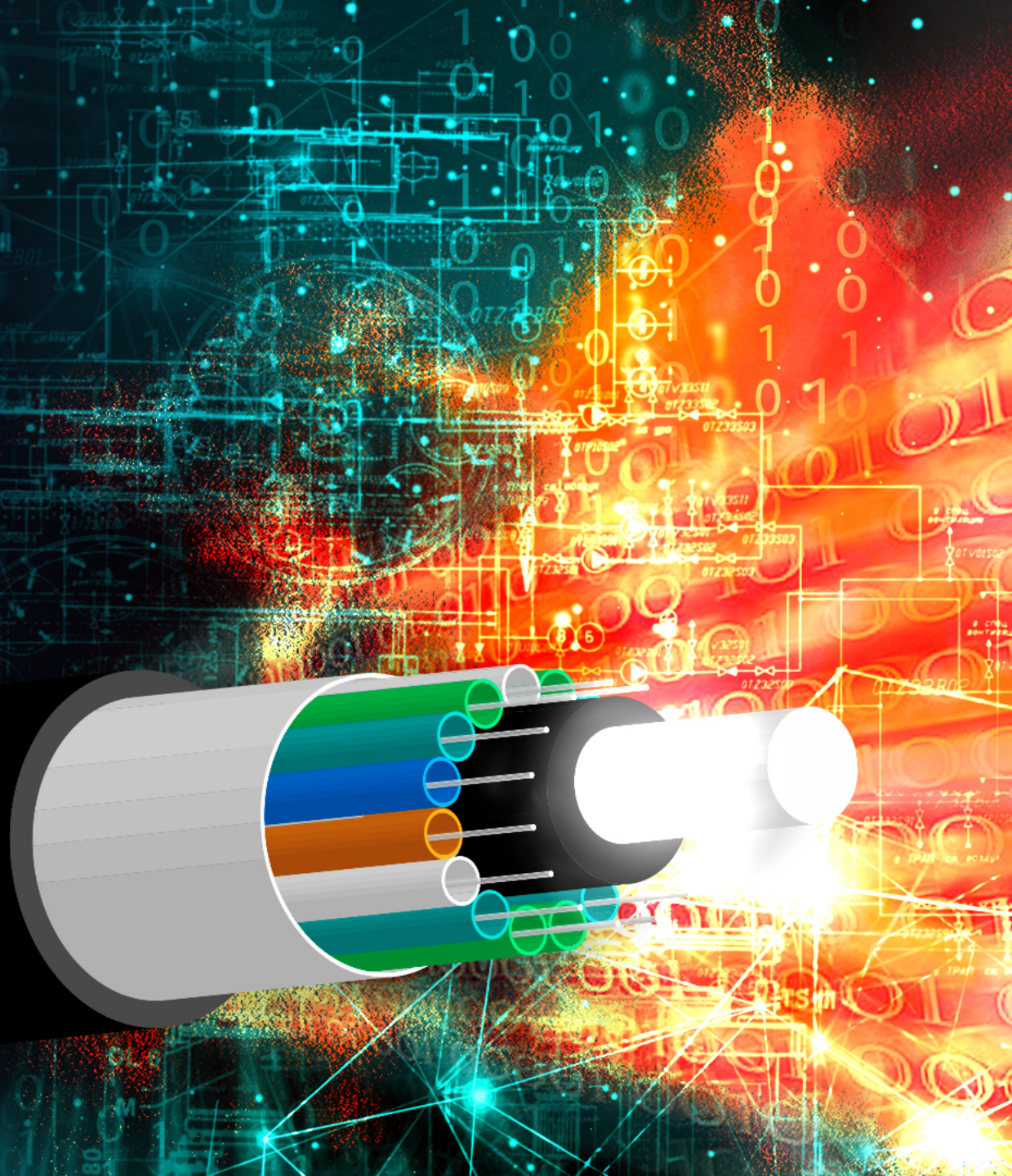
MAXIMIZING PUBLIC & PRIVATE SECTOR INVESTMENTS:

Communication Systems & Broadband Initiatives

January 7, 2021



NOCoE National Operations Center of Excellence

AASHTO

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WEBINAR OVERVIEW

Presenter & Panelist Introductions

Dean Gustafson, PE, PTOE

ITS/TSMO Practice Lead

Lochner

Anna Read

Officer, Broadband Research Initiative

Pew Research Center

Lynne Yocom

Fiber Optics Manager

Utah DOT

Ken Earnest, PE

Assistant Division Administrator, Operations Division

Virginia DOT

John Hibbard, PE

Operations Division Director

Georgia DOT

Rob Brock

Senior Systems Engineer

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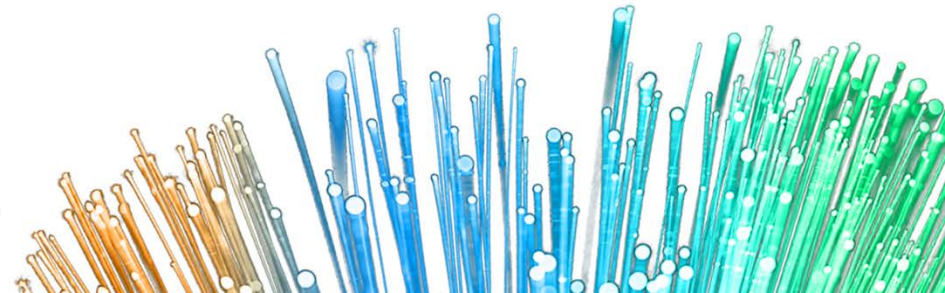


WEBINAR OVERVIEW

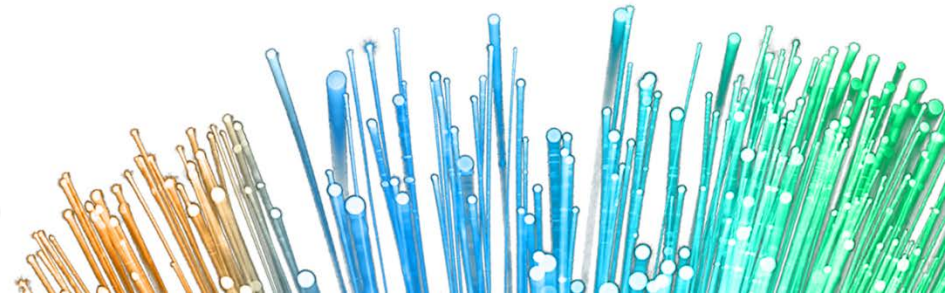
Today's Agenda

PART 1 Presentation overviews of panelists' current communication systems and broadband initiatives

PART 2 Moderated panel discussion

PART 3 Live Q&A

** Add your questions to the chat throughout the presentation.*



Why Fiber?

LOCHNER

Fiber offers…

- Highest bandwidth and lowest latency available
  - Easily supports State DOT ITS infrastructure, including connected and automated vehicle applications
  - Very reliable and secure
- More control over network management than leased services
- Low recurring costs compared to leased services

Federal Code & Resource Sharing

- **In 1988, CFR, Part 645, Subpart B** was modified to allow States to expand their utility accommodation policies to include utility installation on Interstate ROW, provided the installation did not adversely affect traffic or highway safety, or impair the use and aesthetic quality of the highway.
- **23 CFR Part 645, Subpart B and 23 CFR Part 710, Subpart D** permits States to accommodate broadband conduit in highway ROW.
- **Telecommunications Act of 1996** requires telecommunications providers to allow competing vendors to have access to facilities for deploying broadband and mandates the removal of state and local barriers to telecommunications competition.
- **In 1996, FHWA and FCC** recognize mutual benefit of resource sharing to DOTs and telecom industry and issue guidance memorandums.
- **In 2002, AASHTO** issues resource sharing design guidelines.

Federal Direction

President Obama issued Executive Order on June 14, 2012 to facilitate broadband deployment on federal lands, buildings, rights of way, federally-assisted highways, and tribal lands; including dig-once emphasis.

Federal Direction

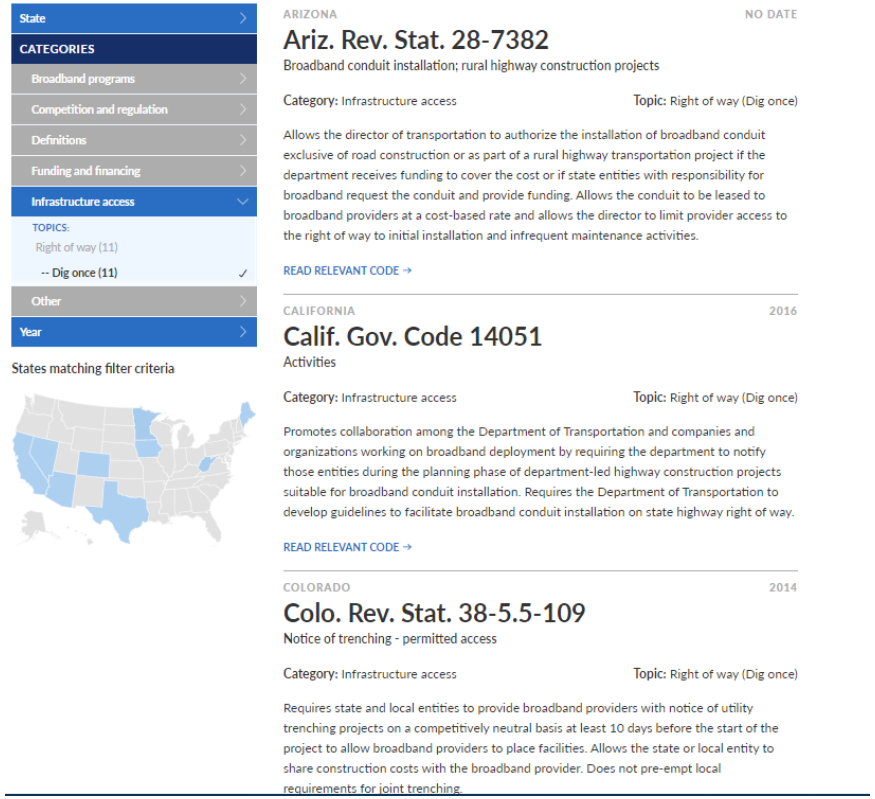
In August 2020, FHWA published NPRM to amend 23 CFR Part 645 to implement changes required by the MOBILE NOW Act (2018) with 4 main elements:

- State DOT identify a broadband utility coordinator position within the State,
- Establish a registration process for broadband infrastructure entities,
- Establish a process to electronically notify broadband infrastructure entities annually about the Statewide Transportation Improvement Program (TIP),
- Coordinate MOBILE NOW initiatives with broadband initiatives, transportation plans, local transportation and land use plans, including strategies to minimize repeated excavations of broadband infrastructure within ROW.

