

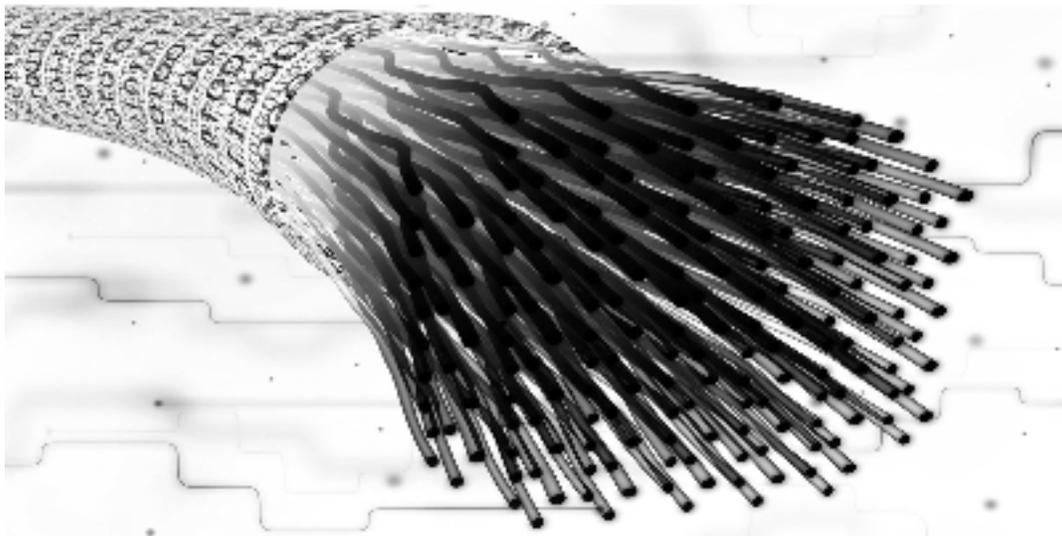


Providence City Technical Advisory Committee (TAC)

# Third Recommendation to City Council

## Municipal Fiber-Optic Network Technical Review

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### **Introduction**

The Providence City Technical Advisory Committee (TAC) is a volunteer advisory committee formed by Providence City Staff at the request of the Providence City Council to further advise the City Council on technical and logistical matters related to the pursuit of a municipal fiber-optic network. The TAC is made up of citizens and staff of Providence City and includes outside industry fiber-optic expertise. All citizens of Providence City have been invited to join the TAC based on interest and/or technical expertise related to the subject matter of municipal fiber optic networks. The TAC consists of members with expertise in the following minimum areas: electrical and computer engineering, public broadcast engineering, amateur and public radio, public works and construction, network engineering, and fiber-optic project management.

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## Background

To date, the TAC has provided a [first recommendation](#) to the City Council regarding a municipal fiber optic network followed by a [second recommendation](#) based on draft agreements pending further review by the TAC and City Council for the construction and operation of the fiber network. In the City Council Meeting, the City Council decided to pursue a memorandum of understanding (MOU) with Strata with the intent to proceed with a municipal fiber optic network. The [City Council](#) directed the TAC to continue its efforts in reviewing the technical and logistical aspects of the agreements and to mitigate risks to the extent possible. Since this time, the TAC has continued to meet with Strata to refine the Construction and Operation Agreements and to mitigate technical and logistical risks in the agreements. This document provides the TAC's third recommendation to the City Council regarding technical and logistical aspects of the final draft Construction and Operation Agreements being provided to the City Council. These recommendations are focused solely on technical and logistical considerations and in no way represent a legal review nor recommendation on legal aspects of the agreements.

## Frequently Asked Questions (FAQs)

The TAC has provided, in addition to its recommendations, a set of [frequently asked questions \(FAQs\)](#) and respective answers which can be found on the Providence City Website. The TAC continues to invite the City Council and the public to review the FAQs and provide any additional feedback or questions that would help to clarify the municipal network construction and operation plans.

## Summary of TAC Recommendations

The TAC has worked with Strata to improve the fiber optic network draft agreements and has reviewed the latest final draft Construction and Operation Agreements dated January 13, 2021. The TAC is satisfied that these agreements represent, and are in line with, the technical and logistical discussions held by the TAC in the interest of the City's pursuit of a municipal fiber optic network. The TAC is also satisfied that the technical and logistical risks have been mitigated to a minimal level in these latest agreements. The TAC appreciates

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the extensive efforts of Strata to fully resolve each of the risks and concerns brought forth by the TAC throughout the discussion and negotiation process.

