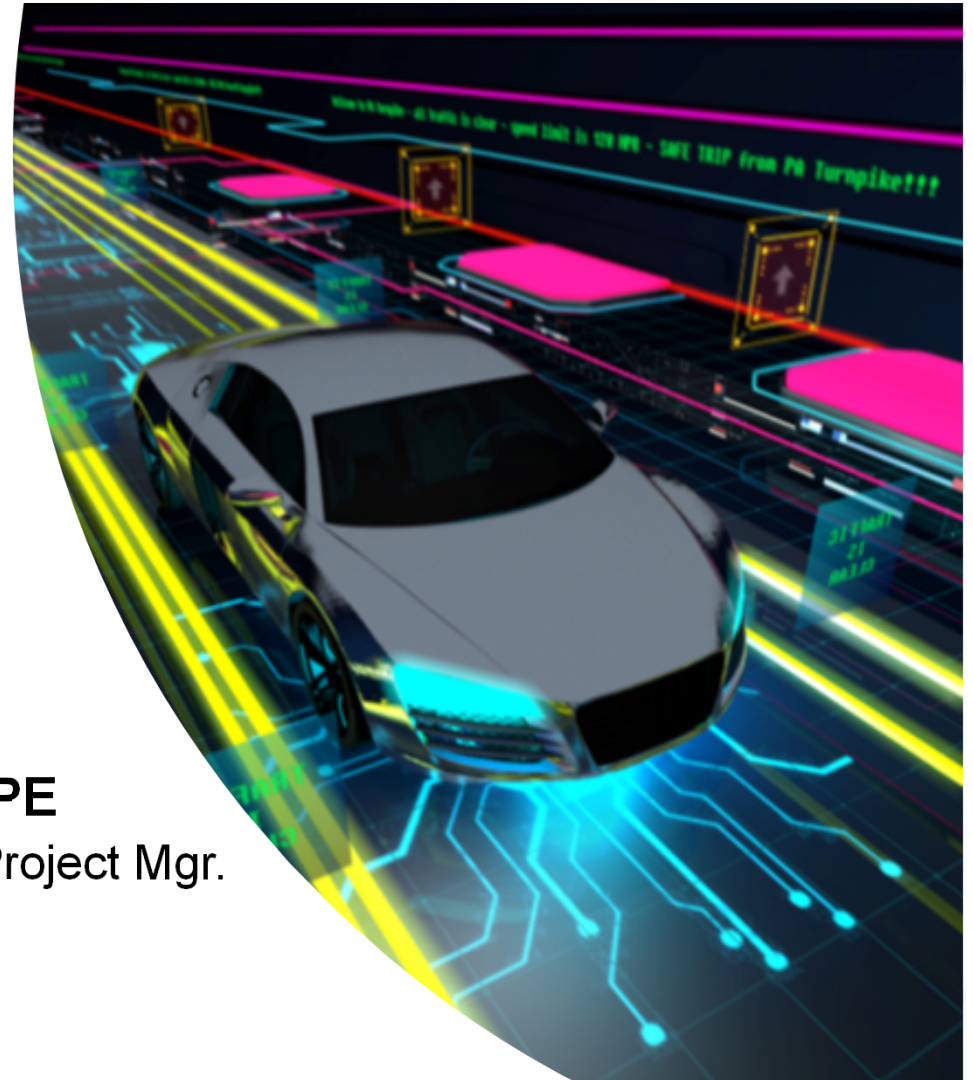


Constructing the PA Turnpike's Fiber Optic Network

Walter Wimer, PE
Design Project Mgr.
PA Turnpike

Steve Dale, PE
Construction Project Mgr.
PA Turnpike



Agenda

- D/B Project Overview
- Objective
- Fiber Design
- Construction Techniques
 - Micro-trenching
 - Junction Box Excavation
 - Bridge mounting
- Fiber OMC contract
- Q&A

