



Alaska Department of Transportation & Public Facilities

ITS Alaska 9th Annual Meeting – September 11, 2017 Presentation
Fairbanks Traffic Operations Center and
Fiber Optic Interconnect Projects



Acknowledgements

- Carl Heim, PE
Engineering Manager
NR Preconstruction Services,
Design Section
- Pam Golden, PE
NR Traffic & Safety Engineer
- Dan Schacher
Fairbanks District Superintendent
NR Maintenance & Operations
- Jason Jacobs
Signal Maintenance Manager
NR Maintenance & Operations



Talking Points

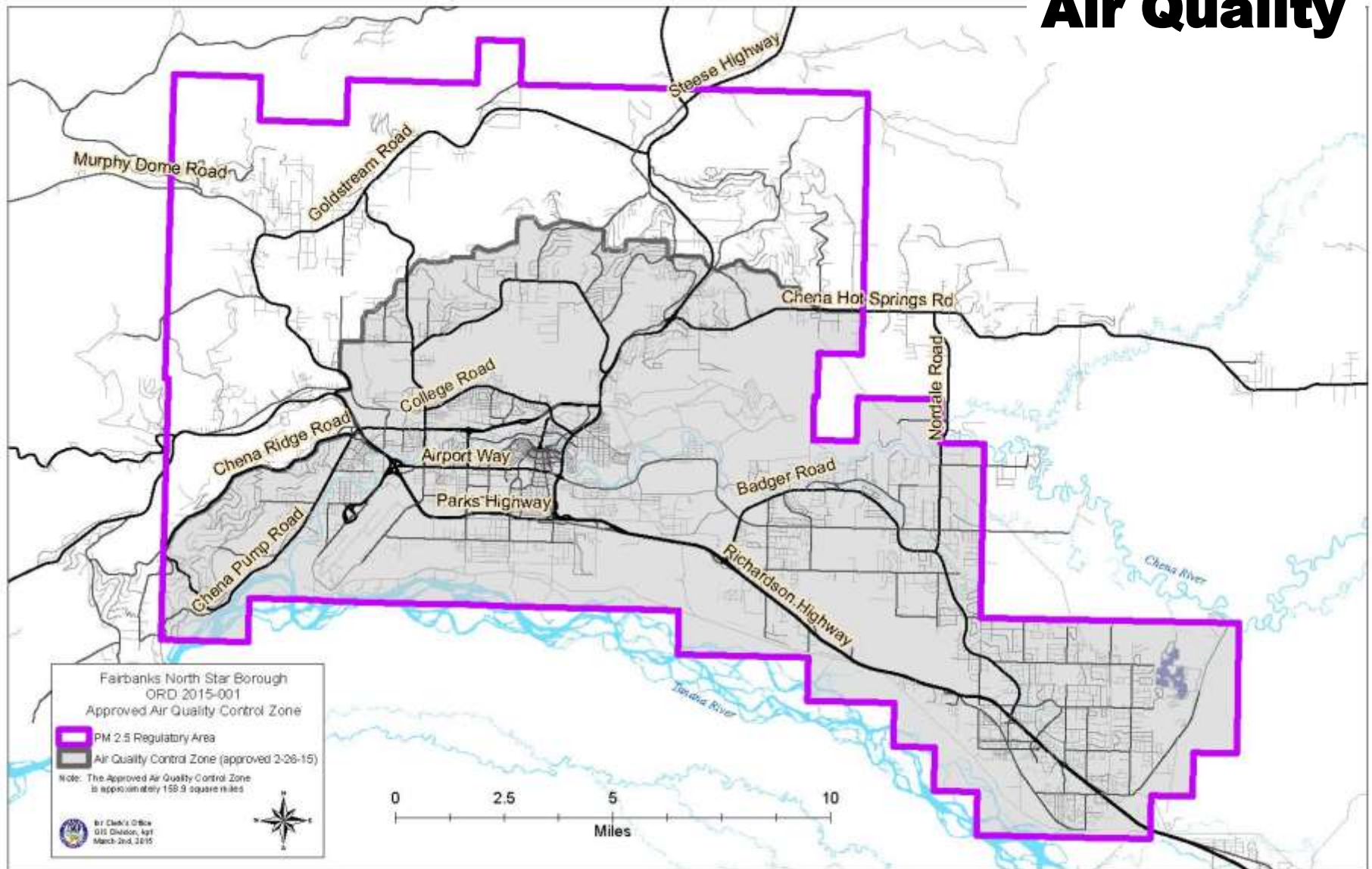
1. Fairbanks Area Air Quality Problem
2. NR Traffic Signal Interconnect Plan
3. NR Fiber Optic Interconnect Projects
4. NR Traffic Operations Center (TOC) Project