Specifically, after reviewing these two agreements, the Providence City TAC recommends that the City Council continue pursuit of the municipal fiber optic network and specifically considers the following:

1. That the City Council seeks any legal counsel it determines necessary in order to ensure the agreements and associated actions are in-line with Utah State Code and that appropriate legal risks are mitigated.
2. That the Construction and Operation Agreements undergo final clerical / editorial review and then are signed once the City has appropriate funding and is ready to move forward in order to begin the construction and operation process of the municipal fiber optic network at the earliest possible date.
3. That the TAC continues to meet with Strata to review engineering plans, consult with City Staff, and provide technical and logistical feedback on each of the engineering phases.
4. That the TAC provides input to the City Staff and City Legal Counsel toward development of a retail service provider (RSP) agreement and pursuit of internet service providers (ISPs) for the municipal fiber optic network.

The Providence City TAC continues to support the City's emphasis on the importance of high-speed internet connectivity in today's fast-paced and communication-based world. The TAC believes that the Providence City municipal fiber optic network plans, as currently laid out, represent the start of a paradigm shift and a unique model for municipal networks.

In addition to confirming the specific direction the city should pursue, the TAC invites the City Council to provide further feedback to the TAC regarding additional work and any concerns raised by the City Council or citizens of Providence City.

For this purpose, the TAC awaits further input and specific direction from the City Council on how to proceed.

## Risks and Mitigation Plans

During review of the technical and logistic considerations in the Construction and Operation Agreements, the TAC recognized a number of risks and discussed mitigation plans for these risks. The listed set of risks is not intended to be comprehensive and only includes those risks associated with technical or logistical concerns. The TAC notes that a significant number of risks have already been mitigated in the latest agreements and so these are not included in the list below. Many risk items have already undergone some mitigation through TAC input and efforts.

In order to clarify which risks the TAC believes are associated with the immediate signing the Construction and Operation Agreements versus which risks are relevant during follow-up stages, the risk tables are split up accordingly.

### Risk Color Code:



Low Risk



Medium Risk



High Risk

### Immediate Risks:

Risk Level	Potential Risks	Mitigation Plan
Medium Risk	<b>GENERAL:</b> Insufficient subscription / take-rate of enhanced Internet services to pay for build-out. Risk is somewhat low due to low take-rate required but impact is very high if take-rate is not met.	<ul style="list-style-type: none"> <li>Marketing through basic Internet service and network ISPs.</li> <li>Pre-commitment priority fee option.</li> <li>Increased utility fee.</li> </ul>
Low Risk	<b>GENERAL:</b> Unable to persuade ISPs to join the Providence City open-access fiber network	<ul style="list-style-type: none"> <li>Network Operation agreement ensures that at a minimum Strata Networks will provide internet services</li> <li>Market opportunity to ISPs.</li> </ul>
Low Risk	<b>NETWORK CONSTRUCTION AGREEMENT:</b> The agreement supersedes all other negotiations and agreements including understandings	<ul style="list-style-type: none"> <li>Ensure that the Engineering Designs approved by the City</li> </ul>

	reached between the TAC and Strata.	sufficiently cover appropriate detail. Note, however, that there is a \$50,000 penalty if the City withdraws.
	<b>NETWORK CONSTRUCTION AGREEMENT:</b> If the City signs the Network Construction Agreement but does not give a “Notice to Proceed” in an appropriate timeframe or the City decides to terminate the agreement then the City must pay damages.	<ul style="list-style-type: none"> <li>• The City can sign the agreement once the City intends to and has the ability to proceed then immediately provides the official notice.</li> </ul>
	<b>NETWORK CONSTRUCTION AGREEMENT:</b> The scope of work in the draft agreement allows a significant amount of flexibility for the City and Contractor as the work plan is pursued. While some flexibility is required, the lack of detail also introduces risk in misunderstanding between the parties as to what is and is not included as part of the contract pricing and plan. The TAC has reviewed a significant amount of information from Strata regarding quality of materials, construction methods, and is generally satisfied; however, these items need further review in the Engineering Design phase prior to approvals.	<ul style="list-style-type: none"> <li>• Consider the risk and determine whether acceptable. Some mutual trust between parties is required based on understandings developed; however, these may not be legally binding should problems arise.</li> <li>• City Staff and TAC to review Engineering Designs prior to design approvals.</li> </ul>
	<b>NETWORK OPERATION AGREEMENT:</b> The draft agreement does not currently allow termination except for material breach.	

