Connected Corridors
Face-to-Face Meeting

Tuesday, August 28th, 2018
1:30 – 3:30 pm
LA County
Agenda

- 1:30-2:00 - Summary of program - Joe
- 2:00-2:30 – MOU - Mort
- 2:30-2:45 – Call for Projects update – Parsons
- 2:45-3:25 – Before and After Study – Tom/SMG
- 3:25-3:30 – Closing
  - Next Meeting at Duarte – Tuesday October 9th
  - (County, Arcadia, Caltrans, Pasadena, Monrovia, Duarte)
Systems Engineering Next Steps

- Design Documents – Details of interfaces and implementations
- Hardware/Software – Building the system
- Integration – Subsystems will come on line this year
Summary
Signal Flush Plan Summary

- All 670 Recommended Signal Flush Plans Designed, in QA and starting stakeholder review

- All major 34 EB routes coded

- All major 37 WB routes coded
Signal Plan Review & Approval

- Delivered preliminary set of eastbound signal plans
  - Pasadena - EB Del Mar – 6 Plans
  - Arcadia - Santa Anita → EB Huntington – 12 Plans
  - LA County - EB Huntington → Mountain – 20 Plans
  - Caltrans - EB Evergreen – 24 Plans

- QA process
  - Simulation of plans in Aimsun
  - Inspection of queues, green wave progression, metrics
Communication – Kali to Comment

- Work ongoing to setup connections between Caltrans, Pasadena and LA County
- Should be completed in September according to current schedule
COTS (Purple Box) - ICMS

- Telegra
  - Getting VPN setup

- Kapsch
  - VPN Established
  - Development effort is underway
  - Network discussions nearing completion

- Parsons
  - Will start next June
TMDD Interfaces to Data Hub

- **Traffic Control Systems**
  - TransCore – Arcadia and Caltrans
    - Installation in Arcadia has occurred – Yes!
    - Will test with Data Hub in September
    - Installation at Caltrans in Sept/Oct
    - Small amount of additional work in process
  - McCain - Pasadena
    - Working on finalizing the requirements
  - Kimley Horn – LA County, Monrovia and Duarte
    - We are getting set to review their design

- **ATMS – Caltrans (CMS Signs, Ramps)**
  - Initial Release delivered in July
  - We are testing out the interface and there will likely be updates needed
**Systems Development and Integration**

- **Release 1.1 of Data Interface Specification released for comment**

- **Working on system deployment automation**
  - Moving the system from the Berkeley Amazon cloud to the Caltrans Amazon cloud
  - Security issues are being addressed
  - Hired new cloud engineer

- **Data Hub**
  - Working on incident pipeline and workflows
  - Stabilized Apache Spark

- **DSS – Response plan generation initial version completed**
  - Simple workflow without error processing
Incident and Response Plan Management

1) Incident is Created – ICMS (Purple Box) or ATMS
2) Incident Routed to DSS - ICMS
3) Response Plan is Generated – DSS
4) Response Plan is Approved – ICMS or ATMS
5) Response Plan is Executed – ICMS
6) Response Plan Components are Performed:
   1) ATMS (Ramps and CMS signs)
   2) Traffic Control Systems (Signals)
   3) Sign Control System (Arterial Signs)
MOU
Mort
Call for Projects
Parsons
Agenda

- I-210 CC Arterial Systems Improvement Project
  System Consulting Services – Scope
- Status of 9 procurement package
- Project Progress
  - Current Status
  - 30-Day Look Ahead
I-210 CONNECTED CORRIDORS ARTERIAL SYSTEMS IMPROVEMENT PROJECT
SYSTEM CONSULTING SERVICES

SCOPE OF WORK

August 28th, 2018
Project Objective

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

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<tr>
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<th>Package Description</th>
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Project Area (cont.)