Air Quality

- The Environmental Protection Agency (EPA) designated Fairbanks as a **PM_{2.5} Nonattainment Area** in 2009 and reclassified Fairbanks as “serious” this Spring.
- **PM_{2.5}** is a tiny air pollutant particle having a diameter of 2.5 microns and less
- Burning of fuel oil, wood, coal, waste oil, and motor vehicle emissions are the primary sources
- Particles can lodge deep inside your lungs and can cause various debilitating heart and lung illnesses

Air Quality



Air Quality

Various studies since 2012 has shown that up to **20% of PM_{2.5}** emissions in Fairbanks is attributed to on-road motor vehicles



Source: Fairbanks News Miner

Air Quality

The DOT&PF response to this issue is to apply **engineering solutions** to reduce motor vehicle emissions. They include:

- Adding motor vehicle plug-ins in public spaces to reduce cold starts & idling time



Air Quality

- Using **ITS Solutions** to reduce motor vehicle idling time at signalized intersections by improving signal operations and maintenance.
 - Improve Center to Signal, and Signal to Signal Communication links
 - Optimize signal timing, phasing, & offsets
 - Monitor traffic in real-time
 - Faster maintenance response to correct traffic signal equipment issues



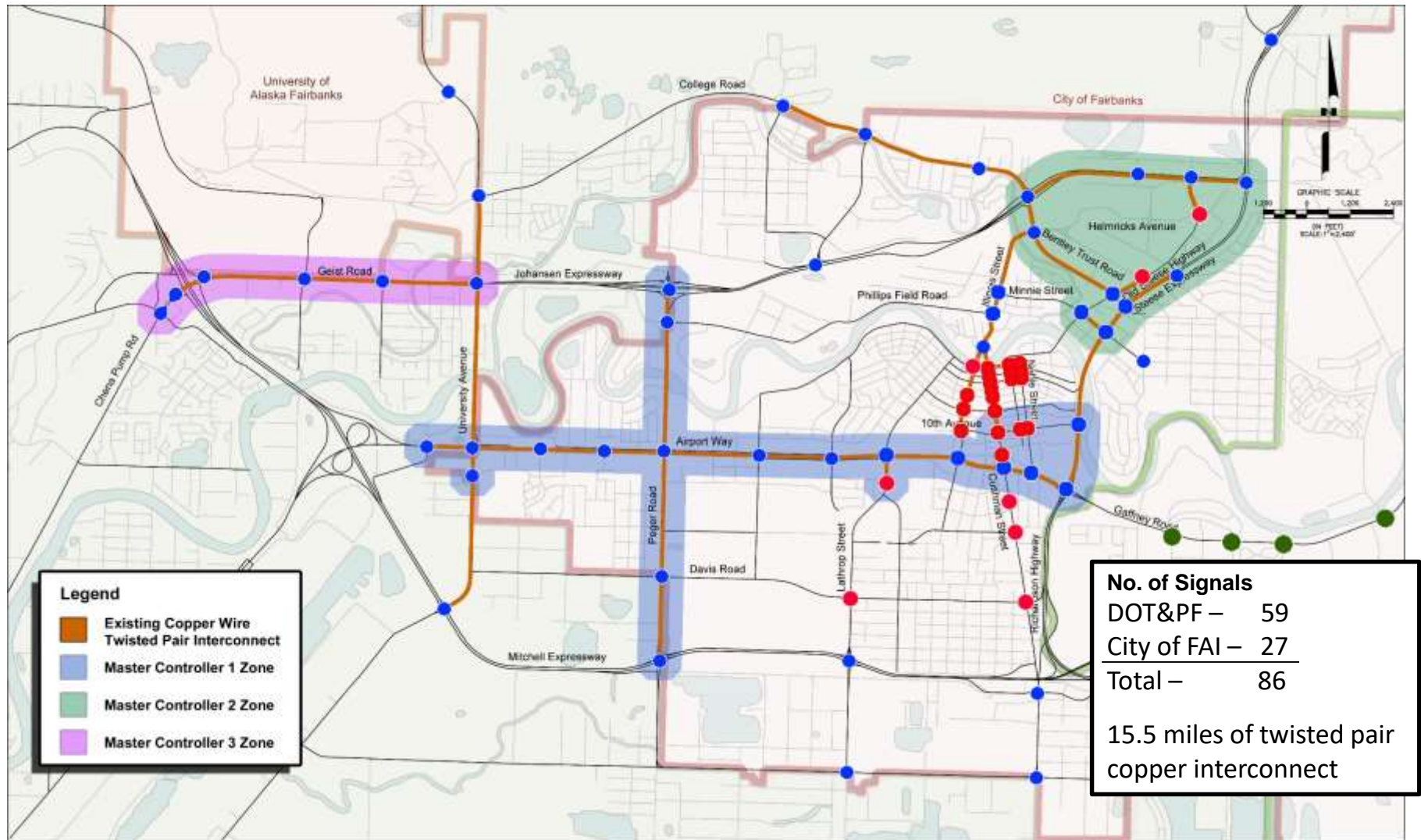


NR Traffic Signal Interconnect Plan Overview

1. Assessment of Existing Conditions
 - Reviewed existing traffic signal infrastructure, including traffic signal cabinet equipment and interconnect links
2. Assessment of Needs
 - Worked closely with NR Traffic Section to identify issues and needs
3. Recommended Improvements
4. Deployment Plan to implement recommended improvements

NR Traffic Signal Interconnect Plan