How States Are Expanding Broadband Access

State Broadband Policy

- Broadband deployment policy as of Jan 1, 2020
- Related analyses
  - 2018, 2019 legislative policy trends
  - How policy shapes deployment



https://www.pewtrusts.org/en/research-and-analysis/data-visualizations/2019/state-broadband-policy-explorer

State Broadband Policy

- State broadband policies primarily fall into five categories:
  - Establish broadband programs
  - Set broadband goals and define key terms (e.g., broadband, unserved and underserved areas)
  - Create funding and financing mechanisms
  - Determine service provision by non-traditional providers
  - Address infrastructure access (e.g., rights-of-way access, dig once)

State Broadband Programs

- Broadband offices
- Broadband programs within agencies
- Task forces and councils

Key Elements of State Broadband Programs

Programs take different forms, share common goals and activities

Introduction

States play a crucial role in efforts to expand broadband to the millions of Americans who still lack access to this vital service. Nearly all states have responded to the growing demand for reliable, high-speed internet by creating broadband offices or designating responsibility for broadband to a state agency, task force, or council. While their structures might vary, state programs share many similarities, including working with local officials and other stakeholders to close gaps in service, managing data on broadband access, and administering grant programs.

Who is in charge of broadband programs?

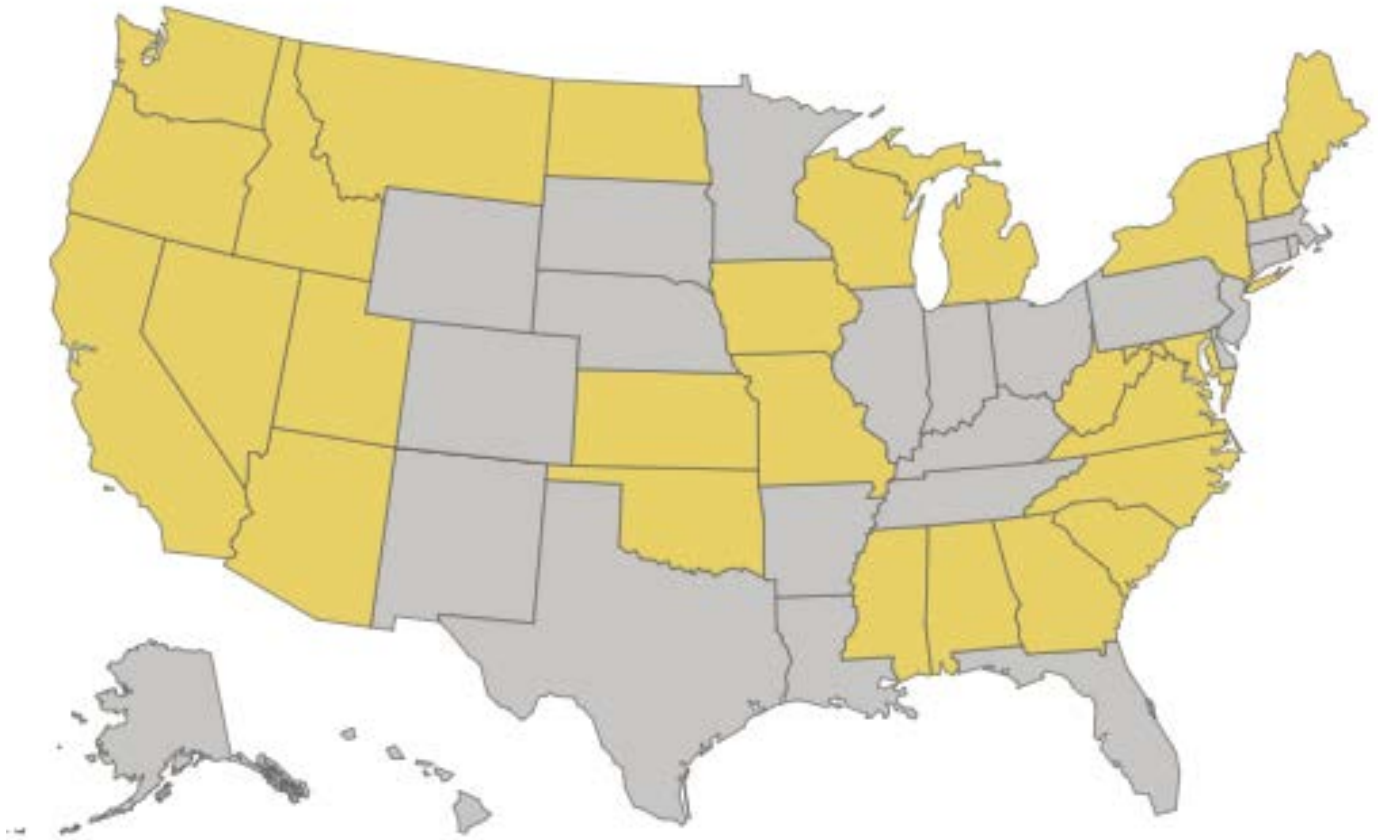
Nearly three quarters of states have created a dedicated broadband office within an agency or designated an existing agency—such as departments of economic development or information technology—with authority for expanding broadband. Others have formed broadband task forces or councils. In some cases, these entities are tasked with overseeing broadband efforts, while in other states, they serve as a first step toward establishing a broadband program.

https://www.pewtrusts.org/en/research-and-analysis/fact-sheets/2020/05/key-elements-of-state-broadband-programs

State Broadband Programs

- Core activities of state broadband programs:
  - Stakeholder engagement (cross-agency collaboration)
  - Data management
  - Planning
  - Administering grant programs

Coronavirus Relief Funds and Broadband



Source: National Conference of State Legislatures

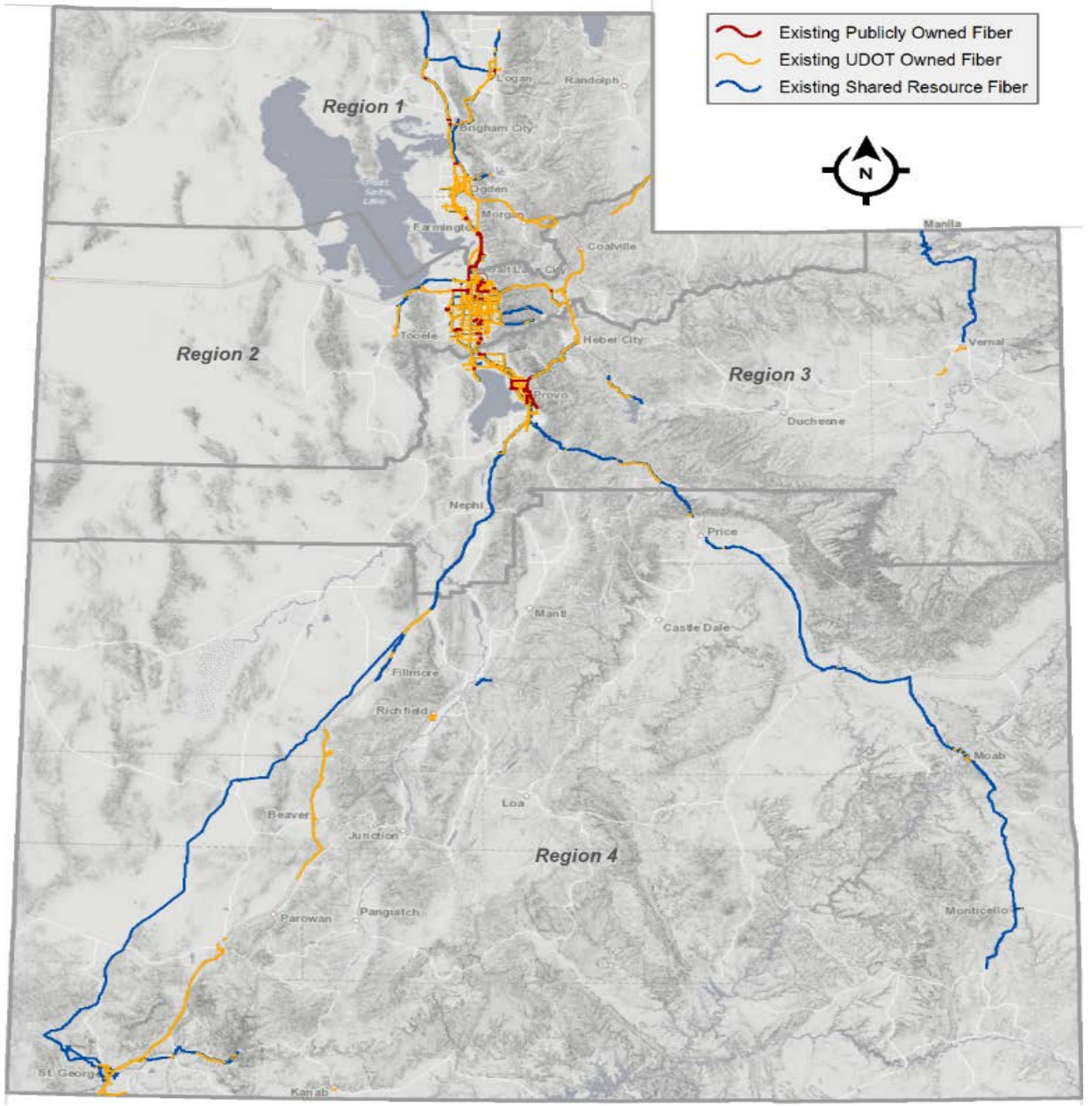
NOCoE Webinar

Fiber Optic Resource Sharing

Lynne Yocom – UDOT Fiber Optics Manager

lyocom@Utah.gov

UDOT Keeping Utah Moving



UDOT Existing Fiber Optic Coverage (May 2020)

Keeping Utah Moving

Extent of the UDOT Network

2,780 miles of fiber optics.

