



Memorandum

TO: Operations Committee

DATE: February 2, 2018

FR: Executive Director

W.I.: 1223

RE: Update on I-880 Performance-Based Device Maintenance Pilot

Intelligent Transportation System (ITS) infrastructure, including ramp meters, closed-circuit television cameras, changeable message signs, and system detectors, supports real-time operations on the region’s transportation network. In partnership with Caltrans, in 2016, MTC embarked on a pilot project to maintain the region’s technology assets on the I-880 corridor in a systematic manner. This pilot includes the preventative and corrective maintenance of traffic operation system devices, adds incentive payments for the contractor to meet key performance indicators, and serves as a regional model for bringing traffic operation devices into a state of good repair.

Performance

Since project inception in May 2016, device health of the corridor’s 1,188 active devices has been consistently trending upwards. As of December 2017, 100% of ramp meters, 95% of cameras, 100% of changeable message signs, and 77% of vehicle detection stations are operational. The combined corridor-wide device health of 93% is the direct outcome of both active preventative and focused corrective maintenance activities, which included successful repair of 419 devices.

| Device Type | May 2016 (Baseline) | Dec. 2017 (Current) | Change |
|------------------------|---------------------|---------------------|--------|
| Ramp Meters | 89% | 100% | 11% |
| CMS | 100% | 100% | 0% |
| CCTV Cameras | 87% | 95% | 8% |
| Vehicle Detector Lanes | 74% | 77% | 3% |

Incentives

Payment for these maintenance activities is structured to incentivize the maintenance contractor to keep devices performing at a high level, and to encourage responsiveness to repairs, as follows:

- Preventative maintenance payments can be increased by 4-10% if equipment is performing above target thresholds. In the past 15 months, the contractor has received nearly \$40,000 for providing enhanced levels of device health.
- Corrective maintenance payments can be reduced by 4-20% for delayed or extended acknowledgement, response, or repair time. Over the past 15 months, the contractor’s payment has been reduced by \$17,000, partly attributable to early project start-up coordination issues.

Pilot Project Lessons Learned To Date

While performance-based contracts are widely used for capital delivery projects, this effort represents an innovative approach for ITS operations and maintenance contracts in California. At the project halfway point, staff has identified the following lessons learned:

1. A performance-based payment structure is an effective approach for device repair and maintenance contracts. Caltrans now also incorporates repair time requirements in its Director Orders' work to improve contractor accountability.
2. Due to the project payment structure, the maintenance contractor has actively sought ways to identify devices in need of corrective maintenance. To accelerate identification of field issues, the contractor worked closely with MTC and Caltrans to develop a unique software tool that actively monitors the communication status of each device. After a communication failure is detected, this system sends out alerts to the contractor, thus enabling faster response and repair of failed devices. Caltrans plans to expand this monitoring capability district-wide, and take a proactive approach to address repairs.
3. The contractor has responded positively to the incentive payment structure. The preventative maintenance component could be even more effective if the incentive payment could be tied more closely to a month-to-month improvement in device health, rather than tying the payment solely to device health targets, per the current contract.
4. Baseline repair times are a good benchmark, but field conditions could impact the ability to meet those benchmarks. In future contracts, staff recommends that repair time parameters be associated with failure types instead of device category.
5. Vehicle detectors account for over 85% of the total devices on the corridor. The four-hour overnight lane closure restriction limits the ability of a contractor to complete detection repair work. The situation is further complicated when there are a number of active construction projects in the same corridor. Currently, 77% of detectors maintained by the contractor are working. To meet the statewide 90% device health target, the repair of detection stations continues to remain a priority for the project. The contractor is following an action plan developed by Caltrans and MTC for conducting, grouping, and scheduling vehicle loop detector repairs. As of December 2017, 84 of 241 loops have been repaired. It is anticipated that the operational percentage for loop detectors will reach 90% by July 2019.

Device Upgrade and Replacement

The contractor is tasked with developing a Device Upgrade and Replacement Plan. Given that communications on the 48-mile corridor currently rely on leased telephone lines (both dial-up and wireless), the contractor identified four alternatives that focus on key improvements to the communication system, as well as replacement of ramp meter controllers, cameras, and detection systems.