Existing Conditions





NR Traffic Signal Interconnect Plan

Existing Conditions

Key Findings

1. Traffic signals located outside of the urban area are not connected to Center
2. Existing interconnect is twisted pair copper telemetry cable – inadequate for viewing multiple live, high quality video feeds that are necessary to monitor traffic in real time
3. No centralized location (Center) to remotely observe traffic operations, adjust signal timings for incident management, or improve intersection and corridor efficiencies



NR Traffic Signal Interconnect Plan

Recommendations

1. Provide an interconnect comm system that connects to **All** NR traffic signals
2. Provide Pan-Tilt-Zoom (PTZ) cameras to enable live traffic observations
3. Provide a Traffic Management Center for centralized signal operations and maintenance
4. Replace the existing copper wire interconnect cable with single mode fiber optic (SM FO) cable – capable of reliably and securely transmitting large amounts of data

NR Traffic Signal Interconnect Plan

Recommendations

Typical Transmission Rates For Video and Data Applications

Video

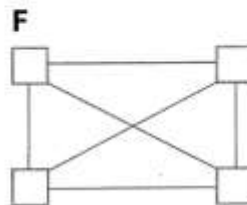
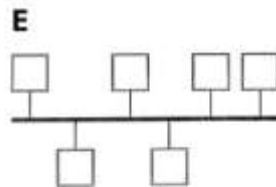
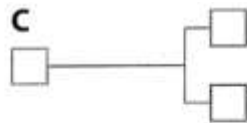
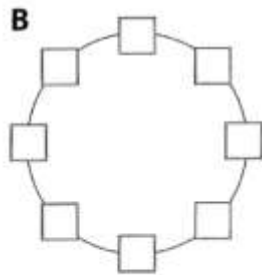
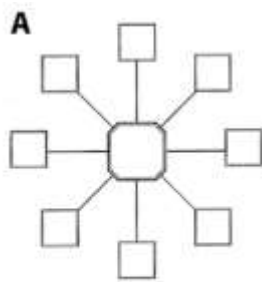
MPEG-4	<400,000 b/s	Video conferencing
H.264	<6,000,000 b/s	Good/high quality video

Data

EIA-232D (RS-232)	19,200 b/s	Data
Ethernet (IEEE 802.3)	10,000,000 b/s	Data
Fast Ethernet	100,000,000 b/s	Data
Gigabit Ethernet	1,000,000,000 b/s	Data
10 Gigabit Ethernet	10,000,000,000 b/s	Data
40 Gigabit Ethernet	40,000,000,000 b/s	Data
100 Gigabit Ethernet	100,000,000,000 b/s	Data

