy-day' fund created at the onset of the business. This would primarily be used as a way to pay for unexpected major repairs, such as might occur after an ice storm or heavy windstorm. It's impossible to insure fiber networks against this kind of repairs. Since the consortium is likely to operate the business in a way that will not generate big profits, it would sensible for the business to create this rainy-day fund at the outset of the business.

There are other ways to handle future liabilities. You would always hope that FEMA or a state agency might come to your rescue after a bad storm – but that doesn't always happen. Some consortiums rely on capital calls to members to fund unexpected expenses – meaning each member would be expected to pay for a pro-rata share on such outlays. However, considering the nature of the consortium members this is not a practical idea and is why we are suggesting the rainy-day fund.

The following are the results of the various financial scenarios. Note that a table of all the financial results is included in Exhibit I which makes it easier to compare scenarios.

High Make-ready Costs

This is the base scenario that uses all of the assumptions described above.

Basic Study	
Asset Costs	$30.9 M
Grant	$14.8 M
Bank Debt / Bond	$ 4.5 M
Membership Fees	$ 1.9 M
IRUs	$11.3 M
Total Financing	$32.5 M
Cash after 20 Years	$ 2.0 M

There are a number of things to notice about the results of this scenario:

- Recall that all scenarios fund not only the cost of the new network but also must cover some start-up costs as well as fund a $1 million rainy-day fund as a hedge against future major repairs.
- In this case, the business plan can handle paying interest expense on $4.5 million in debt. That might be partially funded using the $2.5 million in grant authority in place today for EUPISD plus additional bank debt, or perhaps come 100% from bank debt. The revenue stream for the business is not large enough to cover debt higher than this amount.
- Every scenario in this project requires significant grant funding. In this case, about half of the funding must come from grants.
- That also means that half of the funding must come from consortium members in the form of loans, membership fees, or pre-payment of transport using IRUs.
- Notice that even after 2o years that this scenario only has $2 million in the bank (that includes the rainy-day fund). The future cash number would be higher if the network could attract more external revenues that are assumed in the forecast.

Low Make-ready Costs

This scenario shows the impact of lower capital costs. In this case, the fiber costs, using Finley Engineering's lowest estimate are $2.4 million lower than the base case above.

Basic Study	
Asset Costs	$28.5 M
Grant	$13.4 M
Bank Debt / Bond	$ 4.5 M
Membership Fees	$ 1.9 M
IRUs	$10.3 M
Total Financing	$30.1 M
Cash after 20 Years	$ 1.8 M

There are a few things to notice about the results of this scenario:

- Lower capital costs mean lower IRU fees. Lowering the fiber cost by $2.4 million also lowered the grants required by $1.4 million.
- Otherwise, this scenario is similar to the base case.

No Membership Fees

This scenario eliminates the upfront membership fees that infused $1.9 million into the project.

Basic Study	
Asset Costs	$30.9 M
Grant	$16.7 M
Bank Debt / Bond	$ 4.5 M
Membership Fees	$ 0.0 M
IRUs	$11.3 M
Total Financing	$32.5 M
Cash after 20 Years	$ 1.9 M

This shows that the grants would have to be used to cover any shortfalls in up-front cash from other sources.

No IRUs

This scenario looks at having all members elect to make annual payments for using the network instead of pre-paying a 20-year IRU.

Basic Study	
Asset Costs	$30.9 M
Grant	$26.5 M
Bank Debt / Bond	$ 9.5 M
Membership Fees	$ 1.9 M
IRUs	$ 0.0 M
Total Financing	$38.0 M
Cash after 20 Years	$ 1.2 M

There are a few things to notice about the results of this scenario:

- The increased annual cash flow from member fees increases the amount of debt that the business can support – jumping from $4.5 million to $9.5 million.
- This increased the amount of grant needed jumps significantly from $14.8 million to $26.5 million. The up-front IRU payments make it a lot easier to fund the project.

Add 5% Contingency / Cost Overruns

This scenario looks at the impact of cost overruns when building the network. In an overrun situation the extra capital costs would not have been added into the calculated IRUs and member annual fees. In this example, having a cost overrun equal to 5% of the cost of fiber increases capital costs by $1.3 million.

Basic Study

Asset Costs	$32.1 M
Grant	$16.0 M
Bank Debt / Bond	$ 4.5 M
Membership Fees	$ 1.9 M
IRUs	$11.3 M
Total Financing	$33.7 M
Cash after 20 Years	$ 1.9 M

Cost overruns are troublesome because the consortium would either need to somehow find more grant money or else would have to come up with this funding from members. In this example, it was assumed that grants were found to cover the shortfall. This demonstrates the importance of having assurance about the network cost estimate. This feasibility study took a high-level look at costs and the consortium should probably look in more detail at the Finley cost estimates before trying to fund and build the network.

What Conclusions Can We Draw from the Financial Results?

There are a few conclusions we can draw from the results of the financial analysis:

The project is going to require significant grant funding

Even the best scenario examined requires grant funding of $13.4 million. This is not an atypical finding for a rural fiber network. That much grant funding might be possible, but it's a challenge and possible hurdle for building this network. It's not hard to understand the need for grants since this is a long fiber network that serves less than 200 end-points.

The project would cost less if fiber is constructed in the power space.

The cost of constructing the network in the communications space adds a lot of cost to the project. Cloverland could build a functionally identical network in the power space for more than $10 million less. That fact alone suggests that perhaps the best strategy might be to form a consortium where Cloverland owns the fiber network instead of EUPISD.

This project didn't ask us to quantify the incremental impact of Cloverland owning the network, which would have required us to build a financial model from their perspective. But saving S10 million dollars from a $25 million network is going to be a lot easier to get funded and ought to reduce the cost to everybody.

The project won't support a lot of debt.

The hope at the beginning of the project was that project could be supported through continued payments from members for transport and some small grants, with the remaining funding coming from bank loans. However, the unexpectedly high cost of the fiber network made that impossible. The financial analysis shows that the likely revenue stream for the network can only support total debt of around $4.5 million – which is nor nearly enough to fund the network.

Making this work relies on some upfront funding from consortium members.

The base scenario looks somewhat feasible since Cloverland and a few other consortium members elect to pre-pay an IRU to cover 20-years of transport. These upfront cash infusions help to lower the amount of needed grants. The scenarios also assume upfront membership fees to join the consortium. Without these upfront payments, nearly the entire project would have to be funding with grants. That might be possible, but grant money is never easy to find, so the lesser the amount of needed grants the better.

Return by Consortium Member

The RFP asks us to calculate the rate of return for each prospective member. We were hopeful when we responded to the RFP that this would be possible. However, as we worked on the project, we realized that we can't create any meaningful cost comparison for each member. There are several reasons for this:

- The governance section below includes a lengthy discussion on the challenges of creating a consortium between entities with different abilities to contribute to creating the network and different levels of needs for using the network. CCG's best guess is that you'll end up with a consortium where the members are not equal in the terms of the upfront contribution, or equal in their ability to pay for transport to use the network. These differences became clear one we started to understand the wide variety of potential members of the consortium. There is a huge difference between potential members for the ability to contribute to the network – consider the difference in financial wherewithal between Cloverland Electric Cooperative and the smallest rural health clinic or the smallest rural library.

  The consortium could decide that everybody needs to contribute equally to funding the consortium, but doing so would likely drive away the smallest potential members – and that goes against the overall concept of the network, which was to bring fiber to anchor and key institutions in the UP. There are also likely to be potential members that won't have the flexibility to make an upfront contribution for something like a membership fee or be able to pledge any debt. Any governance structure is going to have to recognize these differences, and that likely is going to result in a financing structure where each member contributes based upon their ability to do so – and that is impossible to predict and would be the results of a negotiation between members.

  It is impossible to know today what each member might be able to contribute to the network. This is one of the major governance issues that members will have to figure out. It's likely the difference in the ability to contribute will also be reflected in some manner in the 'ownership' share of the consortium and voting rights – all issues that are going to require serious negotiations.
- It's also impossible at this early stage to understand how any debt might work. There is a discussion below that describes how difficult it would be to get financing in the name of the consortium if the group is made up of numerous government and private entities. It would be far easier to seek

financing through a few members on behalf of the whole group. But until the extent and the source of the financing is worked out, it's impossible to show any reasonable financial picture for any one member since they may or may not be part of the entities financing or pledging for consortium financing.

- It's also premature to compare the cost side of the equation by members. The whole point of this network is that it migrates members from lousy broadband products provided today by incumbents and creates a world-class fiber network that would provide as much bandwidth as each member needs today and into the future.

  That makes it hard to compare the before and after for members. Consider a small rural health clinic that might be struggling today while using a 5 Mbps DSL connection. How do we compare that to a future where the clinic might elect to upgrade to a gigabit of bandwidth? That is not going to happen at the same cost that the clinic is paying for bandwidth today, and the clinic ought to pay more for the bigger bandwidth pipe.

  We also can't know the whole picture for a given member. The proposed consortium is not going to be an ISP. Rather, it is providing bandwidth over a fiber network to consortium members. Members will be free to contract with ISPs or other kinds of service providers for bandwidth to reach the internet, telephone service, and a host of other products in this case that might now be available to the rural clinic, such as a suite of telemedicine connectivity products.

- Finally, nobody can predict what this transition might cost somebody like a rural clinic. There are federal subsidies to help rural clinics pay for telecommunications needs. This clinic might be getting help to pay for their slow DSL connection today, but they might be eligible to get assistance to pay more for a better fiber connection in the future. The small clinic might be able to have the same out-of-pocket expenses for a state-of-the-art fiber connection as they do for inadequate DSL today. Any attempt to quantify the impact of the change for somebody like this clinic would be a wasted effort because we'd have to make a whole series of assumptions about the clinic's actual out-of-pocket costs.

  Unfortunately, these same kinds of issues impact every other potential member. For example, how to we quantify the impact to Cloverland for getting all of its substations on the same private network so that they can start implementing smart grid? Cloverland would likely struggle to quantify this benefit.

We think the Finley Engineering network cost estimates are a reasonable projection for the cost of building the fiber network and electronics. But there are alternatives that would change the cost of the network. For example, one of our recommendations at the end of the report is to weigh the benefits to the costs for providing redundant routes. There are a few routes included in our network that the consortium might decide not to build as a cost-savings measure.

Our models are not much more than an educated guess when looking at the funding side of the equation. It's going to take a lot of work to quantify how much memberships might be raised by members. IT's going to take equally hard work to quantify what members can afford to pay for transport costs and maintenance expenses to use the network – and even that assumption offers the option of an up-front lump sum or periodic payments. For example, we have assumed that the members collectively might contribute

as much as $1.9 million in membership fees to help jump-start the network – and we've assumed differing levels of membership fees for different members. As the discussion about governance issues below covers, this is going to be a hot topic of negotiations once prospective members begin working out the details of forming a consortium. The group could decide to cut or increase the overall level of membership fees or get rid of that component of financing completely. The members might decide, as this model does, that the amount of membership can vary according to the ability of various members to contribute, or else the fee might be made to be the same for every member. It's impossible to talk about the net cost-benefit to a given member when big decisions like this will have to be negotiated to make this work.

The business models also assume that the consortium must attract significant amounts of grants to make this work, but the models also suggest the consortium will take on as much debt as it can afford. It's possible that the consortium could find enough grant money to not have to borrow – in which case the ongoing payments from members could be reduced. The models also suggest scenarios that would incentivize members to pre-pay for future transport costs using an IRU (long term lease). There is a big difference in the financing of the model of none of the members elect to use the IRU option.

The models make reasonable predictions about how the whole consortium might work. But it's impossible and could be extremely misleading to pretend that CCG has a good enough crystal ball to provide meaningful numbers to potential members about the impact of them of joining the consortium. The analysis showed us that it's far too early to pretend that we can look at detail at each school, clinic, or tribe and quantify the benefits of joining the consortium.

Since this network would need such significant amounts of grant funding, we think that the process of seeing if this consortium might work will have to begin by seeing how much grant funding might be available for this network. CCG doesn't think that potential members can have any meaningful discussion until there is at least some reasonable estimate of the grant money that might be raised for this project. Once the level of grant funding can be estimated, the rest of the negotiations between members could proceed.

IV. OTHER ISSUES

A. Funding for Broadband Networks

Following this discussion is a more generic discussion about issues involved in financing this kind of network. This first section is a summary of the specific issues we think you're going to face in getting this financed.

Business Model Impacts Financing

Earlier in the report, we've identified three possible business models, and there are different financing issues associated with each scenario. This can be summarized as follows:

All three scenarios start with the assumption that the schools will be able to redirect the amounts they now pay towards paying for future transport costs. There are hoops to jump through to make the transition between leased transport today and transports owned by a consortium, but the E-Rate program would allow the schools to migrate to a facility-based solution by going through the right process.