The preferred alternative would enlist the fiber optic communications planned for the 26-mile Express Lane project from Hegenberger Road in Oakland to Auto Mall Parkway in Fremont, and would extend the communications north and south using wireless high bandwidth radios. Lateral conduits would be designed and constructed to establish a connection between field devices and the Express Lanes project. This option would build a network that has sufficient bandwidth to support connected vehicle and other applications, make use of an investment being made within the corridor, and help eliminate the recurring cost for leased communications (estimated at \$574,000 per year). Project design could begin later this year, with full implementation expected to take four to five years.

Next Steps

Staff intends to return to this Committee in spring 2018 to provide a project update and to seek Committee approval for award of a contract to complete the proposed I-880 communications project described above.



Steve Heminger



MAINTENANCE, DIAGNOSTIC, AND REPAIR SERVICE OF TRAFFIC OPERATIONS SYSTEM (TOS) DEVICES

Operations Committee
February 9, 2018

PERFORMANCE BASED DEVICE MAINTENANCE

Project Goals:

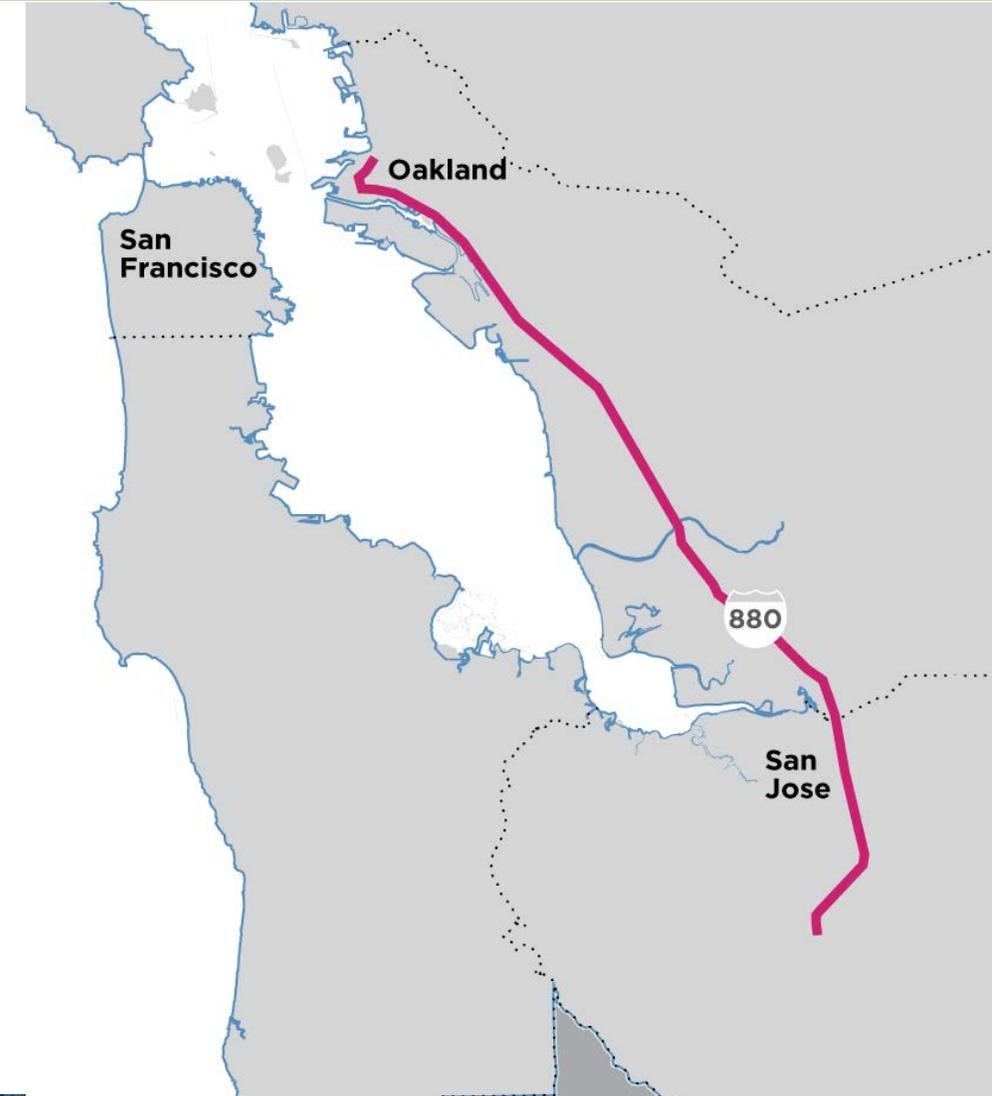
- Improve system operational percentage
- Determine effectiveness of incentive-based maintenance