**FO
Switch
Used**

NR Traffic Signal Interconnect Plan Recommendations



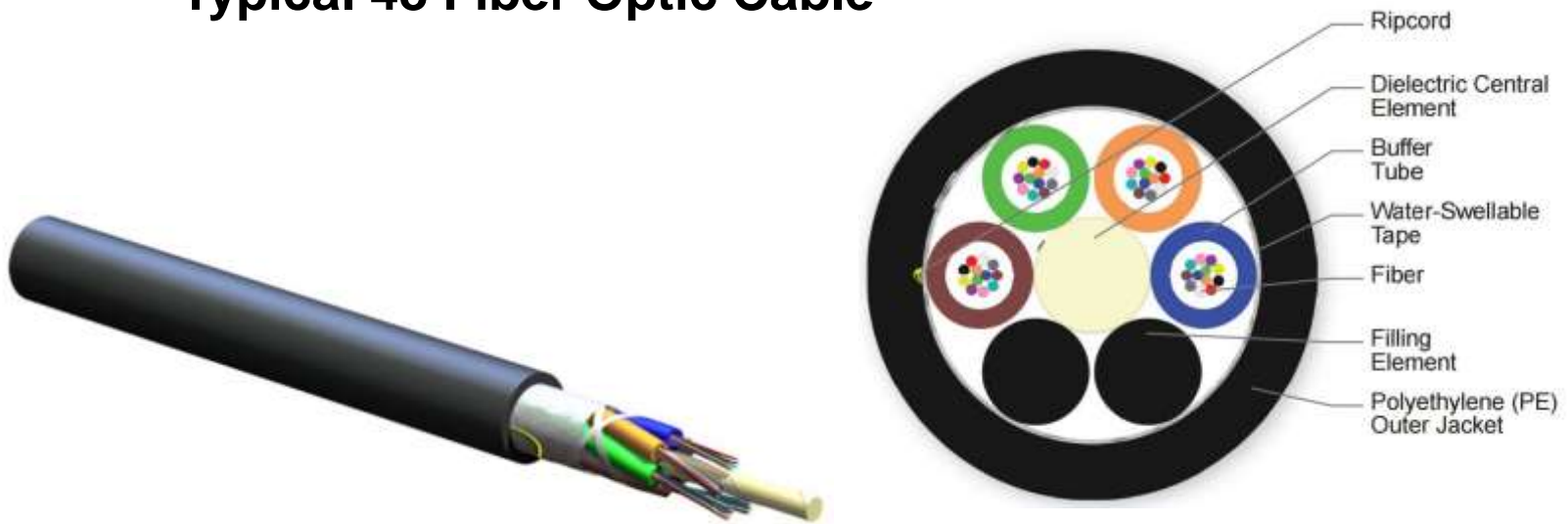
System Topologies

- A. Star
- B. Ring **Selected**
- C. Point to multipoint
- D. Point to Point
- E. Bus
- F. Mesh