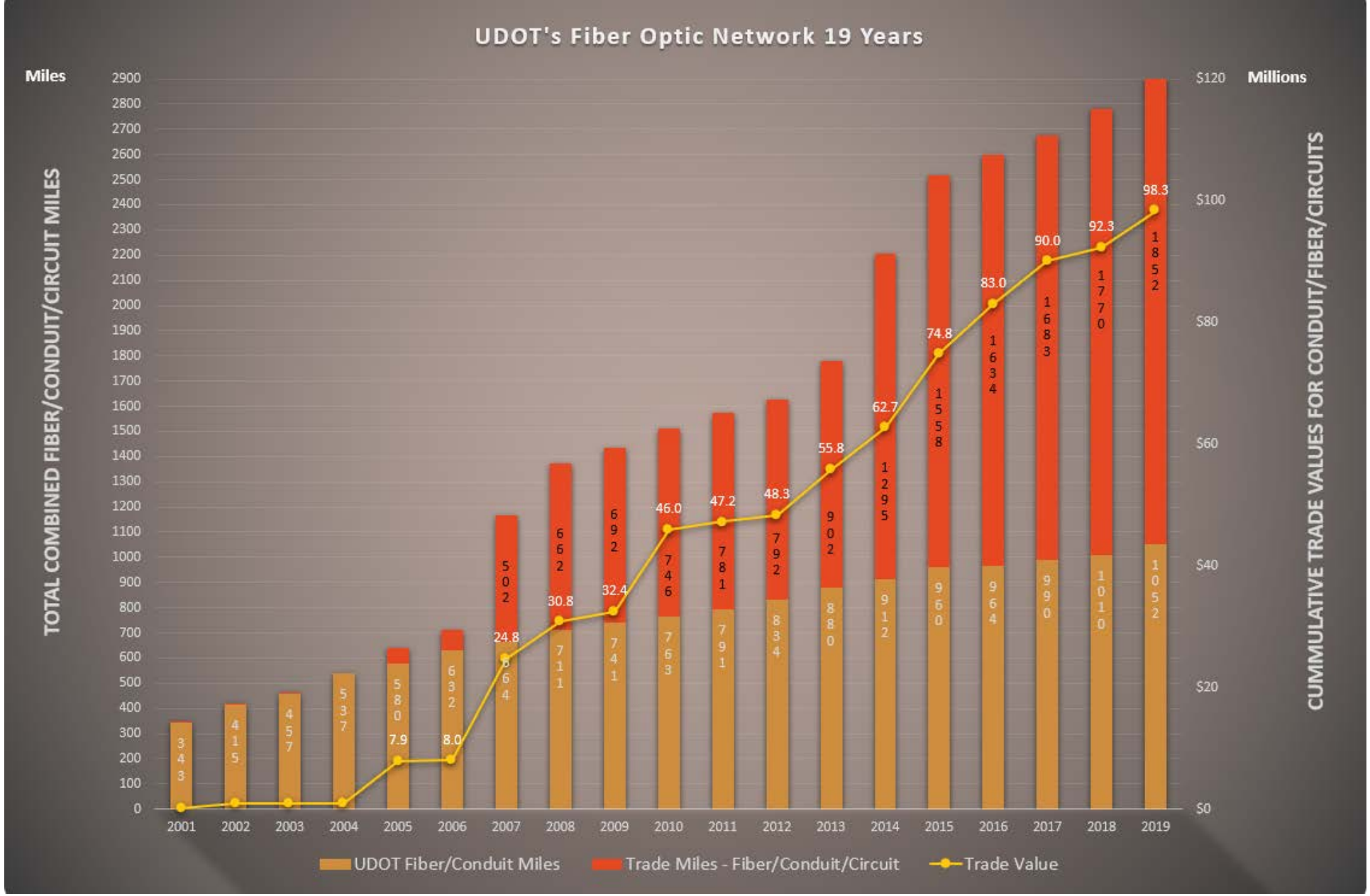
- **1150 miles UDOT**
- **PPP (Public, Private, Partnership) fiber 1852 miles**
  - **St. George connection is with a pipeline for 300 miles not a road. South Central Fiber Circuits 312 miles connect Cedar City, Bryce Canyon, Kanab, Parowan and Beaver.**

Utah Interstate Miles 978 - Installed or currently under construction as of 10/29/2020.

- **Interstate Fiber Miles 791 fiber miles 80%**
- **I-15 400 miles with 390 fiber miles 98%**
- **I-215 29 miles with 29 fiber miles 100%**
- **I-80 197 miles with 97 fiber miles 50%**
- **I-84 120 miles with 113 fiber miles 94%**
- **I-70 232 miles with 162 fiber miles 70%**

Note - Percentages calculated are for road miles and do not include the rural fiber circuit trades of 612 miles.

UDOT Keeping Utah Moving


UDOT's Fiber Optic Network 19 Years
Miles
Millions
TOTAL COMBINED FIBER/CONDUIT/CIRCUIT MILES
CUMMULATIVE TRADE VALUES FOR CONDUIT/FIBER/CIRCUITS
2900
2800
2700
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
900
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537
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632
502
662
692
746
781
792
902
1295
158
1634
1683
1770
1852
1052
990
1010
960
964
912
880
834
791
763
741
711
664
7.9
8.0
24.8
30.8
32.4
46.0
47.2
48.3
55.8
62.7
74.8
83.0
90.0
92.3
98.3
UDOT Fiber/Conduit Miles
Trade Miles - Fiber/Conduit/Circuit
Trade Value

19 Years

Summary of UDOT Fiber Optic P3's

There are projects in every region that have great public private partnerships.

Region 1 Allwest I-84 from Morgan to Henefer.

Region 2 UTOPIA Hideout to US-40

Region 3 Strata and UETN Daggett Project Vernal to Manilla and Dutch

Region 4 First Digital I-15 MP 98 to Cedar City
Emery, White Mesa, and Navajo Nation San Juan Project

The project that I especially think should be highlighted is the Daggett Project because the $6 million three-year project was completed last month. It took three years of joint efforts with UDOT, UETN, and STRATA to get this project built. Other stakeholders included Daggett County, Daggett School District, FCC, US Bureau of Reclamation, US Forest Service, and the Utah State Legislature. We were able to take advantage of Universal Service Funds for $3 million, $1million in State match, and $2 million from STRATA. UDOT and UETN's contribution was $500,000 each. This fiber connectivity to the Flaming George area will not only help UDOT with traffic needs it is servicing the schools, the medical facilities, and the citizens. This will greatly improve the quality of life and the economic development of that area. Cell service has already improved on existing towers and additional towers are being planned.

This project is what PPP's are all about.

