UDOT FIBER OPTIC PROGRAM PLAN

August 2023

UTAH DEPARTMENT OF TRANSPORTATION
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1 INTRODUCTION

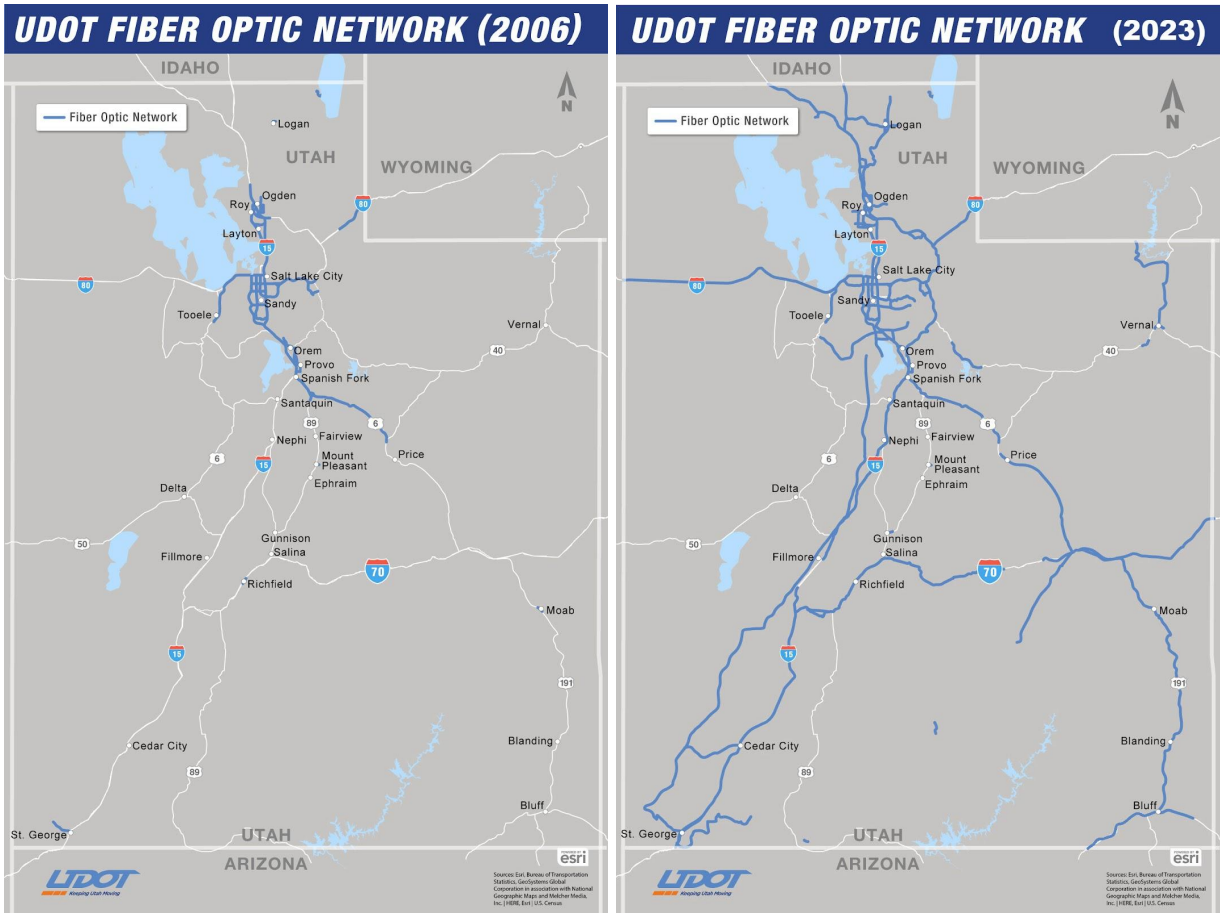
The Utah Department of Transportation (UDOT) has been actively deploying fiber optic infrastructure along the state highway system for many years. High-speed broadband has been critical to supporting and expanding UDOT's Intelligent Transportation System (ITS). For 20 years, UDOT has been using fiber optics to connect traffic cameras, road signs, weather stations, and other sensors to the UDOT fiber network to provide instantaneous traffic updates. Expanding the statewide UDOT fiber network results in safer roads and positions Utah as a leader in connected and automated vehicle (CAV) technology and connected traffic management.

Originally spurred on by changing technologies and infrastructure development ahead of the 2002 Winter Olympics in Salt Lake City, UDOT has continued to expand the network and potential uses for the system. In recent years, this expansion can be seen in many different technology innovations. One example is UDOT's connection of 98% of all UDOT buildings and maintenance sheds to the fiber network. This provides better network security, faster connection speeds and the separation of the ITS network from the Division of Technology Services (DTS) state business network.

Middle-mile fiber optic infrastructure is critical in expanding last-mile, fiber-to-the-home connections. As an open-access network, providers are able to connect to the UDOT middle-mile and provide last mile connections to serve residents and business across Utah.

UDOT currently installs conduit and fiber optics as part of road construction projects and then exchanges use of that fiber to telecommunication companies to expand the overall reach of the network. This process is called public, private, partner, (PPP) resource sharing. The UDOT statewide fiber optic network consists of a combination of UDOT owned fiber optic cable and conduit, and PPP resource shared fiber optic cable, conduit and circuits. The UDOT fiber optic network spans 3,400 miles along federal, state, and local transportation corridors. Of these miles, 40% are UDOT-owned and 60% are resource-shared fiber negotiated through public-private trade agreements.

This plan serves as an update to the 2020 Fiber Optic Strategic Plan and is developed in collaboration with the state's connectivity goals. This plan aims to support local efforts to connect all unserved and underserved Utahns to affordable, reliable high-speed internet. Using this document as a roadmap, UDOT will continue to build on the momentum and success of past middle-mile efforts and continue to lead the nation in middle-mile development.