There is another nuance that has to be considered in any financing scenario. The schools are going to have to continue to pay existing providers for transport while the network is being constructed. The schools will not be able to pivot on a dime and stop the existing payments at the moment that the network is completed – instead, the old payments are likely to be part of a contract for services and the schools will likely have to finish paying for the contractual period even after the network is ready. This timing issue could result in a funding shortfall for the first two years of the forecast that is not included in the projections.

The situation could be complicated further since the construction of the network would reach schools at different times over a 2-year construction period. The transition of moving the schools to the network has to be planned in detail to coordinate with existing contracts that are obligated to pay for transport.

Following are some additional thoughts about the nuances and concerns associated with funding each of the three scenarios:

> *Option 1 – The school consortium owns the network and all other users of the network lease fiber or bandwidth from the schools.*
>
> In this scenario, the schools would be the only party seeking financing. The school today can issue around $2.5 million in bond financing. The forecasts show the ability, and the practical need to finance a greater amount at $4.5 million. If the schools tackled this solution that would mean finding a way to borrow more than their current borrowing cap. The business plan supports the greater amount of debt (assuming the needed grants are found). If this option is to be pursued that issue must be tackled.
>
> The financial analysis also shows that this scenario is going to rely on Cloverland a few other consortium members to pay an up-front IRU for 20-years of transport. The upfront payments are needed to make the project reasonably viable. This will require pricing, negotiating, and finalizing of one or more IRUs before funding the network.
>
> If the schools are allowed to borrow more than $2.5 million and end up using a mix of bond and bank financing, the financing gets complicated as the two lenders will each try to get first priority for loan payments. This is something that commercial borrowers face all of the time, but we've seen complications when trying to blend bank and bond financing.
>
> *Option 2 – A true consortium is created with the schools and other key entities in the UP.*
>
> This is the most complicated funding scenario if every consortium member is also an owner of the network.
>
> First, it would be difficult or impossible to get funding in the name of the consortium when it's brand new with no operational history. That's why start-up businesses often must rely upon the financial strength of the owners. Under these circumstances, a lender will likely want to look at the financial strength of each consortium member and will expect each owner to pledge a portion of new debt. A pledge is a guarantee that if the debt is not paid that the individual members will

cover any shortfall. There are members in this consortium that would likely have problems or be unable to make this kind of pledge.

This issue would be a lot easier if there are fewer owners and where joining the consortium does not automatically equate to ownership. As an example, if the only borrowers are a few entities like the schools and Cloverland, then the financing process would be far easier than if every member had to participate in the borrowing process.

CCG has worked with consortiums with a lot of members and the financing process can be gruesome. As an example, townships are likely to have an issue making such a pledge. Even though the township is not the recipient of this borrowing, such a pledge counts as borrowing in terms of the townships' ability to raise other debt. A good analogy for this would be somebody that cosigns a loan for a family member – that loan counts as outstanding debt for the person that cosigns the note, just as if they had borrowed the money themselves.

Another issue could arise if bond financing is used to finance part of the project. It might become impossible to issue tax-free bonds if that borrowing benefits a consortium that includes for-profit members like Cloverland or others. The schools always have the option to issue taxable bonds, but generally, such bonds have a much higher interest rate. Being in a consortium might eliminate the option of using tax-free bond financing.

Another issue involved in consortium financing is that financing takes a lot longer when multiple parties must guarantee the debt. Collecting all of the needed paperwork from members like townships can be a difficult task, particularly if townships have to formally vote on each step of the process – something routine when approving new debt of any amount.

The other issue with financing with multiple parties is that it's not unusual for there to be several rounds of paperwork until the financing is finished. Consider a real-life example where CCG was working with a consortium that included two county governments and thirteen towns. During the financing process, a few of the towns realized that they would be unable to sign the needed pledge of revenues. This led to having to total reshuffle the debt assigned to each entity and start the paperwork process all over again. This happened twice, and the process of getting the needed pledges took almost six months because the governments had to go through a formal process each time of notifying the public before a government could approve the various steps required by the pledge.

If this project receives grant funding, then there would likely be a tight timeframe for raising the rest of the funding. If funding takes too long, the grants could be lost. The bottom line is that obtaining financing that includes a lot of parties is always exceedingly challenging and invariably takes a lot longer and involves a lot more lawyer fees than anticipated.

Option 3 – The School consortium leases a long-term IRU for fiber on a network owned by somebody else.

From the schools' perspective, this is by far the easiest scenario. If the schools are not a party to the financing, then their only participation would be to agree to use somebody else's network. The

only worrisome consideration in this process is to make sure to continue to satisfy the E-Rate program. That process requires periodic bidding for transport, which is somewhat in conflict with agreeing to use somebody's network for a long time.

Size of the Financing

The hope at the beginning of this project was that a network could be funded by using revenues from consortium members along with some small loans and reasonably small grants. However, the higher-than-expected cost of constructing the network has made that scenario impossible.

The major issue encountered demonstrated by the financial models is that the consortium could not support a lot of debt. In the base scenarios, the maximum amount of debt that can be supported by the consortium is $4.5 million. It is that limitation on being able to cover larger principal and interest payments that force so much of the cost of the project to be funded with grants.

More Details on Financing

Following is a more in-depth discussion about the nuances of the various kinds of financing that might be used for this project. Below we look at the following:

- Private Financing (loans)
- Public Financing (bonds)
- Grants
  - Federal Programs
  - State Programs
- Loan Guarantees
- Customer Revenues

Bank Loans

Following is a discussion of the major issues that could arise when seeking bank financing.

Equity: Banks routinely would expect most a large infrastructure loan to be partially satisfied with borrower equity – meaning that a borrower brings some money to a project so that the bank is not financing 100% of the project. Banks want to see borrowers have some 'skin in the game' so that they share in the risk of the project failing. Banks know from long experience that it's harder for a borrower to walk away from a project that they have invested equity into. The amount of equity required will vary according to the perceived risk of the venture by the lender. The higher the risk, the more equity required.

Equity can take a few different forms:

- Cash: Cash is the preferred kind of equity and lenders like to see cash infused into a new business that can't be taken back out or that doesn't earn interest.
- Assets: It's possible to contribute assets as equity. For example, a new fiber venture might be seeded by having one of the partners contribute an existing fiber route or another valuable asset to the business. In such a case, if the asset is to be considered as equity it

would have to be deeded to the new venture and likely would have to be appraised by an independent appraiser.

- Grants. We've seen banks count grant funding to be equivalent to equity, although banks don't value grants in the same manner as borrower cash or assets.

Loan Terms: The banking industry as a whole does not like to finance long-term infrastructure projects. This is the primary reason why the country has such an infrastructure deficit. Fifty or more years ago, banks would fund things like power plants, electric and water systems, telephone networks, and other long-term revenue-generating assets. But various changes in banking laws have required banks to maintain larger cash reserves which makes them less willing to make long-term loans. Banks have also increased their expectations over time to want to earn higher interest rates. Many attribute this to the fact that giant publicly traded banks have captured most of the banking market. Banks don't like long-term loans since the interest rates get locked in for many years, possibly depriving the banks from earning more on their equity.

Most banks prefer not to make loans with a term much longer than 12–15 years, and many telecom projects can't generate enough cash in that period of time to repay the loans. There are exceptions. A few of the large banks like Key Bank and Bank of America have divisions that will make longer-term infrastructure loans, but these are the exception rather than the rule.

Banks are also averse to start-ups and prefer to make loans to existing businesses that already have a proven revenue stream. A bank would be a lot happier making a loan to Cloverland than they would be to a coalition where Cloverland is a member. This doesn't mean that a coalition loan can't be done, it just means that there is another hurdle to cross at the lender.

If Cloverland is part of the borrowing team or even the only borrower, they have additional options that are not likely available to the Schools acting alone. There are several lending sources that specialize in making telecom loans to cooperatives for telecom ventures.

One such bank is CoBank, a boutique bank that is also itself a cooperative. This bank has financed hundreds of telecom projects, mostly for independent telephone companies and for electric cooperatives. CoBank is a relatively small bank and has strict requirements for financing a project. CoBank often expects significant equity to be infused into a new venture. They tend to have somewhat high interest rates and somewhat short loan terms of 10–12 years.

Cooperatives also have access to another bank that lends only to cooperatives. This is RTFC (Rural Telephone Financing Cooperative) that is owned by cooperatives. This bank has loaned to numerous telecom projects for cooperative members.

Collateral. A major issue for all banks is collateral, which is the assets they inherit if the project should fail. Banks like hard collateral like buildings, vehicles, shares of stock, and other assets that they know they can readily sell for a reasonable price. Banks don't like broadband networks as collateral, because even a little bit of web searching shows them that distressed networks are sometimes sold for pennies on the dollar.

One of the most normal forms of collateral in the telecom world is for lenders to pledge their entire business as collateral when borrowing a large amount of money. People would be surprised to know that even some large ISPs still must make such pledges to take out large loans to build infrastructure. ISPs are often just one failed project away from losing their business.

Return on Bank Equity. Banks don't only consider the interest rate when making loans. A bank concentrates on its return on equity and will consider a combination of factors like interest rates, up-front and monthly loan fees, the likelihood that a borrower will pay a loan off early or default on a loan, etc. A bank will look at a dozen financial parameters before making an offer to lend – all based up their analysis of return on bank equity. There is a general public misperception that interest rates are negotiable, but the same project offered to multiple banks is likely to get nearly identical financing offers everywhere.

Federal Loans

Rural Utility Service (RUS): If Cloverland is part of the financing team there is also an option to borrow from the RUS. This is a part of the Department of Agriculture and is the only federal agency that makes direct loans to broadband projects. The Rural Broadband Access Loan and Loan Guarantee Program (Broadband Program) furnishes loans and loan guarantees to provide funds for the costs of construction, improvement, or acquisition of facilities and equipment needed to provide broadband in eligible rural areas. These loans can't be used for any town with a population over 20,000. The RUS acts much like a bank and follows similar lending practices. I like to describe the RUS as a bank from the 1950s because their lending rules were set by Congress to lend money for rural electrification and have never been modernized.

RUS can make broadband loans and loan guarantees to:

- Finance the construction, improvement, and acquisition of facilities required to provide broadband including facilities required for providing other services over the same facilities. They have financed middle-mile projects like this one many times.
- Finance the cost of leasing facilities that are required to provide broadband if the lease qualifies as a capital lease under Generally Acceptable Accounting Procedures (GAAP). The financing of such a lease will be limited to the first three years of the loan amortization period.
- Finance the acquisition of facilities, portions of an existing system, and/or another company by an eligible entity, where acquisition is used in the applicant's business plan for furnishing or improving broadband. The acquisition costs cannot exceed 50 percent of the broadband loan amount, and the purchase must provide the applicant with a controlling majority interest in the equity acquired.
- Finance pre-loan expenses, i.e., any expenses associated with the preparation of a loan application, such as obtaining market surveys, accountant/consultant costs for preparing the application, and supporting information. The pre-loan expenses cannot exceed 5% of the broadband loan excluding any amount requested to refinance outstanding telecommunication loans. Pre-loan expenses may be reimbursed only if they are incurred before the date on which notification of a complete application is issued.

RUS is allowed to make loans to a wide range of entities. Borrowers can be either nonprofit or for-profit and can be one of the following: corporation; limited liability company (LLC); cooperative or mutual organization; Indian tribe or tribal organization as defined in 25 U.S.C. 450b; or state or local government, including any agency, subdivision, or instrumentality thereof. Individuals or partnerships are not eligible entities.

We must caution that we are not aware of a municipal entity that has ever successfully borrowed from RUS. These loans have specific rules that are part of their charter that are not negotiable and municipal entities generally find that they can't agree to one or more of these provisions. Here are a few of their borrowing covenants that municipalities find to be troubling:

- The rules say that a project needs to bring at least 10% equity, but this is often expanded to be anywhere from 20% to 40% at the discretion of the RUS. In effect, the RUS acts as a bank and they will require enough equity that the project can safely cover debt payments.
- It is exceedingly hard to get a project funded for a 'start-up' business. They would not like it that the new consortium doesn't have a past financial history.
- The RUS typically wants the borrower to pledge their whole company as collateral. Municipalities are unable to make such a pledge. It's hard to think this would make sense for a consortium.
- Their collateral requirements are overreaching in other ways that make them hard to work with for municipal projects. For example, if a funded project is going to share fiber with some existing network, such as buying an IRU for part of a network on some existing fiber, the RUS would want that asset as collateral, which is almost always not possible.

This makes the RUS a very unlikely funding source for this project.

The other big drawback of these loans is that they take a long time to process. They often have a backlog of loan applications at the RUS of a year or longer, meaning you have to wait a long time after application to find out if they will fund your project. Very few existing companies are willing to wait that long unless they are certain they will be funded. If you are coordinating RUS loans with other forms of financing this wait is not practical.