https://www.uen.org/news/article.php?id=996

Dagget PPP 67 miles of FO installed

Keeping Utah Moving

Fiber Optics Flaming George Dam

Minimal Environmental Impact

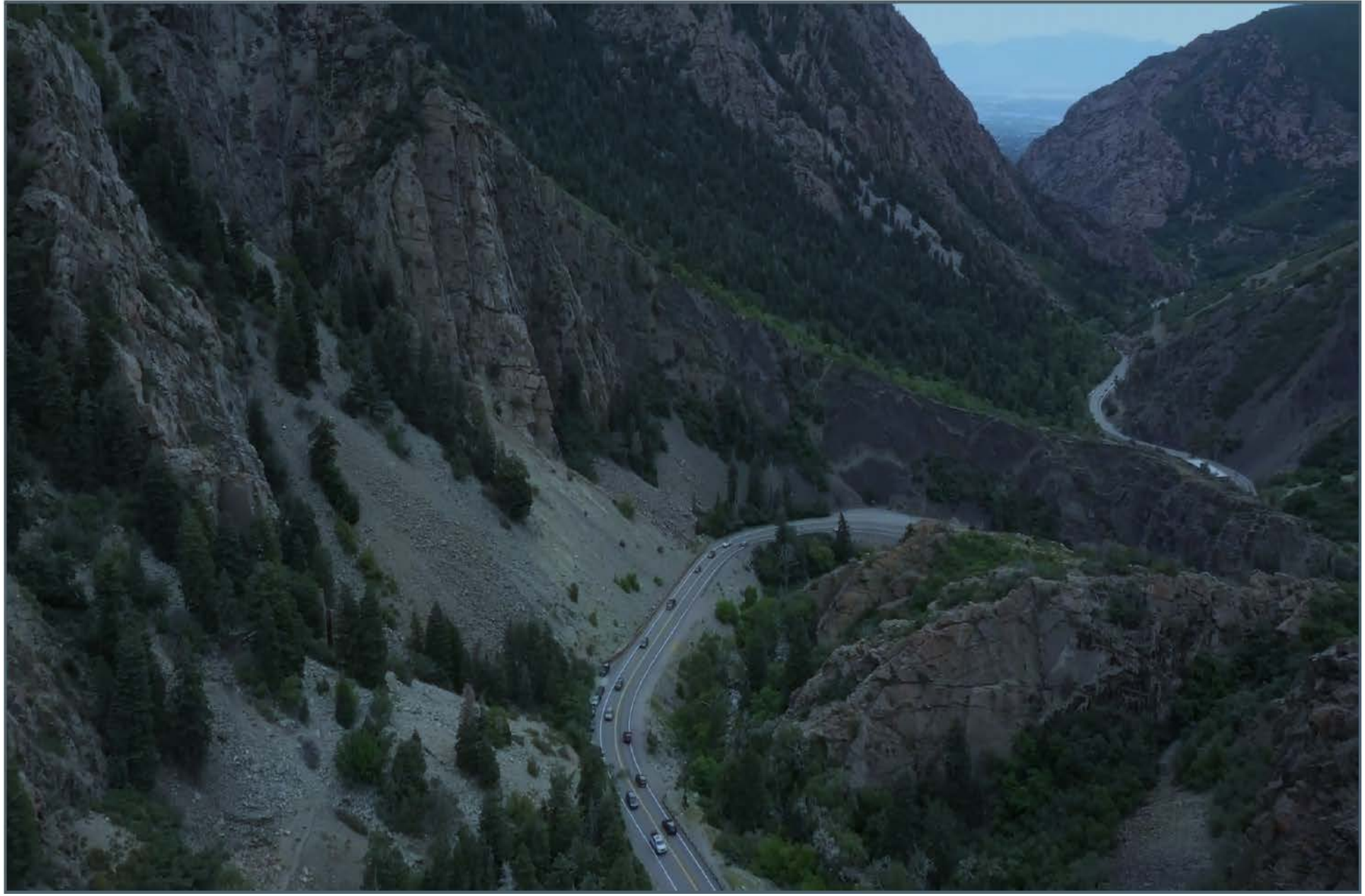
Rock and Weather Challenges

Benefits to Health Care and Education

UDOT Keeping Utah Moving

Community

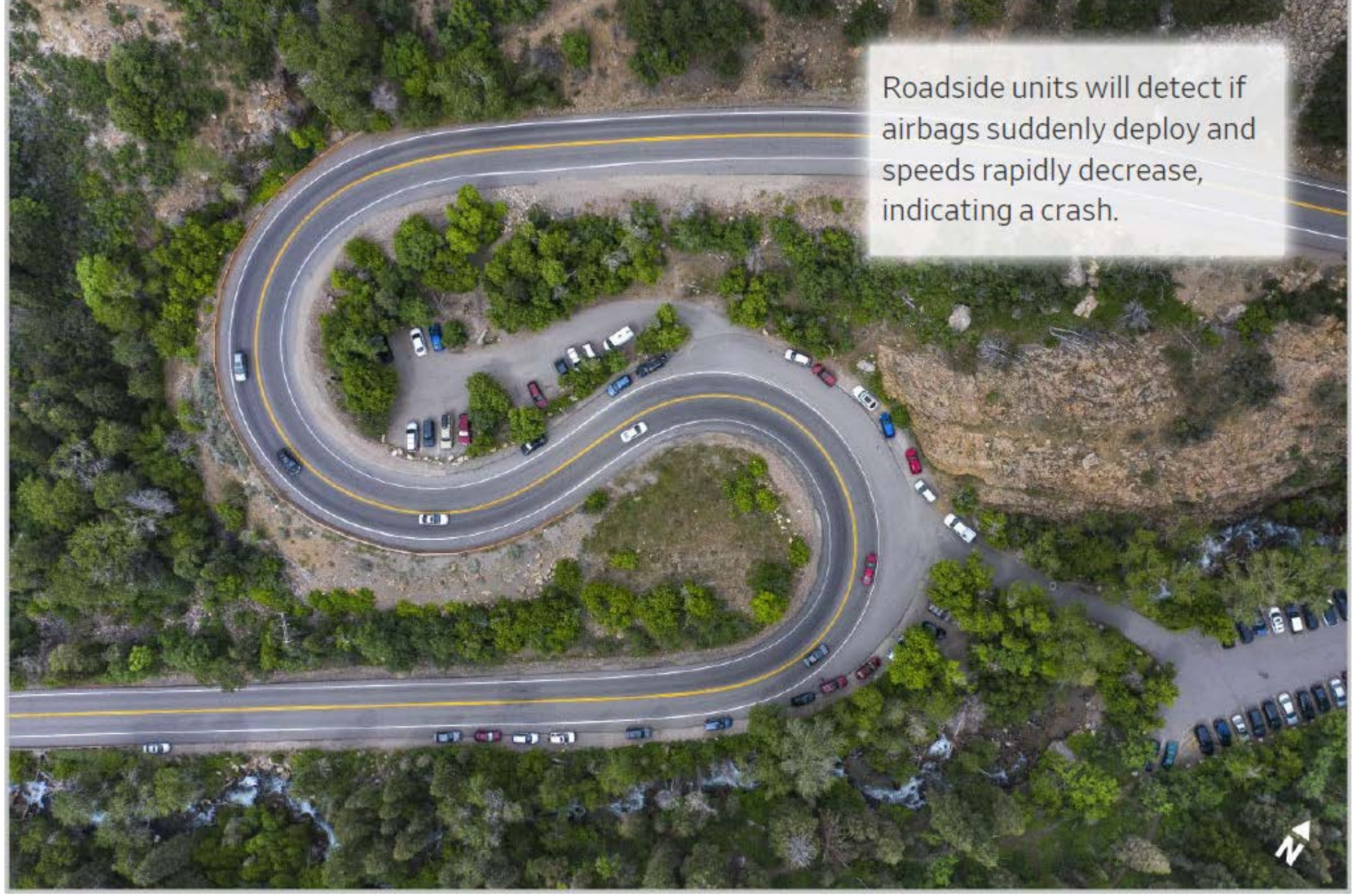
Recreation



—Aerial photography by Dan Krauss for The Wall Street Journal

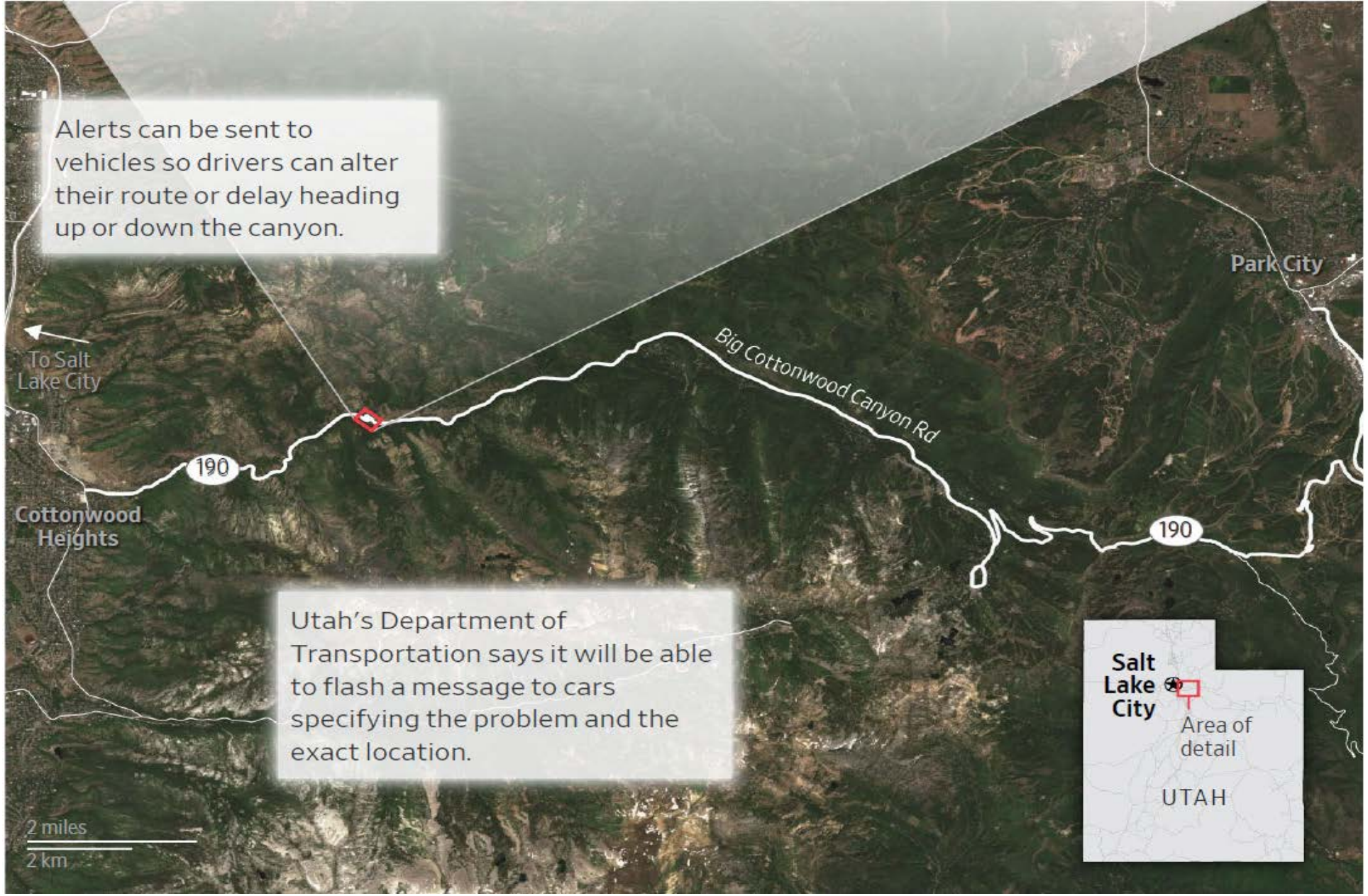
Cottonwood Canyons

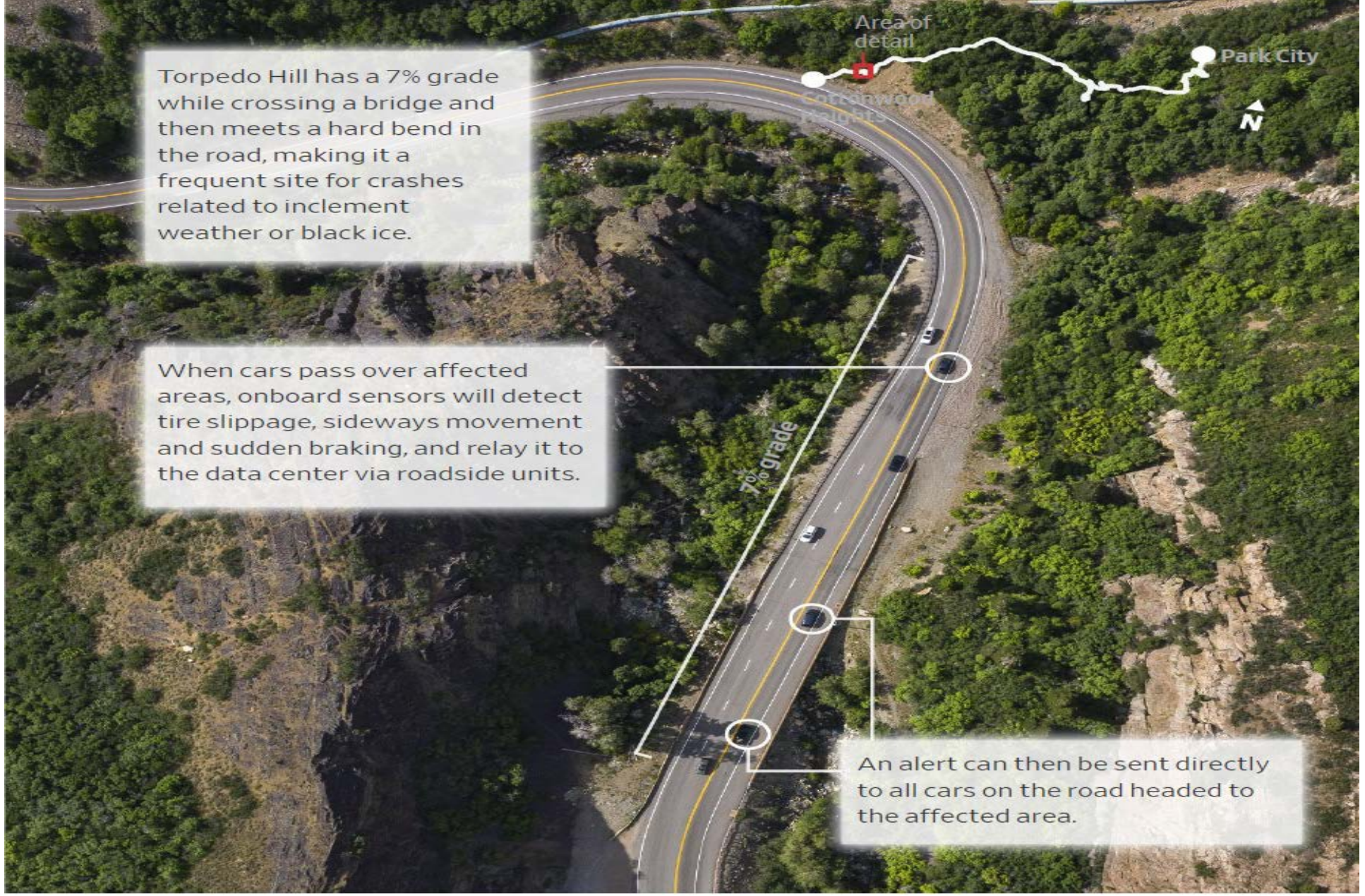
Stakeholders



—Aerial photography by Dan Krauss for The Wall Street Journal

UDOT Keeping Utah Moving


Alerts can be sent to vehicles so drivers can alter their route or delay heading up or down the canyon.
To Salt Lake City
Big Cottonwood Canyon Rd
Park City
190
Cottonwood Heights
190
Utah's Department of Transportation says it will be able to flash a message to cars specifying the problem and the exact location.
Salt Lake City
Area of detail
UTAH
2 miles
2 km


Area of detail
Park City
N
Torpedo Hill has a 7% grade while crossing a bridge and then meets a hard bend in the road, making it a frequent site for crashes related to inclement weather or black ice.
When cars pass over affected areas, onboard sensors will detect tire slippage, sideways movement and sudden braking, and relay it to the data center via roadside units.