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2 PLAN OVERVIEW

2.1 Vision

Utah is a beautiful state that offers a thriving economy, year round access to recreation, a strong education system, and affordable living. A well functioning transportation system plays a critical role in enhancing quality of life. UDOT is responsible for planning and implementing transportation solutions that support the high quality of life available in Utah.

UDOT's Transportation Vision is a shared plan for statewide transportation that supports and maintains the quality of life in Utah. To this aim, UDOT advances transportation initiatives that contribute to good health, better mobility, a strong economy and connected communities.

The UDOT fiber optic network supports statewide traffic management systems that help to keep Utah moving. This plan seeks to contribute to an enhanced quality of life in Utah through:

- Improving roadway safety with a goal of zero fatalities.
- Improving reliability by increasing the redundancy and resiliency of existing fiber networks.
- Connecting communities to high-speed internet through public/private partnerships.
- Preparing and positioning UDOT as a national leader in connected and automated vehicle technology.

2.2 Goals and Objectives Look at Long-Range Plan

To support statewide broadband planning efforts and to continue fulfilling the overall goals of UDOT as a whole, this plan will outline specific goals and objectives that will be used to inform an actionable implementation plan. The goals, objectives, and implementation strategies reflected in this plan will be carried out by UDOT and its partners. With the above stated vision and commitment to fiber optics expansion from UDOT, the following goals, separated into four categories, can be achieved within the five years of this plan:

2.2.1 Better Mobility

UDOT optimizes traffic mobility through the use of new technologies which rely heavily on the interstate fiber backbone. UDOT is continually pioneering new technologies that would not be available without those connections. Having the means to create and implement new technologies on Utah roadways means improved traffic management,

added roadway capacity and innovative designs that keep drivers safe and informed. To keep Utah moving, UDOT aims to give all users of the transportation system choices, so they can get where they want, when they want, in the way they want – safely.

- **Goal 1: Align fiber optic expansion with ITS needs in next 5 years** – The UDOT ITS includes approximately 4,500 devices that require high-speed data connections to provide safety and mobility improvements. Fiber network connections are needed to provide reliable real-time control of safety devices and accommodate the mobility needs of our rapidly expanding population and economy.
- **Goal 2: Connect 100% of the Interstate System to the fiber optic network** – The Interstate System is the highest functional class roadway with the most vehicle miles traveled (VMT). This system provides access to hard to reach communities and is one of the backbones of the Utah economy. The Interstate System is also attractive to private sector investment due to the limited number of access points, less utility conflicts, less land owners to navigate and easier to construct pathways. In 2024, UDOT will reach 100% fiber connectivity on Utah's Interstate System.

2.2.2 Good Health

Having a fiber backbone along interstates allows UDOT to use ITS technologies to know what's happening at any given time. UDOT can provide support in contacting emergency services or public safety dispatchers to assist drivers. Additionally, UDOT's fiber backbone encourages cellular providers to utilize the conduit to provide more options for cellular connectivity.

- **Goal 3: Facilitate roadway safety enhancements and 911 coverage through connection to the fiber optic network** - The first of UDOT's Strategic Goals is to reduce crashes, injuries and fatalities on Utah roadways down to zero. In 2021, there were 61,406 crashes and 297 fatalities on Utah roadways. The fiber optic network is a key part of the solution for achieving the Zero Fatality goal. High speed communication enables UDOT to provide safety technologies to detect hazards, inform motorists of hazards, inform first responders of incidents and facilitate incident response operations. It gives the ability to have real time situational awareness of the roads and their conditions.

  Many rural communities lack access to high speed broadband or lack wireless 911 coverage. Many of these situations require UDOT to make an investment and may not be possible through resource sharing due to the lack of customers. Rural broadband opens markets to small communities and allows access to jobs

without having to add VMT to the transportation system. The recent 2021 connection to Howell is a good example of this. There are now 2 providers servicing this area where there used to be none.

2.2.3 Connected Communities

UDOT recognizes the importance of broadband (high-speed internet) for residents to access all needed resources to support their quality of life. UDOT's fiber network directly impacts many Utahns ability to access vital resources for remote work, telehealth and virtual learning opportunities.

- **Goal 4: Improve redundancy and resiliency of fiber optic network** – UDOT has created over 3,400 miles of fiber optic communications systems either directly owned or through fiber optic resource sharing and there is a need to improve network redundancy and resiliency to ensure the network remains available when needed. No one thinks about resilience until it is needed. The goal is to identify the areas that need additional connectivity and be proactive at planning, building, and establishing that critical infrastructure.
- **Goal 5: Coordinate with other States and Tribal Nations to provide well-rounded connectivity across borders** - UDOT is committed to serving all people who travel in and through the state, which includes those who live near or between state borders, Tribal nations that geographically span large areas between states, and travelers on Utah roads. DOT coordination between surrounding states will be crucial to providing the best possible connectivity to individuals and communities that span over borders. UDOT is also a participating member of the Western States DOT Fiber Group. This group is composed of state DOT's such as Arizona, Nevada, Colorado, New Mexico, Wyoming, Idaho, Oregon, Washington, and Utah. Every year there is a Western States Fiber Summit where the DOT's get together and review legislation, barriers and defining partnerships across state boundaries. This has been especially useful with coordination of federal funds for broadband.

- **Goal 6: Coordinate with city and counties to build middle mile fiber to local last mile projects** - Coordination between UDOT and local municipalities leaders will be essential in order to get all unserved and underserved homes access to broadband across the state. With close coordination, resources and funding can be maximized and the impact of projects can be expanded.

  One of the advantages of the UDOT middle mile fiber network is that it can reduce the cost and complexity of deploying new infrastructure. Rather than building new fiber optic cables, telecoms can use existing UDOT fiber and conduit to provide broadband services to customers. This can make it more feasible for telecoms to expand high-speed internet service in rural areas where the population density may be lower and the cost of deploying new infrastructure is higher.