However, the loan fund is quite large and currently sits at more than $1 billion. Congress generally has been adding additional funds to the RUS pot each year. The RUS also has some discretion and they have it within their power to make a grant as part of the loan. This is something that can't be counted on, but we know of projects where the borrower only had to pay back 80% of what they borrowed.

The other big upside of these loans interest rates can be lower than market rates in some cases, but for the last several years, with low interest rates everywhere, the RUS loan rates were not much cheaper than commercial loans.

Public Financing Options

The schools collectively have access to a limited amount of bond funding that could be used to finance part of the project. This is not a preferred method for financing this project, but since it's possible, the following is a description of the bond funding process.

The two primary mechanisms used for public financing are revenue bonds and general obligation bonds. There are some major benefits to using bond financing. First, the term of the bond can match the expected life of the assets and it is not unusual to find bonds for fiber projects that stretch out for 25 or 30 years. It is also possible to finance a project completely with bonds – although in this case there is not enough borrowing capacity to do that. The last primary feature of municipal bonds is that they can be issued tax-free such that the buyers of the bonds don't have to pay federal and/or state income taxes on the revenue from the bonds.

The cost of a bond issue cannot be judged only by the interest raid paid. The other financing costs of bonds can outweigh the interest rate in the effect on the bottom-line cost of repaying a bond issue. Bonds can include the following 'adders' that can drive up the long-term cost of a bond.:

Capitalized Interest: Bonds begin accruing interest from the day the money is borrowed. As described earlier, for this project, it's likely that the revenues from schools that will be used to support the bond payments might not be available at the start of the project. This likely is going to mean borrowing an amount of money to cover the early interest payments – which is called capitalized interest.

Debt Service Reserve Fund (DSRF): Bondholders might insist on surety – something that makes the bonds safer to buy. A DSRF is the amount that is kept in escrow as a hedge against missing future bond payments. The DSRF is often set to equal a year's worth of principal and interest payments. This money is kept in escrow during the life of the bond and is not available to operate the business.

Bond Insurance: Bond insurance is a different form of surety and is an up-front fee paid to an insurance company that will then pay one year of bond payments to bondholders in case of a default. We've seen bonds issued that have required both a debt service reserve fund and bond insurance.

For much of the last decade, the interest rates charged on bonds have been lower than the interest rate on commercial loans. But that has not always historically been the case. The difference between bond interest rates and commercial interest rates is referred to in the industry as the "spread." Sometimes the spread favors bonds and at other times it favors commercial borrowing. Right now, due to COVID-19, both sets of interest rates are somewhat in turmoil, particularly bond interest rates.

All bond issues expect some type of pledge of backing that would cover the bondholders in case the project fails, and the consortium was unable to make debt payments. Most government bonds are backed by some form of tax revenues such as sales taxes, property taxes, or the general coffers of a government doing the borrowing. It's hard to know what the backing might be if the Schools issued a bond.

Comparing Bond and Bank Financing

Benefits of Bond Financing: There are several major benefits for using bond financing:

- The term of the bond can match the expected life of the assets and it is not unusual to find bonds for fiber projects that stretch out for 25 to 30 years. It's difficult to finance a commercial loan for longer than 15 years. The longer the length of the loan, the lower the annual bond payments.
- Bonds can be used to 100% finance a project, meaning there is no need for cash or equity to fund the new business. Lack of cash equity is generally the requirement that creates a challenge for traditional commercial financing.
- Bonds often, but not always, have lower interest rates than commercial debt. The interest rate is dependent upon several factors including the credit-worthiness (bond rating) of the borrower as well as the perceived risk of the project.

Benefits of Commercial Financing: There are also a few benefits for commercial financing.

- Generally, the amount that must be borrowed from commercial financing is lower, sometimes significantly lower. As mentioned above, the cost of surety or capitalized interest can drive up the cost of a bond issue.
- Construction Loans: Another reason that commercial financing usually results in smaller debt is through the use of construction financing. A commercial loan will forward the cash needed each month as construction is done, and interest is not paid on funds until those funds have been used. However, bonds borrow all of the money on day one and begin accruing interest expense on the full amount borrowed on day one. Construction loans also allow a borrower to only draw loans they need while bond financing is often padded with a construction contingency in case the project costs more than expected.
- Deferred Payment: Commercial financing often will be structured so that there are no payments due for the first year or two. This contrasts with bonds that borrow the money required to make these payments.
- Retirement of Debt: It's generally easy to retire commercial debt, which might be done to pay a project off early or to refinance the debt. This contrasts with bonds that often require that the original borrowing be held for a fixed number of years before it can be retired or refinanced.

Grants

Federal Broadband Grants: Several federal broadband grant programs might benefit this project.

Rural Digital Opportunity Fund Grant (RDOF). The FCC has created a massive $20 billion grant program that will be awarded in 2020 and 2021. This grant program is being funded from the FCC's Universal Service Fund.

The RDOF grants are particularly germane to this project. Cloverland is currently investigating if it wants to pursue an RDOF grant. There may be other parties like telcos or CLECs that are also considering these grants. There are significant amounts of funding available through the grants that would cover a lot of the cost of building last-mile fiber in portions of all three counties.

These grants will be awarded in October and there is no way to know until then if somebody in the UP will win a grant to build fiber-to-the premises in the three counties. If Cloverland or some other party wins these grants and is going to build fiber, that could eliminate, or greatly reduce the

need for this proposed network. We are looking at this project as a middle-mile project since it's used only to connect schools, libraries, and other places like electrical facilities of Cloverland, or anchor institutions inside the various townships. However, since the RDOF grants would fund last-mile fiber over large geographic areas, these same fiber routes would be considered as part of the network needed to reach neighborhoods.

If Cloverland or somebody else was to win the RDOF grant, the most sensible solution would be for the consortium member to migrate and connect to that new network. This would result in the following consequences:

- This is the most likely result in what this report has described in a few places as Option 3 – where somebody other than the schools would finance and own the fiber network. Whoever wins the grants would have to own the network.
- The schools would want to negotiate with the grant winner to use dark fibers. This would provide the same network that would be created with this project. – what would differ would be who pays for and operates the network.
- Since the RDOF grant winner would be building a last-mile network, they would be accomplishing one of the long-term goals for the region – to bring fiber broadband to homes. One of the original hopes for the school network is that it would provide the backbone needed to hopefully entice somebody to build a last-mile network.
- The schools would still create a consortium, but its purpose would be to define the processes for sharing the leased dark fibers, rather than the bigger role of managing the entire network. There would be no need to bring townships or others into the consortium because they would likely be provided fiber connections by the grant winner and wouldn't need to make any investment or pledges to get fiber connectivity. Area CLECs, carriers, and cellular companies would be free to negotiate arrangements with the grant winner to use the new fiber network.

Following are a few key elements of the RDOF grant program:

- The FCC proposes awarding the money in two phases. The Phase I award will award $16.4 in October of this year. There will be a second phase of the grants in 2021 for $4.4 billion, plus any money left from Phase I.
- The grants will be paid out to grant recipients over 10 years. Grant recipients will likely have to borrow money to build the network and then use the grant funding to make the loan payments.
- The money will be awarded using a reverse auction. This means that ISPs will bid on the amount of grant money they are willing to accept for a given geographic area, with the ISP willing to take the least amount getting the grant.
- However, anybody willing to build fiber gains a big advantage in the grant process and is likely to be awarded the funding after several rounds of bidding unless there are two entities bidding to build fiber in the same area.
- The FCC has already defined the areas eligible for the RDOF grants.
- Recipients must complete construction to 40% of the grant eligible households by the end of the third year, with 20% more expected annually and the whole buildout to be finished by the end of the sixth year. Recipients can build faster, but not slower than this schedule.
- Grant winners will be expected to agree to become the carrier of last resort for the grant areas. This means they must accept the responsibility of connecting any new homes to the

network inside the grant areas, within economic reason. Applicants must be able to obtain Eligible Telecommunications Carrier (ETC) status to apply, meaning they must be a facilities-based retail ISP. Grant winners must offer telephone service as part of the product mix.

- Applicants will also need to have a financial track record, meaning start-up companies need not apply. Applicants must also provide proof of financing before receiving any grant funds.
- Grant winners will be subject to controlled speed tests to see if they are delivering what was promised. The current FCC speed test requires that only 70% of customers must meet 70% of the promised speeds requirements for an applicant to receive and keep full funding.

e-Connectivity Grant Program. In March of 2017, Congress passed a one-time $600 million grant/loan program to build rural broadband. The project was labeled as the e-Connectivity Pilot. There is a lot of hope in the industry that Congress will continue this program.

ReConnect Grants.[2] In the 2017 Farm Bill, Congress created a grant program called ReConnect. The program awarded $200 million in grants, $200 million in loans, and $200 million in a combination of grants and loans in 2019. Congress reauthorized an additional $600 million to be awarded in 2020. The 2020 grants have been supplemented with an additional $100 million as part of the recent COVID-19 stimulus plan. Those grant applications were due last spring. There is a lot of hope in the industry that Congress will continue to renew these grants. These grants are administered and awarded by the US Department of Agriculture.

Community Connect Grants.[3] This program specifically targets the poorest parts of the country and ones with little existing broadband. This program awarded $34 million in 2018 and $30 million in 2019. Grant awards for the program are generally between $100,000 and $3 million and require at least a 15% matching from the grant recipient. These grants often go to places like Indian tribal lands or Appalachia.

BroadbandUSA Program.[4] This program is part of the Department of Commerce's National Telecommunications and Information Administration (NTIA). The agency provides an annual database of grants that can sometimes be used for broadband (and are often used for other purposes). Examples include the Appalachian Regional Commission and the Community Development Block Grant (CDBG) Program.

Many of the grants in this category can be used for projects that complement a fiber network. For example, grants can be used for training people to use computers and the Internet (digital literacy). Grants might be used to create solutions for low-income residents of an area, such as creating public WiFi hotspots or for bringing broadband to public housing (digital inclusion).

[2] https://www.usda.gov/reconnect
[3] https://www.rd.usda.gov/programs-services/community-connect-grants
[4] https://www.broadbandusa.ntia.doc.gov/new-fund-search

EDA Grants. The U.S. Economic Development Administration (EDA) has been able to make broadband grants in the past – often as part of larger economic development initiatives. EDA grants are reserved for the poorer parts of the country, based upon wages in a region. [5]

There is no specific EDA grant program that is specifically aimed at broadband, but rather there are several grant programs that are aimed at general economic development activity. We know localities, such as in coal country in Virginia that have been able to get some significant EDA grants for broadband expansions.

It seems likely to use that EDA funding will be more easily found for broadband development since many rural counties now see the lack of broadband as their number one economic development issue. This was magnified during the pandemic and it's clear that rural America is not ready to take part in a digital society where workers and students try to operate out of the home.

Currently, the EDA is administering some grant funding from the FY 2020 Coronavirus Aid, Relief, and Economic Security (CARES) Act. The EDA is currently making grants on a first-come-first-serve basis from about $150 million in broadband funding. The projects must already be shovel ready and ready to begin immediate implementation.

Other CARES funding has been given directly to the states in the form of block grants. Some of the CARES funding specifically targets broadband relief for issues directly related to the current pandemic. For example, some states are using some of this money to provide hot spots for the general public in areas with poor broadband, are providing computers and tablets to K12 students who have to work from home, and are even buying temporary wireless hotspot plans for K12 homes that need connectivity during the pandemic. These funds are temporary and must be spent by December 2020. However, there is a lot of hope that additional funding will be made available next year.

HUD Community Development Block Grants (CDBG). Grants under this program can be used to build fiber or wireless networks to areas lacking in broadband access. Any grant application must meet all three of the following objectives:

- The project must benefit low- or moderate-income neighborhoods
- The project must eliminate "slums / blight."
- The project must demonstrate urgent needs.

The last criteria can now be demonstrated in any community without adequate broadband. Years ago, this was a challenge to prove to HUD. The big hurdle for many grant applicants is the second objective of eliminating blight. We've seen an argument made that improving broadband improves incomes, which ultimately improves impoverished communities. For example, luring tenants to closed storefronts with good broadband meet this test.

The CDBG grants have wide latitude in considering grant applications and can be used in the following ways that benefit broadband:

[5] This website shows the current EDA assistance programs. The website is updated frequently. https://www.eda.gov/funding-opportunities/

- The acquisition, construction, reconstruction, rehabilitation, or installation of public facilities and improvements (which include fiber or wireless infrastructure improvements).
- The acquisition, construction, reconstruction, rehabilitation, or installation of distribution lines and facilities of privately-owned utilities, which includes the placement underground of new or existing distribution facilities and lines.
- Digital literacy classes as a public service.
- Economic development – grants/loans to for-profit businesses, particularly businesses that focus on broadband/Internet access and technology.