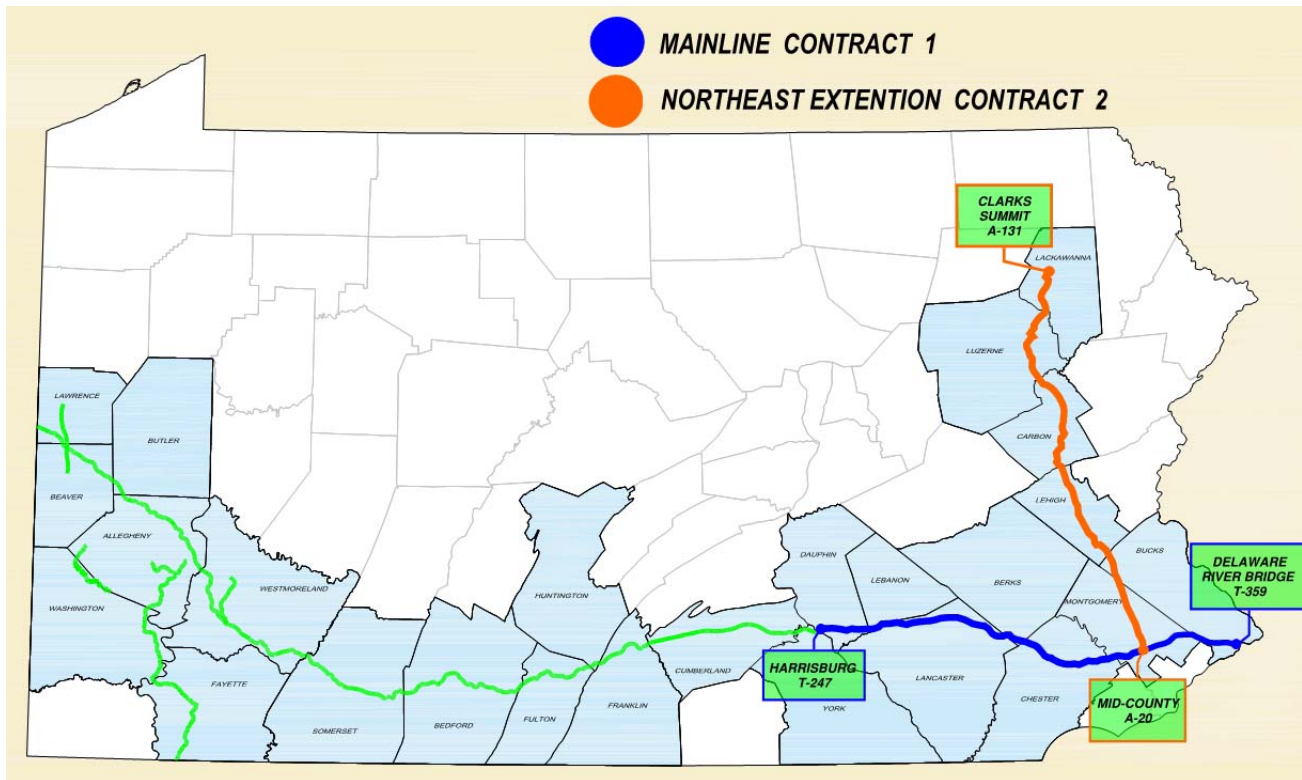


Agenda

- D/B Project Overview



Project Location



OVERALL PROJECT schedule/cost

Contract 1



- Bid Price - \$45 Million
- Notice to Proceed: Sept 17, 2019
- 70% Design Compete: May 2020
- 100% Design Complete: Dec 2020
- Construction Start: Feb 2021
- Completion Date: Nov 19, 2021

Contract 2



- Bid Price - \$50 Million
- Notice to Proceed: Dec 5, 2019
- 70% Design Compete: July 2020
- 100% Design Complete: Dec 2020
- Construction Start: Feb 2021
- Completion Date: Dec 17, 2021



Milestone Completions

Contract 1



MP 247 to 288: Sep. 27, 2021
MP 288 to 333: Oct. 22, 2021
MP 333 to H42.7: Nov. 19, 2021

Contract 2



MP 333 to A44: Oct. 29, 2021
MP A44 to A71: Nov. 19, 2021
MP A71 to A130: Dec. 17, 2021



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Agenda

- D/B Project Overview
- **Objective**

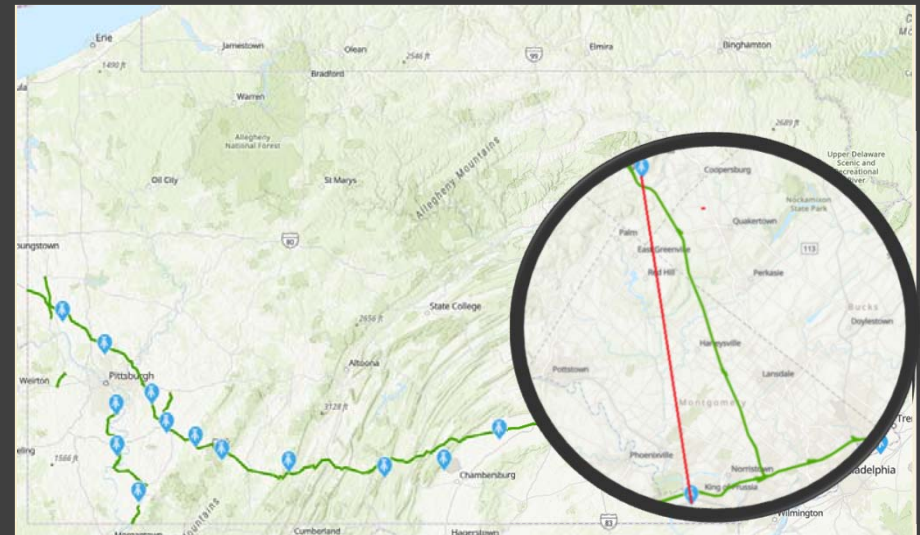
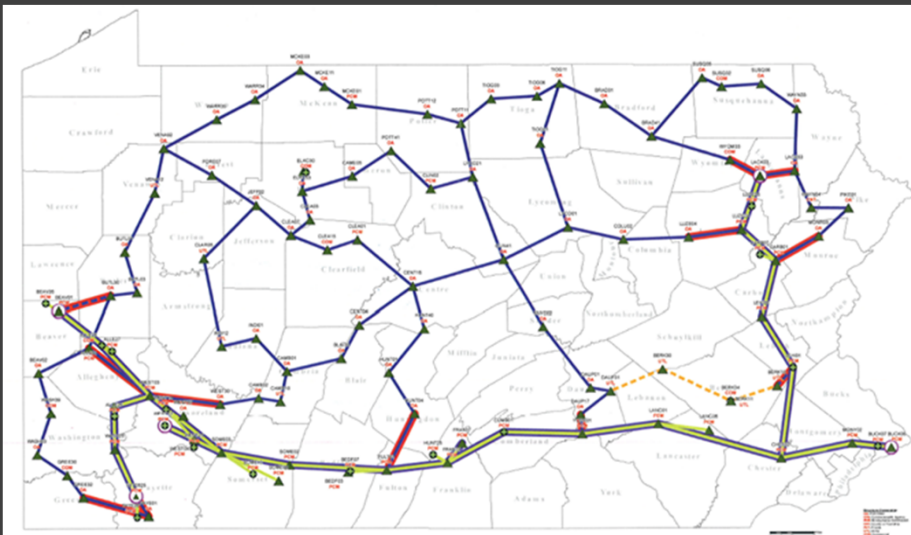


