Connected Corridors
Face-to-Face Meeting

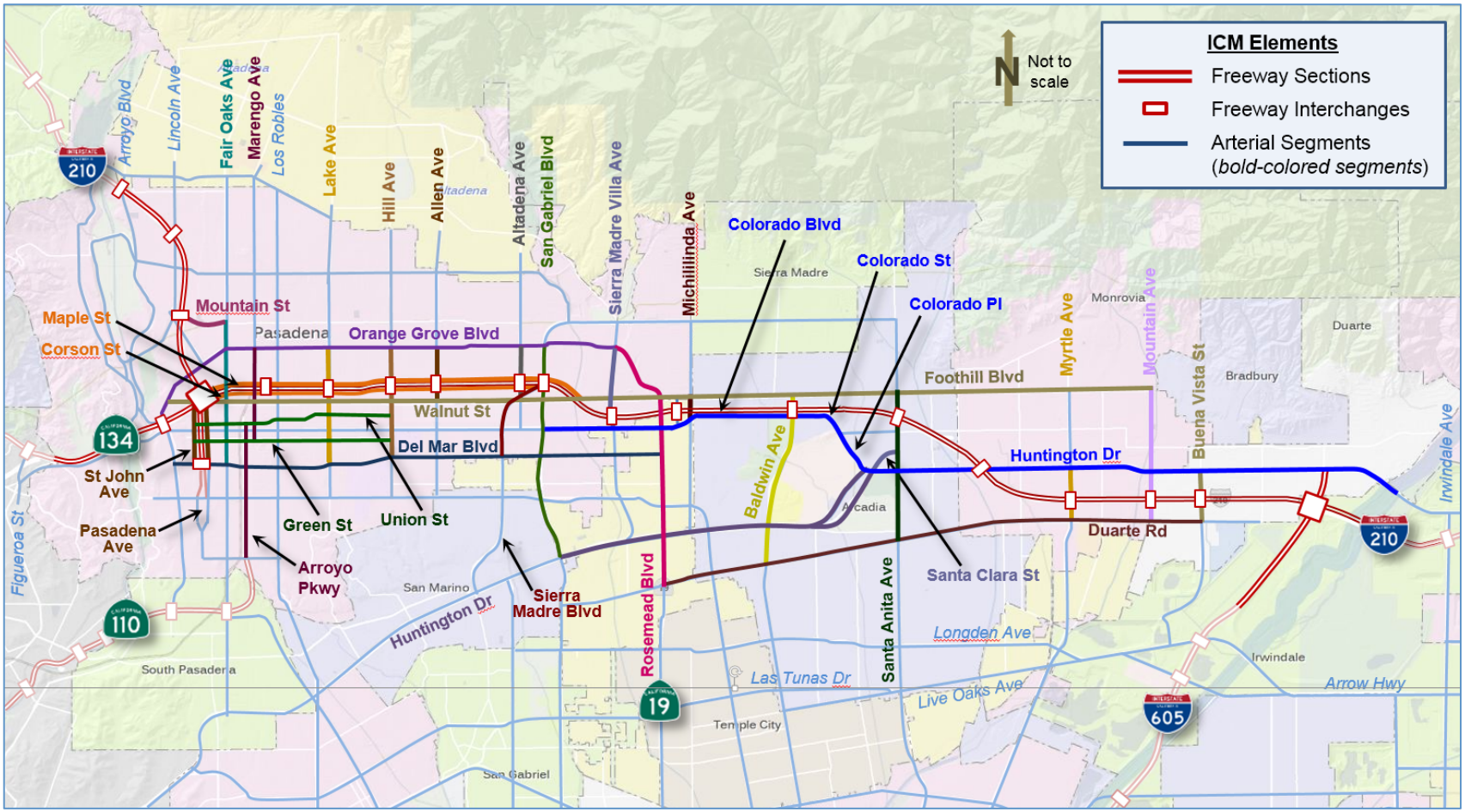
Tuesday, Oct 25th, 2016 – 1:30 – 3:30 pm
Caltrans D7 HQ