Corridor characteristics:

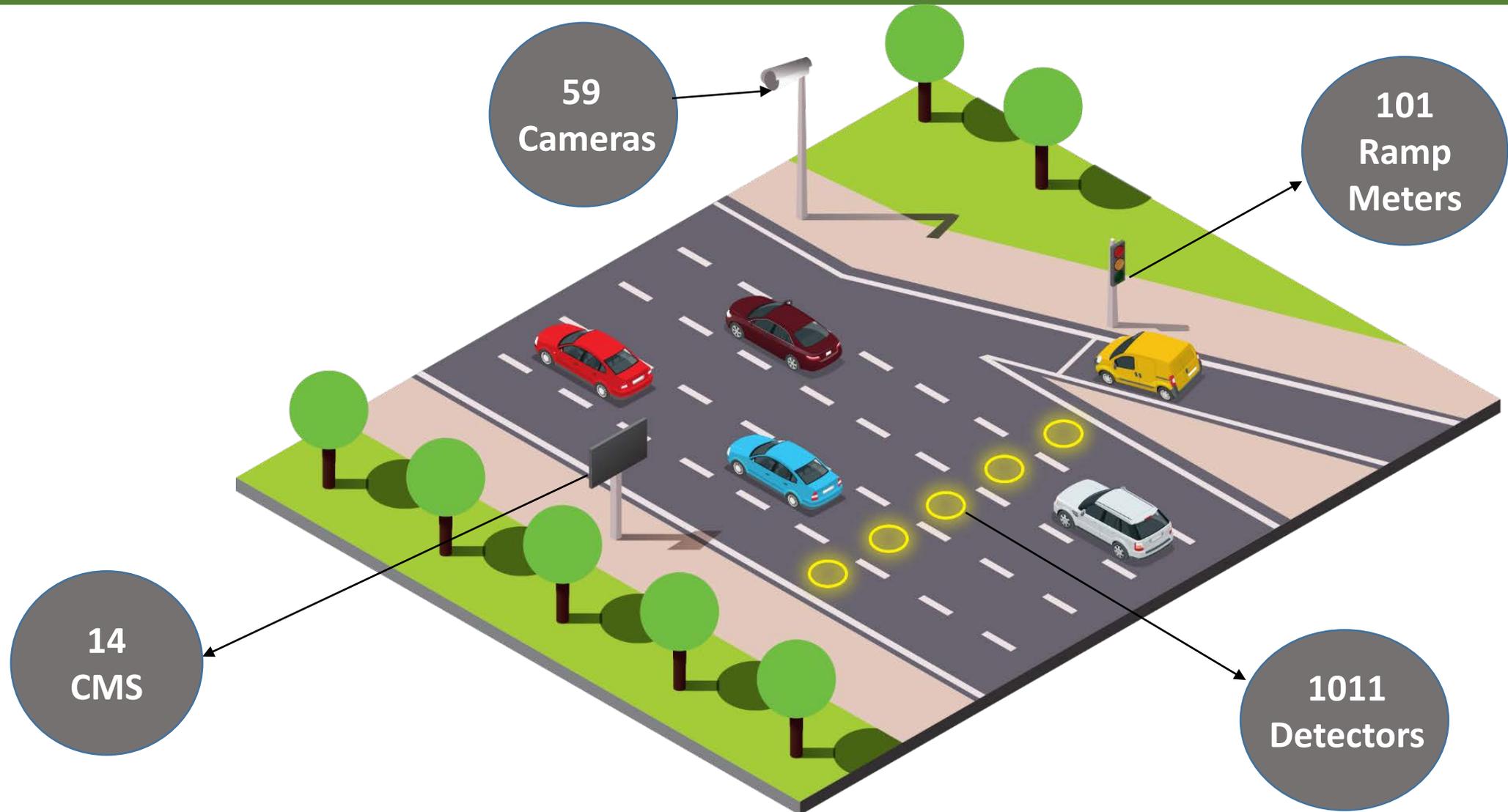
- 50 miles in length
- #5 on MTC's Most Congested Delay List

