Connected Corridors
Face-to-Face Meeting

Tuesday, March 10th, 2020
1:30 – 3:30 pm
LA County
Agenda

- 1:30 - 2:00 – Program Review
- 2:00 - 2:20 – Call for Projects Update
- 2:20 – 2:40 – Kapsch update
- 2:40 – 3:15 – DSS Test Launch Update
- 3:15 – 3:20 – Closing
  - Next Meeting at LA Metro – Tuesday April 28th
  - (Monrovia, Duarte, LA Metro, Caltrans, County, Arcadia, Pasadena)
Joe is Retiring – We need a party on April 28th

- This is the last face to face I will lead (I will attend the next one)
- Zema will lead the next one on April 28th
- There will be a little going away celebration after the April 28th face to face at 3:30 for all of us.

- Imperial Western Brewing
  - In Union Station
    - 800 N. Alameda St.
    - Los Angeles, CA 90012
  - [https://www.imperialwestern.com/](https://www.imperialwestern.com/)
Systems Engineering Status
Schedule – Till Launch (Page 1 of 2)

- Complete Call for Projects Procurement – January 2020
- ATMS Incident Management to Production – March 2020
- Deploy DSS Test System – April 2020
- Complete Deployment/Release Hardening – May 2020
- Complete ATMS Modifications – June 2020
- Prediction running in the cloud – July 2020
- Complete McCain C2C – July 2020
- Loop Data Received from ATMS – August 2020
- Rules Engine running in the cloud – October 2020
- All ITS Elements Installed in Field – September 2020
Schedule – Till Launch (Page 2 of 2)

- Integrate Lane Closure System – September 2020
- All data (sans signs) being received – October 2020
- Estimation running in Cloud – December 2020
- Performance Management System Available – December 2020
- Complete C2C Sign Interfaces – January 2021
- Complete Version 1.0 System Release – February 2021
- System Test and Validation – March/May 2021
- Before Study – March to May 2021
- Launch Pilot – May 2021
## Schedule – Pilot Launch to Pilot Completion

<table>
<thead>
<tr>
<th>Event</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Study</td>
<td>March to April 2021</td>
</tr>
<tr>
<td>Pilot Launch</td>
<td>May 2021</td>
</tr>
<tr>
<td>Kapsch</td>
<td>May 2021 – September 2021</td>
</tr>
<tr>
<td>Parsons</td>
<td>September 2021 – January 2021</td>
</tr>
<tr>
<td>Interim Benefits Analysis</td>
<td>January 2022</td>
</tr>
<tr>
<td>Telegra</td>
<td>January 2022 – May 2022</td>
</tr>
<tr>
<td>After Study</td>
<td>March to April 2022</td>
</tr>
<tr>
<td>Kapsch</td>
<td>June 2022 – September 2022</td>
</tr>
<tr>
<td>Procurement of CMS system</td>
<td>August 2022</td>
</tr>
<tr>
<td>Procurement of Aimsun</td>
<td>August 2022</td>
</tr>
<tr>
<td>Pilot complete</td>
<td>September 2022</td>
</tr>
</tbody>
</table>
DSS Test Launch - Goals for April 2020

- Anthony to show demonstration later in presentation

- Expected outcomes
  - Response plans and metrics for review by stakeholders
  - Metrics for use in benefits analysis

- Functions running real-time 24/7
  - Capture incidents and data on freeways and arterials
  - ATMS C2C and Incident Capture in production and communicating with data hub and CMS
  - Kapsch CMS application in production

- Response Plan generation on demand
  - Response plan generation using rules engine, estimation and prediction
  - Historical and real-time modes
Networking and Center to Center Connectivity

- **Production ATMS**
  - “Request-response” TMDD dialogues work
  - “Subscription update” TMDD dialogue challenges due to networking arrangement supporting app’s multi-node cluster configuration

- **TSMSS**
  - TransCore configured server, now devices “participate” in ICM TMDD dialogues
  - Workaround found for “subscription update” challenges (similar to, but different from, production ATMS issues)

- **ICM User Secure System Access (via Kapsch application)**
  - LACO user setup in progress; reconciling with LACO connectivity policies
Networking and Center to Center Connectivity

- **Ongoing weekly meetings between RIITS, D7 and PATH**
  - Working together to acquire updated firewall/VPN and improved support

- **System monitoring**
  - Discussions ongoing
  - Metro and Caltrans leading the effort
Transient outage, ICM $\rightarrow$ LACO communications

- ICM $\rightarrow$ LACO communications outage for several hours, afternoon of February 4, 2020
- Investigated; cause unknown
- RIITS, Parsons looking at connection reliability
C2C Connectivity good since last Face-to-Face

- Blue band represents redeployment of ICM development environment
- So-called “ghosting” behavior still observed, monitored
C2C Interface Implementations - Status
Systems Development and Integration

- **Priorities**
  - Production system initial stand-up
    - Kapsch deploying to production environment.
  - Improve release frequency – goal is new release to test every week
    - Increasing number of components that are containerized. Hub Mongo processors, persistence components
    - Verifying new deployment strategy for releases and addressing issues as they are identified
  - Updates
    - New release of interface specification – Unique identifiers across jurisdictions for ITS elements, command targets in response plans, minor fixes
    - Deployment of persistence within Development environment
Systems Development and Integration

- **Priorities**
  - Support AMS efforts for launch
    - Continued implementation of estimation, prediction, rules launch
    - Assisting AMS team to integrate estimation, prediction, and rules components
    - Assisting with live incident capture and response plan development, connecting AMS estimation, prediction, and rules to live data pipelines.
Systems Integration

- **Pasadena**
  - Actively working with McCain on integration with Transparity test endpoint. McCain working on TMDD subscription fixes. Target deployment in April.

- **Corridor Management System**
  - Will be implementing new specification with fixes and improvements for response plan implementation and unique identifiers.