FIBER IN ACTION

One of the biggest broadband successes in Utah, directly influenced by UDOT's fiber network, is the Silicon Slopes development located in Utah County. Silicon Slopes is a 501(c)(3) nonprofit organization led by Utah tech and business leaders. This group exists to empower the community to learn, connect, and serve. Major business tycoons such as Adobe, Ancestry.com, Qualtrics and Texas Instruments, among many others, are part of Silicon Slopes. In 2007, the information sector (which includes software publishing) only made up 3% of employment in Utah. Today, it has more than tripled and currently makes up 10% of local employment. None of this growth would have been possible without the access to reliable high-speed internet infrastructure provided by UDOT.

2.2.4 Strong Economy

UDOT is committed to building a strong interstate network which is and will continue to be the backbone to broadband expansion throughout the state. Broadband availability, accessibility and affordability are major factors in shaping the state's economy now and in the future. Another factor that influences the economy is business and commerce. Transportation technologies play a vital role for both. Where jobs, housing, recreation and educational facilities are placed relative to transportation options makes a big difference in how people spend money and move around. Transit-oriented development makes a difference in housing equity. A study

- **Goal 7: Support economic growth and innovation throughout Utah** - The fiber backbone that runs along the interstate system creates middle mile connections that are the stepping stones for telecoms to create last mile connections. These connections help bring broadband to unserved and underserved areas. A broadband connection helps build local economies by allowing rural communities the option of remote work, it attracts more businesses, it provides better tax benefits and it allows more opportunities for residents to access education and training, which directly benefit the workforce in the state.

With the above stated vision and commitment to fiber optics infrastructure, by 2026, UDOT will have over 3,500 miles of fiber optic cable. Additional fiber enables strategies that will improve safety, mobility, and economic development in Utah.

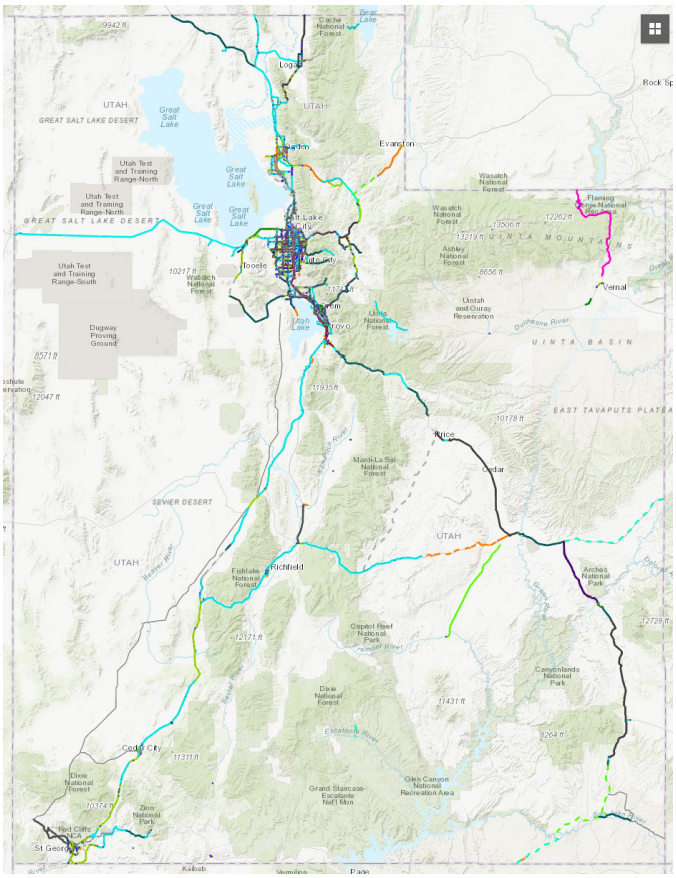
3 ASSET INVENTORY

UDOT fiber optic assets include existing infrastructure, programs and activities that can be leveraged to expand the statewide middle-mile network. These assets are detailed below.

3.1 Existing Fiber Optic Program & Processes

Existing Fiber Optic Network

The UDOT fiber optic network includes a combination of UDOT-owned and resource shared fiber optic cable that spans more than 3,400 miles along Federal, State, local government, and private transportation corridors. Of these miles, 40 percent are UDOT-owned fiber and 60 percent are resource shared fiber leased from private companies through trade agreements for government owned right-of-way, conduit, and fiber.



This network connects ITS devices and government facilities along the Wasatch Front to the far reaches of Utah in St. George, Blanding, Monument Valley, Moab, Kanab, Wendover, Logan, Snowville and Vernal as well as many communities in between. Most corridors with high traffic volumes currently have fiber coverage.

UDOT has developed an extensive GIS-based mapping tool that shows the location of all existing fiber, trade fiber, and fiber needs, and can be found online at http://projects.horrocks.com/arcgis/udotfiber.html.