It's worth noting that the CDBG program also makes block grants to states which then can administer grants. These state grants must still follow the same federal guidelines for eligibility as listed above.

Universal Service Fund. The Universal Service Fund (USF) is operated by the Federal Communications Commission (FCC). Money for the fund comes from small fees assessed to every landline telephone and cellular phone in the US.

The fund was historically used to provide funding to make sure that the most rural parts of the country had affordable landline telephone service. The Telecommunications Act of 1996 expanded the role to cover broadband issues. The current USF supports broadband through four separate mechanisms:

- The High Cost Support Mechanism provides support to certain qualifying telephone companies that serve high cost areas, thereby making rural broadband and phone service affordable for the residents of these regions. Many small telcos around the country have used this funding in recent years to build last-mile fiber networks to serve rural subscribers.
- Low Income Support Mechanism assists low-income customers by helping to pay for monthly broadband or telephone service.
- Rural Health Care Support Mechanism allows rural health care providers to pay rates for telecommunications services similar to those of their urban counterparts, making telehealth services affordable.
- Schools and Libraries Support Mechanism, popularly known as "E-Rate", provides Internet access and other telecommunications services as well as internal network facilities within schools used to deliver telecommunications services to classrooms or libraries.

The FCC program that is most germane to this project is the FCC's Schools and Library Fund (E-Rate). The schools in the county currently receive a significant subsidy to cover the cost of bringing high-speed broadband to the schools.

The basic premise behind this project is that the schools and the regions will be better served, and can save money over the long run if this transport is moved to a fiber network under the control of the Schools. The costs of providing transport on a School network would still be covered by the E-Rate program.

Generally, any school that meets the Elementary and Secondary Education Act of 1965's definition of schools is eligible to participate – which encompasses all public schools and many private schools. Libraries can receive USF assistance if they are eligible for assistance from a state's library administrative agency under the Library Services and Technology Act.

The FCC's mechanism does not provide a direct subsidy to school. Instead, schools and libraries can receive discounts on the costs of services provided by telecom vendors. The amount of discount each school or library can receive under the program ranges from 20 to 90 percent and is determined using a matrix defined each year by the FCC, with schools and libraries located in rural and low-income areas receiving the highest discounts from the fund. The USF compensates the schools' and libraries' vendors for the amount of the discount.

The USF is administered by USAC (the Universal Service Administrative Company) that was appointed by the FCC. The FCC retains responsibility for overseeing the program's operations and ensuring compliance with its rules. USAC's Schools and Libraries Division is responsible for carrying out the program's day-to-day operations.

State Grant Programs

The State of Michigan has a broadband grant program that is managed by the Michigan Department of Technology Management. The specific grant program is called the Connecting Michigan Communities (CMIC) grant program. This program is aimed specifically at building last-mile broadband to parts of the state that have broadband speeds below 10/1 Mbps. Since this is a last-mile grant program, these funds likely cannot be used to construct a middle-mile network.

Loan Guarantees

Another way to help finance broadband projects is through federal loan guarantees. A loan guarantee is just what it sounds like. Some state or federal agency will provide a loan guarantee, which is very much like getting a co-signer on a personal loan. These programs guarantee to make the payments in the case of a default and thus greatly lower the risk for a lending bank. In return for the lower risk, the banks are required to offer a significantly lower interest rate.

These guarantees are not free. There is an application process to get a loan guarantee in much the same manner as applying for a bank loan or a grant, meaning lots of paperwork. And then the agency making the guarantee will generally want a fee equal to several interest "points" up-front. To some extent, this process works like insurance and the agency keeps these fees to cover some of the cost of defaults. If they issue enough loan guarantees, then the up-front fees can cover eventual losses if the default rates are low. These points are a payment to the agency for issuing the guarantee and are not refundable.

Several federal agencies might be willing to make loan guarantees for telecom projects like this one. The following agencies are worth considering:

HUD 108 Program: The Department of Housing and Urban Development has a loan and loan guarantee program that is allotted for economic development. There is federal money under this

program as well as money from this program given to the state to administer. While these loans and loan guarantees generally are housing-related, the agency has made loan guarantees for other economic development projects that can be shown to benefit low-or-moderate-income households. If enough of a fiber project can be said to benefit low-income residents, then these loan guarantees can theoretically be used for a fiber project.

USDA Business and Industry Guaranteed Loans (B&I): The Department of Agriculture provides loan guarantees through the B&I program to assist rural communities with projects that spur economic development. Such a project must, among other things, provide employment and improve the economic or environmental climate in a rural area. These loan guarantees are available to start-up businesses. The program can guarantee up to 60% of a loan over $10 million or greater percentages of smaller loans. The mostly way to get this loan guarantee for this project would be to show that one of the primary goals of the network is to promote somebody else to build last-mile fiber projects that would use this network as a backbone.

Opportunity Zones

Congress created a new tax savings opportunity as part of the 2017 Tax Cuts and Jobs Act. The Act created Opportunity Zones in which investors can get special capital gains treatment and other tax breaks for investing in qualified infrastructure within an opportunity zone. Each state governor then designated specific opportunity zones. There is an opportunity zone in the southeastern third of Luce County.

Qualified investments made inside that area can get special tax treatment. The first benefit is that taxes can be deferred from past investments if the gains are invested inside of an opportunity zone. For example, if an investor had a capital gain from the sale of a property, they could invest those gains and not pay taxes on the gains now but have those gains deferred until as long as 2047. Investors have until 2026 to make such investments.

An investor also gets tax forgiveness on new investments made inside the opportunity zones if that investment is held for at least 10 years. Most of the opportunity zones include sizable areas of low-income residents and a qualified investment must meet a test of benefitting that community in some significant way. A fiber optic network that will bring benefits to an opportunity zone should meet that test because there are lot of demonstrable benefits of fiber.

The opportunity zone financing would only apply to new fiber that is within the opportunity zone. That's probably not a big enough dollar amount to make it worthwhile to pursue this alternative financing. Somebody building last-mile fiber in that area should consider this. The opportunity zone financing would work by bringing in funding from one of the opportunity zone funds that has been created. That would make up one portion of the funding for the project. The likely structure would be to agree to buy out that loan at a fixed amount at a future time, and perhaps pay not principal and interest on the loan until then. The investor would benefit in two ways. They would have wiped out any capital gains on any money lent to the project and would be from capital gains taxes for any 'profits' from this loan.

New Market Tax Credits

The New Markets Tax Credit (NMTC) Program was established in 2000 as part of the Community Tax Relief Act of 2000. The goal of the program is to spur revitalization efforts of low-income and impoverished communities across the United States and Territories. Eligibility to use these funds would depend upon meeting an earnings test for the region. However, much of rural America meets this test if you earmark the funds for the rural parts of a project. New market tax credits are normally used to fund only a portion of a project.

The NMTC Program works by giving big tax credits to investors that are willing to invest in infrastructure projects in qualifying communities. The tax credits are so lucrative that often the other terms for accepting the funding are modest. The tax credit equals 39% of the investment paid out—5% in each of the first 3 years, then 6% in the final 4 years, for a total of 39%.

The Community Development Financial Institutions (CDFI) Fund and the Department of the Treasury administer the program. The process of how the Treasury allots credits is a complicated one and we won't cover it, but in essence, there are entities around the country each year that are awarded tax credits and these entities work as brokers to allot the credits to specific project. The credits are often purchased by the large national banks or other firms that invest in infrastructure.

Generally, in practice, these funds act like a mix of loans and tax credits to the recipient. For instance, a community that received these funds might have to pay some modest amount of interest during the 7 years of the tax credit, and at the end would have a balloon payment for the principal. However, often some or even all of the principal will be excused, making this look almost like a grant.

Because the entities that get the credits change each year, and because you apply with the entities that hold the credits, and not with the federal government, the process for applying for this money is somewhat fluid. However, there are entities and consultants who help find New Market Tax Credits and who can help navigate the maze of requirements.

Assuming that some or all of these counties meet the earnings test, this could provide a portion of the needed funding at a low rate of interest or could even look much like a grant.

Cash Infusions

This project anticipates to different up-front cash infusions. The first would be membership fees to join the consortium. The second would be from lump-sum payments for IRUs.

B. Governance

The RFP asks CCG to look at governance issues. We've also been asked to consider the best practices from other similar consortiums and relevant entities.

A first step in looking at governance issues is to define what governance means. Governance is a set of rules that define the following type of issues (this is not an exhaustive list):

- Overall vision of how the consortium works;
- The role of the Board;
- Membership requirements to join the consortium;
- Rights and obligations of members;
- Ownership of the network;
- Voting rights;
- Who makes day-to-day decisions for operating the network;
- How does the consortium handle contracts with vendors;
- Original financing of the network – who is on the hook for debt;
- Daily technical operations of the network;
- Defining the separation point and responsibility between members and consortium networks;
- Financial stewardship of consortium funds;
- Legal liability of the consortium;
- How the consortium deals with non-members that want to use the network;
- How the consortium deals with cash shortfalls;
- How to deal with a member that leaves the consortium.

CCG has worked with a few dozen consortiums and in our experience getting consensus on these types of issues is one of the hardest parts of forming a consortium. Consider your specific consortium. It's mostly comprised of non-profit government entities, but the consortium must be operated as if it is a for-profit business (even if it doesn't pay taxes). One of the big concerns with this kind of consortium is asking non-businesspeople to make business decisions – something that can go badly wrong. The consortium also might include for-profit entities like Cloverland or perhaps a tribal corporation.

As part of the project, CCG was provided with an early draft ("Draft Agreement") of a consortium agreement. The following discussion refers to some of the points in the Draft Agreement.

Overall Vision of how the Consortium Functions

The Draft Agreement envisions a consortium where every member is equal and has a say in all aspects of operating the business. The Draft agreement assumes that operating expenses will be allocated evenly to members each year. The Draft Agreement implies that every member would be a party to consortium debt. This concept also implies that while consortium members might benefit if the business generates excess cash, each member is also on the hook if there is a cash shortfall of the business. This vision of operating the consortium is functionally the same as if individuals got together and decided to become equal partners in operating any commercial business. This is a legitimate way to operate a business and the world is full of this kind of 'equal partner' arrangements.

But is this the best fit for the likely members that will be in this consortium? The biggest downside of the equal partner concept is uncertainty. The liability of each member to pay their share of operating costs each year is something that doesn't mesh well with a consortium that is made up of entities of different sizes and financial capabilities. As an example, the schools get most of the telecom funding the FCC's E-rate program, and the schools would have a difficult time reacting to a need in the level of funding. The same could be true for townships or small health clinics.

The financial business plans created for this study takes a different approach. We've assumed that one of the major selling points of the consortium is a stability over time of what members pay for broadband transport. That assumption provides potential members with two options – fund an IRU upfront that pre-pays for use of the network for a long period (the models assumed 20 years), or else pay the equivalent fee monthly or annually over that same period.

The Draft Agreement also has an implicit assumption that all members are equal, when in fact they are not. This study looks at a range of different possible members that includes the schools and libraries, Cloverland Electric Cooperative, Townships, medical facilities, and local tribes. The various members are not equal in their ability to fund the network or to fund operating losses of the network in the future. These potential members even differ significantly in the ability to pay the same membership fee to join the consortium.

The business plans created for this project uses a different perspective. For example, the membership fees charged to different types of members were set differently according to the member's likely ability to pay. The annual fees to use the network were also allocated differently based upon the same logic. There is likely a big difference between the willingness of a school, of Cloverland, and of a rural health clinic to be able to pay for broadband. The financial models chose the amounts that would come from each member arbitrarily, and if the consortium is formed in the manner used in the models, these amounts would all be set through serious negotiations among parties. The business plans use the concept that each member would pay as much to join the consortium as they can afford – hoping that all consortium members recognize that everybody in the consortium, and the UP in general benefits by getting a wide array of key stakeholders connected to the fiber network.

Both of these approaches are a legitimate way to structure a consortium. As an example, CCG has worked to put together consortiums between independent telephone companies in various states. For the most part, those consortiums adopted the equal partner concept and every member contributed equally to fund the network and had an equal vote in operating the network. But every member in those consortiums was a successful commercial telco and could afford invest in the consortium. The potential partners in the UP are not equal in their financial capabilities. Potential members also differ in their ability to pay for using the network.

The first discussion that needs to be held between potential partners is this overall concept of the type of partnership that is being created. The contractual agreements needed to put together an 'equal partnership' is the simplest path since all partners are assumed to be equal – but do the potential members of this consortium want to contribute equally? There is a lot more upfront work in putting together a partnership that recognizes that members are not equal. For example, negotiations would be required in defining such things as membership fees and other aspects of funding. There would need to be negotiations to determine the ongoing payments for use of the network if everybody doesn't pay the identical amount. Hardest of all, in an unequal partnership, the ongoing voting rights might not be the same. Partners that contribute more upfront and that pay more for using the network probably have a legitimate claim to a larger voting share in making decisions.