NR Traffic Signal Interconnect Plan

Recommendations

Typical 48 Fiber Optic Cable

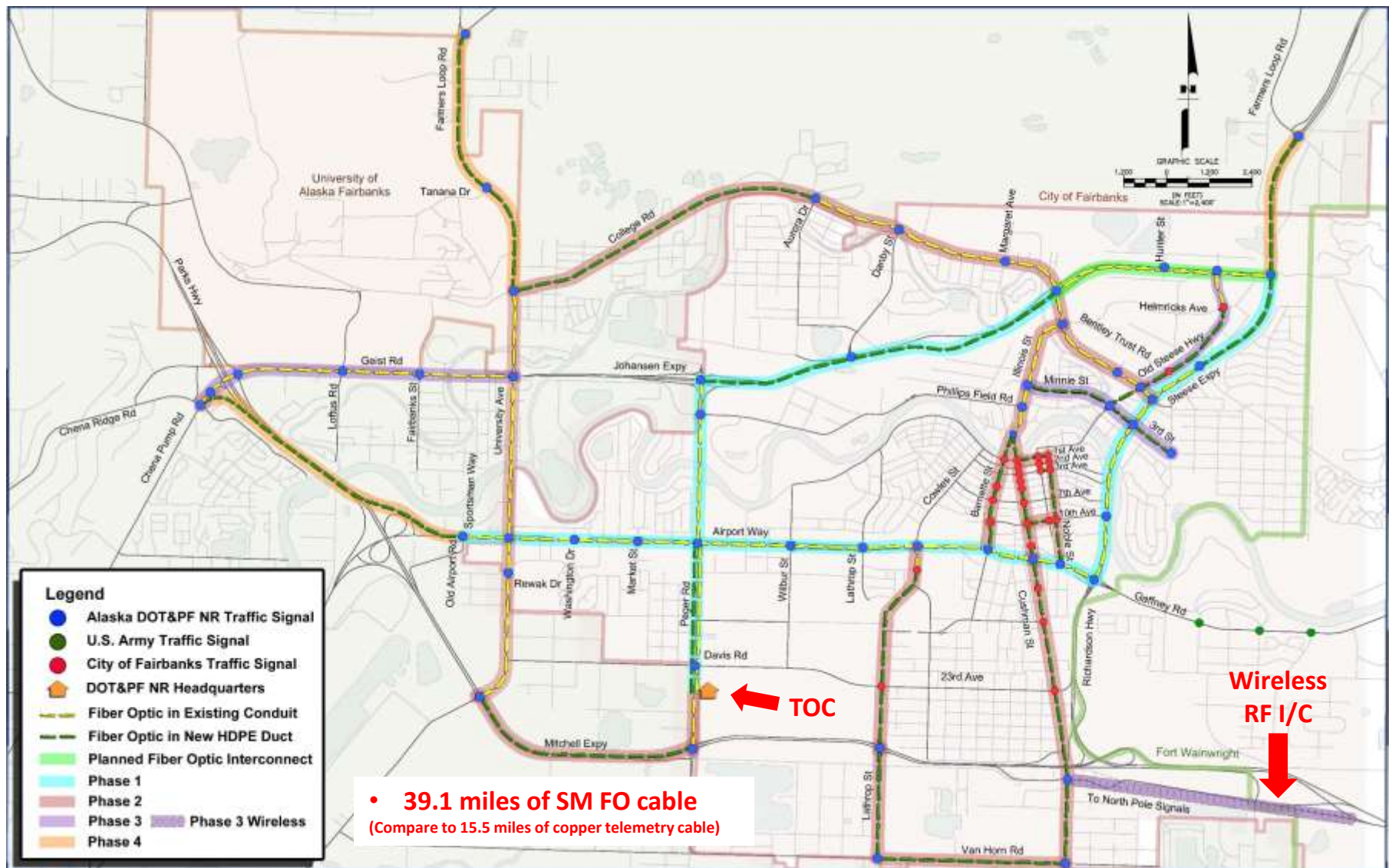




NR Traffic Signal Interconnect Plan Deployment Plan

- Identifies 18 Projects
- Phased prioritization approach.
 - Improve vehicle progression on corridors with high traffic volumes
 - Take advantage of other planned roadway projects
 - Completion of a self-healing FO ring network
 - Provide links to outlying traffic signals
 - Reliability (complete links to create additional rings for added redundancy)
- Construct 39.1 miles of fiber optic cable interconnect
- Construct a Traffic Operations Center (TOC)
- \$16.7 million Total Investment (2014 \$\$\$)

NR Traffic Signal Interconnect Plan Deployment Plan





NR Fiber Optic Interconnect Installation

Current Status

- A total 11.4 miles of SM FO cable installed to date
 - Johansen Expy, College Rd to Steese Expy
 - Airport Way, Sportsman Way to Steese Expy
 - Peger Road, Mitchell Expy to Johansen Expy
 - Cushman St, Airport Way to 1st Ave
 - Noble St, Airport Way to 1st Ave
 - Farmers Loop Road, College Rd to Ballaine
 - Davis Rd, Peger Rd to TOC
- Another 27.7 miles of SM FO cable projects are under design