- **Kapsch (Corridor Management System)**
  - Verified Kapsch interface with ATMS for incident capture. Next steps to work on incident lifecycle management and response plans
Systems Integration

- **ATMS**
  - ATMS moved to production
  - But - Communication issues exist between the ATMS and the Data Hub
  - Created and provided demonstrations to Caltrans personnel
  - Working on prioritization of updates and fixes
  - Continuing testing of changes to accommodate arterial incidents. Continue to identify and correct issues.

- **C2C for Dynamic Message Signs**
  - We have met with the sign vendor and his vendors

- **TSMSS**
  - Data being received. Verifying structure and basic content of feed.
TSMSS – Initial Data Analysis

- Generated 44 page report – Results:
  - Detector Inventory
    - Incorrect unit in “Device-Location”
    - Missing fields of “Device-Description”, “Device-Control-Type”, “Controller-Description”, and “last-Update-Time”
  - Detector Data
    - OK
  - Detector Status
    - OK
  - Intersection Signal Inventory
    - Incorrect unit in “Device-Location”
  - Intersection Signal Timing Pattern Inventory
    - The sum of phase splits in each ring does not match the cycle length
    - There are strange values in “Maximum-Green-Duration” and “Vehicle-Clearance-Duration”
  - Intersection Signal Control Schedule
    - Not available from TSMSS
  - Intersection Signal Status
    - The attribute “Intersection-Signal-Ring-Status” is missing
I-210 Connected Corridors
Face-to-Face Meeting

Los Angeles County DPW TMC 900 South Fremont Avenue,
Annex Building 1st floor
Tuesday, March 10, 2020
1:30 – 3:30 pm
Agenda

- I-210 CC Arterial Systems Improvement Project
  System Consulting Services - Overview
- Status of 9 procurement package
- Next Steps
I-210 CONNECTED CORRIDORS ARTERIAL SYSTEMS IMPROVEMENT PROJECT
SYSTEM CONSULTING SERVICES

STATUS OVERVIEW
### Project Objective

- Assist Caltrans D7 to manage the execution of the 9 arterial ITS improvement projects

<table>
<thead>
<tr>
<th>#</th>
<th>Package Description</th>
<th>Contract #</th>
<th>Contract Status</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bluetooth – Iteris Velocity</td>
<td>07A4470</td>
<td>Completed, Contract Closed</td>
<td>May 2019</td>
</tr>
<tr>
<td>2</td>
<td>Bluetooth – BlueToad</td>
<td>07A4477</td>
<td>Awarded, in Progress</td>
<td>Jun 2020</td>
</tr>
<tr>
<td>3</td>
<td>New Controller Cabinets</td>
<td>07A4761</td>
<td>Awarded, in Progress</td>
<td>Q3-4,2020</td>
</tr>
<tr>
<td>4</td>
<td>Communication Upgrades</td>
<td>07A4479</td>
<td>Installation Completed</td>
<td>Mar 2020</td>
</tr>
<tr>
<td>5</td>
<td>Firmware/Timing Plan Updates/Controller Upgrades</td>
<td>07A4480</td>
<td>Awarded, in Progress</td>
<td>Q3-4,2020</td>
</tr>
<tr>
<td>6</td>
<td>Video Detection System</td>
<td>07A4481</td>
<td>Installation To be Completed</td>
<td>Apr 2020</td>
</tr>
<tr>
<td>7</td>
<td>Data Communication Module and Video Detection Software Upgrade</td>
<td>07A4755</td>
<td>Awarded, in Progress</td>
<td>Q3-4,2020</td>
</tr>
<tr>
<td>8-1</td>
<td>DMS Procurement</td>
<td>07A4792-3</td>
<td>Awarded, in Progress</td>
<td>Jun-Jul 2020</td>
</tr>
<tr>
<td>8-2</td>
<td>DMS Integration</td>
<td>07A4794</td>
<td>Awarded, in Progress</td>
<td>Feb 2021</td>
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<tr>
<td>8-3</td>
<td>DMS &amp; Static Sign Installation</td>
<td>N/A</td>
<td>To be handled by stakeholders</td>
<td>Q3-4,2020</td>
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<tr>
<td>9</td>
<td>Environmental Stations with Air Quality Sensors and Open Data Systems</td>
<td>07A4388</td>
<td>Awarded, in Progress</td>
<td>Q2-3,2020</td>
</tr>
<tr>
<td>#</td>
<td>Package Description</td>
<td>Contract #</td>
<td>Metro &amp; Caltrans</td>
<td>City of Pasadena</td>
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<td>---------------------------------------------------------------</td>
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</tr>
<tr>
<td>1</td>
<td>Bluetooth – Iteris Velocity</td>
<td>07A4470</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bluetooth – BlueToad</td>
<td>07A4477</td>
<td>√</td>
<td>√</td>
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<tr>
<td>3</td>
<td>New Controller Cabinets</td>
<td>07A4603</td>
<td>√</td>
<td>√</td>
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<tr>
<td>4</td>
<td>Communication Upgrades</td>
<td>07A4479</td>
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<td>07A4480</td>
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<tr>
<td>6</td>
<td>Video Detection System</td>
<td>07A4481</td>
<td>√</td>
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<tr>
<td>7</td>
<td>Data Communication Module and Video Detection Software Upgrade</td>
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<td>DMS Procurement</td>
<td>07A4792-3</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>8-2</td>
<td>DMS Integration</td>
<td>07A4794</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>8-3</td>
<td>DMS Installation</td>
<td>N/A</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>9</td>
<td>Environmental Stations with Air Quality Sensors and Open Data Systems (ODS)</td>
<td>07A4388</td>
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Project Area (cont.)
UPDATE ON