Contracts 1-7 Site Location
UPDATE ON
PACKAGES 1-9
# Update on 9 Packages

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| 1      | Bluetooth – Iteris Velocity  | 07A4470    | • NTP: 7/10/2018  
  • Kick-off Meeting: 7/30/2018  
  • Submittal Approved                                                   |
| 2      | Bluetooth – BlueToad         | 07A4477    | • NTP: 7/10/2018  
  • Kick-off Meeting: 7/30/2018  
  • Server Specs (in Virtual Machine Environment) approved by LACPW;  
  • Preparing Submittal                                               |
| 3      | New Controller Cabinets      | 07A4478    | • Disqualified: Bids came above the SB limit (314k).  
  • Procurement Package to be revised per Stakeholder comments on Pkg. 5  
  • To be re-advertised                                               |
| 4      | Communication Upgrades       | 07A4479    | • NTP: 7/13/2018  
  • Kick-off Meeting: 7/30/2018  
  • Submittal under Review (due 9/3/18)                                 |
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PROJECT PROGRESS
Current Status

- **Stakeholder Outreach and Coordination**
  - Stakeholder Coordination Guide Document (draft completed)
    - Reviewed by Caltrans
    - Distributed to Stakeholders for Verification & Approval
    - To be distributed to Contractors
  - Continuously Support Coordination
    - Track Action Items
    - Coordination
      - Among multiple projects
      - Among Stakeholders
      - Between Stakeholders and Contractors
Current Status

- **Service Contract Management**
  - Collect project Baseline (Schedule, Risk)
  - Track Project Progress & Action Items
  - Manage Project Issues
    - Support Resolution
    - Status Tracking
  - Support Coordination
    - Among multiple projects
    - Between Stakeholders and Contractors
30-Day Look Ahead

- Distribute Stakeholder Coordination Guide Document to Contractors
- Support contractors to schedule site investigation and get permit
- Submit August 2018 Project Progress Report
- Collect and Distribute master schedule when it is ready
- Next Project Monthly Status Meeting
  - Wednesday, September 19, 2018; 10:30 AM – 11:00 AM; via Webinar (invitation sent)
Thank You and Questions?
Before and After Study
Tom/SMG
I-210 Connected Corridors

Before/After Evaluation

August 28, 2018
Framework

- **Assumptions**
  - Facilities to Evaluate
  - State Conditions to Evaluate
  - Key Strategies
  - Available Data Sources

- **Performance Measures**
  - Recommended Measures

- **Data Collection**
  - Manual data collection (counts, travel time runs, field observations)
I-210 corridor integrated facilities to evaluate include:

- I-210 freeway and ramps (by city boundary segments)
- Key parallel arterials & connecting arterials (by city segments)
- Key intersections (by city boundary locations)
State Conditions

- **State conditions analysis**
  - Recurrent congestion analysis
  - Non-recurrent congestion (collective) analysis
    - Non-planned events (incidents)
    - Planned events (from maintenance, construction)
  - Specific incident analysis
Possible Incident Scenarios (Types)

- Scenario 1: Major Incident on Freeway (All Lanes Blocked)
- Scenario 2: Moderate Incident on Freeway (Partial Lane Closure)
- Scenario 3: Major Incident on Arterial (All Lanes Blocked)
- Scenario 4: Moderate Incident on Arterial (Partial Lane Closure)
- Scenario 5: Major Incident on Arterial Intersection (I/S Blocked)
- Scenario 6: Moderate Incident on Arterial I/S (Partial I/S Closure)
- Scenario 7: Incident on Freeway On-Ramp
- Scenario 8: Incident on Freeway Off-Ramp
Key strategies:

- **Recurrent Congestion** (excess demand caused)
  - Freeway Adaptive Ramp Metering
  - En-Route Messaging and Traveler Information (?)
  - Arterial Coordinated Signal Operations (?)

- **Non-Recurrent Congestion** (incident caused)
  - Incident Response Planning
  - Advisory Diversion Management and Rerouting
  - Construction/Maintenance Closure/Site Management (?)
Data Sources

- **Detectors** (before & after)
  - Caltrans Freeway PeMS (or ATMS) – freeway & all ramps
  - Arterial intersection signal detection
  - Arterial segment speed/occupancy detection
  - Arterial Bluetooth readers (travel time)

- **Manual** (before & after)
  - Arterial link tube and I/S turning movement counts (before & after)
    - select locations where detection is not available
  - INRIX crowd sourcing data (before & after)
Performance Measures

- Suggested Performance Measures:
  - Traffic Flow (Volumes)
  - Travel Times
  - Ramp Queues
  - Freeway Speeds
  - Delay
  - Vehicle Miles Traveled (VMT)
  - Vehicle Hours Traveled (VHT)
  - Travel Time Variability
  - Congestion Period (Peak Period Hours)
  - Level of Service (Intersections)
  - Mainline Incident Congestion Queue Dissipation Rate
Evaluation