Oct 25th, 2016

Agenda

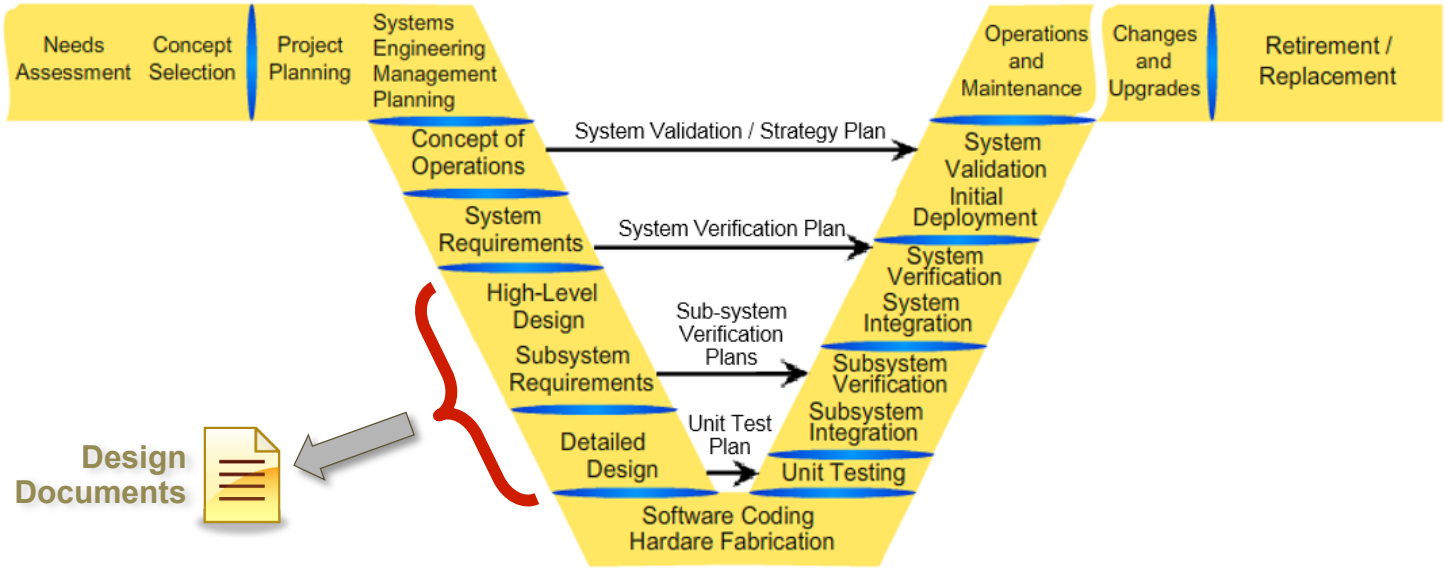
- **Introductions**
- **Schedule Update**
- **Outreach**
- **High Level Design**
  - Software
  - Hardware
- **(AMS) – Analysis, Modeling and Simulation**
  - Modeling
  - Response Planning
- **System Evaluation**
- **Action Items and Closing**

Our Corridor: The I-210



Systems Engineering Next Steps

- **Systems Requirements – What should the ICM system do**
- **Design Documents – How will the requirements be met**



