Fiscal Year 2016-17 Information Technology Request

Transportation

I-25 Fiber Optic Communications Infrastructure

2017-027

PROGRAM PLAN STATUS and OIT BEST PRACTICES

Approved Program Plan? N/A **Date Approved:**

PRIORITY NUMBERS

Prioritized By	Priority	
DeptInst	1 of 3	
OSPB	44 of 46	Not recommended for funding.

PRIOR APPROPRIATION AND REQUEST INFORMATION

Fund Source	Prior Approp.	FY 2016-17	FY 2017-18	Future Requests	Total Cost
CCF	$0	$6,000,000	$0	$0	$6,000,000
Total	$0	**$6,000,000**	$0	$0	$6,000,000

ITEMIZED COST INFORMATION

Cost Item	Prior Approp.	FY 2016-17	FY 2017-18	Future Requests	Total Cost
Land Acquisition	$0	$0	$0	$0	$0
Professional Services	$0	$1,000,000	$0	$0	$1,000,000
Construction	$0	$3,400,000	$0	$0	$3,400,000
Equipment	$0	$1,600,000	$0	$0	$1,600,000
Miscellaneous	$0	$0	$0	$0	$0
Contingency	$0	$0	$0	$0	$0
Software Acquisition	$0	$0	$0	$0	$0
Total	$0	**$6,000,000**	$0	$0	$6,000,000

PROJECT STATUS

This is a new, never-before-requested project.

PROJECT DESCRIPTION / SCOPE OF WORK

The Colorado Department of Transportation (CDOT) is requesting state funds to extend the department-administered fiber optic telecommunications "backbone" along Interstate 25 from Aguilar, in Las Animas County, to the Colorado/New Mexico border. CDOT uses the telecommunications backbone to operate its Intelligent Transportation Systems (ITS) infrastructure to gather data, which the department uses to manage traffic and traffic incidents while providing real-time information to the traveling public. The addition of this 34-mile stretch to the telecommunications backbone will result in complete system coverage along I-25 from Wyoming to New Mexico. To complete the telecommunications backbone along I-25, the project installs the following:

- two conduits in a trench containing fiber optic cable running the 34 miles to be covered by the project;
- network gears and switches required to operate the corridor infrastructure;
- network access points, including manholes and pull boxes;
- closed-circuit televisions;
- variable message boards;
- a weather station; and

- monitoring devices for collecting travel time information.

CDOT explains that it has already installed a telecommunications backbone along Interstate 70 from the Kansas state line to Glenwood Springs, and is currently working to complete the backbone segment extending to the Utah state line.

Cost assumption. CDOT adds a 20 percent charge to all project development for project design, plan reviews, environmental and utility clearances, and other considerations such as contingencies, which accounts for $1.0 million of the project cost. The department estimates that telecommunications infrastructure costs about $100,000 per mile, or $3.4 million for this 34-mile section of infrastructure. The project also includes $1.6 million in hardware and equipment. The right-of-way for the new length of telecommunications backbone is owned by the department.

PROJECT JUSTIFICATION

CDOT explains that the project directly supports and significantly improves public safety by supplying advanced communications infrastructure to the public traveling along a rural corridor that regularly experiences severe weather conditions and has limited communications infrastructure in place. The department says the project allows it to accomplish the following three strategic objectives:

1. Facilitate the use of technology to quickly detect and verify traffic incidents, allowing CDOT to work with law enforcement and emergency responders to ensure fast, appropriate levels of response to incidents, thereby increasing the ability to save lives. Building out this technology will also allow the department to monitor and detect rapidly changing weather conditions and quickly relay this information to travelers. This segment of the telecommunications backbone will be interconnected with the Colorado Transportation Management Center in Golden, which is responsible for disseminating statewide traveler information, including weather, traffic congestion, and travel route information. Information is disseminated to travelers via message boards, phone apps, and other means. CDOT also uses information from the backbone to make operational decisions such as when and how to initiate road maintenance projects.