PACKAGES 1-9
## Package Status – Pkg # 1

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Pkg.</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 1      | Bluetooth – Iteris Velocity | 07A4470 PTM |  • NTP: 7/10/2018  
  • Kick-off Meeting: 7/30/2018  
  • Submittal Approved: 8/16/2018  
  • Installation & Testing Completed on 5/29 & 5/30/2019  
  • Accepted by Arcadia, Documents Submitted  
  • Completed |
## Package Status – Pkg # 2

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Pkg.</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 2      | Bluetooth – BlueToad | 07A4477 DBX | • NTP: 7/10/2018  
• Kick-off Meeting: 7/30/2018  
• Submittal Approved: 10/12/2018  
• Installation:  
  • LA County, Monrovia, Duarte: 10 locations done; LACo VM server configured on 5/15/19; working on LA Co <-> Pasadena VPN connection  
  • Caltrans: 1 location without existing comms. Equipment delivered to LA County  
  • Pasadena: scheduling server installation at TMC & field installation at 11 locations (Mar 2020)  
• Site Testing:  
  • LA County: completed  
  • Pasadena: to be scheduled after installation  
• System Testing:  
  • To be scheduled after installation & site testing  
• Expected to be completed: June 2020 (90%) |
P2 - BlueToad Travel Time System – Comm. Architecture

Future

3rd Party System

Version: 10/09/2019
## Package Status – Pkg # 3

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 3      | New Controller Cabinets | 07A4761 Crosstown | • Advertised: 9/26/19  
• Awarded: 2/11/2020  
• NTP: 2/19/2020  
• Kick-off Meeting: 2/25/2020  
• On-going:  
  • Site Installation Inventory & Material Submittal & Permit application  
  • Expected to be completed: Q3-Q4, 2020 |


## Package Status — Pkg # 4

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Communication Upgrades</td>
<td>07A4479</td>
<td>• NTP: 7/13/2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kanaan</td>
<td>• Kick-off Meeting: 7/30/2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction</td>
<td>• Submittal &amp; RFI Approved: 5/6/2019</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Equipment procured</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Installation of 35 locations: completed</td>
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<td></td>
<td></td>
<td></td>
<td>• Testing: completed</td>
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<tr>
<td></td>
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<td></td>
<td>• Testing Reports: submitted on 1/13/2020</td>
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<td></td>
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<td></td>
<td>• Original Scope: Completed</td>
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<td></td>
<td></td>
<td>• Next steps:</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Close all RFIs</td>
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<td></td>
<td></td>
<td></td>
<td>• Additional 2 POE extenders to be installed at 1 location (Approved CO) in Mar 2020</td>
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<td></td>
<td></td>
<td></td>
<td>• Discussion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 7 locations in LA County — no communications yet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Option 1: Waiting until RIITS network and L3 Switches are available — Q3-4, 2020</td>
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<tr>
<td></td>
<td></td>
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<td>• Option 2: Install 4 additional radios — out of budget</td>
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## Package Status – Pkg # 5

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<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
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<tbody>
<tr>
<td>5</td>
<td>Firmware/Timing Plan Updates/Controller Upgrades</td>
<td>07A4480 CPE, Inc</td>
<td>• NTP: 7/17/2018</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Kick-off Meeting: 7/30/2018</td>
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<td></td>
<td>• Submittal Reviewed but Required hardware/firmware changed per Stakeholder Comment</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Contractor revised price estimate ($128,892.50) lower than original amount ($171,600.00) – reviewed &amp; approved by stakeholders</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Arcadia</td>
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<td>• Pasadena</td>
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<td></td>
<td></td>
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<td>• LA County</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Caltrans</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Material Submittals – approved</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Materials Procurement – in progress</td>
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<td></td>
<td>• Installation Permits – in progress</td>
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<td></td>
<td>• Est. Duration: 6 months</td>
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<td>• Expected to be completed: Q3-Q4, 2020</td>
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### Package Status – Pkg # 6

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<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Video Detection System</td>
<td>07A4481</td>
<td>• NTP: 7/10/18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Traffic Loops Crackfilling, Inc</td>
<td>• Kick-off Meeting: 7/30/18</td>
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<tr>
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<td></td>
<td>• 10/9/18: Conducted Site Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 10/18/18: Submittal approved</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Installation:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• 21 out of 22 installations are completed (2 LA County, 5 Monrovia, 3 Arcadia, 8 Pasadena, 3 in Duarte)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• 1 location in Pasadena: conduit too small. Boring 3” rigid conduit is approved. Installation has started on 3/9/202 and will take 1-2 weeks.</td>
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<td></td>
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<td></td>
<td>• Acceptance Testing: in process</td>
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<td></td>
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<td></td>
<td>• Expected to be completed: April 2020 (90%)</td>
</tr>
</tbody>
</table>
## Package Status – Pkg # 7

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Data Communication Module and Video Detection Software Upgrade</td>
<td>07A4755 Crosstown</td>
<td>• Advertised: 1/2/2020&lt;br&gt;• Awarded: 2/11/2020&lt;br&gt;• NTP: 2/19/2020&lt;br&gt;• Kick-off Meeting: 2/25/2020&lt;br&gt;• On-going:&lt;br&gt;  • Site Installation Inventory &amp; Material Submittal &amp; Permit application&lt;br&gt;  • Expected to be completed: Q3-Q4, 2020</td>
</tr>
</tbody>
</table>

### 30 Locations:
- 4 locations in LA County
- 1 location in City of Duarte
- 3 locations in City of Monrovia
- 8 locations City of Pasadena
- 14 locations in City of Arcadia
## Package Status – Pkg # 8-1, 8-2, 8-3

<table>
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<th>Year</th>
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<th>2020</th>
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<th>2021</th>
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<td>1</td>
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<tr>
<td>Month</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>DMS Procurement</td>
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<tr>
<td>DMS Delivery</td>
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<tr>
<td>DMS Installation</td>
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<tr>
<td>DMS Integration</td>
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<tr>
<td>DMS System Testing</td>
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<tr>
<td>Training</td>
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DMS lead time: 16 weeks  
DMS Pole lead time: 18 weeks