Why are we constructing a fiber optic Network

- Current Backhaul Network
- Open Road Tolling
- Fiber design
- Other connections (ITS, Gates, etc)
- Recent and Future Efforts
- Other Possibilities



Current Backhaul Communications



Move communications to where the need is: at the roadway, NOT the mountain tops

All Electronic Tolling – Tolling In Place

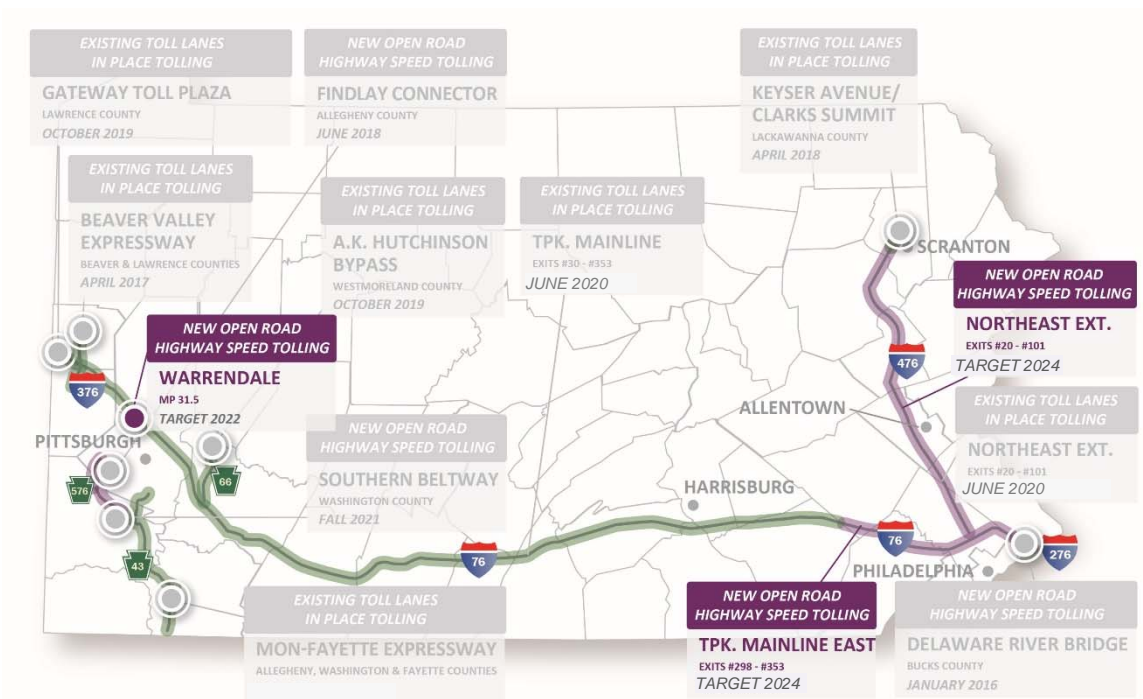


All Electronic Tolling – Open Road Tolling



Highway Speed
Open Road
Tolling (ORT)

All Electronic Tolling – Open Road Tolling



- Target Conversion for ORT:
 - East: 2024
 - West: 2026
- Fiber Design/Build will be complete
- Tolling Gantries will be connected to the fiber

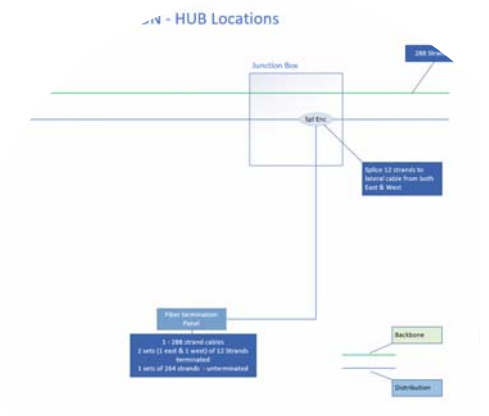
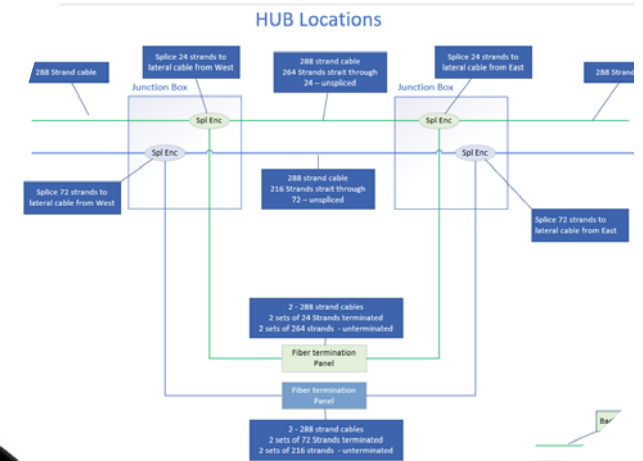
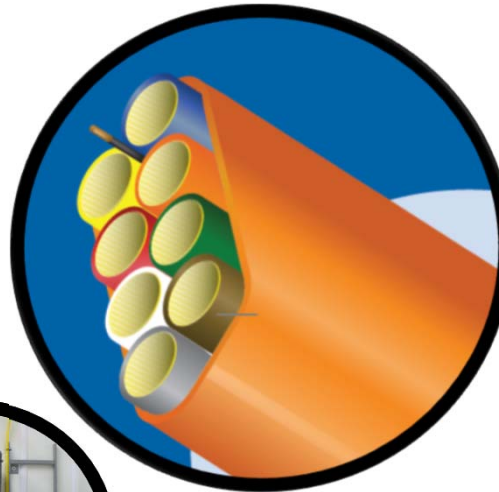
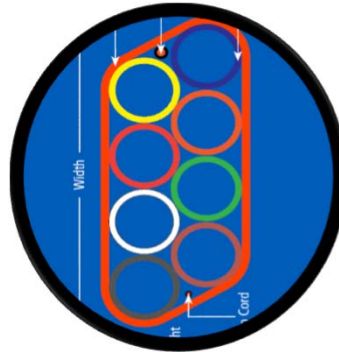
Agenda