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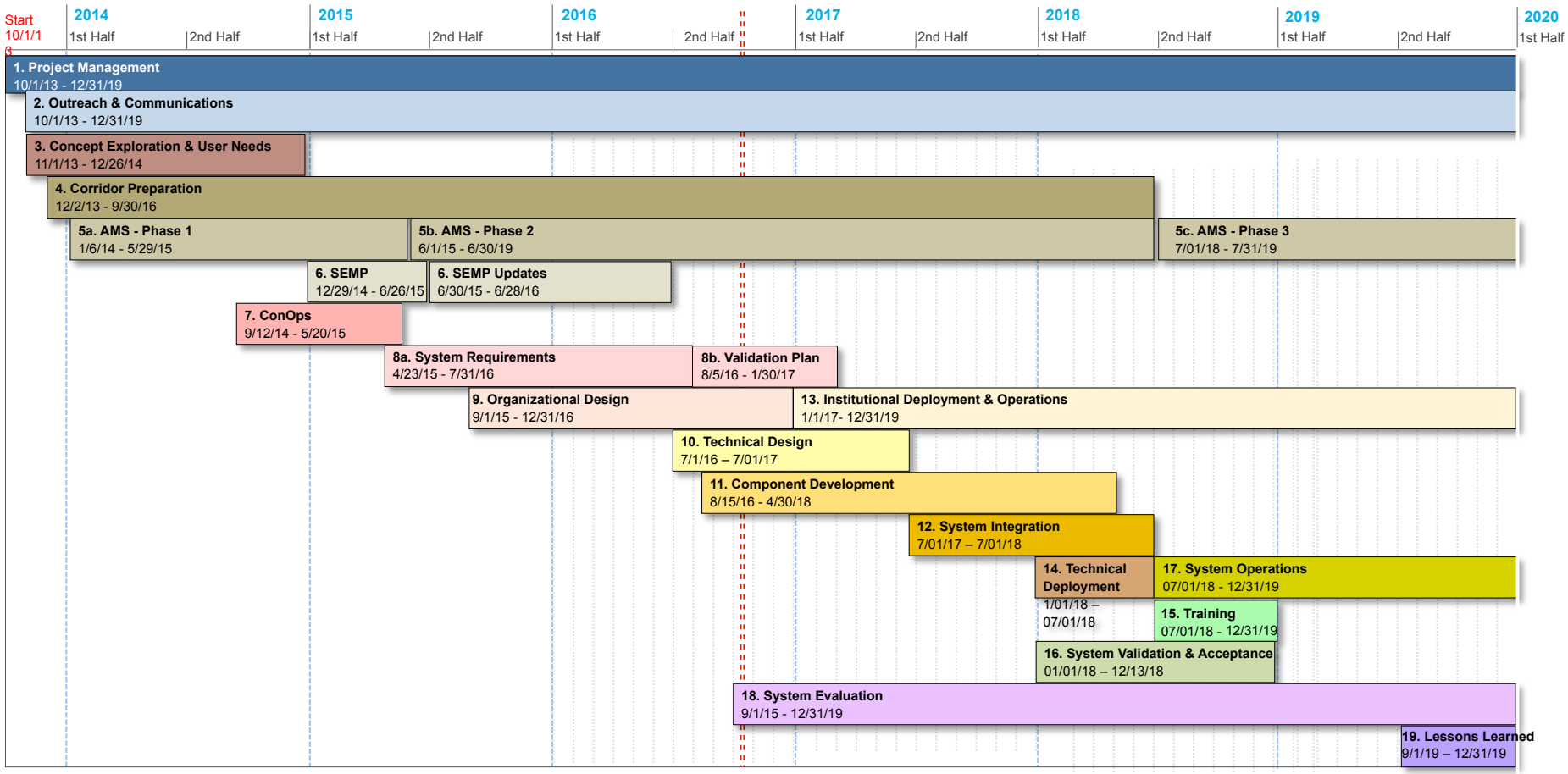
Schedule Update

Schedule


Start 10/1/13
2014
1st Half
2nd Half
2015
1st Half
2nd Half
2016
1st Half
2nd Half
2017
1st Half
2nd Half
2018
1st Half
2nd Half
2019
1st Half
2nd Half
2020
1st Half
1. Project Management
10/1/13 - 12/31/19
2. Outreach & Communications
10/1/13 - 12/31/19
3. Concept Exploration & User Needs
11/1/13 - 12/26/14
4. Corridor Preparation
12/2/13 - 9/30/16
5a. AMS - Phase 1
1/6/14 - 5/29/15
5b. AMS - Phase 2
6/1/15 - 6/30/19
5c. AMS - Phase 3
7/01/18 - 7/31/19
6. SEMP
12/29/14 - 6/26/15
6. SEMP Updates
6/30/15 - 6/28/16
7. ConOps
9/12/14 - 5/20/15
8a. System Requirements
4/23/15 - 7/31/16
8b. Validation Plan
8/5/16 - 1/30/17
9. Organizational Design
9/1/15 - 12/31/16
13. Institutional Deployment & Operations
1/1/17- 12/31/19
10. Technical Design
7/1/16 – 7/01/17
11. Component Development
8/15/16 - 4/30/18
12. System Integration
7/01/17 – 7/01/18
14. Technical Deployment
1/01/18 – 07/01/18
17. System Operations
07/01/18 - 12/31/19
15. Training
07/01/18 - 12/31/19
16. System Validation & Acceptance
01/01/18 – 12/13/18
18. System Evaluation
9/1/15 - 12/31/19
19. Lessons Learned
9/1/19 – 12/31/19