7% grade
An alert can then be sent directly to all cars on the road headed to the affected area.

—Aerial photography by Dan Krauss for The Wall Street Journal

Project Summary

- Projects Estimate: $5 Million
- 35 poles
- 24.5 Miles fiber optics
- 7200 Volt Electrical Systems
- 12 new cameras - 8 Road Weather Systems - 15 chain-up signs
- Improved communications for All Users
- Avalanche Operations Center
- Future ITS expansion (dms, etc.)

UDOT Keeping Utah Moving

CARES ACT Project I-84
8 Million 42 Miles

UDOT Keeping Utah Moving

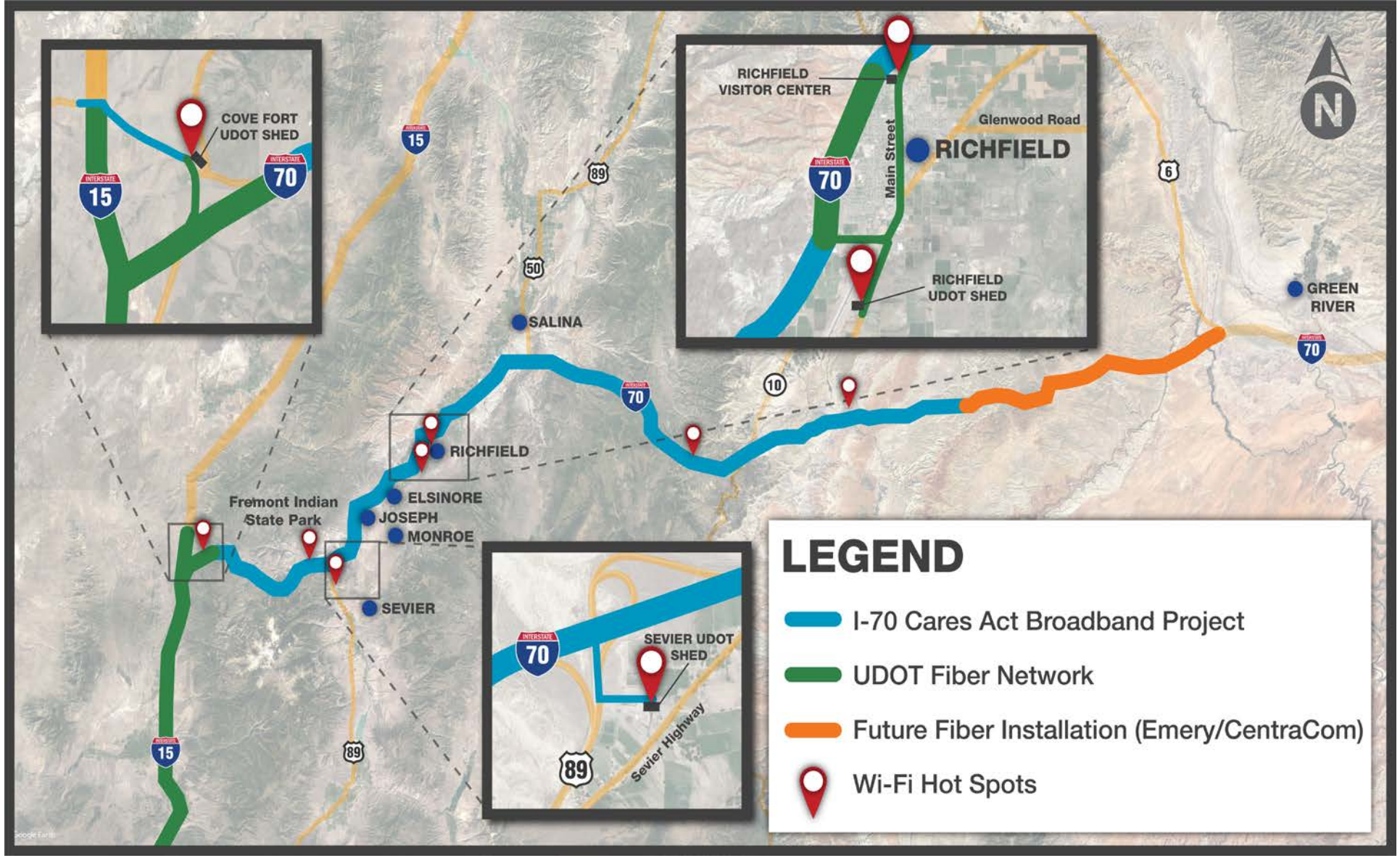
I-84 Medium install
Strata Boys

Junction Boxes – I-84
Lightweight Innovative New Design

UDOT Keeping Utah Moving

Broadband to Underserved Areas
Not for Transportation Only

UDOT Keeping Utah Moving



CARES ACT Project I-70
23 Million 117 Miles

UDOT Keeping Utah Moving

Spyder Plow Remote Control

No Driver

Strata D-8 Plow

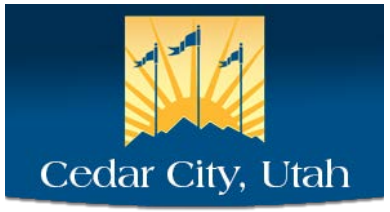
San Rafael Swell

Bore Pit
I-70

Special thanks to our project partners:

CentraCom • Telecom • Fremont Tribal Government • Richfield City
Richfield Data Center • Utah Education and Telehealth Network • Americom • Strata
Beehive Broadband • Utah Department of Technology Services • Utah Communications Authority
Utah Department of Public Safety • SCI Communications • Horrocks Engineers