Recurrent Congestion Analysis
Recurrent Congestion Analysis

1. **Demand Measures**
   - Total freeway Vehicle Miles Traveled (VMT)
     - *From mainline detectors*
     - *Need to agree to definition of peak periods (6am-10am and 3pm to 7pm suggested)*
   - Traffic **volumes** on arterial segments
     - *At select locations where we have good detection data*
2. **Mobility Measures**

   - **Total freeway vehicle hours delay**
     - Need to agree on reference speed (60 mph or 35 mph, or both)

   - **Average travel time**
     - Bluetooth and detection data
     - INRIX data
     - Sample probe vehicle runs/KITS mobile for validation
Recurrent Congestion Analysis

2. Mobility Measures
   – On-ramp delays
     - Requires visual data collection (possibly video at select locations)
       o Need to agree on locations
     - Need ramp volumes (from detection) to document any changes

3. Reliability Measure (need large data sample)
   – Freeway travel time variability
   – Arterial travel time variability
   – INRIX data
Recurrent Congestion Analysis

4. **Other Measures**
   - Extent and duration of queuing at freeway bottlenecks
     - *Need agreement on bottlenecks and bottleneck locations*
     - *Use detection if have agreement on locations*
Evaluation

Non-recurrent Congestion Analysis
Why “significant” non-recurrent congestion is proposed

Not many collision-free days
Why “significant” non-recurrent congestion is proposed

Not many collision-free days
No incident-free days
Non-recurrent Congestion Analysis

1. **Mobility Measures**
   - Extent of congestion on freeway as a result of incident
     - *total delay and travel time and take total VMT into consideration (given that this measure is very difficult to compute as it has to be estimated and compared against “normal conditions)*
   - Changes in traffic conditions on arterials as a result of incident
     - *Volumes*
     - *Speeds*
     - *Travel times*
Non-recurrent Congestion Analysis

2. Traveler Behavior
   - Extent of diversion of traffic from freeway as a result of incident
     - Volumes at off-ramps, on-ramps, and arterials
     - Detection data
3. Safety Measures

- Crash statistics (difficult due to delay in data availability)
  - *This measure will tell us if the various strategies reduced crashes*
  - CHP CAD; Metro FSP records
  - SWTRS after 6-12 months
  - TASAS only for before conditions only;

- Frequency, type, and severity of primary and secondary incidents
  - CHP CAD; Metro FSP records
  - SWTRS – after 6 months;
  - TASAS only for before conditions only
Evaluation

Specific Incident Analysis
Specific Incident Analysis

- Assessing impacts of the ICM on specific non-recurrent congestion
  - Few collisions are the same – a before and after for specific types of collisions may not be possible
  - Assess to extent possible based on data samples collected
  - Rate of queue dissipation evaluation:
    - This measure would determine whether the I-210 Connected Corridors operations and its response plans (with integrated and coordinated arterial route signal timing modifications with traveler information) had an impact to the rate of reduction in the incident-caused congestion queuing and to the increase in the productivity flow rates through the affected diversion off-ramps and arterials.
Specific Incident Analysis

• This would indicate that the amount and the impact of congestion (e.g., queue length and length of time of the queue presence) on the freeway is reduced.

• This would also indicate that the increased productivity flow through the off-ramps and arterials would result in reduced impact (e.g., keeping more of the diverted traffic along the preferred arterials and reducing the total length of time diverted traffic is on the arterials) on the local facilities.

• Data collection approach:
  o Identify after condition ICM operations impacted incident(s)
  o Identify type, location, direction, season, day of week, time of day
  o Determine average rate of queue dissipation and hourly impacted off-ramp flow
  o Determine average hourly flow along ICM operated arterials
Specific Incident Analysis

- **Data collection approach (cont.):**
  - Identify most similar representative before condition incidents for comparison
    - Note – since we are measuring only the rate of change and the rate of flow (and not absolute quantity totals), incidents do not necessarily need to match exactly. Similar in type, in reasonably close proximity location (e.g., using the same bypass arterials), in same direction, in reasonably similar time-frame may be enough.
  - Identify type, location, direction, season, day of week, time of day
  - Determine average rate of queue dissipation and hourly flow of the same off-ramps as after condition
  - Determine average hourly flow along the same arterials as after condition
Specific Incident Analysis