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Outreach and Communications

Project Charter Amendment

- Received two minor comments (County and Metro)
- Changes from the June 2015 Project Charter:
- **THE CORE STAKEHOLDERS NOW DESIRE TO AMEND THE PROJECT CHARTER AS FOLLOWS:**
  - The following Primary Contact Persons shall be updated as follows:
    - Caltrans District 7 – Samson Teshome
    - Metro Operations – Bruce Shelburne
    - SGVCOG – Phil Hawkey, Executive Director
    - SCAG – Naresh Amatya, Acting Director, Transportation Planning
  - The Core Stakeholders will, in a timely manner, review and approve the I-210 Pilot System Requirements and the design documents.
  - LACDPW, Pasadena, Arcadia, Monrovia, Duarte, and Foothill Transit are receiving infrastructure and/or software improvements as part of the LA Metro 2015 Call for Projects funding. These agencies agree that the improvements, while installed by CT D7 (the Project Sponsor), will be owned, operated, and maintained by LACDPW, Pasadena, Arcadia, Monrovia, Duarte, and Foothill Transit respectively. Separately, the agencies will work with CT D7 to execute an "Asset Transfer Agreement" or similar document that outlines the improvements in each jurisdiction.
  - CT D7 agrees to 24 hours per day/7 days per week corridor/asset monitoring from the Los Angeles Regional Transportation Management Center (TMC) near Glendale, CA.
- **The Core Stakeholders agree to execute additional agreements for various aspects of the Project. Possible examples include an Operations and Maintenance Plan, a System Integration Plan, and a Memorandum of Understanding.**