The Role of the Board

In general, there are two kinds of Boards – strong Boards or weak Boards. The choice of those two words to describe Boards is unfortunate – because who wants to part of a weak Board? This same distinction can be seen across the political spectrum as various states, cities and counties have established political positions of a similar nature – there are different states with strong or weak governors and cities with strong or weak mayors.

There is a big difference in how the two types of Boards would operate in this consortium. A strong Board is one that would be expected to make routine decisions on how to operate the business. They might get into the minutiae of operating the business and vote on mundane details such as deciding the pay raises for employees or negotiating the nitty-gritty details of an agreement with a cellular carrier.

A weak Board would isolate themselves from these kinds of daily operating decisions by delegating the responsibilities to make decisions to an operating partner. The Draft Agreement includes this concept of hiring EUPISD as the initial operator of the network. But the Draft Agreement doesn't fully isolate the Board from some day-to-day decisions.

Because this consortium includes a lot of members that are not businesspeople, CCG strongly recommends that the Board completely outsource the operation of the business. This would mean executing an Operating Agreement with EUPISD or somebody else to be full-charge operators of the network. The operator of the business would be in charge of all aspects of operating the business. The operator would hire any needed employees and the consortium would have no employees. The operator would be free to pursue new revenue opportunities and attract outside parties to use the network. The operator would prepare budgets and would fully keep the Board informed of financial performance and of activities like taking on new customers of the network.

This arrangement would have what is considered as a weak Board. But the Board still has important responsibilities. For example, it would be sensible for all revenues to be deposited in consortium bank accounts and for the consortium to fund the operating expenses from these accounts. The Board would be responsible for taking on debt and making sure that debt obligations are made. The Board would be able to set operational expectations, such as establishing priorities in case of network outages or other important aspects of operating the network. The Board would approve all capital expenditures to expand, upgrade or maintain the network. Yet, this Board would not be making the day-to-day decision on how to operate the business.

Membership requirements to join the consortium

This goes back to the same questions raised above. The ability to attract members is likely going to hinge upon the decision to treat partners equally versus negotiate with partners according to their ability to contribute. For example, smaller health clinics and some townships might find themselves unable to meet the contribution requirements if everybody must contribute the same and pay the same in the future.

Rights and obligations of members

The rights and obligations of a member should be clearly stated in any agreement. The rights are

essentially the sales pitch to attract partners. The obligations define the costs of members to support the network once joining. The combination of these two lists is likely to be the basis for potential members deciding to join the network.

The Draft Agreement cedes a few rights to members that you probably don't want to allow. For example, the agreement would allow a member to invite and connect to outside parties at their location. This is not a good idea from a network operations and planning perspective. All decisions on how and where outside parties join the network should be in the hands of the network operator and not of members. For example, most networks of this type will only allow outside parties to join at specific locations like at certain buildings and huts where there is room for collocation equipment. The way the Draft Agreement is written, members could be in competition with each other and with the consortium in terms of attracting and getting revenues from outside parties. You're going to want anybody that joins the network to have a contractual arrangement with the consortium and also pay only the consortium for such connections and other related services.

Original Financing of the Network
Ownership of the Network
Voting Rights

These topics are interrelated. These are some of the most important questions that need to be answered. It's important to recognize that ownership can be separate from governance.

The biggest question to wrestle with is how ownership ties to debt. CCG has worked with consortiums that had many members and which then sought bank financing in the name of the consortium. This kind of consortium financing is extremely complicated.

As an example, CCG worked with a consortium of governments in Minnesota where the financing became so complicated and cumbersome that the financing process killed the prospective consortium. This consortium tried twice to get debt and failed due to the complications of coordinating with and needing pledges from multiple government entities.

If there are multiple owners of a consortium, most lenders will want a pledge from each member for some portion of the debt. This complicates financing several ways. First, each member would have to provide the same kind of paperwork as if they were borrowing the full amount. With as many members as might be in your consortium, that means stacks of backup documentation for a loan that might be six-foot-tall – and banks will charge high fees for having to analyze all of the paper. You're also going to find that there will be consortium members that might not meet the lender's requirements – that's what eventually sunk the Minnesota consortium when several consortium members didn't have the financial wherewithal to make the needed loan guarantee. The processes for consortium debt can also be ghastly. There might be half a dozen steps in the financing process where members must get approval from their own Boards to approve documents. Not only is that cumbersome and time-consuming, but nothing can proceed until every party complies with each step of the process. Worse yet, each member will have legal counsel reviewing the process and attempting to make changes. If you try to finance debt as a consortium, the fees to make this work are high, the time needed to make it work will take far longer than you think is reasonable, and there is a good likelihood that somewhere during the process that some members are going to be unable to meet the needed requirements to guarantee the debt.

What's the alternative to consortium debt? The easiest alternative is for a few members to guarantee the debt on behalf of the consortium and then lend the money to the consortium. As an example, the schools can raise as much as $2.5 million in bond funding. It might be possible for the schools to borrow this money and then lend it to the consortium. CCG has seen this type of loan made many times. The parties funding the bonds are going to want some guarantees from the consortium members – but this would not be the same process as getting banks to approve each member. There are other members of the consortium that might be capable and willing to lend to the consortium. Cloverland might have this ability. The tribes might have access to low-cost debt that could be used for this purpose. A few townships might be willing and able to do this – which is quite different than having all townships guarantee consortium debt.

It's important to note that the amount of debt being discussed is not gigantic. At most, it looks like the consortium might be able to cover the debt payments on perhaps $4.5 million of debt. Most of the external funding of the network will need to come from grants.

If the debt is guaranteed by only a few members, the raises another question about ownership. Should members that have a bigger financial stake in the success of the business have a bigger ownership share – or should they have all of the ownership? This raises the question of whether embers that contribute debt to the business will trust members who didn't finance the network to make decisions that could impact the servicing of that debt.

On the other hand, the business models also contemplate that members will pay a membership fee to join the consortium. In the business world, making payments to join a consortium would generally mean at least some level of ownership – this is analogous to parties that provide equity to a partnership.

The final issue to consider is that it seems unlikely that every member will be able to contribute the same amount of membership fees. The CCG model assumes these fees are set somehow according to the ability to pay – but the fees could just as easily be distributed equally to each member. But that would probably result in some potential members being unable to afford to join the consortium. Where a township might be able to fund a $10,000 membership fee, this might prove impossible for a small rural health clinic or a library.

CCG foresees this discussion of ownership and funding to be one of the most difficult topics to come to terms with at the start of the project. CCG strongly recommends against trying to obtain consortium financing. Since the consortium would be a new business with no history, that will almost surely mean needing individual pledges for debt from each owner/member – and that is a financing path you want to avoid. The alternative is to seek financing through a few members, and that asks the question if members that contribute more ought to have a higher share of ownership (that's how most commercial partnerships work). Associated with the debt questions are the questions of raising some start-up capital through membership fees. If those fees are not set equally, this also raises additional questions of how to decide ownership. One last question to wrestle with is if all of the members even want or need ownership. The most practical way to make the consortium work (in terms of the least amount of complications and paperwork) is the have the network owned by one, or a few members. There could still be a consortium that decides together on issues or network operations that affect everybody. This raises again the original point above that ownership is not the same as governance – they can be negotiated separately.

These two topics also mesh into the question of voting rights. Voting rights are straightforward in a consortium where every member contributes equally to the financing of the network. CCG thinks it more likely that the consortium you are contemplating will not have equal contributions since there is a big difference between the ability of prospective members to contribute to starting the business.

Consortiums that don't have equal ownership deal with voting in several different ways. Even consortiums that start with equal ownership have to deal with this issue if members are allowed to buy shares of the business from other members.

One way that unequal ownership is translated into voting rights is to treat ownership as if contributions to the business were buying shares of stock. In this situation, a member that owns 10% of the network would have twice the vote of a member that owns 5%. Having uneven voting shares makes for cumbersome votes on issues. But this is how many corporations vote on issues – voting rights are distributed in the same manner as ownership.

Another alternative is to somehow segment the different groups of owners into classes of ownership. For example, all of the schools might have a different ownership share than all of the townships. Under this structure, the Board might be made up of one member from each class of owners. This might mean having to delay voting on controversial issues until each Board member polls their sub-members. Many organizations make decisions in this manner. This still requires taking a tally by class of owners to see the results of voting.

The final solution that we see with unequal ownership is that different sets of members are eligible to vote on different topics. For example, every member might have an equal vote when sitting things like policies for operating the network. But the set of members that vote on financial issues might be restricted to members that have a financial interest in the business. This kind of structure can get complicated in keeping track of who can vote for what. But this is a somewhat common situation in the business world when corporations issue different types of shares of stock. Owners of common stock would typically have different voting rights than owners of preferred stock – and some corporations have numerous classes of stock, so this can be complicated.

CCG doesn't think that members will be able to have meaningful discussions about voting rights until after the biggest issues of who contributes and who owns the business have been resolved. We've found that consortiums tend to find solutions that are fair to all members – and in a consortium with unequal ownership that generally means that voting will not be done using one equal vote for each member.

Who makes Day-to-day Decisions for Operating the Network?

CCG strongly recommends that you consider the option where the consortium outsources the operations completely to an operating partner such as EUPISD (or somebody else like Cloverland). The consortium Board would still set all policies and goals for the business which would be defined in detail in an Operating Agreement between the consortium and the operator. The consortium would have the ultimate say-so in that they could replace an operator that wasn't meeting their expectations or following their policies.

The consortium does not want the headaches of having to make day-to-day decisions. One of the

characteristics of any Board is that it takes a while to make any decision, and operating a broadband network often involves the need to make snap decisions.

How Does the Consortium Handle Contracts with Vendors?

If the consortium outsources the operations of the network to an operator, then that party can have full authority to deal with vendors, employees, and anybody else that is part of the process of operating the business. The Board can always put limitations on this ability. For example, the Board might ask to be consulted for expenditures over a defined dollar amount – which ought to be set high enough to keep the Board out of making day-to-day decisions.

Without outsourcing this authority, the Board would be tasked with reviewing and approving every contract to buy goods and services for the business – it's likely that the Board won't have the technical expertise or business experience to understand the nuances of each arrangement.

Daily Technical Operations of the Network
Defining the Demarcation Point Between Member and the Consortium Network

The Draft Agreement allows members to define what happens on the member side of the network demarcation, with the caveat that any such decisions must not impede the operations of the network.

CCG would recommend that this concept gives too much authority to members. For example, the choice of electronics chosen by members will impact the costs of operating the consortium. Consider the fact that fiber signals need to be boosted when sent over distance. This means that there will be fiber repeaters in the network that are used to boost the signals. The forecast prepared by Finley Engineering assumed one set of network electronics provided by a single vendor – Finley is vendor-neutral and hasn't suggested the vendor. But once that vendor is chosen, then members ought to be required to operate end electronics that are compatible with the network. It would be a costly operational nightmare if every set of members elected a different vendor and the network had to have repeaters for multiple brands of electronics. We would recommend that the consortium should reserve the right to approve member electronics choices. If a member chooses to select a vendor that's not compatible with the network electronics, then that member ought to pay for any intermediate equipment needed in the network to handle their chosen vendor. That's how the consortium would deal with the issue with an external party – you'd expect them to pay to collocate equipment they need that is unique for their needs. This should equally apply to members or else the consortium could face extraordinary costs for network electronics.

It's also normal in a consortium to not allow both members and outside parties from touching the network in any way outside of the point of demarcation. Such points of demarcation should always be inside of a member building and no member or outside party should ever be allowed to touch outdoor fiber. Allowing access to anybody other than consortium technicians is asking for major problems.

Financial stewardship of consortium funds

The consortium has several decisions to make relative to the management and handling of funds.

The cleanest approach that most consortiums take is that funds should never be comingled between the

consortium and members or the operator. CCG would recommend that the consortium maintain its own set of bank accounts. All revenues should be paid into these finds. Debt payments should be made from these funds. The consortium would use the funds to pay the operator for the day-to-day operations of the network. The operator would have zero access to consortium funds. The operator could pay vendors from funds forwarded by the consortium – but the two parties should determine up-front which costs are paid by the operator and which are paid directly by the consortium. It should be noted that this arrangement requires some person (or multiple signatures) on the consortium Board to have check signing authority.

The consortium also has to decide how to handle accounting. This could be delegated to the operator or the consortium could have a bookkeeper. In any case, the operator should prepare budgets for the cost of operating the network and should report monthly to the Board on the financial performance of the business.