Right-of-Way Access

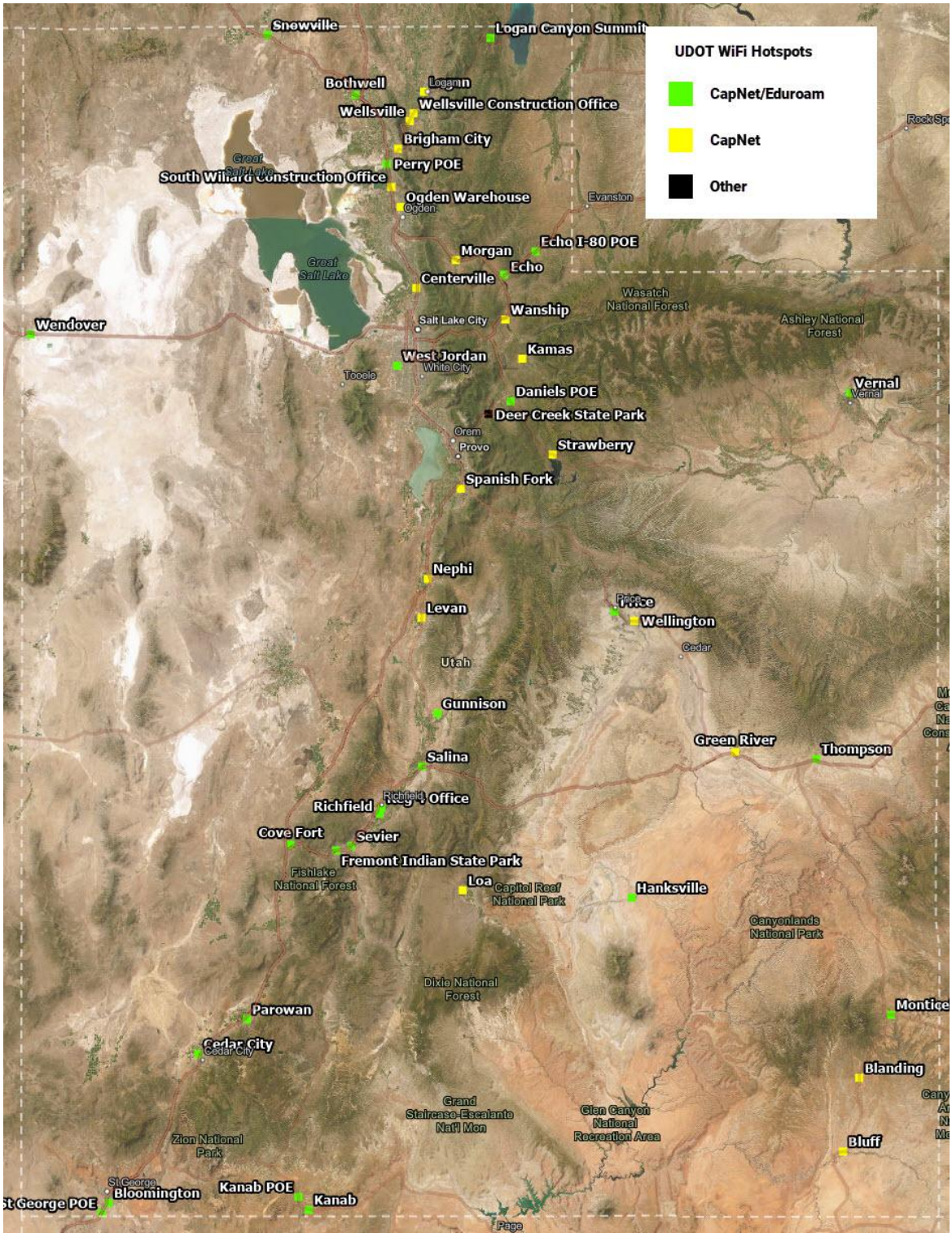
In 1999, Utah passed legislation (S.B. 150) allowing telecommunications providers access to the right-of-way (ROW) on interstate highways. This allowed UDOT to leverage highway ROW to install conduit and fiber optics during road construction projects. Seeing the opportunity this provided, UDOT formed a shared resource framework that allowed public-private partnerships with telecoms. Telecoms are able to utilize excess state-owned conduit in exchange for UDOT use of private assets in areas

where UDOT does not have infrastructure. This has resulted in the explosive growth of the UDOT fiber network and has expanded the reach of telecoms to many unserved and underserved locations.

UDOT Maintenance Shed Wi-Fi Hotspots

UDOT began the process of installing and activating high-speed Wi-Fi hotspots at each of its maintenance shed locations in 2020 as part of CARES Act funded projects. In addition to expanding fiber optic infrastructure along I-84 and I-70, publicly accessible hotspots were installed in Box Elder, Sevier, Millard and Emery Counties. Due to the popularity of these hotspots, UDOT continued to invest state dollars to extend public hotspots to all UDOT maintenance sheds. There are currently more than 46 connected maintenance sheds with plans to connect all maintenance sheds by 2026. UDOT hotspot locations can be found on the GIS map.

The map below indicates locations where UDOT has installed and activated free public Wi-Fi hotspots. This map will continue to evolve and be updated and the most current Wi-Fi hotspot deployments can be found here.



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3.2 Funding Sources

The purpose of this section is to outline activities that will support universal service, identify key players responsible for implementing these activities, specify funding sources and highlight the expected outcomes for each planned activity. Universal service is the principle that all Americans should have access to both telecommunications and high-speed internet at just, reasonable, and affordable rates.

Program	Total	Agency	Purpose	Timeline	Match Requirement
Capital Projects Fund for Broadband	$10B	U.S. Treasury	Funds projects that enable work, education, and health monitoring in response to the COVID-19 pandemic.	All funds must be expended by Dec. 31, 2026	No match requirement
Broadband Equity, Access and Deployment (BEAD) Program	$317M (BEAD allocation for Utah)	NTIA. Administered locally by the Utah Broadband Center	Federal grant program to fund broadband expansion to unserved and underserved locations. Planning grant: $50K	Implementation: 2024-2026	25% of project costs except in certain high-cost areas
ReConnect Grant Program (100%)	Max award: $25M Program total: Up to $150M	USDA	Funding for construction, improvement, or acquisition of facilities and equipment needed to provide broadband service to rural communities. UDOT provides	Ongoing	25% of overall project cost

			letters of support and technical assistance to ISPs applying for ReConnect funds.		
ReConnect (Loan/Grant Combo)	Max award: $25M loan, $25M grant Program total: Up to $300M available	USDA	Funding for construction, improvement, or acquisition of facilities and equipment needed to provide broadband service to rural communities. Loan represents 50% of project cost with interest set by the US Treasury. UDOT provides letters of support and technical assistance to ISPs applying for ReConnect funds.	Ongoing	N/A
Discretionary Grant Funding Programs	Dependant upon approval	USDOT	Funding for construction, improvement, or acquisition of facilities and equipment needed to provide broadband service to rural	Ongoing	Dependent upon grant program

			communities. The Federal Highway Administration and National HIghway Traffic Safety Administration are the main bodies overseeing DOT fiber optic grant programs		

4 NEEDS AND GAPS ASSESSMENT

To ensure that all Utahns have access to high-quality broadband internet, a needs and gaps assessment is essential. This assessment will identify gaps in UDOT's fiber backbone connections and focus on how the expansion of middle-mile infrastructure will improve connectivity across the state. Through needs identification, data collection, and analysis, UDOT can develop and implement strategies that address these gaps, and focus on and prioritize expanding middle-mile infrastructure to areas of the state with the large concentrations of unserved and underserved households.