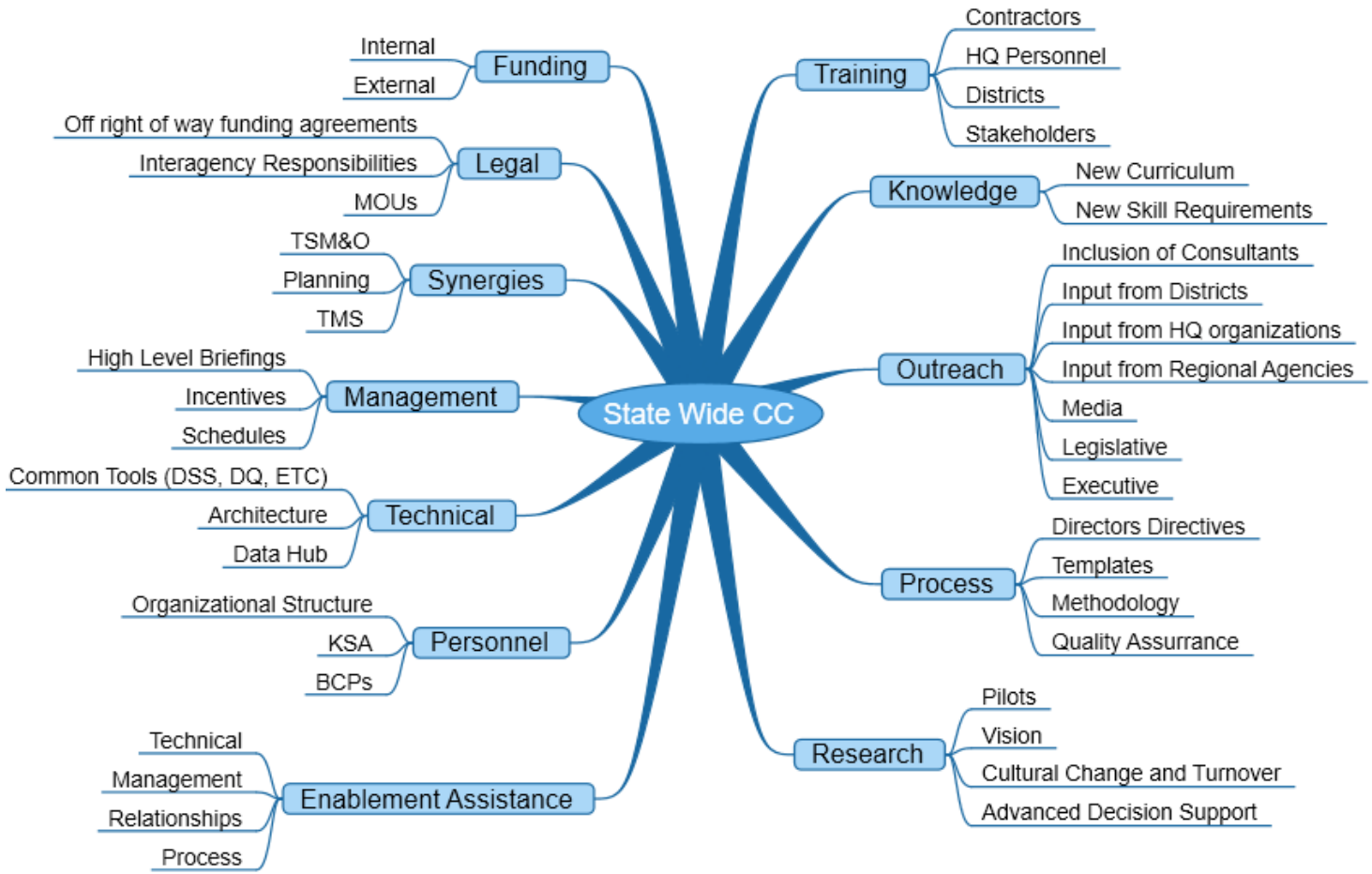
Connected Newsletter

- Currently writing articles
- Distribution in November

CC Statewide Rollout

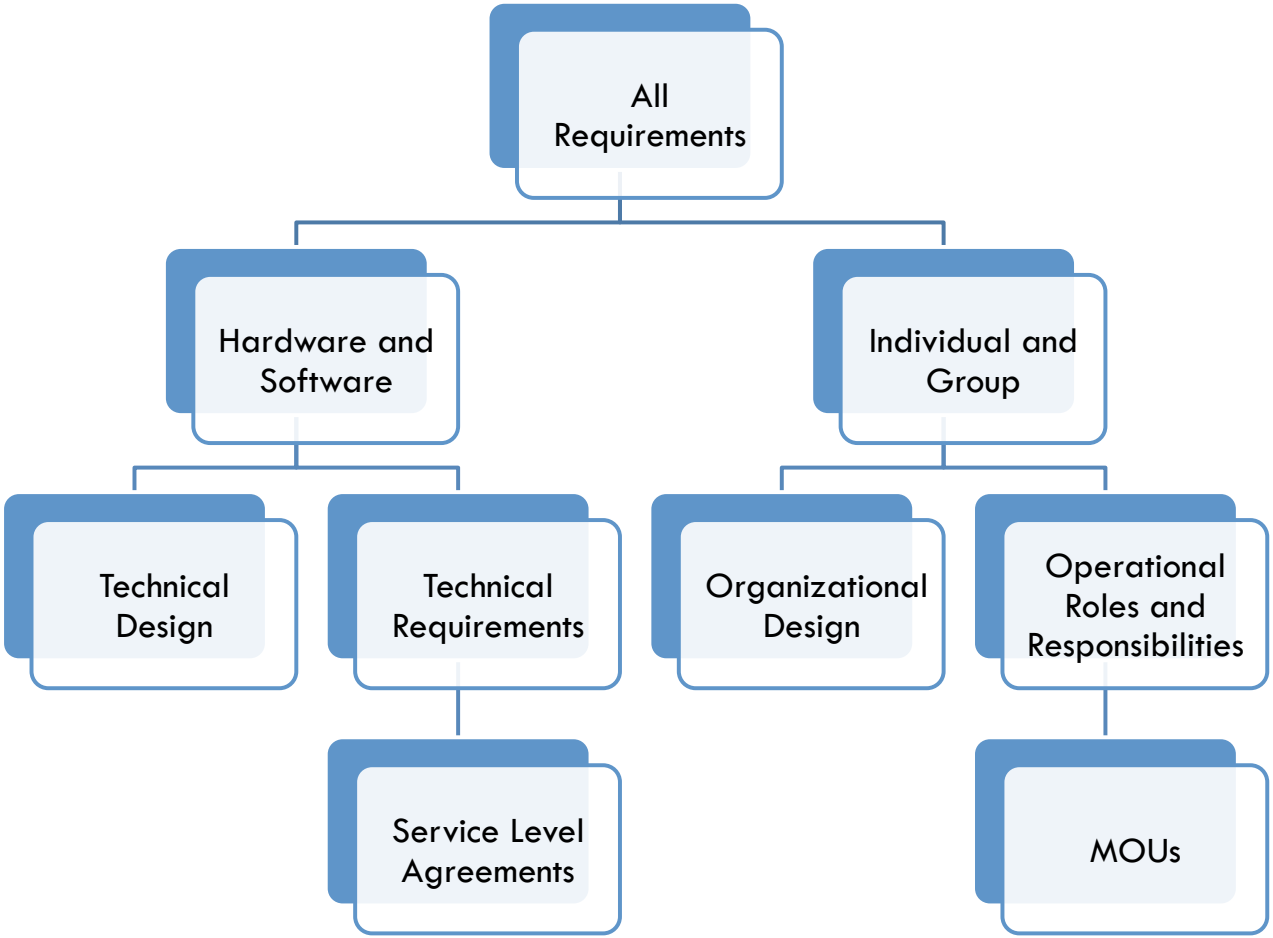
- PATH and CT HQ are working on the project
- The information will be presented via a website at CT – first on the CT intranet and then on the internet
- An outline has been prepared
- Working on the layout for the website
- Starting to add text (using some information from the CC website and the CCDocs website, as well as new text)
- Project will be complete by the first quarter of 2017 but hope to have a majority of the work done by December