April 2021, Hard Launch of I-210 CC System (Est.)
## Package Status – Pkg # 8-1

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 8-1    | Advanced Traveler Information Systems: DMS Procurement | 07A4792-3 Elan Moyal | • Advertised: 10/25/19  
• Awarded: 12/2/2019  
• Kickoff meeting: 12/19/2019  
• Material Submittals & procurement: in progress  
• Expected to be completed: June-July 2020 |

### Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
<th>Caltrans</th>
<th>LACO</th>
<th>Pasadena</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMS</td>
<td>21</td>
<td>2</td>
<td>2</td>
<td>17</td>
<td>Approved (lead time: 16 wks)</td>
</tr>
<tr>
<td>Poles</td>
<td>19</td>
<td>0</td>
<td>2</td>
<td>17</td>
<td>Approved (lead time: 18 wks)</td>
</tr>
<tr>
<td>Pull boxes</td>
<td>21</td>
<td>2</td>
<td>2</td>
<td>17</td>
<td>Changed Requirement, updating submittal</td>
</tr>
<tr>
<td>Power &amp; Comm Cables</td>
<td>11,000 ft</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>Approved</td>
</tr>
<tr>
<td>Radios</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>Approved</td>
</tr>
<tr>
<td>Signal Control System</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Evaluating options</td>
</tr>
<tr>
<td>Servers</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Changed Requirement, updating submittal</td>
</tr>
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</table>
## Package Status — Pkg # 8-2

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 8-2    | Advanced Traveler Information Systems: DMS Integration | 07A4794 Parsons | • Advertised: 11/14/19  
• Awarded: 1/3/ 2020  
• Kickoff meeting: 1/14/2020  
• Working on  
  • System architecture diagrams – draft in review  
  • Installation quality checklist – draft ready  
  • ATMS Integration – define development tasks  
• Expected to be completed: Q1 2021 |
I-210 CC DMS Integration
Overall Communication Diagram

- Caltrans D7 Field Device
- Caltrans D7 Field Network
- LA County TMC
- I-210 CC DMS Sign Control System
- K-H Signal System
- LACO Field Device
- LACO Field Network
- Pasadena TMC
- Pasadena Field Network
- Pasadena Field Device
- Pasadena Trans
- Pasadena Transit
- Foothill Transit
- Other Agencies
- Arcadia TMC
- Arcadia Field Network
- Arcadia Field Device
- Transcore Signal System
- LARTMC
- L-210 CC DMS Sign Control System
- ATMS
- TSMSS Signal System
- ICM, DSS I-110, I-405
- Pasadena TMC
- Pasadena Trans
- Pasadena Transit
- Foothill Transit
- Other Agencies
- Caltrans HQ
- TMCAL
- Caltrans D7 Field Device
- Caltrans D7 Field Network
- Arcadia Field Network
- Pasadena Field Network
- Internet VPN
- Internet
- Foothill Transit
- Pasadena Transit
- Other Agencies
- Pasadena Field Network
- Pasadena Field Device
- Pasadena Trans
- Pasadena Transit
- Foothill Transit
- Other Agencies
- Transcore Signal System
- LARTMC
- L-210 CC DMS Sign Control System
- ATMS
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- Other Agencies
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- TMCAL
## Package Status – Pkg # 8-3

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Package Name</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 8-3    | Advanced Traveler Information Systems: DMS & static sign Installation | N/A to be handled by Caltrans, LAPDW, & Pasadena | • DMS Installation:  
  - To start after hardware & software are delivered (May-June 2020)  
  - LA County: start after Aug – Oct 2020  
  - Pasadena: expected Jun – Sep 2020  
  • Static Signs Installation:  
    - Ordered by Caltrans Maintenance Group: Jul. 2019  
    - take 9-12 months (Est. Jul 2020)  
    - Installation will be handled by Caltrans  
    - Expected to be completed: Q3-Q4, 2020 |
## Package Status – Pkg # 9

<table>
<thead>
<tr>
<th>Pkg. #</th>
<th>Pkg.</th>
<th>Contract #</th>
<th>Project Status</th>
</tr>
</thead>
</table>
| 9      | Environmental Stations with Air Quality Sensors and Open Data Systems (ODS) | 07A4388 Cal Poly Pomona | • NTP: 6/29/18  
• Kick-off Meeting: 7/12/18  
• Environmental stations  
  • Roadside study done  
  • Field installation done – 6/7/19  
  • Collect data and analyze data - ongoing  
• ODS  
  • Coordination w/ Foothill Transit & Pasadena Transit  
  • Coordination w/ PATH  
    • Data Specification  
    • Sample Response Plan  
    • Inventory of Road Network, Signal ID  
    • To start testing with response plan generated by DSS  
  • Coordination w/ Caltrans  
    • Communications Architecture - done  
  • Expected to be completed: Q2-Q3 2020 |
Next Steps

- Package 2: Install TMC & field equipment in Pasadena
- Package 3: Confirm site installation inventory and submit material submittal
- Package 4: Install 2 additional POE extenders at 1 location, close contract
- Package 5: Complete material procurement
- Package 6: Complete installation at 1 location in Pasadena & complete acceptance testing
- Package 7: Confirm site installation inventory and submit material submittal
- Package 8-1: Continue procurement; coordinate with 8-2
- Package 8-2: Develop integration plan
- Package 8-3: Track 8-1 status
- Package 9: Support setting up comms & system testing
Thank You and Questions?
I-210 CALTRANS Pilot, March 10th, 2020

Kapsch TrafficCom

Integrated Corridor Management
I-210 Integrated Corridor Management
Kapsch Update

Tim O’Leary
March 10, 2020
EcoTrafiX Product Status

- EcoTrafiX V3.2 scheduled for June 2020

- In progress:
  - Improve roadway link incident creation
  - Waze integration
  - Regional Map device filters
  - Regional Map transparent layers
EcoTrafiX Interface Status