In evaluation of the current state of the UDOT fiber optic network while considering last-mile connections needed in areas with high numbers of unserved and underserved households, UDOT will focus deployment and expansion to the following areas when they align with STIP projects.

- San Juan County
  - SR-276
  - SR-261
  - US-191
- Duchesne and Uintah Counties
  - US-40
  - US-191
  - SR-35
- Box Elder County
  - SR-13

    - SR-102
- Cache County
    - SR-23
    - SR-165
    - SR-142
    - SR-218
    - UT-101
    - SR-61

On the UDOT fiber map, sections of highway are marked if they are a priority area UDOT wishes to run fiber through or if they are segments of road that have projects or funding for deploying fiber in the near future. State highways that do not yet have UDOT fiber in them often do not have any fiber in them due to their remote locations.

4.1 Metrics for System Use & Reliability

The reliability of communication between the central system and ITS devices has been greater than 94% since 2020. UDOT uses Spanning Tree, AIMS, and What's Up Gold maintenance database software to track fiber connectivity. If a link in the network goes down, the system will automatically reroute information through an alternative path if available. If an alternate path is not available, the AIMS system auto-generates a work order for the maintenance staff to investigate and make necessary repairs. With the current network monitoring system, damaged links of fiber may go unnoticed if there is an alternate path. This has been problematic in identifying causes of damage and reimbursement for repairs. Newer systems are in development to replace and upgrade current monitoring systems.

Bandwidth in the network is generally limited to the capacity of switch hardware located in field cabinets and communication hubs. UDOT completed the process of upgrading all branch line field switches to one gigabit per second (GBPS) and backbone hub switches to 10 GBPS capacity.

5 OBSTACLES AND BARRIERS

UDOT has identified various obstacles related to broadband deployment and adoption within the state. These obstacles include environmental clearance, right-of-way, permitting, funding, geography, and redundancy.

Environmental Clearance

Broadband projects, whether local or statewide, face significant challenges as it relates to the environmental clearance process. Navigating the regulatory framework for clearance and permitting can be time consuming and costly for broadband projects. Many broadband funding mechanisms are time based which is often in conflict with lengthy environmental processes. As UDOT fiber optic projects move through development and design, the risk of delays must be evaluated and solutions must be developed to ensure expedited project deployment.

Right-of-Way and Permitting

It is important to obtain various permits at the earliest stages of implementation. This includes coordinating with utilities; addressing canal and waterway crossings; securing railroad permits; obtaining federal, state, and local permits in the right-of-way; and obtaining easements when broadband equipment encroaches land outside of the public right-of-way.

The table below shows many of the permitting entities withinUtah with longer lead times. Initiating the permitting application process promptly is essential to meet any of the implementation deadlines. It is important to note that this list is not an exhaustive list and may evolve between the publication of this plan and the construction phase.

Level	Approximate Timeframe for Permitting	Entity
Local	30 Days	City Engineering
Local	30 Days	County Engineering
State	30 Days	State Parks and Recreation
State	30 Days	State Trust Lands

State	30 Days	State Wildlife Reserve
State	30 Days	UDOT
Federal	180 Days	Bureau of Indian Affairs
Federal	180 Days	Bureau of Land Management
Federal	180 Days	National Park Service
Federal	180 Days	U.S. Corps of Engineers
Federal	180 Days	U.S. Forest Service
Utility	45 Days	Electrical Company
Utility	45 Days	Gas Company
Utility	45 Days	Other Telecom
Railroad	90 Days	Union Pacific Railroad
Tribal	Unknown	Tribal Lands

Funding

One of the biggest barriers to middle-mile deployment is the high upfront cost of deploying fiber optics over long distances. Bringing connections to remote areas from a fiber optic backbone requires significant investment and securing funding can be challenging. Additionally, many of the funding mechanisms for fiber optic infrastructure emphasize or require last mile connections which is not the role that UDOT plays in fiber optic expansion.

Geography and Rurality

Utah is a large state with a diversity of terrains many of which can make fiber optic deployment physically difficult and costly. Additionally, the rural areas of Utah make up 77% of the state's land but only houses 12% of the state's population. The rurality of these areas combined with high deployment costs acts as a barrier to private investment in these areas. This underscores the importance of UDOT investment in

middle mile infrastructure to open these rural markets up to affordable, reliable last mile connections.

Redundancy
Successfully connecting communities in Utah requires diverse fiber paths along middle mile connections. Redundancy is critical to ensuring that a single cut or disturbance in the network does not result in a widespread outage. Redundant service is especially critical during natural disasters or other emergency situations.

Despite these challenges, the UDOT fiber optic network is a critical piece of infrastructure vital to improving overall internet connectivity. The expansion of middle-mile networks enables last-mile providers to reach end-users. Overcoming these obstacles is imperative to achieve the long-term vision for connectivity in Utah.