Cities - Counties - Special Services



Trade Partners

UDOT Keeping Utah Moving

Telecoms

Trade Partners

State Agencies

UTA

DTS

UTAH AGRC

UCA
UTAH COMMUNICATIONS AUTHORITY

uen

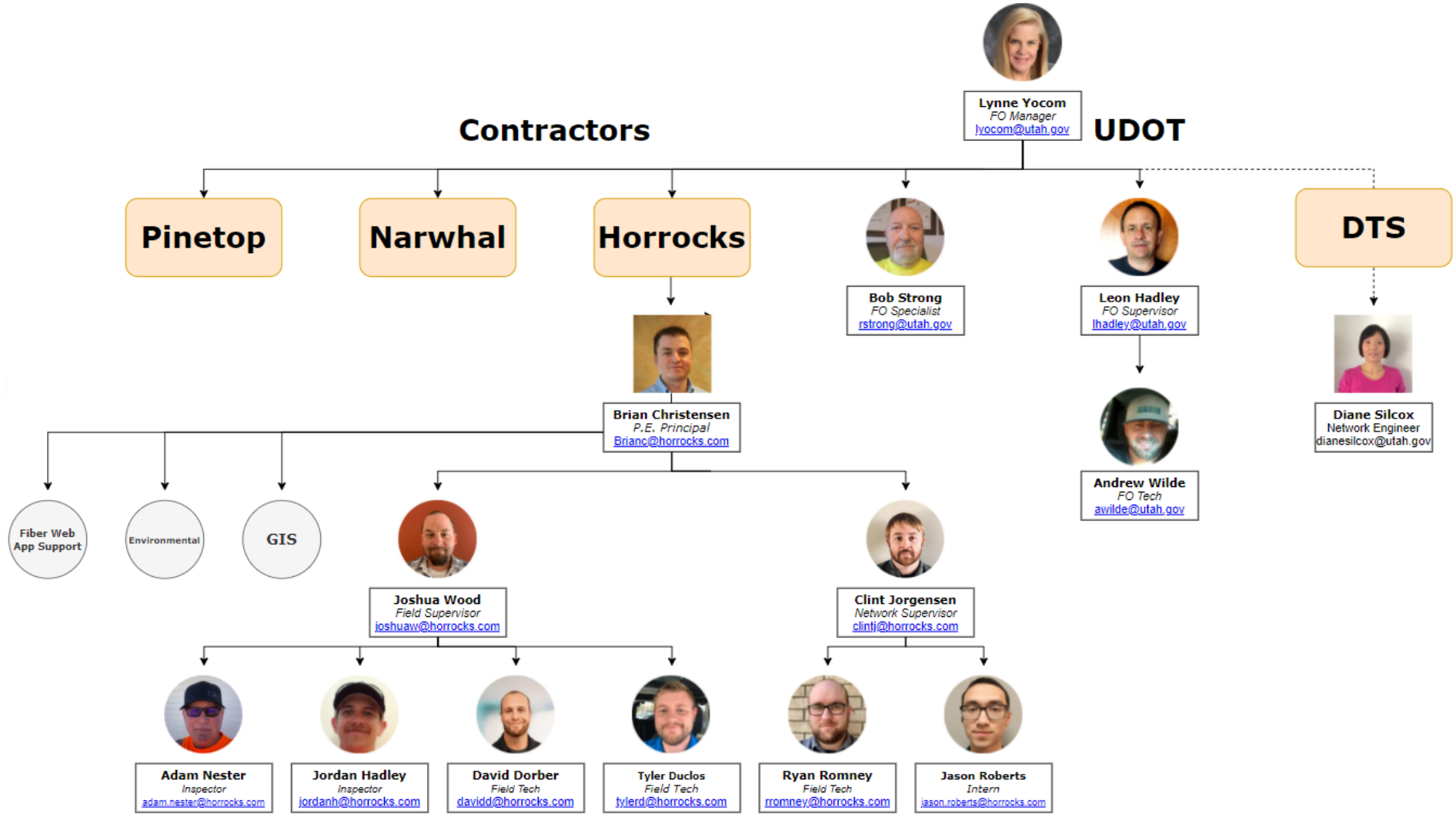
THE UNIVERSITY OF UTAH

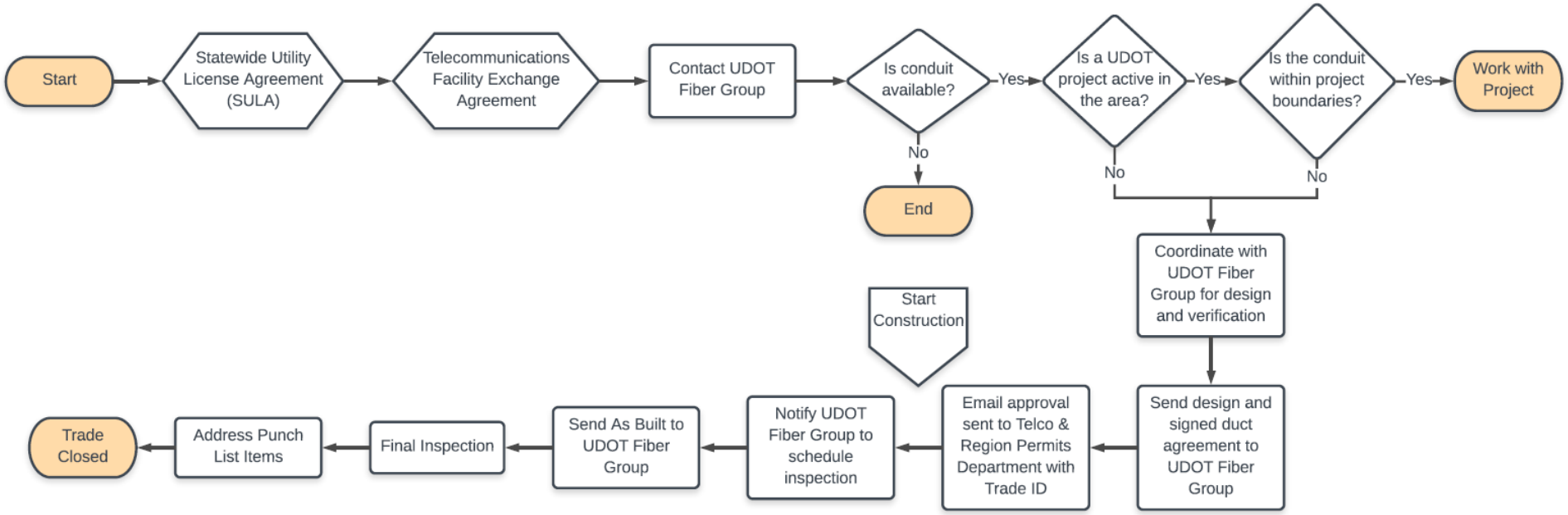
Utah Governor's Office of Economic Development
BUSINESS • TOURISM • FILM

Trade Partners

UDOT
Keeping Utah Moving

UDOT Fiber Group Organization Chart





Telecom Partnering Flowchart

Links

- Utah Code 72-7-108 - https://le.utah.gov/xcode/Title72/Chapter7/72-7-S108.html
- R907-64 – https://rules.utah.gov/publicat/code/r907/r907-064.htm
- R907 – 65 – https://rules.utah.gov/publicat/code/r907/r907-065.htm
- R930 – https://rules.utah.gov/publicat/code/r930/r930-007.htm
- Fiber Map -

  https://horrocks.maps.arcgis.com/apps/webappviewer/index.html?id=096d0a7dd31a4be289b9623935308fc9
- Agreements and Valuation - https://www.dropbox.com/sh/x07914hkpiybfe1/AABaIN3XT4tQuL8QgweIIXAOa?dl=0
- Infrastructure and Broadband Coordination – Governor's Office of Economic Development

  https://law.justia.com/codes/utah/2019/title-63n/chapter-3/part-5/section-501/
- Fun Video Links –
  - Americom - https://www.youtube.com/watch?v=DxSaeDUhP2E
  - Fox - https://www.fox13now.com/news/local-news/win-win-fiber-optics-lines-make-utah-roads-safer-and-help-rural-utahns-connect
  - Micro Trench - https://www.youtube.com/watch?v=8p4xHIwuMhI

VDOT'S FIBER OPTIC RESOURCE SHARING PROGRAM

Ken Earnest, P.E., Assistant Division Administrator, Operations Division

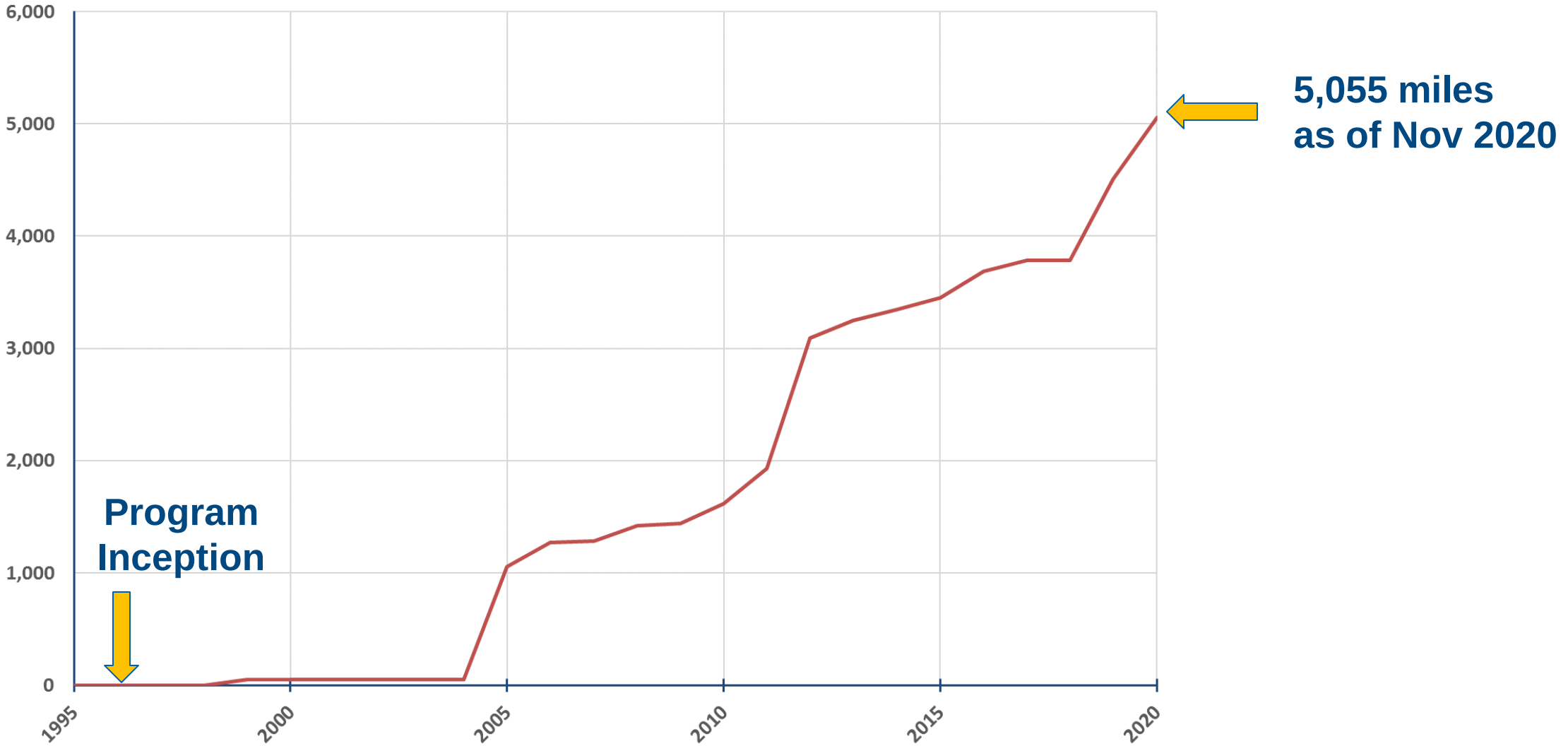
Fiber Resource Sharing – Reduced Costs for VDOT