- D/B Project Overview
- Objective
- **Fiber Design**



Fiber Design

- *Microducts*
- *Microfiber cable (288 strands)*
 - *PTC Backbone*
 - *PTC Distribution*
 - *Commercialization*
- *Hub locations*
- *Other demarcation sites*

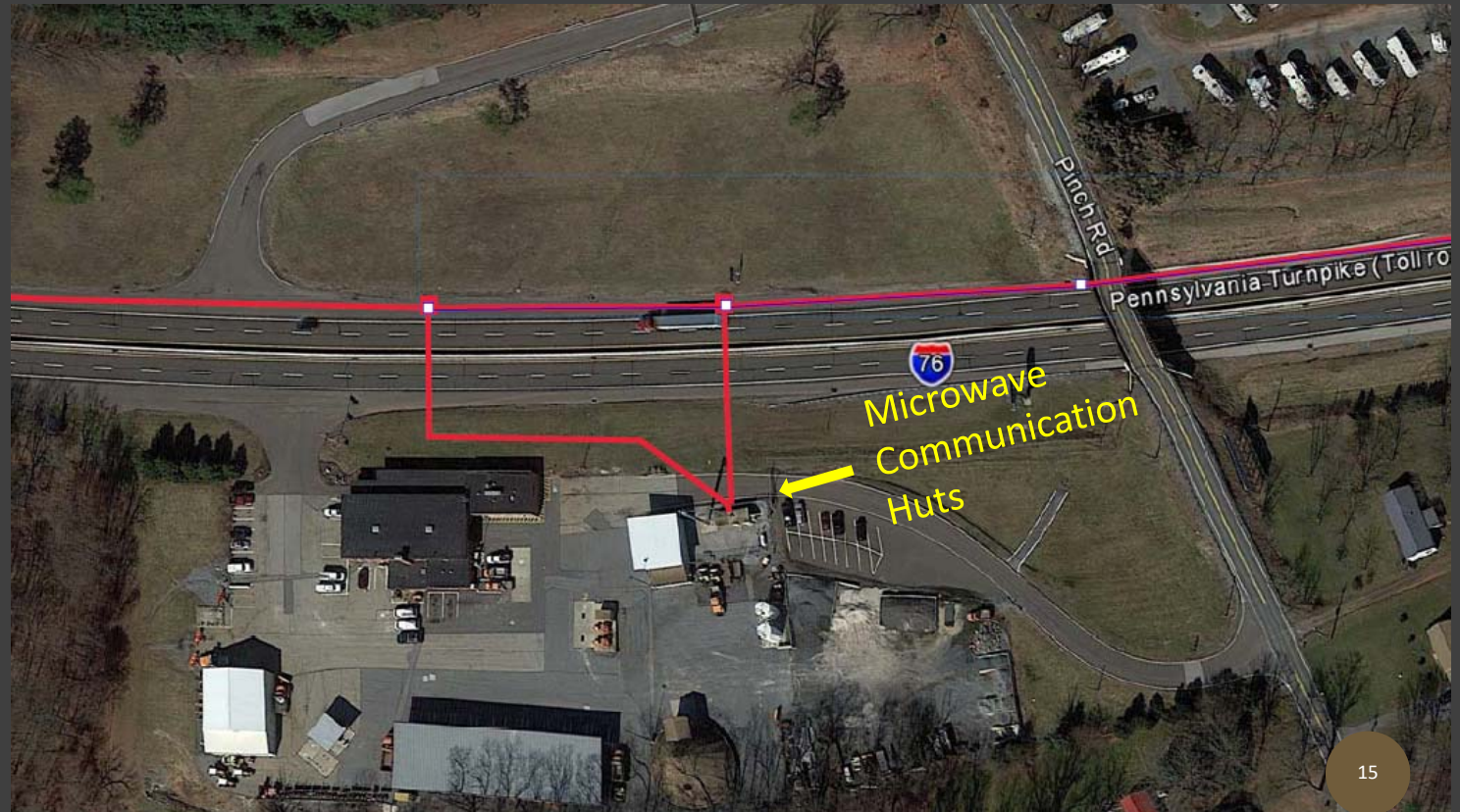


Example Demarcation

Mt Gretna
Maintenance
Facility

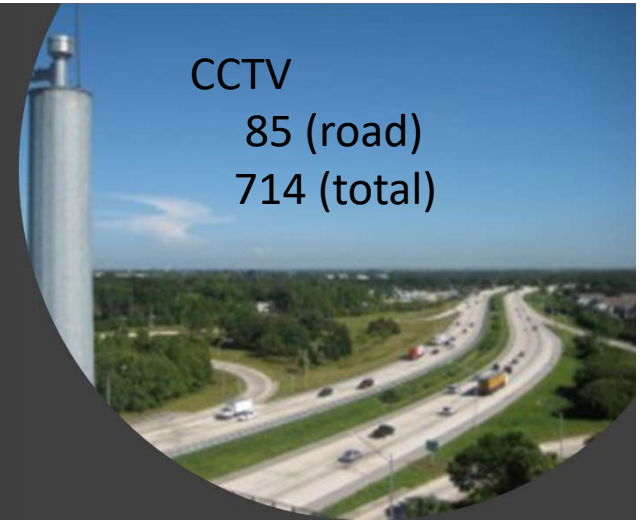
Other Non-Hub

- Interchanges
- ORT Gantry
- Tunnels
- ITS devices



Other Connections

- Goal to connect all ITS devices to fiber
- Off-pike devices - leased services
- Initial Fiber project will not include connecting these devices
- O&M and Commercialization (OMC)
 - Includes services to make ITS connections