Project budget: \$7.2M

Contract Duration: 3 years



I-880'S ITS LANDSCAPE



DEVICE PERFORMANCE UPDATE

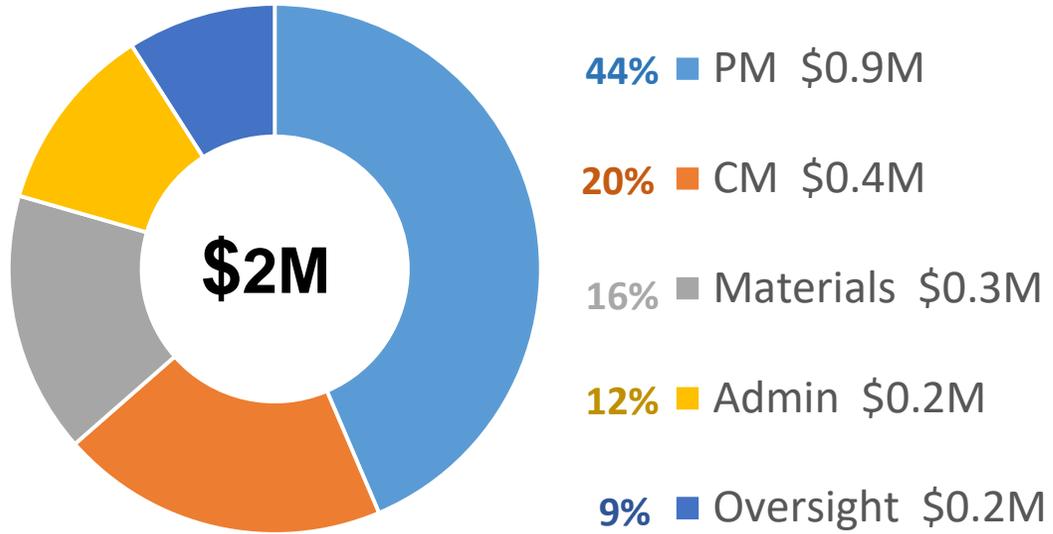
- 419 devices have been repaired
- 84 vehicle detection loops have been brought back online

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PROJECT COSTS AND PROJECTION

Project Cost Breakdown
(Thru June 2017)



\$5M



880 Corridor
TOS Devices
90%
Operational

July 2019

\$75M



Caltrans D4
TOS Devices
90%
Operational

April 2023



LESSONS LEARNED

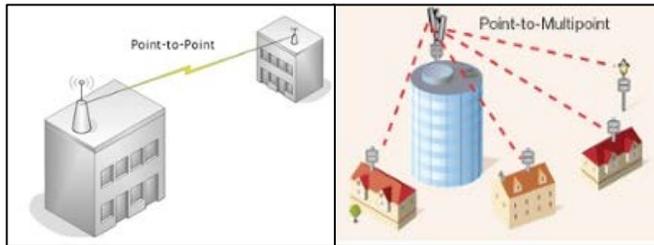
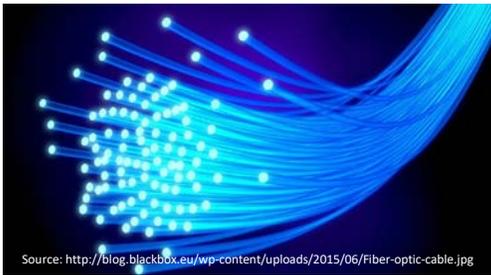
1. Performance Based Maintenance Appears Effective
2. Loop Repairs Require Significant Efforts
3. Legacy Equipment Is In Need of Replacement



source: <http://fcpaprofessor.com/wp-content/uploads/2016/05/lessonslearned.jpg>

UPGRADE AND REPLACEMENT OPTIONS

- Communication Infrastructure
 - Fiber Optic Cable
 - Wireless Radio System
- Controller Technology
- Closed Circuit Television Cameras



RECOMMENDATION-FIBER AND WIRELESS COMM.

- Increased bandwidth capabilities to support future deployments
- Ease of operations and maintenance
- Flexibility for expansion
- Upgraded controllers and comm. network enable some remote monitoring
- Eliminate recurring leased line communication costs once deployed



NEXT STEPS



Install new controllers and replace cameras
(Funded)



Seek local funds to add lateral connections



Issue procurement to design communication network