- **Installing comparable fiber infrastructure would cost VDOT $150,000 – $300,000/mile**
- **Resource Sharing partners maintain the shared fiber route which would otherwise cost VDOT $1,800/mi/yr**
- **VDOT currently operates 1,621 miles of shared fiber that would cost $243M – $486M to build, and $2.9M annually to maintain**
- **Each camera transitioned from leased broadband services onto fiber can save VDOT up to $5,000 annually**

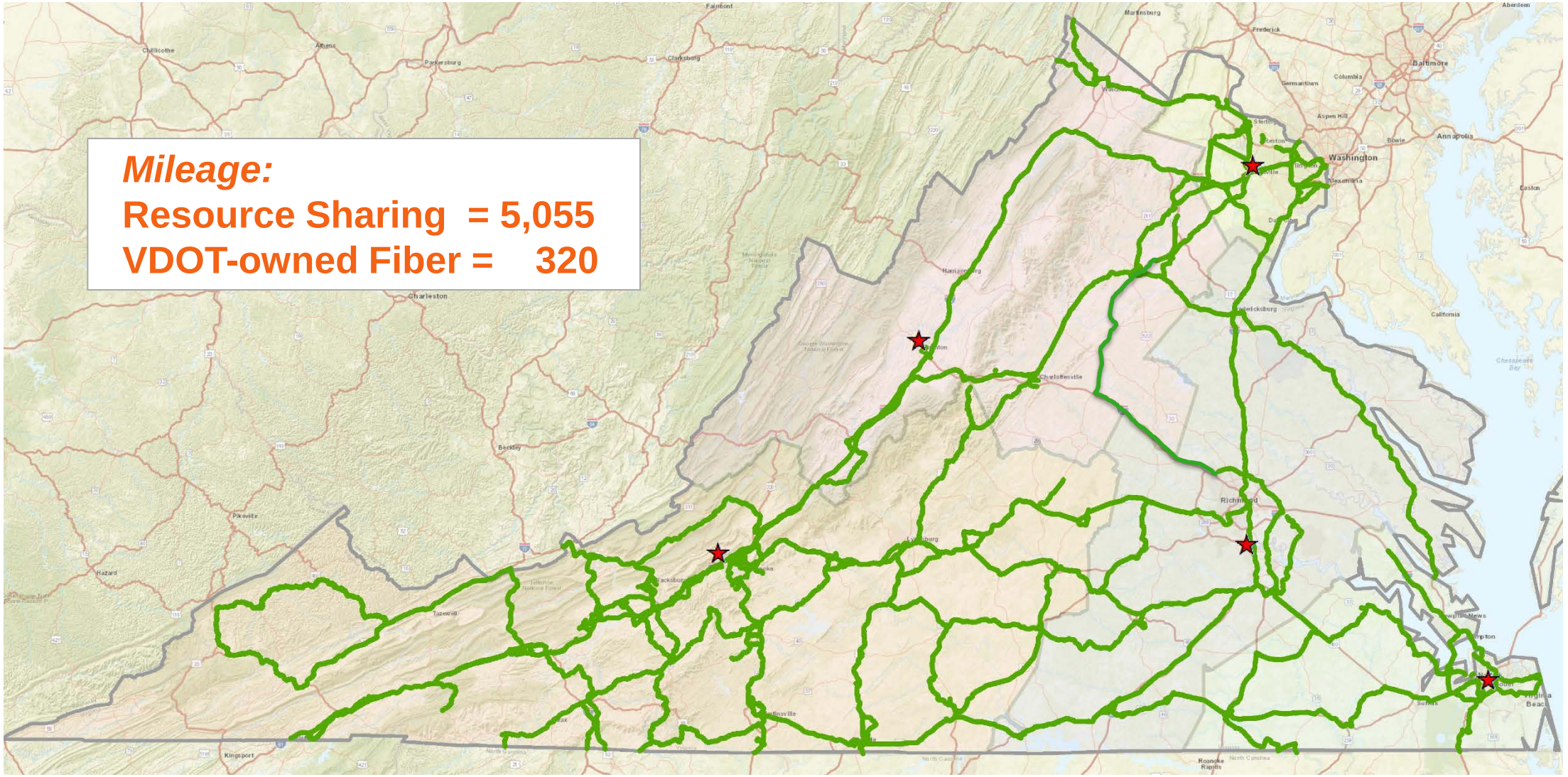
Fiber Optic Resource Sharing (FORS) in Virginia

- Virginia's Administrative Code (24VAC30-151) allows fiber within Limited-Access ROW through resource sharing agreements
- VDOT can receive any combo of goods, services or cash
- VDOT FORS program began in 1996 and accelerated with tobacco settlement/broadband stimulus funding, and growth of internet, data centers and trans-oceanic cables
- Currently 23 active partners: including major telcos, wholesale providers, co-ops and public agencies
- All agreements are non-exclusive

Cumulative Resource Sharing Fiber Miles



Fiber Routes Available to VDOT



Maximizing the Value of VDOT's Fiber Assets

- Connect directly to major data centers
- Eliminate costly TOC leased circuits
- Eliminate costly leased circuits to devices
- Extend high-speed communications to signalized corridors

Recent Programmatic Updates

- Pursuing cash compensation in addition to infrastructure
- Value based on quantity and location of requested Limited-Access ROW
- Agreements now include terms for broader public use
- Deploying comprehensive fiber asset management tool