CC State Wide Roll Out



High Level Design

High Level Design



System Engineering – Requirements

PARTNERS FOR ADVANCED TRANSPORTATION TECHNOLOGY
INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

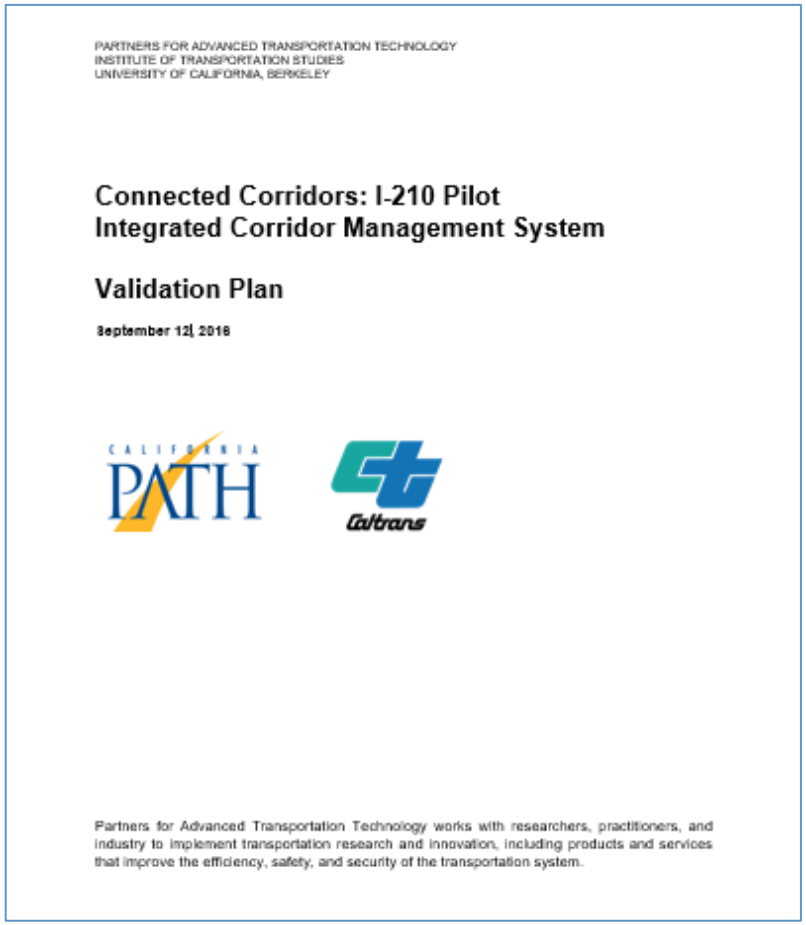
Connected Corridors: I-210 Pilot
Integrated Corridor Management System

System Requirements

October 13, 2016

Partners for Advanced Transportation Technology works with researchers, practitioners, and industry to implement transportation research and innovation, including products and services that improve the efficiency, safety, and security of the transportation system.

