

Colorado Transportation Management System (CTMS)

PUEBLO FREEWAY MANAGEMENT SYSTEM (FMS)

FINAL REPORT

(FY00 Earmark)

May 16, 2005

Prepared For:

Federal Highway Administration (FHWA), Colorado Division
12300 West Dakota Avenue
Lakewood, Colorado 80228

Prepared By:

Colorado Department of Transportation (CDOT) Region 2
905 Erie Avenue
Pueblo, CO 81002

EXECUTIVE SUMMARY

The Pueblo Freeway Management System (FMS) was a FY00 earmarked project. The objective of the project was to enable the Colorado State Patrol (CSP), the City of Pueblo Police Department (PPD), and CDOT (both Region 2 and Colorado Traffic Management Center or CTMC in Denver) to remotely monitor roadway conditions and to deliver travel information to motorists along sections of I-25 and US50 in the City of Pueblo.

Since its construction in October 2002, the system has improved incident management and responsive time, has enabled us to monitor traffic conditions, has enhanced communications, and has allowed CDOT Region 2 to expand its Intelligent Transportation System (ITS) in the region. The system has become a very important element of the CDOT Region 2 ITS Architecture.

PROJECT OVERVIEW

The preliminary design was completed as part of the Pueblo Gateway project in 1998. In November of 1999, CDOT received a \$786,421 matching federal fund for implementing a regional FMS. One of the requirements for receiving this fund was the development of a memorandum of understanding (MOU) among all the parties and agencies, regarding the implementation, operations and maintenance of FMS. In January 2001, the MOU was agreed upon and signed by CDOT Region 2, City of Pueblo and State Patrol.

The design of Region 2 ITS Architecture was completed in May 2001. The construction of the Pueblo FMS started in August 2001 and was completed in October 2002. The total construction budget was \$1,535,522 (\$749,100 contributed by CDOT with the federal matching fund of \$786,421). In addition, CDOT funded the final design and the construction management.

The major components of the system include: one VMS sign, five CCTV cameras, one fully equipped Traffic Management System (TMS) Building, approximately 11,100 feet of conduit, 30,000 feet of fiber optical cable, six work stations, and various traffic monitors. Traffic

monitors were installed at the following facilities: TMS Building, State Patrol, CDOT Region 2 Traffic and Maintenance, City Police Department, and City Transportation Department. Staffs at these facilities can view live pictures from all five CCTV cameras. CTMC in Denver operates the VMS sign, but Region 2 has its over-ride authority.

The system has enabled CDOT Region 2 Traffic, Maintenance, CTMC, State Patrol and the City Police Department to monitor traffic conditions and to provide quick responses to incidents along I25 and at the vicinity of the Gateway project (interchange of I25, US50 and SH47). The system has significantly increased the productivity of our traffic engineers and signal technicians. From offices, we use this system in conjunction with the Traffic Control System (TCS, signal software) to monitor the signals. From our offices, we can see if the signals respond to traffic, as well as monitor traffic patterns.

For example, we received several complaints that EB right turn vehicles did not yield to the WB left turn vehicles at the intersection of I25 ramp and US50. Without the system, those complaints would be hardly understood because there were two large-size “yield” signs and the yield pavement markings for the EB right-turn vehicles. Using this system, we reviewed the live images from the camera for hours, and were able to identify the cause of the complaints. As a result, we installed additional traffic control devices. We believe that traveling public now is satisfied with these new devices.

The system has helped State Patrol and CDOT Maintenance immensely by providing visual monitoring of the highways. The following is a quote from State Patrol: “On numerous occasions, State Patrol was able to spot problems and to notify appropriate CDOT or law enforcement in a timely manner concerning accidents, incidents of debris and hazards. The system does provide a more timely response and help restore the flow of traffic quickly”. Overall, the system has reduced potential secondary accidents by reducing incident responsive time, increasing throughput of cars, people, or goods moved per unit time, increasing travel time reliability, and reducing vehicle fuel consumption and emissions.

LESSONES LEARNED

The Pueblo FMS project was one of the first two ITS projects that CDOT completed. The project used the most advanced technologies at the time when it was planned and designed. Some of the technologies were the first that had ever been used in the State of Colorado. For example, the lowing device technology of the CCTV Camera was the first used in the State.

Overall the project was very successful. It received tremendous cooperation among the major stakeholders and partners. Agencies involved in the project worked closely with each other. For example, CMTC staff provided their experts in CCTV cameras and networking equipment, which Region 2 staff did not have. The City of Pueblo obtained a railroad crossing permit for the project through a maintenance agreement between the City and the BNSF railroad. The conduit over the 8th Street Bridget crosses the BNSF railroad. It would have taken years if CDOT would have to obtain the permit from BNSF directly. In addition, the State Communication granted the project a permit installing a wireless receiver on its tower. Without this permit, the project would have to install a pole more than 120 feet tall. These were only a few examples of the cooperation that the project received, which we believe was the key of the success.

We have also learned some other lessons from this project. From the construction commence to the completion and final acceptance, it took over one year. One of the problems encountered was related to wireless communication. As mentioned earlier, there are five CCTV cameras. Video images from four cameras are transmitted to the TMS building via fiber optical cables. Video images from the fifth camera (at 1st Street Ramp), however, were transmitted to the TMS building via wireless communication. One wireless receiver was installed on the camera pole. The other receiver was installed on the State Communication tower. The distance between these two receivers is approximately 2 miles. The images from this camera were clear initially. A couple of months later, the images from this camera became unstable. Sometime we could receive images and sometime there was nothing from that camera. After several months of trying different receivers, different cameras and different wirings, it was finally found that a tree between these two receivers had grown significantly and the line of sight was partially blocked. Consequently, we had to move the receiver on the tower up another 20 feet.

The second problem with wireless connected cameras was the quality of the images. The images received from the wireless connected camera were not as clear as the ones from the fiber-connected cameras. Since the completion of the project, Region 2 has expanded its ITS system. We extended the fiber to the wireless connected camera. Now all the cameras are connected to the TMS building via fibers. In addition, Region 2 has extended the fiber to Pueblo West, and added two CCTV cameras.