NR FO Interconnect Construction





NR FO Interconnect Construction





NR FO Interconnect Construction





NR FO Interconnect Construction



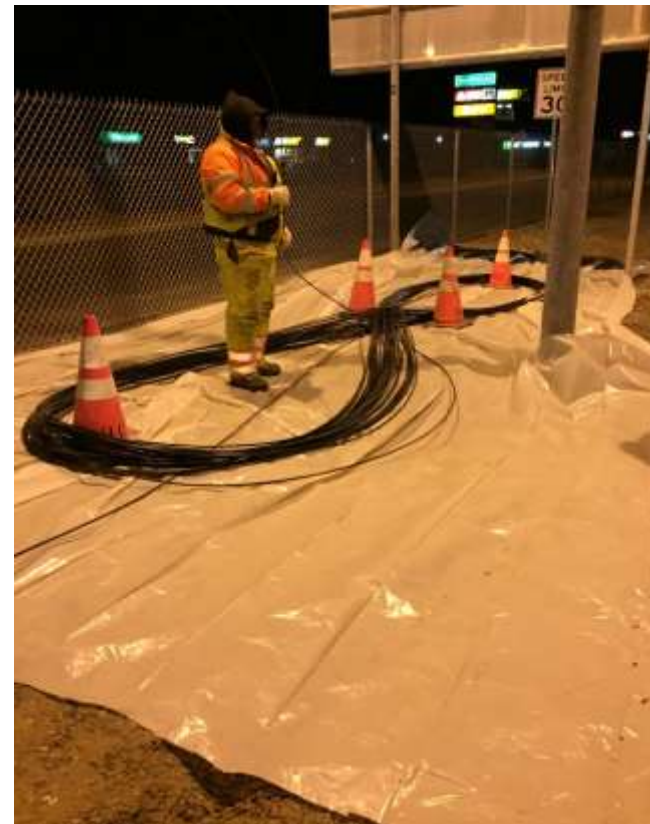