### Follow-Up Risks:

Risk Level	Potential Risks	Mitigation Plan
	<b>GENERAL:</b> Unforeseen problems or natural disasters during or after build-out	<ul style="list-style-type: none"> <li>• Agreements include Force Majeure considerations</li> </ul>

		<ul style="list-style-type: none"> <li>• Construction Agreement includes delay penalties for Contractor</li> <li>• The additional revenue from the fiber network, at some point in the future, could be used for unforeseen issues (as opposed for use in other areas of the city).</li> </ul>
	<p><b>GENERAL:</b> When there is an issue with Internet service it could be either the responsibility of the ISP, the network operator (e.g., Strata Networks in the PPP proposal), or the city. Who does the customer call?</p>	<ul style="list-style-type: none"> <li>• Add terms in the future ISP agreements to ensure the ISP is the point of contact for service issues. The ISP then works with the network operator and the city as-needed.</li> <li>• Consider whether the city can transfer calls to the city to appropriate ISP.</li> </ul>
	<p><b>GENERAL:</b> The customer might be confused about the receipt of two separate bills - one from the city with the Internet utility / service fees and one from the ISP.</p>	<ul style="list-style-type: none"> <li>• Communicate early with Providence City citizens to educate them on the process for selecting an ISP and how billing will work. See also FAQs.</li> </ul>
	<p><b>GENERAL:</b> Technology evolves quickly and enhanced bandwidth above the 1Gbps may be required for some customers</p>	<ul style="list-style-type: none"> <li>• TAC has reviewed oversubscription level of bandwidth in Operation Agreement</li> <li>• TAC / City Staff to ensure engineering plans include a minimum allowance for "jumpered"</li> </ul>

		<p>connections at a given Fiber Distribution Hub (FDH) to be converted to active ethernet or other options.</p> <ul style="list-style-type: none"> <li>• TAC recommends specifically utilizing XGS-PON equipment which has enhanced data-rate capability than traditional G-PON.</li> </ul>
	<p><b>GENERAL:</b> Providence City and its citizens are not satisfied with the services provided by a Network Operator or ISP (i.e., not meeting specific criteria)</p>	<ul style="list-style-type: none"> <li>• Ensure agreements with ISPs and the Network Operator are set for appropriate term lengths and provide specific criteria to ensure citizens of Providence City receive the expected service. Allow for Providence City to seek immediate alternatives if criteria are not met.</li> </ul>
	<p><b>NETWORK OPERATION AGREEMENT:</b> City is responsible for all fiber drops not covered in the construction agreement (see above construction agreement associated risk).</p>	<ul style="list-style-type: none"> <li>• Consider how the City will handle new fiber connections.</li> <li>• All existing residences are covered along with some planned growth in the Construction Agreement.</li> </ul>
	<p><b>NETWORK OPERATION AGREEMENT:</b> The City is obligated to a minimum payment to the Network Operator of \$7,400.00 per month or the subscriber fee - whichever is greater. This sets a minimum number of 370 subscribers required to</p>	<ul style="list-style-type: none"> <li>• In the Network Operation Agreement, this minimum requirement applies</li> </ul>

	cover the Network Operation fee.	only once construction is complete.
	<b>NETWORK OPERATION AGREEMENT:</b> The agreement does not have any minimum quality standards nor specific indication of the equipment or type of network to be deployed. The TAC recommends utilizing an XGS-PON network (or G-PON network in sub-parts of the city where there is no or little subscription). Furthermore, the TAC recommends setting a maximum fiber distribution split of 1:64 (though less is better) in order to accommodate both the legacy and improved network type.	<ul style="list-style-type: none"> <li>• City Staff and TAC will incorporate consideration as part of Phase I engineering design review.</li> </ul>
	<b>RETAIL / INTERNET SERVICE PROVIDER AGREEMENT:</b> This agreement has not been created nor reviewed. Create this document and ensure minimum cybersecurity requirements including prevention of account modification using social engineering techniques ( <a href="https://www.businessinsider.com/hacker-social-engineer-2016-2">https://www.businessinsider.com/hacker-social-engineer-2016-2</a> )	<ul style="list-style-type: none"> <li>• TAC will work with Strata to provide input on technical and logistical review for appropriate ISP requirements in the RSP / ISP agreement with the City.</li> </ul>

The TAC welcomes additional input and direction from the City Council regarding any additional risks or mitigation plans that should also be considered related to technical or logistical aspects of the proposed municipal fiber-optic network during the engineering design phases should the agreements be signed.