Good progress:

- EcoTrafiX receiving events from ATMS
- EcoTrafiX forwarding ATMS events to PATH’s Hub
- EcoTrafiX ready to receive Response Plans from DSS
- Created accounts for LA County and Arcadia
- Working on production environment deployment
EcoTrafiX Interface Status

**Interface**
- Integrated
- Ready to integrate
- In development

**TMCs**
- Arcadia
- LA County
- Others

**Caltrans ATMS**
- Ramp Meter Commands
- Voting
- Center Active
- Events
- Response Plans

**EcoTrafiX (CMS)**
- Ramp Meters
- DMS
- Signal Controllers
- Detectors
- Response Plans
- Events

**PATH HUB**
EcoTrafiX Status

Next Steps

- Deploy EcoTrafiX V3.1: multiple closed links/lanes
- Request TMCs execute device commands
- DSS send Response Plans to EcoTrafiX
- EcoTrafiX exchange Voting with ATMS
- EcoTrafiX send Response Plans to ATMS
Thank You!

Kapsch TrafficCom
4256 Hacienda Drive, Suite 100
Pleasanton, CA 94588
USA

www.kapsch.us

timothy.oleary@Kapsch.net

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Test Launch
Last time for January Demo…
Today’s Demo

Data Hub

Freeway Data
Arterial Data

Incident

Response Plan

Estimation
Estimation Results (after launch)

Response Plans for evaluation

RPG (Rules)

Metrics

PPM (Aimsun)
Test DSS Goals for April

- **Functions running real-time 24/7**
  - Capture incidents
  - Capture data on freeways and arterials

- **Functions running on demand**
  - Estimation, PPM (Prediction), and RPG (Rules)
  - Historical and real-time modes

- **Expected outcomes**
  - Response plans and metrics for review by stakeholders
  - Metrics for use in benefits analysis
  - Ability to demonstrate operation
  - Find and fix bugs
  - Move forward with system integration
Incident Location

- HOV and two mainline lanes blocked near Myrtle exit

In the future, when connected to ATMS or a “purple” box, we will delete this slide and demonstrate graphically the incident input.
Detours Activated

- HOV and two mainline lanes blocked near Myrtle exit

  Myrtle off-ramp to Myrtle on-ramp

  Huntington off-ramp to Mount Olive/I-605
In future, the incident will be entered from an ATMS or “purple box” system.
Estimation Integration
Estimation Integration
Test Launch Demo Overview

AMS System

[Diagram of AMS System]

Estimation
- Signal State
- Freeway Sensing
- Arterial Sensing
- Initial State
- Estimation Results
- Logs

Rules Engine Application
- Incident
- Estimation Results
- RP for Evaluation
- Prediction Metrics
- Ranked Response Plans
- Logs

Rules
- Facts

Prediction
- Prediction Process Manager
- Aimsun
- PostgreSQL
Integration of Initial State
Test Launch Demo Overview

Scorecard

[Diagram with Flowchart and Scorecard Information]
# Resulting Score Card

<table>
<thead>
<tr>
<th>Incident</th>
<th>I-210 EB @ San Gabriel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response Plan Evaluated</td>
<td>WB_Art_Foothill_Michilli_SanGabriel_135</td>
</tr>
<tr>
<td>Simulation Period</td>
<td>13:00 - 14:00 60 min</td>
</tr>
<tr>
<td>Evaluation Period</td>
<td>13:15 - 14:00 45 min</td>
</tr>
<tr>
<td>Number of Simulation Runs</td>
<td>1</td>
</tr>
</tbody>
</table>

## Performance Metrics

### Ramps

<table>
<thead>
<tr>
<th>Incident</th>
<th>No-Response Scenario</th>
<th>Response Scenario</th>
<th>Change</th>
<th>Change %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream Off-Ramps</td>
<td>8913 vehs</td>
<td>5407 vehs</td>
<td>3506</td>
<td>38.8</td>
</tr>
<tr>
<td>Downstream On-Ramps</td>
<td>3270 vehs</td>
<td>3542 vehs</td>
<td>272</td>
<td>7.7%</td>
</tr>
<tr>
<td>Peny Queue vehs</td>
<td>1136 vehs</td>
<td>1371 vehs</td>
<td>235</td>
<td>20.2</td>
</tr>
<tr>
<td>Detour #1 vehs min</td>
<td>41.8 min</td>
<td>42.5 min</td>
<td>0.7</td>
<td>1.7%</td>
</tr>
<tr>
<td>Detour #2 vehs min</td>
<td>2.9 min</td>
<td>3.4 min</td>
<td>-0.5</td>
<td>-17.2%</td>
</tr>
</tbody>
</table>

### Travel Times

<table>
<thead>
<tr>
<th>Incident</th>
<th>No-Response Scenario</th>
<th>Response Scenario</th>
<th>Change</th>
<th>Change %</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMT veh-mi</td>
<td>163,174 veh-mi</td>
<td>163,993 veh-mi</td>
<td>819</td>
<td>0.5%</td>
</tr>
<tr>
<td>VHT veh-mi</td>
<td>6,982 veh-mi</td>
<td>6,679 veh-mi</td>
<td>-303</td>
<td>-4.4%</td>
</tr>
<tr>
<td>Total Delay veh-hrs</td>
<td>4,197 veh-hrs</td>
<td>4,075 veh-hrs</td>
<td>-12</td>
<td>-0.3%</td>
</tr>
<tr>
<td>VMT veh-mi/veh-hrs</td>
<td>23.38 veh-mi/veh-hrs</td>
<td>23.83 veh-mi/veh-hrs</td>
<td>4.55</td>
<td>19.4%</td>
</tr>
</tbody>
</table>