System Engineering – Validation Plan



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Connected Corridors: I-210 Pilot
Integrated Corridor Management System

Validation Plan

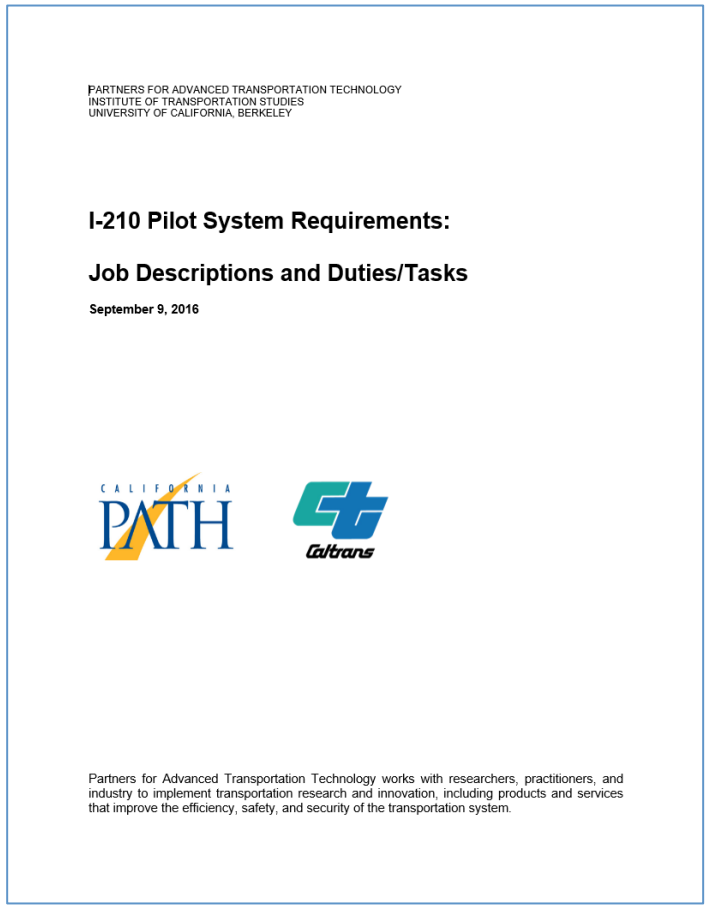
September 12, 2018

Partners for Advanced Transportation Technology works with researchers, practitioners, and industry to implement transportation research and innovation, including products and services that improve the efficiency, safety, and security of the transportation system.

Subcomponents - Schedule

		2016	2017				2018			
		4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Quarter	4th Quarter
Org and Personnel	**Personnel**	Define	Design	Assign	Assign	Assign	Ready	Deploy	Release	Run
	Training	Define	Design	Build	Build	Build	Train	Train		
Software	**ATMS**	Define	Design	Contract	Build	Build	Test/Int	Deploy	Release	Run
	IEN	Define	Contract	Build	Build	Build	Test/Int	Deploy	Release	Run
	Closures	Sample	Decision	Implement	Implement	Test	Test/Int		Release	Run
	Call for Projects (SW)	Contract	Design	Build	Build	Build	Test/Int	Complete	Release	Run
	TSMSS	Design	Build	Test/Int				Deploy	Release	Run
	Data Hub	Design	Build	Build	Build	Build/Load	Test/Load	Deploy	Release	Run
	Purple Box	Design	Contract	Buiild	Build	Build	Test/Int	Deploy	Release	Run
	511 Integration	Define	Design	Build	Build	Build	Test/Int	Deploy	Release	Run
	RIITS Integration	Define	Design	Build	Build	Build	Test/Int	Deploy	Release	Run
	PEMS	Specs	Design	Contract	Build	Build	Build	Test/Load	Release	Run
Hardware	**Call for Projects (HW)**	Contract	Design	Build	Build	Build	Complete	Test/Int	Release	Run
	I-210 Project	Build	Build	Build	Build	Test/Int	Deploy		Release	Run
Data	**City Data**	Pas	Mon/Dua	Quality	Quality	Ready			Release	Run
	210 Data	Quality	Quality	Quality	Ready					
AMS	**Modeling**	Design	Build	Build	Build	Build	Test/Int	Deploy	Release	Run
	Rules Engine	Define	Design	Build	Build	Build	Test/Int	Deply	Release	Run
	Rules	Determine	Determine	Determine	Determine	Determine	Load/Test	Deploy	Release	Run
	Response Plans	Design	Design	Build	Build	Test	Test/Int	Deploy	Release	Run
System Integration	**System Integration**		Build	Build	Build	Build	Build	Test	Release	Run