## Next Steps

The TAC awaits further direction and/or confirmation regarding the recommendations provided herein. Should the City Council choose to continue pursuing a municipal fiber-optic network, the following next steps are recommended:

1. The City Council is invited to direct the TAC regarding next steps and request specific review of any technical or logistical items requiring further explanation or understanding.

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2. Once the agreements are signed, the TAC recommends continuing its efforts by helping consult with City Staff regarding technical details for Phase I engineering design as they become available.

## **Conclusion**

The Providence City volunteer Technical Advisory Committee (TAC) appreciates that the City Council has pursued a municipal fiber-optic network. Providence City is a beautiful place to live. By adding critical fiber infrastructure to the city, Providence City will be a front-runner and exemplar for other cities in Cache Valley. The TAC invites the City Council to consider the recommendations provided herein and to give direction and feedback on this matter.

Respectfully,

The Providence City Technical Advisory Committee (TAC)

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## Appendix 1: Related Fiber Network Definitions

Fiber-optic Cable	A glass cable that uses light waves to transmit data that consists of a fiber bundle or single fiber, strength members, and a cable jacket.
Open Access Network	An open-access network (OAN) separates the physical access to the network from the delivery of <u>services</u> . In an OAN, the owner or manager of the network does not supply services for the network; these services must be supplied by separate retail/content (ISP) service providers.
Utility Model	A business model whereby a city installs, operates and maintains a physical fiber network that is connected to all city addresses and all residents pay a minimum “utility” charge.
Subscription Model	A business model that installs fiber trunk lines to every city street, but only connects and charges those addresses that “subscribe” to the network.
Active Ethernet	An Active Ethernet network has a direct point to point connection that provides a dedicated link from the network to the subscriber.
PON/GPON	Passive Optical Network (PON) is a point-to-multipoint access network. Its main characteristic is the use of passive splitters in the fiber distribution network, enabling one single feeding fiber from the provider to serve multiple homes and small businesses. GPON is Gigabit Passive Optical Network.
Aerial Installation	Installation of cable above ground on existing power company poles.
Inground Installation	Underground installation of fiber conduit and cable.
Service Drops	A connection to a customer facility from the network cabinet.
Take-rate	The percentage of subscribers out of the total number of available service addresses.
Micro-Trenching	Micro-trenching is an installation method in which a narrow and relatively shallow trench is cut, usually on an asphalt roadway. Trench dimensions can range from .75 to 2.24 inches wide and 8 to 16 inches deep.
Nano-Trenching	A shallower trenching method than micro trenching; google fiber used this in some locations and cable was popping out of the asphalt.
Directional Drilling	Directional drilling (HDD), is a minimal impact <u>trenchless</u> method of installing underground utilities that offers significant environmental advantages over traditional cut and cover pipeline/utility installations. The technique is routinely used when conventional trenching or excavation is not practical or when minimal surface disturbance is required.

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Missile Boring	Missile boring, also known as horizontal boring, underground pneumatic boring, or impact boring is a method of point to point underground boring. Missile boring has been utilized as a standard for installation of public utilities.
Pedestal	A telecommunications pedestal is a ground-level housing for a connection point for underground cables. Pedestals are used for CATV (known as a cable box in such a situation), telephone, <u>PONS</u> , and other telecommunications systems.
Franchise taxes	The term franchise tax refers to a tax paid by certain enterprises that want to do business in a government jurisdiction.
Backbone	A backbone interconnects and ties together diverse network locations together located at different geographical locations.
Ring Topology	In a ring network, every device has exactly two neighboring devices for communication purposes. It is called a ring topology as its formation is like a ring.
Star Topology	In a star topology there exists a <u>point-to-point connection</u> between a node and hub device. The hub device takes a signal from any node and passes it to all the other nodes in the network. The hub works as a server and it controls and manages the entire function of the network.
Symmetrical Connections	In a symmetrical internet connection, the upload and download speeds are the same.
Cabinet, Shed, Hut	An enclosure that houses electrical equipment.
Hub	A hub is a basic networking device that connects multiple computers or other network devices together. Unlike a network switch or router, a network hub has no routing tables or intelligence on where to send information and broadcasts all network data across each connection. Sometimes the term hub is also used to indicate a location where various interconnections occur physically in a star topology.
Churn / Replacement	Churn is customer turnover. Replacement is making up for lost customer business.
Main Line / Trunk Line	The primary fiber backbone or line from which feeder lines are split off.
Feeder Line	A feeder line is a peripheral route or branch in a <u>network</u> , which connects smaller or more remote nodes with a route or branch carrying heavier traffic.
Infrastructure Fee	A fee charged to pay for the cost of network infrastructure.
Network Refresh Fee	A fee paid to cover the cost of replacing equipment that fails, needs repair or becomes obsolete.