2. Extend foundational infrastructure required to support and operate "Connected Vehicles" applications, such as vehicle-to-vehicle and vehicle-to-infrastructure communications. Connected Vehicles is part of the federal ITS initiative, and envisions facilitating communication between vehicles and infrastructure to increase safety and mobility and decrease the environmental impact of driving. Through communications interconnection, the ITS infrastructure will help vehicles to avoid crashes while reducing traffic congestion and associated fuel use. A reliable, high-speed communications network is required to implement Connected Vehicles technology.

3. Foster interconnectivity of transportation management centers with New Mexico as part of the Nationwide Public Safety Broadband Network, and create a platform to work with Wyoming to provide levels of transportation services that travelers expect. The project will also provide the ability for future interconnectivity from I-25 along the eastern portion of US 160, which would enhance broadband services in southeastern Colorado.

The department says failure to fund the project will result in a significant delay in improving safety for travelers along the I-25 corridor while negatively impacting travel times.

PROGRAM INFORMATION AND IMPLEMENTATION PLAN

The department says participation in the ITS program and Connected Vehicles initiative requires use of a reliable, high-speed communications network, such as its fiber optics telecommunications backbone. For information on these federal programs, along with the practical applications of the backbone, see the Project Justification section.

CDOT notes that its fiber optics telecommunications backbone is used by its partners for a variety of public services, as follows:

Higher education. Several higher education institutions, including the Colorado State University Fort Collins and Pueblo campuses, the Colorado School of Mines, the Auraria Higher Education Center, and the University of Colorado Boulder and Anschutz campuses, share the fiber optic backbone for internet traffic, supporting research,

student services, and inter-campus communications. Using the backbone results in cost savings for the institutions and students.

K-12 education. CDOT partners with the East Central Board of Cooperative Education to use the fiber optic backbone between Denver and Burlington. This arrangement has provided high-speed connectivity to 18 school districts, creating distance learning opportunities for students, saving money for the districts, and bridging the digital divide.

Emergency services. CDOT has connectivity agreements with the Clear Creek County Sheriff's Office, the Evergreen Fire District, and the Jefferson County Emergency Communications Agency, resulting in cost savings for these agencies and support of public safety efforts. CDOT is also in discussions with the city of Colorado Springs about using the fiber backbone to support Colorado Springs emergency services efforts.

Local transportation agencies. A number of local governments, including the city and county of Denver, Douglas County, Summit County, and the cities of Lakewood and Colorado Springs, share CDOT cable and conduit to support their traffic services.

Tertiary partners. Some entities have created partnerships of their own to use CDOT's fiber optic backbone infrastructure. For instance, the Colorado School of Mines shares its backbone input with the National Renewable Energy Laboratory for research purposes, and with the Jefferson County School District.

For project implementation, CDOT says it will initiate the project by contacting and establishing a broad-based stakeholder group consisting of representatives from:

- CDOT engineering, maintenance, and planning;
- cities and counties;
- Transportation Planning Regions,
- Colorado State Patrol, including the Port of Entry Unit;
- local law enforcement;
- emergency responders;
- the Colorado Motor Carriers Association;
- the New Mexico Department of Transportation; and
- other interested parties.

CDOT plans to present the project, identify the project purpose and goals, and address opportunities for stakeholders to work together by leveraging project infrastructure and related transportation services and applications. CDOT will work with these stakeholders throughout and following project implementation to ensure that the project is successful.

COST SAVINGS / IMPROVED PERFORMANCE OUTCOMES

CDOT says this segment of the I-25 corridor is very rural in nature with limited to no communications infrastructure in place, and that there will be significant benefits for travelers upon project completion from receiving real-time travel time and road condition information. The department notes that the greatest benefits to the traveling public will be safety-related, as the project will allow CDOT the ability to detect, verify, and communicate with law enforcement and emergency medical services (EMS) to respond faster and at the appropriate level to incidents in the corridor. CDOT says that national transportation studies regarding the benefits of improved communications infrastructure related to incidents indicate that:

- incident response time was reduced by 42 percent;
- primary incidents were reduced by 35 percent;
- secondary incidents were reduced by 30 percent;
- weather-related incidents were reduced by 40 percent and overall incidents by 41 percent; and
- incident duration was decreased by 11 percent.