NR FO Interconnect Construction





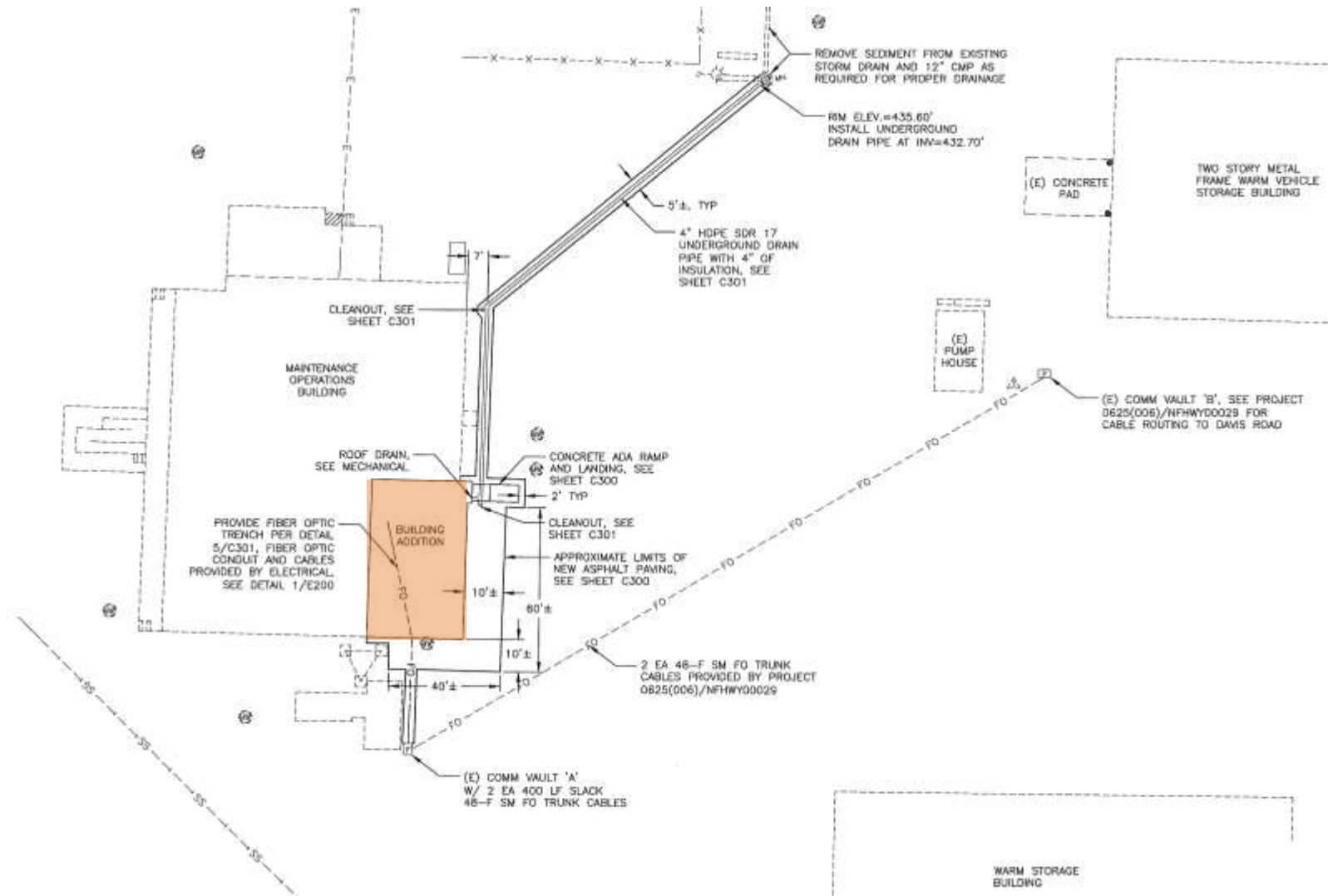
NR FO Interconnect Construction



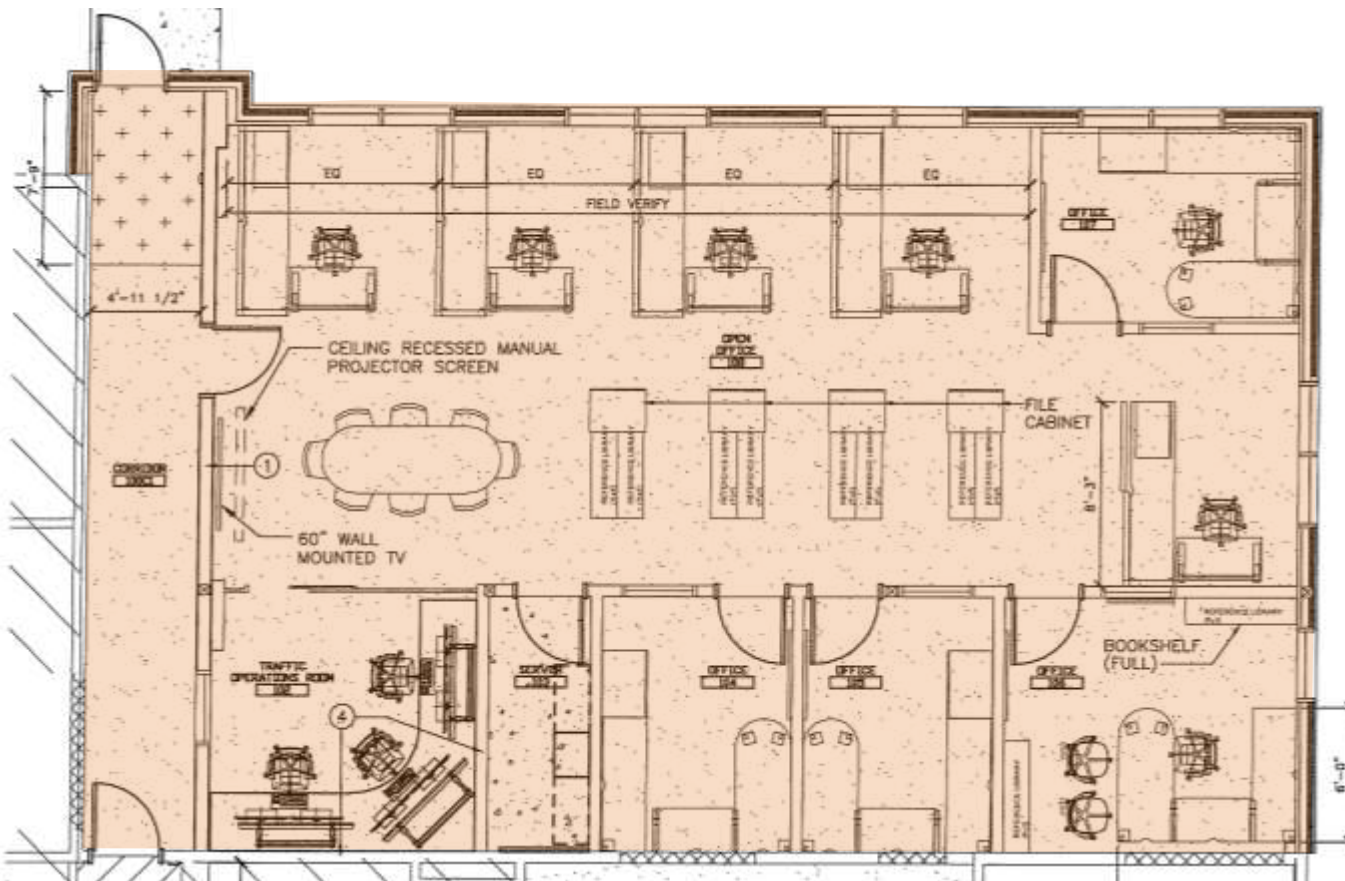
NR Traffic Operations Center Vicinity Map