Legal Liability of the Consortium

This is always a concern for anybody joining a consortium. Most consortiums have found ways to indemnify members from decisions made the consortium.

One of the reasons to outsource the operation of the network is to provide a legal shield to individual members. The operator can be required to carry insurance that covers issues associated with the operation of the network, the treatment of employees, etc.

At a minimum, the consortium will want to carry insurance that shields individual Board members from decisions approved by the Board.

How the Consortium Deals with Non-members that want to Use the Network

The business plan relies on revenues that will come from non-members like CLECs, carriers, and cellular companies. The easiest way to deal with this issue is to delegate the process of onboarding a non-member customer to the operator.

Boards have a few decisions to make in trusting an operator on these issues – we see a big range of the ways that Boards handle this. One common approach is for the Board to approve a list of the prices for typical products that might be sold on the network. If there is a standard price for dark fiber or for a VPN connection, then the operator would be authorized to sell such products to anybody without Board approval. There are always going to be situations that fall outside of a standard price list. The Board could insist on pre-approving non-standard arrangements or could instead have guidelines in place that would let the operator negotiate most such situations.

The alternative is for the Board to approve all arrangements with outside parties. We know Boards that do this, but typically such Boards have a lot of technical expertise that is integral to the process. In your case, we'd think that your Board is likely not going to provide much substance to a negotiation with a cellular carrier, so CCG recommends that you set standard pricing and decide how you want to handle unique opportunities.

One of the most interesting items in the Draft Agreement is the ability of the Board to reject outside parties

from using the network. While this might happen occasionally in networks, we've rarely heard of any network that turns down a revenue opportunity. As long as it's clear that outside parties must play by the rules established by the consortium and the operator, we find this 'right' to be something we're rarely seen used.

How the Consortium Deals with Cash Shortfalls

This is one of the stickiest issues that any business with multiple owners faces. The Draft Agreement assumes that the operating costs of the network will be borne equally by all members. That implies that in a situation where there is a cash shortfall that all members will contribute equally to satisfy the shortfall. That's a legitimate way to handle shortfalls, and some of the consortiums of telephone companies mentioned earlier handle cash shortfalls this way. Their governance documents will have a section that deals explicitly with 'cash calls'. This defines how members must react to a cash shortage, such as defining how quickly they must cover a shortfall. These agreements also define what happens if a member is unable or unwilling to meet the cash call.

In looking at your potential membership we think that the ability for the consortium to routinely expect members to make up cash shortages might drive some entities to not join the consortium. The various government entities that might be members often have well-defined and tight budgets and might be unable to react quickly, or at all to a cash call.

This is one of the reasons that the business model forecasts include a $1 million rainy day fund. These funds could be used to cover temporary shortfalls or to cover larger problems like storm damage or unexpected equipment failure. The consortium should have a goal to always replenish any funds taken from the rainy-day fund.

It's also possible that after the consortium has been in business for a few years that it could get a line of credit from a bank that would enable the use of short-term borrowing to cover short-term needs. Such a line of credit would be under the sole control of the Board and not the operator.

But even with a rain- day fund and perhaps a line of credit, it's possible that the business could run out of cash and might require cash calls from members. For this reason, any agreement needs to have a detailed discussion of what happens when there is such a cash shortfall. For example, most agreements have ways to deal with members that can't meet a cash shortfall. Generally, any member that steps up in such a case to meet another member's shortfall ends up taking some share of ownership from the defaulting member. Since your particular consortium has members that might have a problem meeting a cash call, this will be a hot topic of discussion.

The Draft Agreement also had another provision that is related that we don't like. While it automatically allocated cash shortfalls to members, it also distributed 'profits' or cash surpluses to members. We think that distributing profits or dividends should be something the Board will want to consider carefully. For example, our financial projects predict that starting 7-10 years after the creation of the network there will be electronics that need to be upgraded or replaced. Our forecasts assume that the business will sit on excess funds in anticipation of these future replacements. The models don't specifically create what the industry calls a capital sinking fund, but this is well worth considering. This is related to the rainy-day fund but would be used for capital upgrades and replacements.

Of course, once the business has satisfied all cash needs – when the rainy-day fund is full and a capital sinking fund is in place and funded, then the Board could consider distributing profits. This goes back to the earlier points in the model of defining ownership. Profits can be distributed in many different ways and not strictly in relation to ownership. For example, distributions could first be aimed at returning membership fees if those were collected on a different basis than ownership share.

How to Deal with a Member that Leaves the Consortium

The Draft Agreement suggests that when a member decides to leave the consortium that the remaining members then get to decide if they want to reform the consortium. This is a dreadful idea because it implies that having a member leave the consortium would dissolve the consortium. Nobody will lend or sign a long-term contract with the consortium if there is a provision for the consortium to automatically fold. That would invalidate every agreement in place and might trigger a renegotiation of every aspect of operating the business. That would be a drastic overreaction to a member leaving. Such a provision would likely make it impossible to get consortium financing, get a line of credit, or even getting an operator that will trust you.

It's not unusual for consortiums to lose or gain members. The normal way to handle this is to have in place rules that talk about any needed redistribution of ownership and related things that would change when a member comes or leaves the consortium. This is normally one of the more mundane aspects of these agreements. Another thing to consider is allowing members to 'buy' the ownership share of anybody that wants to leave. This concept is something that members like because it says there is value in their ownership and that they might be able to get some money if they leave. The Draft Agreement has a departing member lose all value in the business, and that is a bad message to give to prospective members.

Summary

As this discussion shows, determining governance is not easy. It's probably prudent that you don't go too far down the path of trying to pre-determine many of the topics I've discussed above – because members are likely to have strong feelings on some of these topics. It's been CCG's experience that working out the governance issues will be the most time-consuming aspect of creating a consortium. Every member, and their lawyers, are going to have different ideas about how all of this should work. Our recommendation is to start on governance issues early once it looks like a consortium is possible.

How to Make This Work

The EUPISD has already created a core set of documents that were referred to in this discussion as the Draft Agreement. We think those documents provide an adequate shell for creating the governance agreement for the consortium. It would be necessary to layer in whatever decisions members make about the above issues as they are decided.

There is not going to be any ready-made shell document that is any better than the Draft Agreement. Most consortiums that are similar to what you are contemplating have either been formed by a group of commercial companies – meaning it's unlikely that you'll ever get to see such agreements, or else the agreements were created as part of some consortium of government entities operating under very specific

state laws that define the ways that governments can work together. These arrangements vary widely between states. In any case, this consortium would not be a pure government consortium and would be a mix of government and private entities, so agreements of only government entities will not address most of the issues discussed above.

In the recommendations section of the report below we make a specific recommendation about how to make this work.

C. Risks

No project is without risks, and this section of the report identifies a few risks that ought to be considered when contemplating the long-term business model.

Changes in Federal Funding. There is no guarantee that E-Rate funding will stay the same as today, or even that there will always be an E-Rate program. It's conceivable at some point that the Universal Service Funds gets reshuffled or even replaced with something else.

One thing to recognize is that the current Universal Service Fund has a funding crisis is that one of the key sources of funding is a fee assessed on every landline telephone in the country. As the number of landlines has dropped, the FCC has reacted by forcing the fee on landlines to be increased. Landlines are likely not going to zero, but even residents and businesses that keep landlines are converting to Voice over IP, which is not always assessed the USF fees, depending on how the service is delivered to customers. The fund will have big problems in a few years if the government doesn't modify the funding source – and for now, the topic of widening the fund to include assessments on broadband has been killed by ISP lobbyists.

This project puts a huge amount of reliance on the payments from E-Rate remaining steady and predictable - there is no guarantee that will occur.

You Are Competing with Last Mile Fiber Networks. Some portion of the business plan will be competing with any last-mile fiber networks that might be constructed in the region. For example, some of the potential stakeholders in this project, like the townships and their various government buildings might be better off as a retail customer on a last-mile fiber network rather than stick with the consortium.

The selling point for your network is to offer the townships high-bandwidth fiber, which is something they can't get today. But the cost of paying their fair share for this service from the consortium is likely going to be a lot higher than what the townships would pay if somebody was to build a last-mile fiber network throughout the region. This is a factor of economy-of-scale. The townships are one of only a few participants in your network, but they would be one of many participants in a last-mile network.

This means that some of your stakeholders might become highly conflicted about sticking with your consortium if they become able to buy adequate bandwidth products at a fraction of the monthly cost as staying with you.

The Network is Susceptible to Major Damage. We saw an example of this just a few months ago when local utilities like Cloverland and the phone companies were clobbered by a big ice storm. The consortium

is going to somehow plan to pay for such unexpected events – and they could happen at any time, and at any frequency. A good example of this is looking at the history of hurricane damage in Florida. There have been years when the state has been hit by multiple major hurricanes in the same year, and there was also a 10-year stretch recently when there were no major hurricanes.

It's hard for a carrier to prepare for and fund major damage. Owners of fiber networks can't buy insurance to protect against weather damage. Most network owners create a 'rainy day fund to be at least somewhat prepared for a bad event – but mostly they hope that damage will be covered by FEMA as part of a declaration of an emergency. Unfortunately, that doesn't always happen for things like ice storms, which can be local and not widespread.

Revenues might Not Track with Expense Inflation. A lot of businesses expect that over time that their revenue streams will increase to keep up with the inflation in the cost of operating the business. That might not be the case with this business.

For example, some of your revenue streams might involve a long-range IRU that is calculated at the start of the project and that will hold stead for many years. Other revenues such as E-Rate don't necessarily increase over time. This raises the risk that your operating margins and cash flows will feel pressure over time.

There is Always a Risk of Competing Technologies. The investment for this network is long-term, and over a long period there could be alternate technologies that could bring cheaper, yet adequate broadband to some of the consortium members. Fiber can provide more bandwidth than any other technology, but not every location of every consortium member is going to need giant broadband. That means technologies like 5G wireless or low-orbit satellites could offer a reasonable alternative that might draw some members away from the consortium.

D. Creating Fiber Jobs / Jobs Training

The RFP for the report asked us to look at the topic of training telecom technicians for the Upper Peninsula.

A Shortage of Telcom / Fiber Technicians

It's a timely question because the US as a whole has a shortage of trained technicians to work with fiber optics networks. This shortfall has come about for a few reasons. One of the primary reasons is due to the labor practices of some of the biggest owners of fiber networks like AT&T, Verizon, CenturyLink, and Frontier. All of the big telcos have been downsizing technical staff for various reasons. Much of it has to do with the phasing out of traditional copper networks. The technical staffs of the telcos have been systematically downsized for well over a decade, and in doing so these companies have not been hiring many new technicians, but rather training existing copper technicians to become fiber technicians. This has an impact on the whole industry since in the past, many of the trained technicians working throughout the industry began their careers at the big telcos. That funnel of newly trained technicians has dried up.

The other reason for a shortage of trained telecom technicians is the recent explosion of new fiber construction. Companies everywhere are building fiber networks. The big carriers have been investing heavily in fiber. For example, over the past four years, AT&T built fiber to pass over 12 million homes and businesses. Verizon has been building fiber across the country to provide fiber to its cellular towers – including small cell sites that are now scattered throughout most urban areas.

There is also a huge amount of fiber being built by smaller companies. The FCC's ACAM program from the Universal Service Fund has resulted in fiber being built in portions of rural America that are operated by the small telephone companies and cooperatives. The FCC and other federal and state agencies have been awarding grants to carriers to build last-mile fiber optic networks. Various independent fiber overbuilders have been building fiber in small towns and in a few urban markets of the country.

All of the fiber construction has resulted in a recent shortage in trained fiber technicians needed for fiber construction. Within the last year, we've seen inflation in the cost of building fiber networks as it's becoming clear that the demand for trained construction crews is outpacing the number of available construction crews nationwide.

The pace of fiber construction is accelerating. The FCC estimated recently that fiber networks have been built to pass over 15% of all homes in the country. That percentage is likely to double over the next five years. The FCC is helping to fuel the demand for fiber construction. For example, they will be awarding the two biggest telecom grant programs soon. In October the FCC will be holding a reverse auction to award $16.4 billion to construct rural broadband networks over the next six years. Another $4 billion will be awarded from that program next year. The FCC will also be awarding $9 billion for the 5G Fund, and much of that money will be used to build fiber networks to beef up rural cellular coverage. Meanwhile, a majority of states now have broadband grant programs, and the level of funding to these programs increasing due to the recognition during the pandemic that millions of students don't have access to broadband at their homes.

Taken all together, the market forces mean an unprecedented amount of fiber construction for the next five years, and likely for at least a decade or more beyond that. Already in 2020 we don't have enough trained fiber technicians to meet the demand for fiber construction.