- **Data collection approach (cont.):**
  - Use freeway PeMS data for incident-caused congestion queue dissipation (speed contour plots) and impacted off-ramps hourly flows
  - Use the I-210 Connected Corridors arterial detection data for the impacted arterials hourly flows
Specific Incident Analysis

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<th>Duration (min)</th>
<th>Freeway</th>
<th>CA PM</th>
<th>Abc PM</th>
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<td>Other</td>
<td>CHP</td>
<td>I210 E/S Myrtle Ave</td>
<td>1182-Trf Collision-No Inj</td>
<td></td>
</tr>
</tbody>
</table>
Specific Incident Analysis
<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/23/2018 8:36</td>
<td>[1] 4 VEH TC - BLOCKING #1 and #2 LNS</td>
</tr>
<tr>
<td>8/23/2018 8:36</td>
<td>[4] [Appended, 08:37:40] [1] 2 VEH TC BLKING #1 LANE</td>
</tr>
<tr>
<td>8/23/2018 8:36</td>
<td>[31] [Appended, 08:58:16] [1] WHI CHEV CAMARO VS CD</td>
</tr>
<tr>
<td>8/23/2018 8:36</td>
<td>[30] [Appended, 08:58:16] [4] [Appended, 08:37:40] [1] 2 VEH TC BLKING #1 LANE</td>
</tr>
<tr>
<td>8/23/2018 8:37</td>
<td>[4] [Appended, 08:37:59] [1] PER RP - 2 SEP TC - 5-6 VEHS BLKG #2-3-4 LNS</td>
</tr>
<tr>
<td>8/23/2018 8:37</td>
<td>[8] [Notification] [CHP]-SV - PLT 70188F1 - WHI/BLK PK TRK - LEAVING THE SCENE - POSS INJURIES 0-1179 [Shared]</td>
</tr>
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<td>8/23/2018 8:37</td>
<td>[35] [Appended, 08:58:16] [8] [Notification] [CHP]-SV - PLT 70188F1 - WHI/BLK PK TRK - LEAVING THE SCENE - POSS INJURIES 0-1179 [Shared]</td>
</tr>
<tr>
<td>8/23/2018 8:38</td>
<td>[10] PLT RTNS CLR 05 GMC VN O/O TUJUNGA - SV LS PULLING OVER EB 210 TO SB 605 PROB DISABLED FROM TC [Shared]</td>
</tr>
<tr>
<td>8/23/2018 8:38</td>
<td>[37] [Appended, 08:58:16] [10] PLT RTNS CLR 05 GMC VN O/O TUJUNGA - SV LS PULLING OVER EB 210 TO SB 605 PROB DISABLED FROM TC [Shared]</td>
</tr>
<tr>
<td>8/23/2018 9:56</td>
<td>[63] TASK .841 SILA/TMCLA/CTLA/LILA,SIGALERT UPDATE - HOV AND #1 LN ARE NOW OPEN [Shared]</td>
</tr>
<tr>
<td>8/23/2018 9:56</td>
<td>[62] [FSP] has closed their incident [180823LAFSP00069]</td>
</tr>
<tr>
<td>8/23/2018 10:01</td>
<td>[65] [Notification] [CHP]-PLS CONFIRM - #2 IS ONLY LN BLKD? THANKSNN [Shared]</td>
</tr>
<tr>
<td>8/23/2018 10:08</td>
<td>[66] 81-201 RDWY CLR --- AFFECT JUST CLR'D #2 LNS [Shared]</td>
</tr>
<tr>
<td>8/23/2018 10:09</td>
<td>[67] ^TMC COPIES RDWY CLEAR [Shared]</td>
</tr>
</tbody>
</table>
Specific Incident Analysis

Aggregated Speed (mph) for I210-E (46% Observed)
Tue 08/21/2018 06:00-18:59
Traffic Flows from Left to Right

Speed:
Specific Incident Analysis
Aggregated Speed (mph) for 210-E (45% Observed)
Thu 06/23/2016 06:00-18:59
Traffic Flows from Left to Right
Framework

- **Before evaluation**
  - Spring 2019 (Feb to Mid-Mar or May)

- **After evaluation**
  - Spring 2020
Thank You
and
Next Meeting
(Suggest October 9th at Duarte)