NR Traffic Operations Center Site Plan



NR Traffic Operations Center Floor Plan

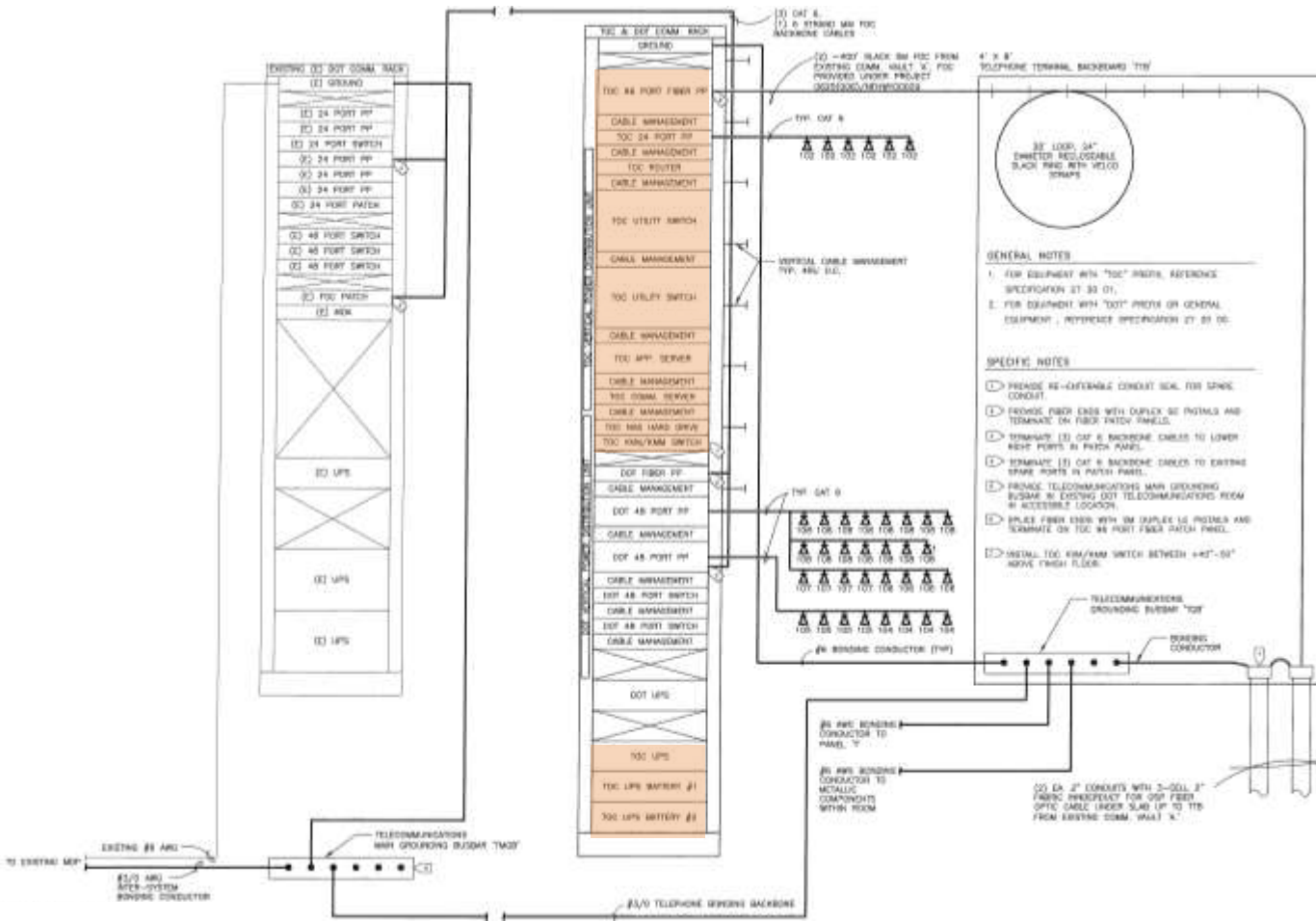


TOC Stats

- 1,785 SF Addition to M&O Building
- Low Bid - \$1.65 Million
 - \$180K Contaminated Soils
 - \$400K ATMS
- 9 - office space
- 4 - ATMS work stations, each w/ dual 24" monitors
- 2x2 Video Wall w/ 4 – 55" HD LED flat screens
- TOC should be operational by the end of September 2017

NR Traffic Operations Center

Server Rack



Server Rack Stats

8' high x 19" wide
52 Rack Units

1-96 Fiber Termination Panel
1-24 Fiber Patch Panel
1-Router
2-Utility Switches

1-Application/Database Server
1-Comms Server
1-NAS 4Tb Server Backup
1-KVM/KMM Terminal Switch
w/19" LCD Screen

1-UPS w/ 2 backup batteries

NR Traffic Operations Center Construction Photos



NR Traffic Operations Center

Construction Photos



NR Traffic Operations Center

Construction Photos



NR Traffic Operations Center

Construction Photos



NR Traffic Operations Center

Construction Photos



NR Traffic Operations Center

Construction Photos



NR Traffic Operations Center

Construction Photos



NR Traffic Operations Center Construction Photos



NR Traffic Operations Center

Traffic Operations Room



NR Traffic Operations Center

Server Room





Questions?