### Stats - Area (Zones 3-4-5-6)

<table>
<thead>
<tr>
<th>Incident</th>
<th>No-Response Scenario</th>
<th>Response Scenario</th>
<th>Change</th>
<th>Change %</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-Response Scenario</td>
<td>408 vehs</td>
<td>47,096 vehs</td>
<td>4301</td>
<td>1063.8%</td>
</tr>
<tr>
<td>Response Scenario</td>
<td>2,774 vehs</td>
<td>2,805 vehs</td>
<td>31</td>
<td>1.1%</td>
</tr>
<tr>
<td>Delay veh-hrs</td>
<td>2,118 veh-hrs</td>
<td>2,237 veh-hrs</td>
<td>119</td>
<td>5.5%</td>
</tr>
<tr>
<td>VMT veh-mi/veh-hrs</td>
<td>17.36 veh-mi/veh-hrs</td>
<td>16.5 veh-mi/veh-hrs</td>
<td>-0.86</td>
<td>-5%</td>
</tr>
</tbody>
</table>

### Stats - Detour #1

<table>
<thead>
<tr>
<th>Incident</th>
<th>No-Response Scenario</th>
<th>Response Scenario</th>
<th>Change</th>
<th>Change %</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2,237 veh-hrs</td>
<td>119</td>
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<tr>
<td>VMT veh-mi/veh-hrs</td>
<td>17.36 veh-mi/veh-hrs</td>
<td>16.5 veh-mi/veh-hrs</td>
<td>-0.86</td>
<td>-5%</td>
</tr>
</tbody>
</table>

### Stats - Detour #2

<table>
<thead>
<tr>
<th>Incident</th>
<th>No-Response Scenario</th>
<th>Response Scenario</th>
<th>Change</th>
<th>Change %</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-Response Scenario</td>
<td>408 vehs</td>
<td>47,096 vehs</td>
<td>4301</td>
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<td>2,805 vehs</td>
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<td>2,237 veh-hrs</td>
<td>119</td>
<td>5.5%</td>
</tr>
<tr>
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<td>16.5 veh-mi/veh-hrs</td>
<td>-0.86</td>
<td>-5%</td>
</tr>
</tbody>
</table>

### Fury Queue

<table>
<thead>
<tr>
<th>Incident</th>
<th>No-Response Scenario</th>
<th>Response Scenario</th>
<th>Change</th>
<th>Change %</th>
</tr>
</thead>
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<td>16.5 veh-mi/veh-hrs</td>
<td>-0.86</td>
<td>-5%</td>
</tr>
</tbody>
</table>

### Productivity - Network

<table>
<thead>
<tr>
<th>Incident</th>
<th>Sub-Score veh</th>
<th>Normalization Value veh/hr</th>
<th>Normalized Sub-Score points</th>
<th>Weight points</th>
<th>Score</th>
<th>Improvements</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-Response Scenario</td>
<td>2,000 veh</td>
<td>1,000 veh/hr</td>
<td>150 points</td>
<td>0.200</td>
<td>46.0 points</td>
<td>-1.00</td>
</tr>
<tr>
<td>Response Scenario</td>
<td>2,000 veh</td>
<td>1,000 veh/hr</td>
<td>150 points</td>
<td>0.200</td>
<td>46.0 points</td>
<td>-1.00</td>
</tr>
</tbody>
</table>

### Travel Time

<table>
<thead>
<tr>
<th>Incident</th>
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<th>Penalty</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>No-Response Scenario</td>
<td>-0.3 min</td>
<td>0.40 mph</td>
<td>503.4 veh-mi</td>
</tr>
<tr>
<td>Response Scenario</td>
<td>-0.3 min</td>
<td>0.40 mph</td>
<td>503.4 veh-mi</td>
</tr>
</tbody>
</table>

### Network Performance

<table>
<thead>
<tr>
<th>Incident</th>
<th>Improvements</th>
<th>Penalty</th>
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</tr>
</thead>
<tbody>
<tr>
<td>No-Response Scenario</td>
<td>-5.0 mph</td>
<td>2.00 veh-mi/hr</td>
<td>2,500.0 veh-mi/hr</td>
</tr>
<tr>
<td>Response Scenario</td>
<td>-5.0 mph</td>
<td>2.00 veh-mi/hr</td>
<td>2,500.0 veh-mi/hr</td>
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</tbody>
</table>

### Productivity - Fury & Detours

<table>
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</tr>
<tr>
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<td>-5.0 mph</td>
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<td>2,500.0 veh-mi/hr</td>
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### Fury Queue

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<tbody>
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<td>2.00 veh-mi/hr</td>
<td>2,500.0 veh-mi/hr</td>
</tr>
<tr>
<td>Response Scenario</td>
<td>-5.0 mph</td>
<td>2.00 veh-mi/hr</td>
<td>2,500.0 veh-mi/hr</td>
</tr>
</tbody>
</table>
Software Development
Software Development Progress

- **Estimation**
  - Estimation generates densities and vehicle queues (needed for Aimsun simulation)
  - Internal visualization tool for testing
  - Integration of workflow into test DSS

- **Prediction**
  - Parallel Aimsun runs now supported in workflow
  - API improvements to run faster

- **Resolving issues with message content between system components**

- **New code repositories to manage versions and changes**
□ **Work flow completed**

- Raw Data → Data Aggregation → Freeway & Arterial Estimation → Result Integration → Initial States

□ **Freeway estimation generates density estimates in veh/mi/lane**

□ **Arterial estimation generates 5-min average queues**
Freeway Estimation Sunday
Freeway Estimation 14:02
Freeway Estimation 14:04
Freeway Estimation 14:10

Raw Data for Mainline: 71769 - All Lanes
Mainline VICS 71769 - SANTA ANITA 1
Sun 03/08/2020 13:30:00 to Sun 03/08/2020 14:30:59

Raw Data for HOV: 71768 - All Lanes
HOV VICS 71768 - SANTA ANITA 1
Sun 03/08/2020 13:30:08 to Sun 03/08/2020 14:30:59