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Network Operator Fee	A fee paid to the contractor that oversees and manages the network.
Internet Service Provider Fee	A fee charged by an Internet Service Provider (ISP) for content including an internet connection, phone service and programming.
Total Retail Fee	The total amount charged to the customer including the Infrastructure Fee, the Network Operator Fee, the Network Refresh Fee, and the Internet Service Provider Fee.
Internet Service Provider (ISP)	An Internet service provider (ISP) is a company that provides customers with Internet access, often referred to as “the provider.” Services, such as telephone and television services, or personal websites or home pages may be provided. The services and service combinations may be unique to each ISP.
Content Provider	An ISP that typically provides connection to Internet services.
Landline	A phone connection via a wired network as opposed to a wireless connection such as cell service.
Megabit (Mb), Gigabit (Gb)	Megabit = 1,000,000 one million bits; Gigabyte 1,000,000,000 one billion bits, a thousand times more than a megabit. Bit = a unit of computer information or data-storage capacity that consists of a one or a zero. A byte is made up of 8-bits and therefore a megabyte and gigabyte are 8 times larger than a megabit and gigabit respectively.
Megabits per Second (Mbps), Gigabits per Second (Gbps)	Common data-rate metrics which express the number of bits per second sent across a network [see also Megabit (Mb), Gigabit (Gb) above].
UTOPIA/UIA	A fiber network service in Utah started about 15 years ago that serves about a dozen cities. UTOPIA offers a turn-key service at no cost to a city government as long as a certain threshold number of subscribers is achieved.
Network Operations Center	A network operations center, or NOC (pronounced “knock”), is a centralized location where IT technicians directly support the efforts of <u>remote monitoring and management (RMM) software</u> .
Telemetry	Telemetry, in general, is a term for technologies that accommodate collecting information in the form of measurements or statistical data, and forward it to IT systems in a remote location.
Broadband	Broadband is data transmission that transports multiple signals and traffic types. The medium can be coaxial cable, optical fiber, radio or twisted pair. In the context of Internet access, broadband is used to mean any high-speed Internet access that is always on and faster than dial-up access.
FTTP	Fiber To The Premises (FTTP) is a fiber optic cable delivery medium that provides Internet access directly to a user or groups of users from an Internet service provider (ISP).

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Public Private Partnership (PPP)	A public-private partnership is a cooperative arrangement between two or more public and private sectors, typically of a long-term nature. In other words, it involves government and business that work together to complete a project and/or to provide services to residents.
5G/Wifi Small Cells	Small cells are low power, short range wireless transmission systems (base stations) to cover a small geographical area or indoor / outdoor applications.
Smart City Initiatives	A smart city initiative uses different types of electronic sensors to collect data. Insights gained from that data are used to manage assets, resources and services efficiently; in return, that data is used to improve the operations across the city. This includes data collected from citizens, devices, buildings and assets that is then processed and analyzed to monitor and manage traffic and transportation systems utilities, water supply networks, waste, crime detection, information systems, schools, and other community services.
Redundant Network	Redundancy is the installation of additional or alternate network devices or equipment to ensure availability in the case of device or path failure to avoid an extended outage. A ring topology is redundant by nature because two paths exist to a given interface.
Backhaul	A backhaul is the communication and network infrastructure responsible for transporting communication data from end users or nodes to the central network or infrastructure and vice versa. It is the intermediate communication infrastructure that connects smaller networks with the backbone or the primary network.