But construction is only half the story, and the smaller part of the demand for fiber techs. We also need fiber technicians to maintain and operate fiber networks after they are constructed. As an example of a common metric, an outside fiber technician in a truck is needed to service every 2,000 – 2,500 homes that served by fiber. The same effort also requires a fiber electronics technician for every 5,000 – 7,000 fiber customers. As all of the billions are poured into building fiber networks, we're going to need huge numbers of technicians to maintain and service the new networks.

Specific Types of Technicians Needed

There are several specific kinds of technicians needed to construct and maintain new fiber networks, as follows:

Construction Technicians. There are several categories of construction technicians needed to build the many miles of fiber construction we're going to be seeing nationwide.

Buried Fiber Technicians. Constructing buried fiber involves several techniques that required specialized training. One category of buried fiber technicians operate heavy equipment used to bury conduit – which is an empty pipe which is placed in the ground to protect fiber optic cables. The process is referred to as boring and the conduit is placed anywhere up to four feet underground. Once in place, fiber is pushed or pulled through the empty conduit using additional specialized equipment.

Another type of buried construction is done in rural areas using a heavy vehicle called a cable plow. This a truck of the size and weight of a dump truck. The plow literally pushes the fiber up to 18 inches below the soil as the plow drives slowly along the shoulder of roads. The process needs to halt at every driveway or intersection to bore the fiber as needed to bypass the driveway or road.

Aerial Fiber Technicians. This is specialized work done to build new fiber optic cables placed on poles. Aerial technicians largely work in the air using cherry-pickers or lifts that allow them to work high up on poles. Aerial construction is a multistep process. The first step is something called make-ready which makes poles ready for construction. This involved moving existing wires and cables to make room for a new fiber, or in some cases constructing a new and taller utility pole that ill accommodate all of the existing wires plus the new fiber. Next, once the poles are ready for construction a metal messenger wire is placed on poles. Finally, the fiber cables are strapped to the messenger wires.

There is a more specialized for of aerial fiber construction done largely by electric companies which place fiber near the electric wires. This uses a special kind of fiber that is self-supporting but non-conductive of electricity. Technicians working in this space are specialized since they have to be certified to work near high-voltage wires and well as know how to install fiber.

Drop Technicians. Drops are fibers that go from the street to a home or business. Drops can be either buried or aerial depending on how the fiber on the street was constructed. Drop technicians must learn the many different techniques used to reach homes or businesses and done in such a manner as to not disturb the existing landscaping.

Fiber Splicers. Fiber splicing is a specialty trade. During the construction process a splice has to be every place there is a change of size of the fiber bundle or any place where a reel of fiber happens to run empty. In building a community fiber network this would equate to a lot of splices. Splicing of large cable is meticulous work because the fiber splicer needs to match up colored wires from both fiber before splicing them together. That's hard enough to do with a 25-fiber cable but it intricate and challenging for a 144 or 288-fiber cable. Technicians that do splicing during construction earn a relatively high payrate and these technicians usually only do the splicing.

Maintenance Technicians. These are technicians who take care of the fiber network once it's been constructed. This is somewhat of a jack-of-all trades job in most companies. These techs will help to troubleshoot problems to identify the exact cause of a problem being experience by a customer (or identified by the network monitoring process). Maintenance technicians generally work with fiber along the streets, drops, electronics at the customer location, and wiring or wireless networking inside a customer premise. These technicians also work with electronics or passive fiber components located in various huts or cabinets located throughout the network.

Electronics Technicians. Electronics technicians in most companies concentrate of electronics and don't work with fiber cable. There are a host of different kinds of electronics in a fiber network. There included:

- Transport electronics used to connect to the Internet at some distance location
- Transport electronics used to create transport routes or redundant fiber rings within the local network
- Electronics that are used to light customer fiber and communicate with customers (various kinds of fiber technology can be used for the last-mile)
- Electronics that are used to provide services like telephone, broadband connections, cable TV, smart home, etc. This might include a wide variety of specialized servers and switches
- Electronics located at customer sites that might include the fiber terminating equipment (ONTs), WiFi or other routers, larger electronics used for large customers or apartment complexes

Electronics technicians have to be proficient in working with the operating from each brand and type of electronics used in the network (every brand of equipment tends to have proprietary and unique software and a dozen different software interfaces might be found in a typical network. Further, some existing programs are centered solely on fiber optic technology while some programs also include training as an electrical line technician, meaning the technician would work in the power space on poles or could seek employment with electric companies.

Types of Training Programs

Looking around the country, formal training seems to be concentrated in the area of fiber installation and maintenance. We could not find any specific programs for telecom electronics technicians. Most training in electronics is done directly by the vendors of the specific equipment being used – and broadband companies send new technicians to these courses as needed.

Most of the technician training programs include some combination of classwork and hands-on apprenticeship training. In the apprenticeship scenario, students earn money as they take the training, with wages increasing over time as students become more knowledgeable.

Types of Certifications

Certified Fiber Optic Technician[6]

[6] https://www.thefoa.org/cfot.htm

This is the gold-standard for fiber optic technicians. Candidates receive a certification certificate that demonstrates a level of knowledge in a wide range of topics involved with fiber construction and installation.

Candidates for the certification must have at least two years of relevant field experience. Training by employers, manufacturers, or vendors of cabling products may be recognized as part of the experience requirements. Field experience must include:

- Participation in multiple installation jobs, preferably including premises and OSP installations
- Experience preparing various cable types
- Experience with fusion splicing and several termination types
- Experience testing with visual inspection, VFL, OLTS, OTDR

Candidates with enough experience can sit directly for the certification and not taking any formal training. But many training programs include the training needed to understand the wide range of topics that are on the CFOT test. Areas where training might make sense includes:

- Overview of fiber optic applications and installations
- Communications systems utilizing fiber optics
- Fiber optic components appropriate for fiber optic networks
- Installation of premises and outside plant fiber optic cable
- Splicing and termination
- Testing fiber optic components and cable plants
- Hands-On lab exercises including hands-on splicing, termination and testing

Certified Premises Cabling Technician (CPCT)[7]

This certification is for designers, installers and operators of premises cabling networks. Premises cabling refers to building and campus cabling that is generally customer-owned and used for local area networks of computers (LANs), security systems (CCTV and alarms), building management systems, distributed antenna systems (DAS for cellular and WiFI) and other applications inside buildings or on a campus. The certification covers copper and fiber optic cabling and wireless communications.

To qualify for the CPCT certification, candidates must have at least two years of relevant field experience, including documented experience installing and testing premises cabling networks. Training by employers, manufacturers or vendors of cabling products may be recognized as part of the experience requirements. Field experience must include the following:

- Participation in multiple installation jobs, preferably including building and campus installations
- Installing various cable types and hardware
- Terminating UTP and coax cable and fiber optics,
- Testing copper and fiber cables
- Experience with appropriate tools and test equipment

Candidates can be self-taught or take training courses in the following areas:

- Overview of premises cabling systems -copper, fiber and wireless

[7] https://www.thefoa.org/cpct.html

- Communications systems utilizing premises cabling
- Premises cabling standards
- UTP and coax copper cabling
- Fiber optic cabling
- Cabling for wireless
- Design of premises cabling networks
- Installation of premises cabling
- Testing copper and fiber optic cable plants
- Hands-On lab exercises including cable preparation, termination and testing

Examples of Training Programs

Following are a few existing programs that offer this training. We chose a few from Michigan or nearby states, and there are many more across the country. As you already knew, there doesn't seem to be any such training on the UP.

Ann Arbor Electrical Training Center. AAETC)[8]

This is a four-year apprenticeship program that includes classroom training. The program is to train Tele/Data technicians for residential, commercial, and industrial applications. Apprentices work under the direct supervision of a qualified installer/technician doing installation and repairs on office buildings, schools, hospitals, stores, apartment buildings, private homes, or any other location where tele/data installation must be provided and maintained. The training also includes learning about the services provided over fiber networks – voice, video, and data.

The program has 160 hours of classroom training per year to go along with the hands-on work in the field as an apprentice.

This program pays an hourly wage that increases as students get more proficient. Wages start at $16.06 per hour, but by the end of fourth year climb to $30.52 per hour.

Detroit Electric Industry Training Center (DEITC)[9]

This school offers a five-year apprenticeship program for Inside Construction Wiremen. There are apprenticeship programs that pair up students in training with real-life experience in working with companies. Cited in the footnote to this example is an apprenticeship program in Detroit sponsored by the International Brotherhood of Electrical Workers and the Southwestern Michigan Chapter of the National Electric Contractors Association.

This particular training course is a 5-year program combining both one the job training as an apprentice and classroom training. These particular courses are a mix of both electrical and fiber wiring training. The areas of emphasis in the particular course is inside wiring, such as wiring fiber in large buildings like hospitals, universities, etc.

[8] https://www.aaejatc.org/4-year-voice-data-video

[9] https://detroiteitc.org/programs/

This program pays an hourly wage that increases as students get more proficient. Wages start at $19.08 per hour, but by the end of fourth year climb to $31.79 per hour.

Terra State University[10]

This university located in Fremont, Ohio offers both of the industry certification programs listed above – CFOT and CPCT. This differs from the programs above in that these are a pure training and are not accompanied with a hands-on apprenticeship program. A student will have to come to these programs with the requisite working experience. The courses are a combination of 50% online training and 50% hands-on lab work.

The CPOT course covers fiber optic cabling. Labs include terminating and splicing fiber optic cabling. Students learn how to use an OTDR to test fiber optic cabling.

The CPCT course covers copper and fiber cabling. Students also learn about wireless networks and how to put them together. Labs include building copper cable, punching down copper cable into 66 and 110 punchdown blocks, wireless setup, and designing a network.

Grant Funding Opportunities

There are numerous federal grants that can be used to help to fund training for job creation:

The Rural Economic Development Loan and Grant (REDLG) program provides funding for rural projects through local utility organizations. USDA provides zero-interest loans to local utilities which they, in turn, pass through to local businesses (ultimate recipients) for projects that will create and retain employment in rural areas. The ultimate recipients repay the lending utility directly. The utility is responsible for repayment to USDA.

https://www.rd.usda.gov/programs-services/rural-economic-development-loan-grant-program

Community Development Block Grant (CDBG) program provides annual grants on a formula basis to states and local governments, to be used for economic and community development, principally for low- and moderate-income persons. These grants would be applied from the State of Michigan.

https://www.hudexchange.info/resource/4891/cdbg-broadband-infrastructure-faqs/

Workforce Innovation and Opportunity Act (WIOA) for adult, dislocated worker, youth, and basic labor exchange programs. The nation's business-led Workforce Development Boards help set the strategic direction for the programs and services in their respective labor markets. These grants would awarded through the State of Michigan.

https://www.dol.gov/agencies/eta/wioa/

[10] http://terra.edu/community/kern_center/industrial_it_certifications.php

The Telecommunications Industry Registered Apprenticeship Program ("TIRAP") is a joint venture of telecommunications companies, industry associations and the U.S. Department of Labor that develops credentialed apprenticeship programs available to qualified employers for career development of the telecommunications workforce.

https://www.tirap.org

Labor's Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program represented a major investment to increase the ability of community colleges to address the challenges of today's workforce. Grants were designed to help workers eligible for training under the Trade Adjustment Assistance (TAA) for Workers program, as well as a broad range of other adults. Every state received funding for each of four years through 256 grants totaling $1.9 billion. TAACCCT grants, which continue through September 2018, are impacting 60% of the nation's publicly-funded community colleges and building industry-aligned programs in manufacturing, health care, information technology, energy, transportation, and other industries.

https://www.dol.gov/agencies/eta/skills-training-grants/community-colleges

Indian Energy and Economic Development (IEED) operates under the Assistant Secretary, Indian Affairs. It consists of the Division of Energy and Mineral Development (DEMD), the Division of Capital Investment (DCI), and the Division of Economic Development (DED). DEMD provides technical assistance to over a hundred fossil fuel and renewable energy projects on Indian trust land; DCI administers the Indian Affairs Loan Guarantee and Insurance program, which leverages more than $100 million annually in economic activities throughout Indian Country; and DED funds economic development feasibility study and NATIVE Act tourism grants, helps build legal infrastructure, and fosters commercial opportunities in Native American communities.

https://www.bia.gov/as-ia/ieed

American Indian Tribally Controlled Colleges and Universities. This program helps eligible institutions of higher education increase their self-sufficiency by providing funds to improve and strengthen the academic quality, institutional management, and fiscal stability of eligible institutions.

https://www2.ed.gov/programs/iduesaitcc/index.html

Native American-Serving Nontribal Institutions. This program provides grants and related assistance to Native American-serving, nontribal institutions to enable such institutions to improve and expand their capacity to serve Native Americans and low-income individuals.

https://www2.ed.gov/programs/nasnti/index.html

Socially-Disadvantaged Group Grants The primary objective of the Socially Disadvantaged Groups Grant program is to provide technical assistance to socially-disadvantaged groups through cooperatives and Cooperative Development Centers.