Estimation

Google
Freeway Estimation 14:15

Google
Arterial Estimation

- 2020-03-09 11:40AM
Arterial Estimation

- 2020-03-09 11:40AM
Data Quality
Recent sensor data availability is very good

- Daily checks use PeMS 5-min data
- Weekly checks use PeMS %Observed

<table>
<thead>
<tr>
<th>Freeway Section</th>
<th>Direction</th>
<th>Sensor Availability Percentage</th>
<th>Sensor Availability Target</th>
<th>Past Target Accomplishment</th>
<th>Date of Degradation</th>
<th>Proposed New Target Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-210 PM 22.6 - 25</td>
<td>East</td>
<td>82.4%</td>
<td>90%</td>
<td>na</td>
<td>na</td>
<td>5/1/2019</td>
</tr>
<tr>
<td></td>
<td>West</td>
<td>88.0%</td>
<td>90%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-210 PM 25 - 43.25</td>
<td>East</td>
<td>90.1%</td>
<td>90%</td>
<td>3/7/2020</td>
<td>3/7/2020</td>
<td></td>
</tr>
<tr>
<td></td>
<td>West</td>
<td>90.8%</td>
<td>90%</td>
<td>2/8/2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SR-134 PM 11.4 - 13.5</td>
<td>East</td>
<td>76.0%</td>
<td>90%</td>
<td>3/7/2020</td>
<td>3/7/2020</td>
<td></td>
</tr>
<tr>
<td></td>
<td>West</td>
<td>76.8%</td>
<td>90%</td>
<td>1/18/2020</td>
<td>3/7/2020</td>
<td></td>
</tr>
<tr>
<td>I-605 PM 22.93 - 28</td>
<td>North</td>
<td>99.4%</td>
<td>90%</td>
<td>1/18/2020</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>90.5%</td>
<td>90%</td>
<td>3/7/2020</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Real-time I-210 Freeway Data Quality

- Real-time feed for PeMS D7 data on I-210 corridor
  - Monitoring percentage of VDS missing every hour
  - Data drops are typically short-lived
  - Loss of data will affect estimation results

![Graph showing %VDS Missing from 02/23 to 03/07]
Arcadia Data Quality

- **Detector Inventory**
  - 543 detectors at 52 intersections
  - 264 of them (at 19 intersections) are on detour routes

- **Detector Health**
  - Overall detector health rate (on detour routes) in 70% range
  - **Improvements**
    - Huntington @ Sunset is back online since 2020/02/19
  - **Major issue for “bad” detectors**
    - Keep reporting zero values
  - Kevin tells us that a few intersections, “are offline due to a traffic signal project that should be complete this week with communications re-established soon afterwards.”
    - Santa Anita @ Santa Clara
    - Santa Anita @ Colorado
    - Colorado @ First
    - Huntington @ Santa Clara
    - Huntington @ Santa Anita
LACO, Monrovia and Duarte

- **Detector Inventory**
  - 123 detectors at 21 intersections
    - 54 from LACO, 43 from Monrovia, and 26 from Duarte
  - 107 of them (at 18 intersections) are connected to KITS and on detour routes

- **Detector Health**
  - 94% health rate for those 54 detectors in LACO
  - 60% health rate for those 43 detectors in Monrovia
    - Issue for “bad” detectors: keep reporting zero values
  - 88% health rate for those 26 detectors in Duarte
    - Port numbers have been updated and IDs in our systems
    - TMDD Date-time Format has been fixed at Huntington @ Mount Olive
Stakeholder Progress
Response Plans – Stakeholder Progress

- **Pasadena (80 CC Intersections)**
  - 43 intersections are programmed with Connected Corridors flush plans

- **LA County (6 CC Intersections)**
  - All 6 timing sheets completed and ready for implementation

- **Monrovia and Duarte (17 CC Intersections)**
  - 3 revised signal plans completed along Huntington
Response Plans – Stakeholder Progress

- **Arcadia (19 CC Intersections)**
  - 17 intersections are programmed with Connected Corridors flush plans on Huntington, Foothill, and Santa Anita
  - 2 additional intersections awaiting installation of 2070 controllers on Colorado

- **Caltrans TSMSS (15 CC Intersections)**
  - Productive meeting held on March 4th with Ken and Samson’s team
  - Next steps
    - Continuing validation meetings with Caltrans
    - Goal to load signal plans onto controllers by April
Next Steps
Next Steps

- Continue systems integration
- Include ATMS and CMS into the next demo
- Refine plan for demonstration at 2020 ITS World Congress
Caltrans HQ asked us to estimate performance metrics for the I-210.

We also looked at how many 1 hour or more incidents there are on the I-210 as part of this study.

We ran simulations of multiple lane closures at different times using our detour routes.

We also looked at results from the I-15 and the I-80.
**Potential I-210 Activations**

- **Frequency of incidents with lane closures on I-210 WB, Jan-Jun 2018**
  - Focusing on incidents lasting 30+ minutes
  - Incidents between mileposts 22 and 39 only

<table>
<thead>
<tr>
<th>Lanes Closed</th>
<th>Number of Events</th>
<th>Average Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>97</td>
<td>1.18 hrs</td>
</tr>
<tr>
<td>2</td>
<td>28</td>
<td>2.22 hrs</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>2.55 hrs</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2.25 hrs</td>
</tr>
<tr>
<td>5+</td>
<td>3</td>
<td>5.08 hrs</td>
</tr>
<tr>
<td></td>
<td>137</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Lanes Closed</th>
<th>Number of Events</th>
<th>Average Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>388</td>
<td>1.18 hrs</td>
</tr>
<tr>
<td>2</td>
<td>112</td>
<td>2.22 hrs</td>
</tr>
<tr>
<td>3</td>
<td>32</td>
<td>2.55 hrs</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>2.25 hrs</td>
</tr>
<tr>
<td>5+</td>
<td>12</td>
<td>5.08 hrs</td>
</tr>
<tr>
<td></td>
<td>548</td>
<td></td>
</tr>
</tbody>
</table>