6 IMPLEMENTATION PLAN

6.1 Priorities and Implementation Plan

Planned Activity	Key Stakeholders	Project Estimates Funding Sources	Estimated Timeline	Status as of July 2023
Logan Canyon (Highway 89)	UDOT, U.S. Forest Service, Cache County, Rich County, Public Safety, Century Link, CentraCom, First Digital, Pacific Corp. , State Parks, Cellular Companies, Crown Castle,	$20,000,035	2024	Funded (Capital Projects Fund for Broadband) Under Construction
Trappers Loop (SR-167 and I-84)	UDOT, U.S. Forest Service, Morgan County, Public Safety, Beehive Communications, Liberty Communications,	$10,000,000	2025	Funded (Capital Projects Fund for Broadband) In Design

	UTOPIA, Utah State Parks, Cellular Providers, Weber County, Morgan County, Huntsville Town, Morgan City, Snowbasin Resort			
Levan (SR-28, U.S. 50, SR-260, U.S. 89, SR-31)	UDOT, Utah County, Juab County, Sanpete County, Sevier County, Santaquin, Mona, Nephi, Levan, Fayette, Gunnison, Centerfield, Thistle, Birdseye, Pines, Indianola, Hill Top, Fairview, Mount Pleasant, Spring City, Ephriam, Manti, Sterling, Axtell, Salina, Aurora, Sigurd, Public Safety, State of Utah, CentraCom, Fairview Power, U.S. Forest Service	$16,600,000	2026	Funded (Capital Projects Fund for Broadband) In Design
Jurassic (U.S. 40)	UDOT, Ute Tribe, Strata Networks Public Safety, State Parks and Recreational Areas, Wasatch County, Duchesne County, Uintah County, Heber City, Duchesne, Roosevelt, Vernal	$30,000,000	N/A	Not Funded

Duchesne Energy Corridor (SR-191 to SR-6)	UDOT, Ute Tribe, Emery Telcom, Strata Networks, UCA, Public Safety, Cellular Providers, Carbon County Duchesne County, Duchesne	Included in road rehab project	2026	Funded In Design
Capitol Reef (SR-24)	UDOT, Public Safety, Emery Telcom, South Central Communications, Beehive Communications, National Park Service, Utah State Parks, Ticaboo, Bullfrog, Torry, Wayne County, Garfield County, Kane County	Blanding to Hanksville $38,819,475 Hanksville to Torry $14,789,792 Torry to Boulder $11,536,515 Extension to Bullfrog (UT-276 MP 0-37) $8,389,822 **Total Project Cost: $119,897,484**	N/A	Not Funded
Zions (UT-9)	UDOT, Public Safety, Centurylink, South Central Communications, National Park Service, Washington County, Kane County, Springdale, Rockville	$14,358,162	N/A	Not Funded
US-89; Kanab to I-70	UDOT, Public Safety, South Central Communications,	$25,538,102	N/A	Not Funded

	Utah State Parks, Piute County, Sevier County, Garfield County, Kane County, Kanab, Orderville, Glendale, Hatch, Panguitch, Circleville, Junction, Marysvale, Sevier			

6.2 Key Execution Strategies

Drawing on the vision and goals in Section two, this section explains the specific strategies that UDOT will implement to accomplish the goals. These strategies, which apply to all goals, are focused on core processes and methods to continue to guide the development of UDOT's Fiber Optic Program.

Strategy 1: Utilize Resources to Progress the Fiber Optic Program

UDOT uses a combination of in-house staff and engineering consultant staff to maintain the fiber network. UDOT staff includes a network manager and two maintenance technicians located at the Traffic Operations Center. For each region there is a project manager to oversee ITS projects and a utility locator to mark UDOT conduit locations for staking and during construction. Engineering consultants supplement UDOT staff with inventory of the fiber network, maintenance of a network GIS database, development of fiber splice details, trade partner coordination, design engineering, and construction management.

In addition to the Fiber Optic Program and system growth opportunities, there are opportunities to grow the team that leads the Fiber Optic Program. Adding a full-time employee to the Fiber Optic Program team at UDOT as well as future fiber optic maintenance staff within regions would provide a continued focus on the growth and maintenance of UDOT's fiber optic network. UDOT's Fiber Optic Program Network manager will continue to explore opportunities to fund these additional roles.

Strategy 2: Uphold Technical Standards Throughout Development of the Fiber Optic Program

UDOT maintains comprehensive technical standards for design and construction of fiber optics, enabling complete and consistent implementation of conduit, cable, splice vaults, and communications hubs. The Traffic Management Division continues to foster coordination between design, construction, and maintenance staff to identify and incorporate lessons learned into the standard drawings, manual of instruction, and specifications.

Strategy 3: Identify and Obtain Funding to Expand the UDOT Fiber Optic Program

The UDOT Fiber Optic Program will utilize the Statewide Transportation Improvement Program (STIP) to continue to expand the statewide middle-mile fiber network. The STIP program is a six-year plan of highway and transit projects for the State of Utah. The STIP includes projects on the state, city and county highway systems as well as projects in national parks, national forests and Tribal lands. The UDOT Fiber Optic Program maintains an interactive map detailing STIP projects and UDOT fiber optic needs. This map can be used to coordinate and integrate fiber optic expansion into planned roadway improvements.

The UDOT Fiber Optic Program will implement a joint build approach to share costs, maximize transportation funding impact, and expedite construction and deployment of broadband to unserved and underserved areas. This joint effort will connect multiple new internet points through the State and offer opportunities for last mile connections.

As STIP funds projects, the UDOT Fiber Optic Program will identify opportunities to partner with those projects and install UDOT fiber and conduit during the design and construction of STIP projects. Recommendations for upcoming STIP projects that align with UDOT middle mile needs are documented in the UDOT Fiber Broadband Plan GIS map.

The UDOT Fiber Optic Program will evaluate and prioritize joint projects based on a number of criteria. Consideration will be given to:

- Potential number of community anchor institutions served.
- Last mile fiber service to potential subscribers along the route.
- Improvements to network redundancy.

UDOT's Traffic Management Division requests State and Federal funding for fiber network expansion projects that meet a specific need of connecting traffic signals, ITS devices, UDOT buildings or government facilities to the central system. Additional discretionary funding may also be used for fiber projects. These funding sources are

limited and vary depending on UDOT and Metropolitan Planning Organization (MPO) priorities each fiscal year.