https://www.rd.usda.gov/programs-services/socially-disadvantaged-groups-grant

Rural Community Development Initiative RCDI grants are awarded to help non-profit housing and community development organizations, low-income rural communities and federally recognized tribes support housing, community facilities and community and economic development projects in rural areas.

https://www.rd.usda.gov/programs-services/rural-community-development-initiative-grants

Strengthening Community Colleges Training Grants (SCC) will build the capacity of community colleges to collaborate with employers and the public workforce development system to meet local and regional labor market demand for a skilled workforce. The purpose of this grant is (1) to increase the capacity and responsiveness of community colleges to address the skill development needs of employers and dislocated and unemployed workers, incumbent workers, and new entrants to the workforce; (2) to offer this spectrum of workers and other individuals accelerated career pathways that enable them to gain skills and transition from unemployment to (re)employment quickly; and (3) to address the new challenges associated with the COVID-19 health crisis that necessitate social distancing practices and expanding online and technology-enabled learning and migrating services to a virtual environment.

https://www.dol.gov/sites/dolgov/files/ETA/grants/pdfs/SCC%20FOA-ETA-20-07.pdf

Building State Capacity to Expand Apprenticeship through Innovation The goal of these funds is to expand the national Registered Apprenticeship system by funding baseline activities that improve States' ability to serve, improve, and strategically scale the Registered Apprenticeship Program (RAP) model described in 29 C.F.R. parts 29, Subpart A, and 29 C.F.R. 30; and to fund innovations aimed at using RAPs as a tool for developing the economy and building infrastructure. In June 2017, the President issued an Executive Order (E.O.) 13801, Expanding Apprenticeship in America, with a focus on preparing workers to fill both existing and newly created jobs, and to prepare workers for the jobs of the future. Apprenticeship is an industry-driven, high-quality career pathway where employers can develop and prepare their future workforce, and apprentices can obtain paid work experience, classroom instruction, and a portable, nationally-recognized credential. The E.O. directs the federal government to "promote apprenticeships and effective workforce development programs." Expanding apprenticeships can help individuals gain the skills necessary to fill vacancies and help employers find skilled workers more easily and quickly.

https://app.getpocket.com/read/3079488660

Youth Apprenticeship Readiness Grant Program The purpose of this program is to support the development of new or the expansion of existing Registered Apprenticeship Programs (RAP) for youth. This also includes quality pre-apprenticeship programs that lead to a RAP. This grant program supports the President's Executive Order and the Department of Labor, Employment and Training Administration's goals to promote pre-apprenticeships, to develop a strong youth apprenticeship pipeline, and to expand access to youth apprenticeships. As a result, the grant will: 1) Increase awareness and adoption of the earn-and-learn apprenticeship model as a solution for experiential learning at the secondary educational level; 2) Increase parental, young adult, and employer awareness around the benefits of youth participation in RAPs, as well as their engagement in these models; 3) Develop and expand the number of RAP opportunities for youth, ensuring they meet RAP standards and

pre-apprenticeship programs are of high quality and lead to RAP; 4) Increase academic and career-focused learning among youth, based on sound assessments, to increase employability in the labor force; 5) Promote increased alignment between state education and workforce systems through the development of policies that facilitate the transition from school to a RAP; and 6) Increase RAP opportunities for all youth, particularly underrepresented populations (including women, people of color, ex-offenders, persons with disabilities), youth with barriers to employment, and out-of-school youth.

https://www.dol.gov/sites/dolgov/files/ETA/grants/pdfs/FOA-ETA-20-06.pdf

Job Corps Scholars Program - The Employment and Training Administration (ETA), U.S. Department of Labor (DOL, or the Department, or we), announces the availability of approximately $23,738,000 in grant funds authorized by the Workforce Innovation and Opportunity Act, Section 156 (a) (29 U.S.C. 3193(a)) and Section 189(c) (29 U.S.C._3249(c)) for Job Corps Scholars Program Partnership. Under this Funding Opportunity Announcement (FOA), DOL will competitively award grants to accredited, two-year, public community colleges; accredited, public two- and four-year historically Black colleges and universities (HBCUs); and accredited tribally controlled colleges and universities (TCCUs) as part of a "Job Corps Scholars Program" demonstration project. Grantees must enroll Job Corps eligible youth and provide those enrolled with intensive counseling services to support and facilitate each student's employment and career success.

https://www.dol.gov/sites/dolgov/files/ETA/grants/pdfs/FOA-ETA-20-03.pdf

E. Recommendations

Following is a list of recommendations that come from our analysis of the opportunity.,

Wait to see what Happens with the RDOF Grants

The FCC RDOF grants are likely to provide $50 - $60 million for somebody to build broadband in the three counties. If Cloverland or some other entity accepts this money to build a fiber network, then the best option for the schools would be to lease dark fiber from that new network. If the RDOF grant funding is awarded to build some other technology, then this project becomes a priority.

From a timing perspective, this might not be ideal since the winners of these grants have up to six years to build the new networks. That would likely result in schools being added to a fiber network over several years, making the transition trickier. But the over results is a far better deal for the schools – they could transition to a fiber network and likely end up with the same dark fiber network they were aiming for with this larger idea – all without having spent any school money or resources to fund and build the new network.

It's also possible that somebody could win the grant to build fiber to only a portion of the three counties. In that case, the new fiber builder could provide part of the needed solution for this proposed network and a consortium still might make sense to build what's not covered by the RDOF grants.

The grants will be awarded this October. Once the winner of the grant is announced, if a fiber overbuilder wins the grant it ought to be fairly easy to determine the extent to which the RDOF grants provide the needed solution.

Figure out the Governance and Organizational Issues

The RFP asks CCG to recommend how to create the needed organizational structure and governance rules. We recommend a process something like the following as a way to help the prospective members understand the governance issues and then determine how they want to make this work:

- We recommend another all-day session, or perhaps a series of shorter sessions moderated by Doug Dawson of CCG to discuss the many issues associated with these kinds of partnerships. We think you hired CCG because we have this specific experience. For example, Doug has been involved in negotiating operating and governance agreements for middle-mile networks owned by private entities and networks owned by government entities. Your consortium is unique in having ownership and governance by both kinds of entities. The meeting would discuss the governance issues discussed in this report. That would include things like the following:
    - Should every member make the identical contribution to kick off the business (membership fee) or can this be negotiated according to an entity's ability to contribute? How would the decision to negotiate contributions affect issues like ownership and voting rights?
    - How is the ownership share of the business determined?
    - What's the best way for this consortium to seek financing, and how might this decision affect ownership and governance?

  - What's the best operational structure? Is the consortium willing to take on having employees or would it make more sense to hand operational issues to an outside party though the use of an Operation Agreement?
  - How will the partners handle negative issues like cash shortfalls and cash calls?
  - What should the consortium do with excess cash?
  - What happens when a member wants to leave the consortium?
  - Should there be a process for allowing an entity to sell its ownership share to other members? What happens if a commercial member business sells or merges with somebody else?
  - There should be a discussion of the housekeeping items like the details of governance (length of term for officers of the entity and related issues). What is the best governance structure for this particular group of owners? Does every member want to be on a Board and always have a vote? Should there instead be some sort of Board where various members rotate into roles of governance? Regardless of governance structure, are there issues that would require a vote from every owner? Doug Dawson would provide specific recommendations from the best practices of other comparable partnerships for the group to consider for these kinds of topics (that would be tailored once the make-up of the consortium is known).
- After this first meeting, each potential member would be asked to provide feedback to a specific set of questions. After some fixed internal. CCG would compile a summary of the various responses and that comparison document would allow for discussion among the potential partners on the best structure that fits everybody's needs. This would likely lead to additional group meetings to work out differences of opinions on topics. Doug would be glad to moderate these discussions. It would not be unusual for this to take a series of calls. Doug worked with one consortium that had a dozen such group calls before every consortium issue was resolved.
- Once a framework is developed for a consortium partnership, Doug Dawson would work with the consortium's lawyer to capture the structure in a consortium contract. This can probably be done the most easily by modifying the Draft Agreement that has already been prepared for this purpose.
- The typical next step from there would be to pass this document for legal and perhaps accounting review to professionals chosen by the group. From there a partnership agreement can be drafted for final negotiation and agreement.

Investigate Some of the Financing Nuances

The analysis shows that the ideal funding structure might be to mix bond funding and commercial bank funding for the project if it moves forward. We've identified some potential issues with mixing different kinds of financing that probably should be explored before any specific proposals are made to members. When mixing different sources of funding, the key issue to iron out is the willingness of different lenders to accommodate each other so that the total borrowing package works. We don't think it's ever too early to talk to potential lenders.

Consider Paring Back the Project

There are ways that the cost of the project could be pared down to be more affordable. You might want to consider the following ideas:

- There are a few fiber routes that could be eliminated. As an example, there is an expensive fiber route at the eastern edge of the project that runs through Mackinac Island. The primary purpose of this route is to create redundant routing. While redundancy is always preferred, eliminating routes like this one could make the project more affordable.
- We know there are other parties contemplating building east to west across the counties to reach to the western end of the UP. It makes sense to partner with these entities to reduce the cost of constructing these routes yourself. It might make sense to join in partnerships on these routes or to prearrange fiber swaps to use these routes in exchange for other fiber you plan to build.
- The electronics cost for lighting the fiber for this project are a lot higher than what we normally see for a project of this number of miles of fiber. The extra cost comes from two factors. The most expensive reason is that some of the fiber routes switch back and forth between fiber you would build and leased fiber routes. The cost of cramming the fiber signal onto a few leased fibers is expensive, and in the long-run will likely create a bottleneck on those leased routes if traffic volumes for the consortium members continue to climb over time. The second issue is that you create several different fiber rings in the east-central portion of the network which also adds extra cost. We don't have an easy solution for these problems, but we think some creative engineering designs might help to bypass or ameliorate these issues. It's worth exploring alternatives. We largely designed the fiber network that you asked for with the project, but perhaps a better question to ask going forward is if there are cost-savings alternatives -and what would you give up to save money?

Consider Reaching out to Potential Consortium Members

We know that you've been waiting for this report to get more serious with potential consortium members. Unfortunately, the first recommendation above says you should wait out the RDOF grant process that will award funding for last-mile broadband in the three counties in October. While the numbers in this study are not what you hoped for, the concepts in this paper are worth discussing. It's not too early to perhaps call together some preliminary meetings of the various stakeholders to talk about what a project like this might look like.

This report has highlighted some issues that are probably worth sharing with prospective consortium members. For example, the paper identifies the likely rough funding structure. The paper also discusses governance issues in detail. If the RDOF for the three counties goes to a fiber overbuilder then this project is not going to be needed. It's a judgment call if you want to start discussing these findings now or wait out the RDOF process first.

Consider Tackling the Project in Phases

It may be difficult or impossible to fund and build the whole project you have in mind all at once. The ability to so is going to depend upon being able to raise a lot of grant funding.

You should consider how you might instead proceed with smaller amounts of grant funding. For example, a smaller grant that might build fiber to connect a half dozen schools would mean that those schools could eliminate some of the leased transport they use today. If only one school on such a network can get fast broadband, then it could be shared with all.

There are likely to be some interesting grant opportunities over the next year or two, and many of those grants are going to favor solving the homework gap and funding better broadband for rural schools. You should keep abreast of these opportunities and build any fiber that you can. Every route of leased transport you can eliminate is a victory and is another step towards getting the schools onto a private network.

Be Persistent

If you are unable to build this entire network at one time, you need to be persistent, because it's a great goal. Even should somebody win the RDOF funding for the three counties to build fiber, there are likely going to be some fiber routes you'll need to build on your own. Don't get discouraged if you find partial solutions, because as long as you are persistent, you'll likely eventually achieve the goals you established in the RFP for this project.

EXHIBIT I: SUMMARY OF FINANCIAL RESULTS

		Assets	Grants	Debt	Member Fees	IRUs	Total Funding	Cash End of Year 20
1	**High Make-Ready**	$30.9 M	$14.3 M	$4.5 M	$1.9 M	$11.3 M	$32.5 M	$2.0 M
2	**Low Make-Ready**	$28.5 M	$13.4 M	$4.5 M	$1.9 M	$10.3 M	$30.1 M	$1.8 M
3	**No Membership Fees**	$30.9 M	$16.7 M	$4.5 M		$11.3 M	$32.5 M	$1.9 M
4	**Add 5% Contingency**	$32.1 M	$16.0 M	$4.5 M	$1.9 M	$11.3 M	$33.7 M	$1.9 M
5	**Schools / Cloverland Only**	$30.8 M	$19.1 M	$2.5 M	$0.8 M	$ 9.9 M	$32.3 M	$2.0 M