 Extrapolating for full year and 2 directions

- **548 potential activations / year**
Simulated freeway benefits of response plan activations

- 1-hr incidents similar to those observed
- Response plan activated 15 minutes after incident and terminated 30-60 minutes after incident cleared
- Evaluation over 2-hour period from start of incident

<table>
<thead>
<tr>
<th>Dir</th>
<th>Milepost</th>
<th>Location</th>
<th>Lanes</th>
<th>Ratio</th>
<th>Closed</th>
<th>Time</th>
<th>Peak</th>
<th>Duration</th>
<th>VMT veh-mi</th>
<th>VHT veh-hrs</th>
<th>Delay veh-hrs</th>
<th>Speed Change mph</th>
<th>Back Queue (15-mph) mi</th>
<th>Upstrn Off-Ramps</th>
<th>Dwnstrm On-Ramps</th>
<th>Screenline</th>
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<tbody>
<tr>
<td>WB</td>
<td>26.10</td>
<td>Lake</td>
<td>2/6</td>
<td>0.33</td>
<td>No</td>
<td>12:00 PM</td>
<td>No</td>
<td>1</td>
<td>371</td>
<td>1.1%</td>
<td>-43 -7.6%</td>
<td>5.6</td>
<td>-0.18</td>
<td>151</td>
<td>279</td>
<td>339</td>
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<tr>
<td>WB</td>
<td>26.10</td>
<td>Lake</td>
<td>2/6</td>
<td>0.33</td>
<td>No</td>
<td>4:00 PM</td>
<td>No</td>
<td>1</td>
<td>2,731</td>
<td>1.2%</td>
<td>-211 -3.1%</td>
<td>1.5</td>
<td>-0.26</td>
<td>198</td>
<td>258</td>
<td>-186</td>
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<tr>
<td>EB</td>
<td>35.60</td>
<td>Buena Vista</td>
<td>3/6</td>
<td>0.50</td>
<td>Yes</td>
<td>3:00 PM</td>
<td>1</td>
<td>336</td>
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<td>-82 -1.1%</td>
<td>-76 -1.3%</td>
<td>0.2</td>
<td>0.16</td>
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<td>311</td>
<td>139</td>
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<tr>
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<td>30.75</td>
<td>Baldwin</td>
<td>3/6</td>
<td>0.50</td>
<td>Yes</td>
<td>4:00 PM</td>
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<td>1,959</td>
<td>2.3%</td>
<td>-198 -1.2%</td>
<td>-261 -5.1%</td>
<td>0.8</td>
<td>-0.74</td>
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<td>705</td>
<td>-153</td>
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<tr>
<td>EB</td>
<td>32.75</td>
<td>Santa Anita</td>
<td>3/5</td>
<td>0.60</td>
<td>No</td>
<td>12:00 PM</td>
<td>No</td>
<td>1</td>
<td>327</td>
<td>0.3%</td>
<td>4 0.1%</td>
<td>0.1</td>
<td>-0.05</td>
<td>42</td>
<td>62</td>
<td>172</td>
</tr>
<tr>
<td>EB</td>
<td>32.75</td>
<td>Santa Anita</td>
<td>3/5</td>
<td>0.60</td>
<td>Yes</td>
<td>4:00 PM</td>
<td>1</td>
<td>717</td>
<td>0.7%</td>
<td>-128 -2.0%</td>
<td>-105 -2.1%</td>
<td>0.5</td>
<td>-0.25</td>
<td>165</td>
<td>195</td>
<td>196</td>
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<tr>
<td>WB</td>
<td>26.10</td>
<td>Lake</td>
<td>6/6</td>
<td>1.00</td>
<td>No</td>
<td>12:00 PM</td>
<td>No</td>
<td>1</td>
<td>11,999</td>
<td>7.0%</td>
<td>-554 -7.4%</td>
<td>3.6</td>
<td>-0.73</td>
<td>853</td>
<td>752</td>
<td>251</td>
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<tr>
<td>WB</td>
<td>26.10</td>
<td>Lake</td>
<td>6/6</td>
<td>1.00</td>
<td>No</td>
<td>4:00 PM</td>
<td>No</td>
<td>1</td>
<td>5,549</td>
<td>3.1%</td>
<td>-297 -3.9%</td>
<td>1.7</td>
<td>-0.80</td>
<td>524</td>
<td>591</td>
<td>1,775</td>
</tr>
</tbody>
</table>

*Higher VMT with lower VHT
→ better movement on freeway
CC I-210 Pilot Performance Impacts

**Safety**

- Reduction in number of crashes: 3% reduction from 548/year to 532/year
- I-80: 3% reduction in incidents WB direction against a 12% increase countywide
- Reduction in first responder exposure by reducing and managing incident-related congestion.
mobility

- reduced delay (for incidents resulting in 1 or more closed lanes for ½ hour or more)
  - reduction in vehicle hours of travel (VHT). Low/High estimates: (3%-8%) (182,257-290,364 VHT) or ($3,233,290 - $5,151,152) per year.

- increased corridor throughput.
  - Freeway: 0.6% to 4.6% (50-285 Veh/Hr.); Arterials: 1.6% to 9.8%; Corridor: 50-1774 Veh/Hr.

- Small increase in Vehicle Miles Traveled (VMT): autos redirected to arterials
CC I-210 Pilot Performance Impacts

- **Reliability**
  - Improved Travel Times and Speeds (increase: L - 1.5mph – H - 5.6mph)

- **Environmental**
  - Reduced GHG and particulate emissions from reduced delay & increased speeds
  - Reduced fuel consumption
Thank You
and
Next Meeting
(Suggest Tuesday April 28th at LA Metro)