Most UDOT-owned fiber and conduit is installed as part of roadway and structure projects. This procurement method has two advantages over stand-alone fiber projects – first, roadway and structure projects generally have a higher priority for funding and, second, it costs much less to install conduit during construction of roadways and bridges. A disadvantage of installing conduit and fiber with transportation projects is the scope of work is usually limited to upgrades of an existing roadway within a specific area cleared by an environmental document. This leaves lengthy gaps of conduit between various projects.

UDOT frequently evaluates potential federal funding options, and has received funding, from these entities:

- U.S. Department of the Treasury
    - Broadband Capital Projects
- National Telecommunications and Information Administration (NTIA)
    - IIJA Middle Mile Competitive $1 Billion Grant

Using a combination of these funding sources, UDOT has been successful in building a 3,400 mile network of reliable fiber optics that provides invaluable safety, mobility, and economical benefits to UDOT and the state of Utah. UDOT will continue leveraging these funding options to connect 100% of Utah's interstate system as well as to provide fiber optics to power various ITS needs.

Strategy 4: Leverage Established Public/Private Partnership Program to Continue Expanding the Fiber Optic Program

As explained in the 2020 Utah Broadband Plan, "UDOT trades existing or planned conduit and fiber on a foot-by-foot basis, and trades fiber optic on a foot-by-foot strand basis. Trade agreements are for 30 years with automatic five-year renewal. Telecoms are responsible for maintenance of all fiber lines and conduit."

Trading infrastructure and/or resource sharing with private businesses provides multiple benefits to UDOT, including expanding fiber and/or conduit access at a very low cost. Overall, this partnership model has provided $105.8 million of savings for Utah. Trades reduce duplicate infrastructure in roadway corridors, improve aesthetics, and reduce potential conflicts with future roadway projects. Trades also promote improvement and expansion of communication systems. Reliable and fast communication systems are a key factor for economic development and growing the economy. A limiting factor to trades is that it is limited to corridors that are profitable for private business. This procurement method is often not viable for some remote locations.

Growth for fiber optics in Utah has been steady, and with the help of fiber trade there have been periods of significant growth for the network. However, without intact linear runs of fiber optics or built in redundancies, the network is still incomplete and unable to offer maximum benefit to UDOT, stakeholders, or the public. A continued effort to complete the network, fill gaps with new fiber lines and create redundancies that serve as backup connections for possible interruptions is needed. The following are companies that UDOT has partnered with as part of it's fiber trade program:

6.3 Ongoing Stakeholder Engagement

Continued stakeholder engagement is vital to the success of UDOT's broadband deployment strategies. UDOT will continue to build strong relationships with community partners, telecommunication companies and key stakeholders as this plan is implemented. The success of getting all residents connected to reliable high-speed internet will be dependent on the ability to continually coordinate efforts with local community partners as UDOT continues to build the fiber backbone throughout Utah.

Key initiatives to support continued engagement include:

- **Build Relationships with Telecommunication Companies:** Continuing to build and nurture relationships with telecommunication companies can help to ensure that all Utahns have access to high-quality, affordable broadband internet. UDOT and telecommunication companies work tangentially to bring broadband to all areas of the state. The partnerships between UDOT and telecommunication companies are vital to broadband infrastructure and middle mile/last mile connections.

  The following strategies promote the establishment of collaborative partnership with local telecommunication companies:

  - Streamline permitting and processes: Review and streamline the permitting and approval processes for telecommunication companies to facilitate efficient infrastructure deployment.
  - Foster public-private partnerships: Explore opportunities for public-private partnerships with telecommunication companies to leverage resources, expertise, and funding.
  - Collaborate on funding opportunities: Work together with telecommunication companies to identify and pursue available funding sources, grants, or subsidies for broadband projects.
  - Regular communication and updates: Establish regular communication channels to keep telecommunication companies informed about UDOT's initiatives, policies, and upcoming projects related to broadband infrastructure.

- **Continue Stakeholder Communication:** Stakeholder communication that is frequent and transparent helps build and maintain community

support. UDOT will aim to educate, garner support, and celebrate accomplishments through stakeholder communication. Tactics for communicating with stakeholders should be varied and represent traditional and virtual engagement. Some examples of tactics to continue stakeholder communication include:

  - Develop a communications strategy to educate and inform stakeholders about the UDOT Fiber Optic Department
  - Keeping the UDOT website and social media pages up-to-date with the latest project information
  - Maintaining feedback channels for stakeholders to communicate with UDOT such as a project hotline or project-specific email account
  - Hosting public meetings to inform the public about upcoming projects
  - Reach out to local media to cover milestones or completed projects
  - Create social media and/or ad campaigns

- **Identify and Update Public Partner Priorities**: Each community within Utah has different needs, resources, technologies, financing, and partnership options. Reevaluation of priorities will be required to keep community members engaged, achieve a local vision of connectivity, and increase broadband utilization. This is also an opportunity to identify partnership opportunities in the form of shared construction or trades.

  By establishing and strengthening working relationships with a variety of stakeholders with different backgrounds, UDOT may identify additional opportunities, barriers or initiatives. Continued coordination with key stakeholders will allow UDOT to clearly communicate the benefits of connectivity, empower local entities to advocate for broadband initiatives and build enthusiasm and support for projects.

- **Maintain clear and consistent key messaging:** When communicating with stakeholders, partners and other impacted parties, UDOT will create clear and concise key messaging to be shared through all levels of the organization. Key messages are the main points of information UDOT will want stakeholders to understand and remember relating to broadband

priorities in the Department. Clear messaging will not only help stakeholders understand fiber-related information, but it will also allow legislators to better understand and help advocate for and bring funding in for the department.

6.4 Estimated Timeline

The overall broadband strategy and implementation plan covers a multi-year and multi-level effort across agencies. The UDOT Fiber Optic Department is building on the momentum of past success which will accelerate the deployment of the projects listed in this plan. The following represents a standard UDOT fiber optic project timeline.