Recent/Future Efforts

Connected & Autonomous Vehicles (CAV)

Traveler Information Message (TIM) for:

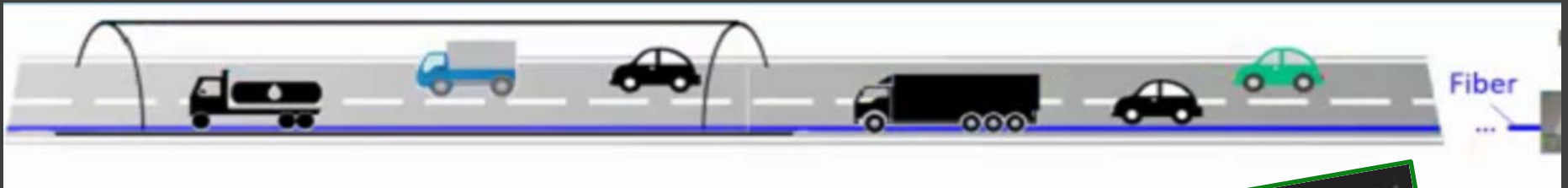
- Curve Speed Warning (Reduce Speed Alert and Weather Condition Alert), Link - <https://youtu.be/j7VHs1V9-CM>
- Work Zone Concepts (Lane Closure and Reduce Speed Alerts)
- Queue Warning (Lane Closure, Congestion and Queue Alerts)
- Spot Weather Advisory (Weather Condition Alert and Reduce Speed Alerts)
- Incident Management Response (Pre-warning Guidance and Reduce Speed Alert)

Basic Safety Message (BSM)

- Vehicle to Vehicle (Emergency Brake Light Activation and Forward Collision Warning, Lane Departure, Merge Assist) and Vehicle to Infrastructure

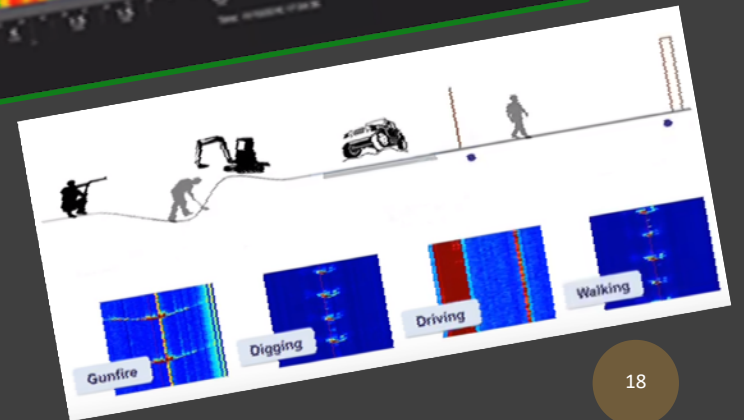
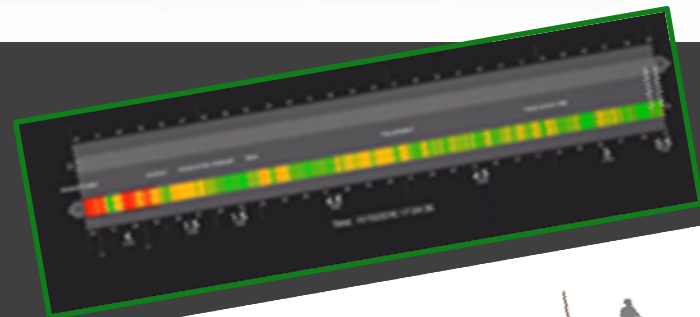


Other possibilities



Fiber optic monitoring

- Real time speed pattern monitoring, congestion
- Real time traffic counts, volume & flow
- Violation detection (wrong way traffic)
- Abnormal event detection (traffic accidents, abnormal braking)
- Pavement damage (potholes) detection