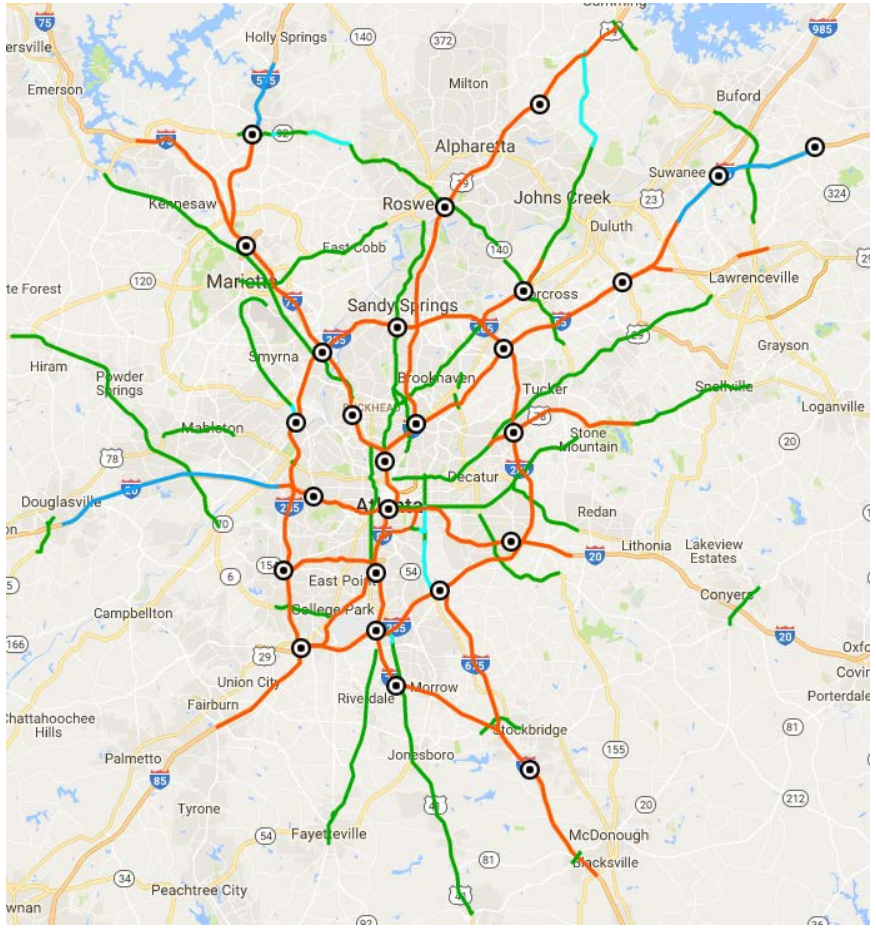
Georgia Department of Transportation

Broadband Public-Private-Partnership

John L. Hibbard

Operations Division Director

Existing Infrastructure



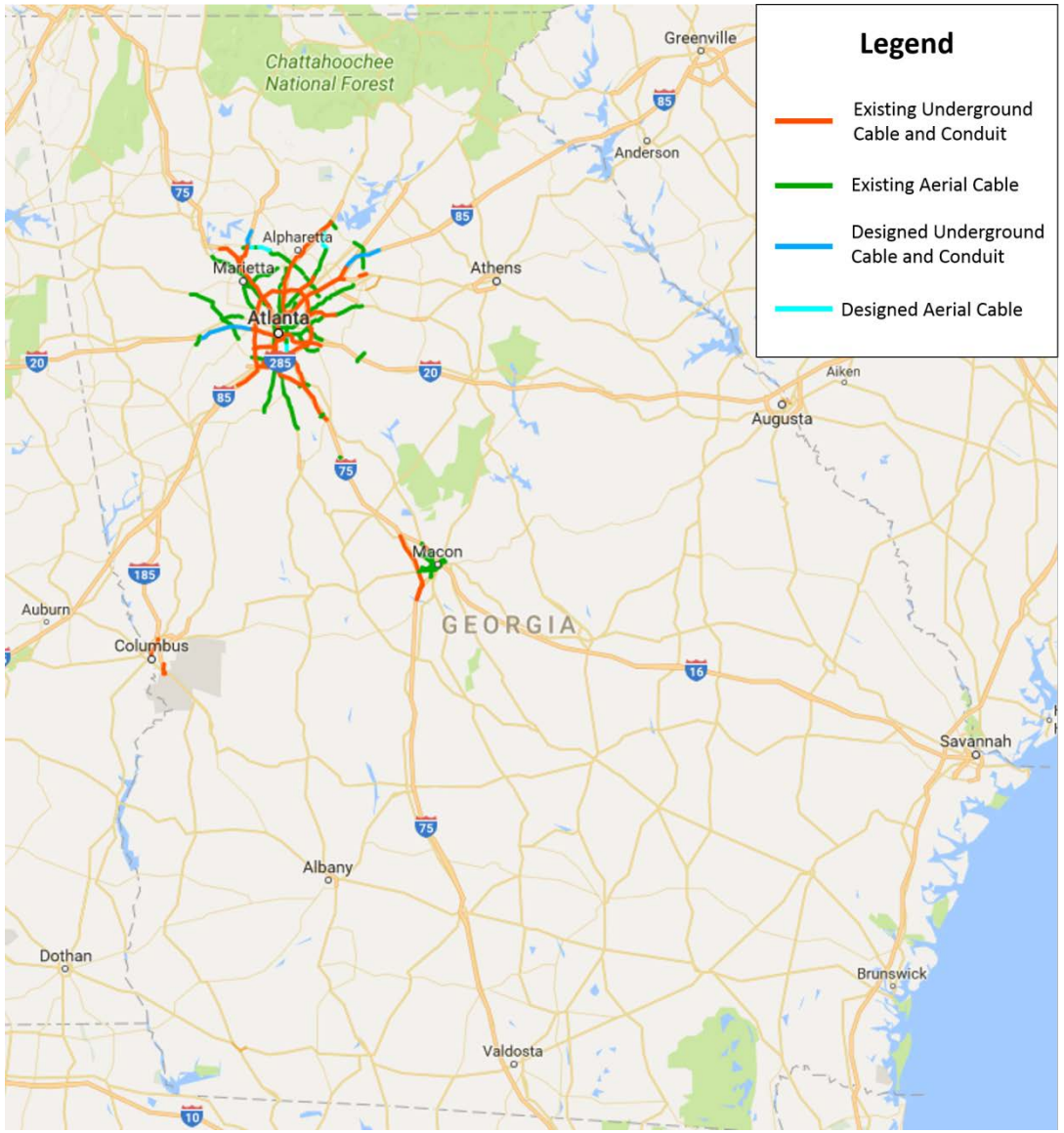
Project Goals

Expand Navigator System statewide for GDOT operations

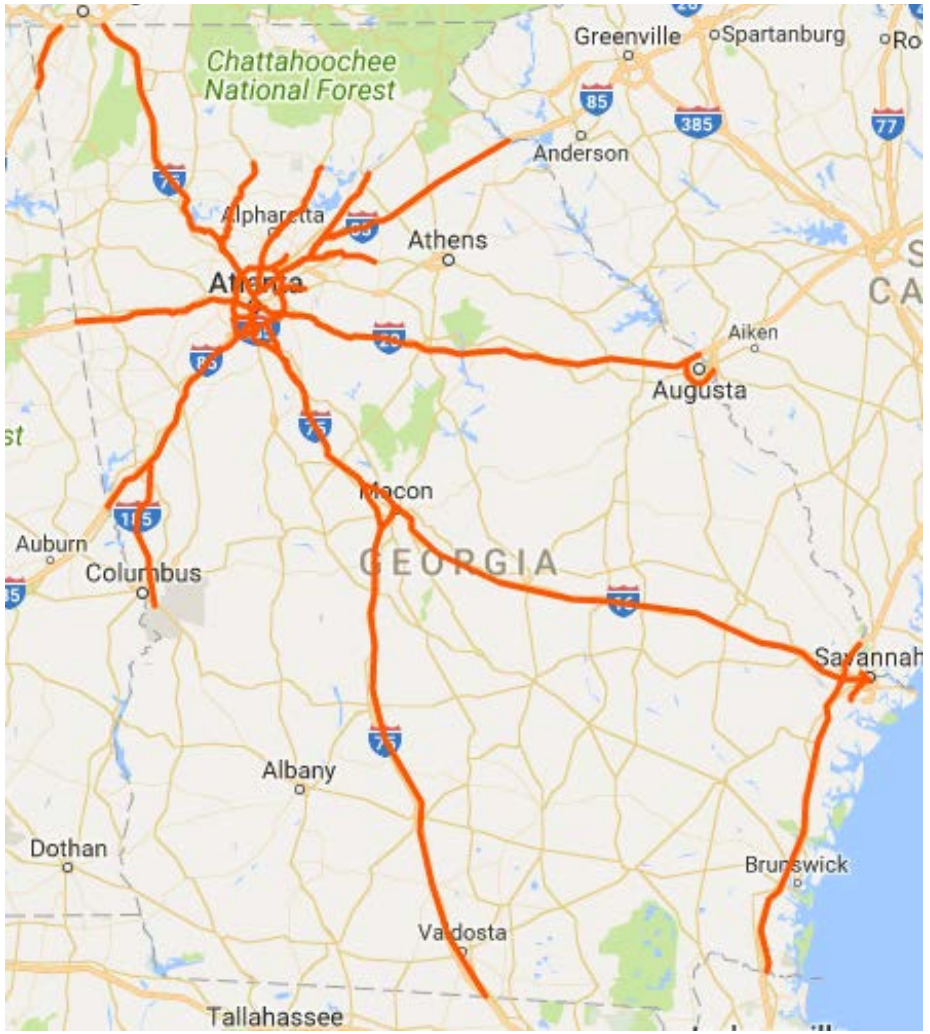
Establish a fiber backbone to help meet rural Georgia's needs

Encourage 4G/5G wireless deployment across state

Revenue Neutral



Statewide Broadband/Wireless P3



Broadband Considerations

LOCHNER


U.S. broadband networks are built primarily using non-interstate right-of-way and private property.
BUSINESS INSIDER

5G Carrier Deployments

- Obstructions can impact connectivity.
- Initial costs for rollout are high.
- Limitations of rural access.
- Battery drain on devices.
- Upload speeds don't match download speeds.
- Detracting from the aesthetics.
- The range of 5G connectivity is not great as the frequency waves are only able to travel a short distance.
- 6G is running in development labs

Satellite Broadband

- Satellite broadband to complete the last-mile connectivity problem
- New providers SpaceX Starlink and Amazon Project Kuiper will provide high-speed, low latency broadband
- Broadband speeds up to 1Gbs are advertised
- Providers are competing for a $16B Federal rural broadband contract to provide broadband nationwide. $10B awarded in NOV 2020
- Would allow DOT agencies to encumber funds for their ATMS, TSMO and ITS programs

WEBINAR PART 2:
Moderated Panel Discussion

Moderator

Dean Gustafson, PE, PTOE

ITS/TSMO Practice Lead

Lochner

Panelist

Anna Read

Officer, Broadband Research Initiative

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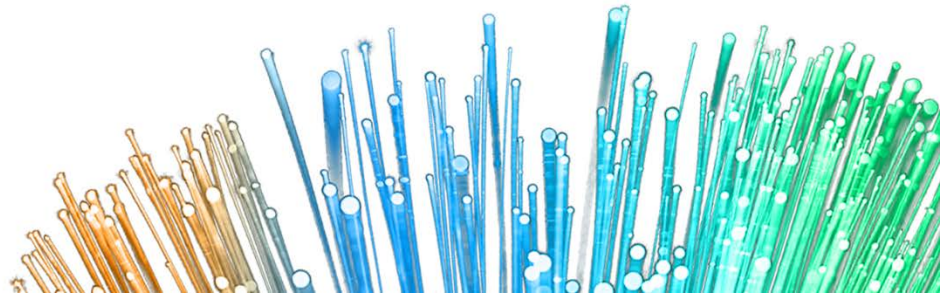
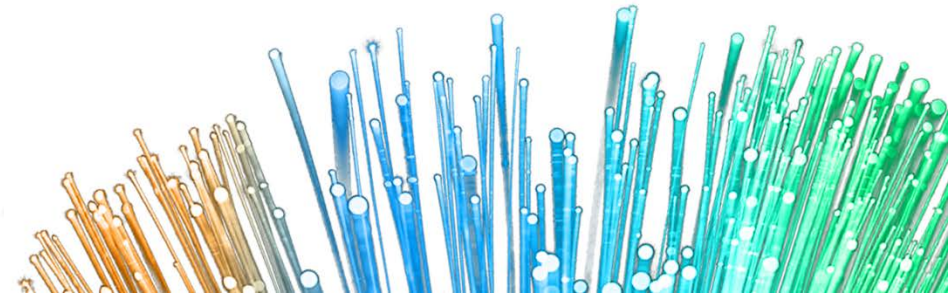


WEBINAR: PART 3

Live Q&A

Have a question you would like to ask? Type it into the chat window for consideration.

Questions will be reviewed and presented by the webinar host.



THANK YOU!

Presenters

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