CDOT states that the project will significantly improve the probability that incident victims receive medical treatment

within the "golden hour," the phrase EMS use to refer to the time period lasting up to one hour following traumatic injury being sustained by a casualty or medical emergency, during which there is the highest likelihood that prompt medical treatment will prevent death.

CDOT calculates the safety benefit from the project will consist of:

- a reduction of 4.46 property damage-only crashes per year;
- a reduction of 2.07 injuries per year *(note: injuries, not injury crashes)*; and
- a reduction of 0.17 fatalities per year *(note: fatalities, not fatality crashes)*.

CDOT used values from the National Safety Council's *Average Economic Cost per Death, Injury, or Crash, 2013* report, and found that these crash reductions equate to a crash reduction safety benefit of approximately $457,000 per year.

The department says that performance-related goals for the project have not been identified yet. However, it notes that performance measures may include, but not be limited to:

- reduction of the fatality rate per 100 million vehicle miles traveled;
- reduction of the serious injury rate per 100 million vehicle miles traveled;
- reduction of incident clearance time, which is the time from when the incident is reported to the time the incident is cleared; and
- reduction of incident duration time, which is the time from when the incident response team arrives on scene to the time the roadway is cleared.

SECURITY AND BACKUP / DISASTER RECOVERY

According to CDOT, this project will help provide network redundancy in southern Colorado for ITS devices such as roadside video cameras, travel time monitoring devices, variable message signs, and road and weather information stations along the I-25 South/State Highway (SH) 160 West corridor. The project will also provide a geographically-critical redundant multicast video system that will be hosted in Pueblo, which is the current CDOT disaster recovery site. CDOT says this will provide real-time video of the I-25 South corridor and SH 160 West, including Wolf Creek Tunnel, and can be expanded as a redundant site for the entire state. The multicast video system is used by CDOT, Colorado State Patrol, and numerous local agencies and private partners.

BUSINESS PROCESS ANALYSIS

CDOT says that this project is designed to extend fiber optic telecommunications along I-25 to provide complete system coverage from Wyoming to New Mexico. This coverage allows it to complete strategic objectives surrounding traffic safety, emergency response, weather conditions tracking, mobility, and interstate connectivity, as outlined in the Justification section.

PROJECT SCHEDULE

	Start Date	Completion Date
Design	July 2016	October 2016
Construction	October 2016	July 2017

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OPERATING BUDGET

The department expects the operating impact of the project to be about $30,000, and says this cost will be absorbed within its $25 million annual ITS operating and maintenance budget.

STAFF QUESTIONS AND ISSUES

1. If this project is not funded through the capital construction process, does the department plan to complete the project using other resources? If so, what resources will it use and what would be the estimated time frame for the project's completion?

CDOT does not have a specific funding source to complete this project. Without CDC funds, CDOT has no ability to predict if, or when, this project would be completed.

2. The project request information indicates that the project will help the department prepare for and support the federal Connected Vehicles Initiative. Is the federal government providing any funding to states that participate in this initiative?

CDOT has applied to the federal government for funding to support participation in the Connected Vehicles Initiative. Unfortunately, CDOT was unsuccessful in securing federal funding.

3. When does the department expect to build out fiber optic backbone infrastructure along Highway 160?

Eagle Net fiber on SH 160 west of I-25 is complete from I-25 to Southfork; CDOT has 24 strands. Region 5 has funds to build approximately 15 miles of additional conduit and fiber west from Southfork to the base of Wolf Creek pass. They are 4 miles short given the amount of funding they have. We're working with Region 5 on a trade agreement with Eagle Net to provide the 4 miles needed. Such a trade could also increase the length of fiber that could be installed, taking the route over Wolf Creek, but a few more dollars could get the length to the bottom of the west side of the pass. Regarding fiber from Wolf Creek pass to Durango, Eaglenet is seeking funding/partners to build. This is not a top priority and the last report stated that it could be five years out.

4. Is CDOT working with OIT on this project at all? If you are, please describe OIT's engagement in the planning process in terms of evaluation, suggestions, and recommendations.

We have been in contact with OIT staff regarding broader technology initiatives for CDOT, but not directly related to this request.