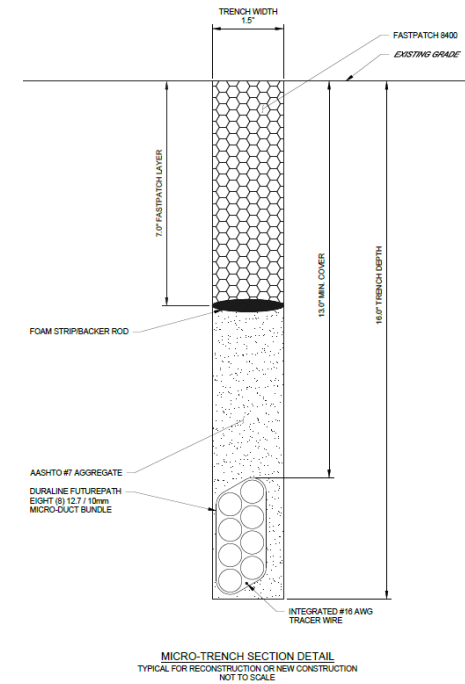
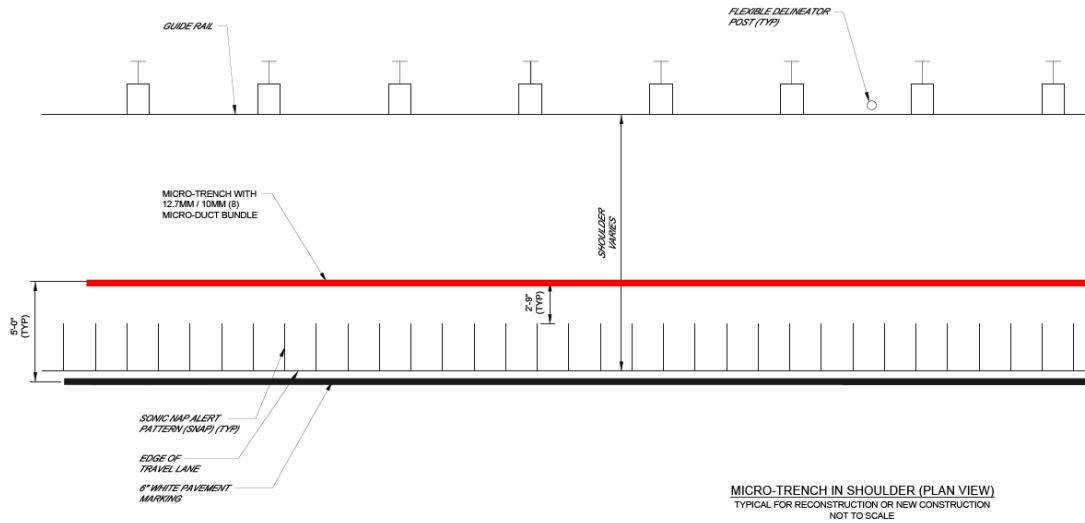


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Agenda

- D/B Project Overview
- Objective
- Fiber Design
- **Construction Techniques**
 - Micro-trenching
 - Junction Box Excavation
 - Bridge mounting



Shoulder Micro-Trenching



Shoulder micro-trenching

- Typical machinery in operation:



Shoulder micro-trenching

- Conduit installation and restoration:

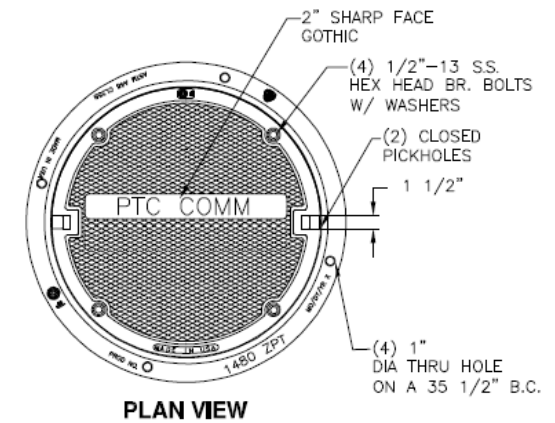
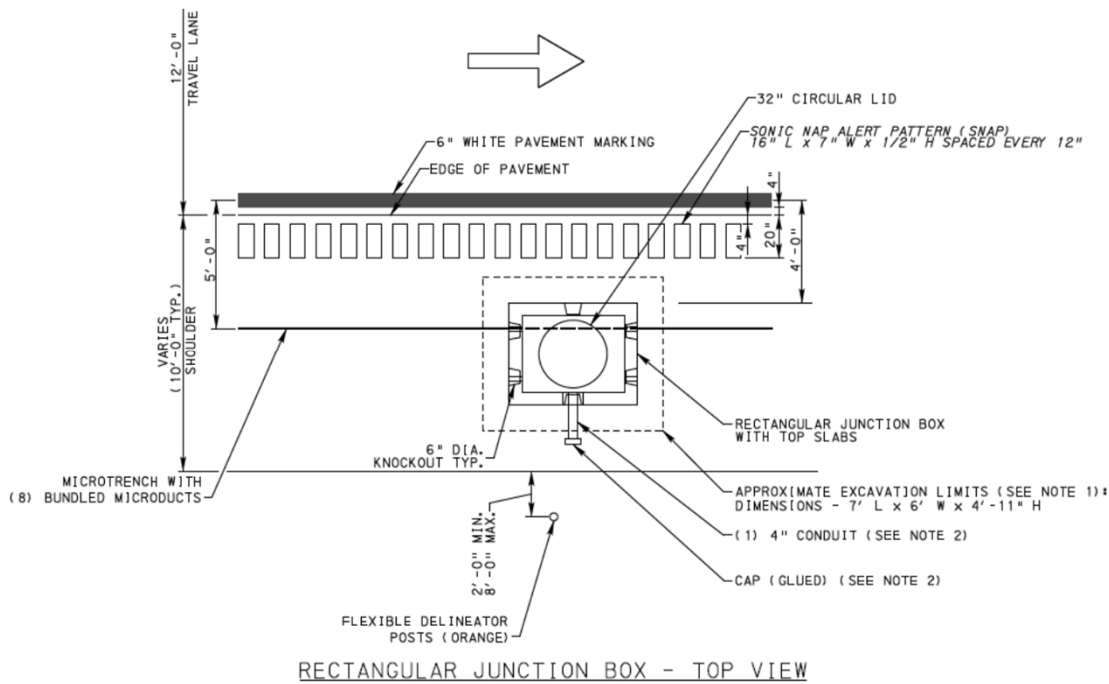


Junction Box Excavation

- Typical Junction Box excavation and micro-duct in the shoulder
- Junction Boxes spacing maximum of 2400 feet
- Splice enclosures and slack loops in Junction Boxes