Individual Broadband Project Minimum Timeline

Step	Description	Timeline
High-Level Design (HLD)	Create a preliminary FTTP (Fiber to the Premise) design before fielding and jurisdictional research	30-60 Days
Low-Level Design (LLD)	Create a FTTP design that is constructible using fielding data and jurisdictional research	60-90 Days
Permitting	Get approval from the appropriate jurisdictions for construction	Up to 180 Days
Construction	Build a functioning FTTP network	90-180 Days
Project Audit	Review construction documents, conduct AARs, create audit documentation	Up to 90 Days

Note that some of these phases may overlap, while others must be completed sequentially. Unforeseen circumstances or delays might impact the overall timeline.

Minimum duration: 30 days (HLD) + 60 days (fielding and LLD) + 180 days (permitting) + 90 days (construction) = 360 days (about 1 year) for full turn-key implementation.

If some phases can be completed concurrently, the duration could be shortened. For example, construction can be started on certain segments of the broadband build that have approved permits much sooner than the predicted 180 days, shortening the original estimate for the overall project duration.

It is crucial to account for potential delays and other factors that may affect the project schedule. Regular communication with relevant stakeholders and close monitoring of progress can help mitigate risks and keep the project on track.

6.5 Alignment

This plan seeks to align its vision, goals, objectives and implementation plan with other existing statewide planning documents such as the UETN Local Broadband Plan, UDOT Long Range Plan, ITS Plan, Highway Safety Plan and UDOT's Strategic Direction Plan. Each of these planning documents strive to create a more connected Utah. Cooperation in these efforts will be key to timely statewide broadband expansion.

The Utah Strategic Highway Safety Plan, which was developed under UDOT's direction, is focused on reducing serious injuries and fatalities with the ultimate goal of Zero Fatalities on Utah's roads. The Plan emphasizes that "swift response from emergency teams can save lives." The Plan also emphasizes the importance of Public Safety's role in "clearing roadways, which reduces the risk of secondary crashes as a result of unexpected traffic conditions."

The UDOT Statewide Long-Range Transportation Plan (LRP) outlines future roadway improvements and funding allocations throughout 2050 for communities in rural Utah. The LRP has specific goals and objectives related to mobility and accessibility with aims to improve the reliability of the transportation system. The LRP incorporates ITS considerations into the prioritized improvement projects slated for implementation.

ITS Master Plan along with the ITS Design Manual outlines ITS device needs and standards statewide. These devices are all connected to the UDOT fiber optic network and rely on connectivity to be functional. These devices include avalanche signage, closed circuit television, curve warning signage, ramp metering, speed feedback signage and other traffic mechanisms that contribute to safer roadways. The UDOT fiber optic department will work to prioritize fiber deployment with ITS needs in the next five years.

UDOT's Strategic Direction contains the goals and strategies to guide UDOT's efforts to improve the quality of life and economic vitality of the state. These goals and strategies are meant to guide the processes, procedures and programs of UDOT. The three goals of the strategic direction include:

- Zero crashes, injuries and fatalities
- Optimize mobility
- Preserve infrastructure

The UDOT fiber optic department seeks to work towards these goals through safer, connected roadways that employ technology to optimize transportation.

Utah Education and Telehealth Network (UETN) partners with UDOT to expand broadband access to Utah's education and healthcare institutions. UDOT and UETN will identify joint initiatives and projects that align with the STIP program to maximize dollars spent and the number of unserved/underserved students reached. This opportunity for collaboration is reflected in the UETN Broadband Plan.

Alignment will also need to be prioritized with local telecommunication companies. By partnering these companies, UDOT aims to ensure comprehensive coverage throughout the entire state through middle mile infrastructure and then telecommunication companies will be tasked with bringing fiber-to-the-home connectivity off of UDOT's fiber backbone. The UDOT Fiber Plan emphasizes the importance of connecting critical infrastructure to fiber and enhancing the reliability and resilience of essential services. By prioritizing the fiber-optic networks along the interstate system, UDOT seeks to strengthen broadband infrastructure and support future growth and technological advancements.

6.6 Technical Assistance

UDOT is a national leader in expanding a fiber optic network to advance traffic management capabilities and expand broadband across the state. Coined the "Utah Model," the UDOT fiber optic network benefits UDOT and telecommunication providers through leveraging public-private partnerships. This has resulted in the creation of a vast fiber network with minimal capital investment.

UDOT possesses the technical capability to both locate and design their fiber optic system through internal and/or consultant resources. Additionally, Utah has a strong consultant and contractor community that provides ample availability of resources for design and construction, as needed. The use of available resources could speed development of concept reports and/or project development and design to enable more ready to construct fiber optic projects.

UDOT will complete all of its CFP projects by December 31, 2026. We will assist all partners with permits, environmental clearances, and coordination with other agencies so they can meet their construction deployment deadlines at the same time.

7 CONCLUSION

In conclusion, the broadband strategic plan outlined above serves as a roadmap for UDOT to maximize the potential of a connected transportation system to drive economic growth, enhance connectivity, and foster innovation. Through collaboration among government entities, private sector partners, agencies, and community stakeholders, this fiber optic plan establishes a solid foundation for harnessing the transformative power of broadband to enhance Utahns quality of life through transportation.

APPENDIX A: Project Descriptions

Overview UDOT Rural Broadband Middle Mile Fiber Optic Backbone 472 miles

US-40 – MP 18.8 to MP 175 - 135 miles $35,000,000

SR-167 - Huntsville to Snow Basin to Mountain Green 19 miles 10,000,000

US-89 – Logan Canyon MP 459.8 To 492 33 miles 20,000,000

US-89 – Zions Canyon MP 21.6 – 57 36 miles 20,000,000

US-89 – Knab to Sevier MP 65 – 127 miles - 30,000,000

SR-95 - Blanding to Hanksville MP 0 – MP 121.4 121.4 miles 35,000,000