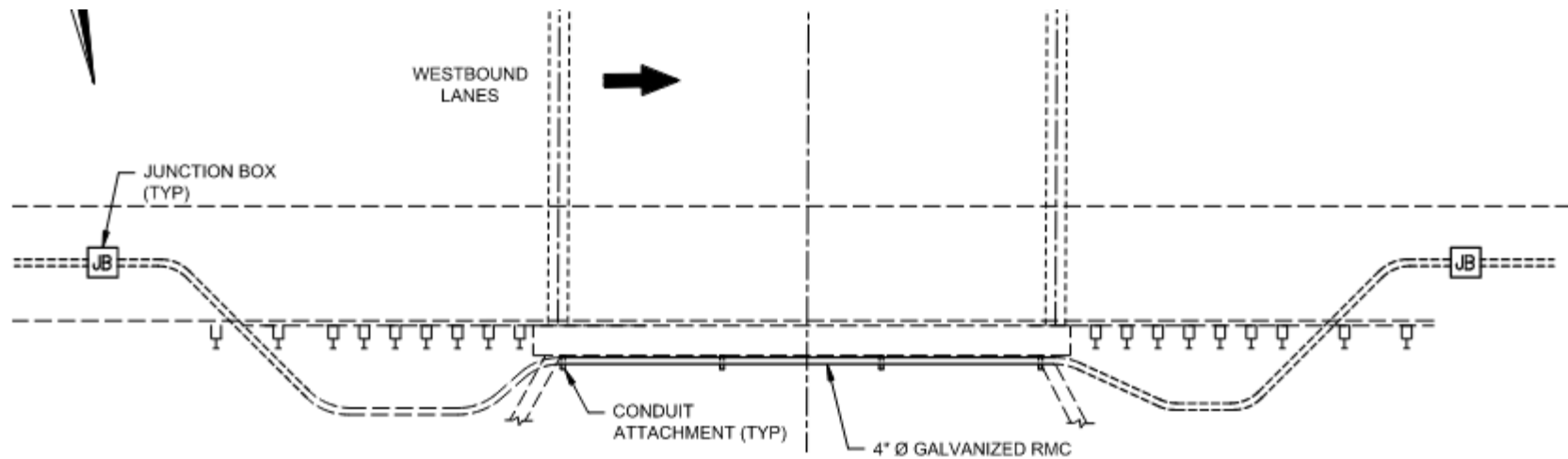


Junction Box Plan



Bridge Mounted Conduit

- Conduit Mounted on outside face of bridge parapets



Bridge Mounted Conduit



Bridge Mounted Conduit



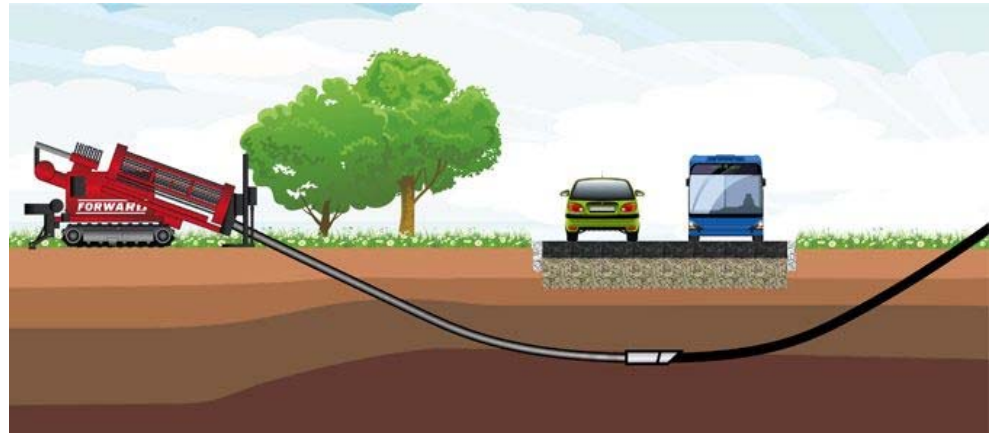
Bridge Mounted Conduit

- Existing conduits in place mounted under bridge:



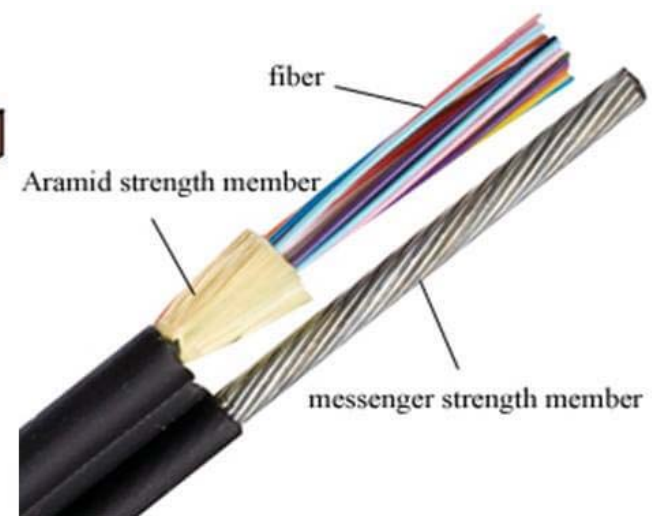
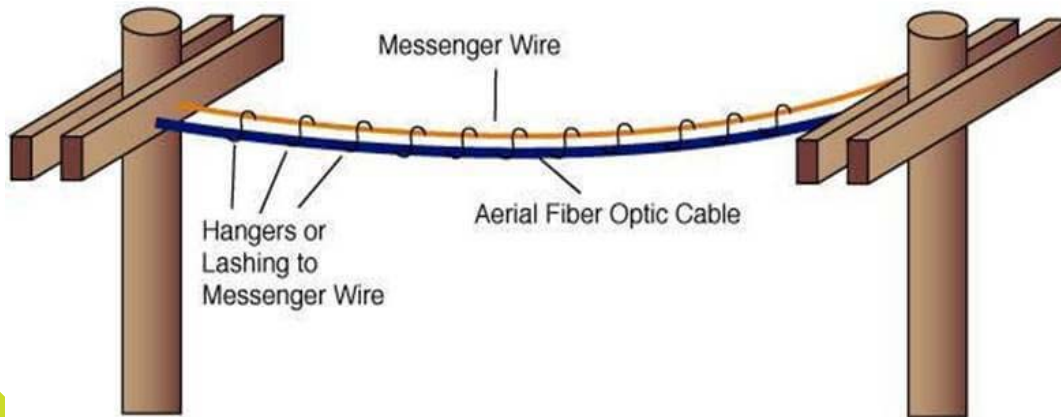
Directional Boring

- Photo and figure of directional boring operations:



Aerial Installation

- Installed in areas where roadway reconstruction is anticipated within 5 years.
- Wood Poles installed behind guiderail, barrier, or outside clear-zone



Aerial Installation

- Contract 1 Aerial Sections:
 - Mileposts 307.6 to 326.2
 - Mileposts 350.5 to 352.3
 - Mileposts 353.0 to 356.0
- Contract 2 Aerial Section:
 - Mileposts A36.9 to A43.8



Demarcation Sites

- Example demarcation location:
 - Miller Building



Coordination of Work

Contract 1

Project	Approximate Mileposts	Anticipated Start	Anticipated Completion
Bituminous Overlay	MP 282 - 292	Under Construction	Fall 2020
Cashless Tolling	MP 290 - 331	Summer 2020	Summer 2022
Bituminous Resurfacing	MP 292 - 299	Spring 2020	Summer 2021
Bituminous Overlay & Median Barrier Replacement	MP 299 - 308	Under Construction	Summer 2020
EB-704 Bridge Replacement	MP 302.81	Spring 2021	Fall 2021
EB-705 Bridge Elimination	MP 303.39	Spring 2020	Fall 2020
EB-719 Bridge Replacement	MP 310.39	Spring 2020	Fall 2022
Median Barrier Replacement	MP 308 - 312	Winter 2019/2020	Fall 2020
Bituminous Resurfacing	MP 312 - 319	Spring 2021	Spring 2022
Cashless Tolling	MP 332 - 349	Spring 2020	Summer 2022
Bituminous Resurfacing	MP 333 I/C	Spring 2021	Summer 2022
Bituminous Resurfacing & Median Barrier Replacement	MP 334 - 340	Winter 2019/2020	Fall 2021
DB-242 Bridge Replacement	MP 355.63	Summer 2019	Late Summer 2021

Contract 2

Project	Approximate Mileposts	Anticipated Start	Anticipated Completion
Bituminous Resurfacing	MP A20 – MP A26	Spring 2021	Summer 2022
Cashless Tolling	MP A27 – MP A77	Summer 2020	Fall 2021
Roadway and Bridge Reconstruction *	MP A31 – MP A38	Under Construction	Spring 2021
NB-202 Bridge Replacement	MP A40.12	Spring 2020	Fall 2020
Bituminous Resurfacing	MP A44 I/C	Spring 2021	Fall 2021
NB-314 Bridge Replacement	MP A49.67	Spring 2021	Fall 2021
Bridge Painting	MP A51.36 – MP A51.82	Spring 2020	Fall 2020
Bituminous Resurfacing and Slope Work	MP A59 – MP A68	Spring 2021	Fall 2022
NB-363 Bridge Replacement	MP A59.22	Fall 2020	Fall 2021
Bituminous Resurfacing	MP A95 – MP A101	Under Construction	Fall 2020
Cashless Tolling	MP A99 – MP A122	Summer 2020	Fall 2021
Bituminous Resurfacing	MP A104 – MP A115	Spring 2021	Fall 2022
Bridge Rehabilitation	MP A105-MP A119.53	Spring 2020	Fall 2020
Bituminous Resurfacing	MP A120 – MP A128	Spring 2020	Fall 2021
Bridge Replacement	MP A130.23	Under Construction	Summer 2021

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- **Fiber OMC contract**





Fiber OMC Contract

- Operation & Maintenance and Commercialization Services
- Awarded to Plenary Broadband Group – June 2020



Key aspects of OMC Contract

- 25 Year contract
- O&M Services
 - Coordination with FON D-B contracts
 - Fiber management system
 - Perform routine maintenance
 - Connection of new and existing devices
- Commercialization
 - Eastern Network
 - 50/50 Share in Net Revenues with PTC
 - Guaranteed Minimum Revenue for PTC
 - Future Development of Western Network



OMC - Permitted Commercialization Services

- Market micro-ducts on a wholesale basis;
- Offer dark fiber services on a wholesale basis
- Provide wireline lit fiber services/direct connections to retail customers, including area businesses and employers, residential customers, and Internet Service Providers (ISPs).
- May install new cell towers within Commission's ROW, subject to PTC approval on a case-by-case basis.



OMC - Additional Services as needed

- Coordination with Commission Projects
 - Advanced coordination when necessitated by Commission construction projects;
 - Protecting the Fiber from unwanted physical access or intrusion including locating and mark-out services or relocating if needed.
- Western Network development
 - Expansion dependent upon funding and commercial interest
 - Providing O&M services in connection with the ongoing expansion of the Fiber Infrastructure



QUESTIONS?

2021 APC Innovation Conference
April 14, 2021