Job Descriptions and Duties/Tasks



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INSTITUTE OF TRANSPORTATION STUDIES
UNIVERSITY OF CALIFORNIA, BERKELEY

I-210 Pilot System Requirements:

Job Descriptions and Duties/Tasks

September 9, 2016

Partners for Advanced Transportation Technology works with researchers, practitioners, and industry to implement transportation research and innovation, including products and services that improve the efficiency, safety, and security of the transportation system.

- Corridor Champions
- Corridor Manager
- Corridor Technical Manager
- Corridor Data Analyst
- Traffic Engineers
- Data Analysts
- Software Engineers
- Electrical Engineers
- Database Administrators
- Stakeholders
- Maintenance Staff
- Information Technology Support
- Information Technology Security
- TMS/TCS Operators
- Transit Field Supervisors
- Public Information Officers
- First Responders
- Outreach and Communications Manager

Job Descriptions and Duties/Tasks

- OVERVIEW and PROCESS
  - Three additional columns have been added: "Needed for Pilot," "Filled By," and for CT, "Who?"
  - The section referenced from the System Requirements is being added
  - Hope to have all additional information added by the end of October
  - Information has been added for the Corridor Manager, Corridor Technical Manager, and the Corridor Data Analyst for now

Job Requirements Document showing columns

3.3. STRATEGIC INCIDENT/EVENT RESPONSE PLANNING

Strategic Response Planning means ensuring that response plans for incidents/events can be designed, developed, reviewed and tested.

Responsibility	Requirement Source	Needed for Pilot	Filled By	Who
1. Lead incident/event response planning.	9.3.1	✓	C	
2. Determine the percentage of time that appropriate Traffic Engineers are present for response planning sessions; work with stakeholders to resolve attendance issues.	8.3(1)	✓	C	
3. Determine and ensure rules exist.				
a. Determine and ensure rules exist for incident detection.	8.3(2)	✓	C	
b. Determine and ensure rules exist for incident severity.	8.3(3)	✓	C	
c. Determine and ensure rules exist for zone of influence.	8.3(4)	✓	C	
d. Determine and ensure rules exist for special situations.	8.3(7)	✓	C	
e. Determine and ensure rules exist for building response plans from components.	8.3(8)	✓	P	
f. Determine and ensure rules exist for selecting a response plan for implementation.	8.3(9)	✓	P	
g. Determine and ensure rules exist for sending response plan instructions to corridor assets.	8.3(10)	✓	P	
4. Ensure that stakeholders have identified and defined all response plan components needed to manage incidents and events; determine, with Traffic Engineers, the percentage of required response plan components that are defined and listed.	8.3(5)	✓	P	
5. In consultation with all relevant stakeholders, determine the information to be sent to 511 services, HAR stations, and third-party providers as part of response plans.	9.3.2	✓	P	
6. Post-Incident/Event Review				
a. Ensure that reports summarizing the results of the incident response plan and its effects on corridor performance are generated after each incident or event in the corridor for which a response plan was generated.	8.3(13)	✓	C	
b. Conduct a post-incident analysis review with all affected agencies within one week of each significant event.	9.3.5	✓	C	
c. After each incident, unscheduled event, or planned event, in coordination with Traffic Engineers and other	8.3(5)	✓	C	

Job Descriptions and Duties/Tasks, continued

Overall Themes

- When thinking about the roles and the duties, CT has responsibilities and PATH has responsibilities for the Pilot (which will extend at least one year past the actual "launch")

Caltrans

- Leadership
- Day-to-day response plan and incident management work
- Hardware and communication system maintenance
- Outreach (shared with PATH)
- Performance monitoring
- Data quality reporting

PATH

Identifying software and data system problems

Software and data system maintenance

Overall system integration measurements & efforts

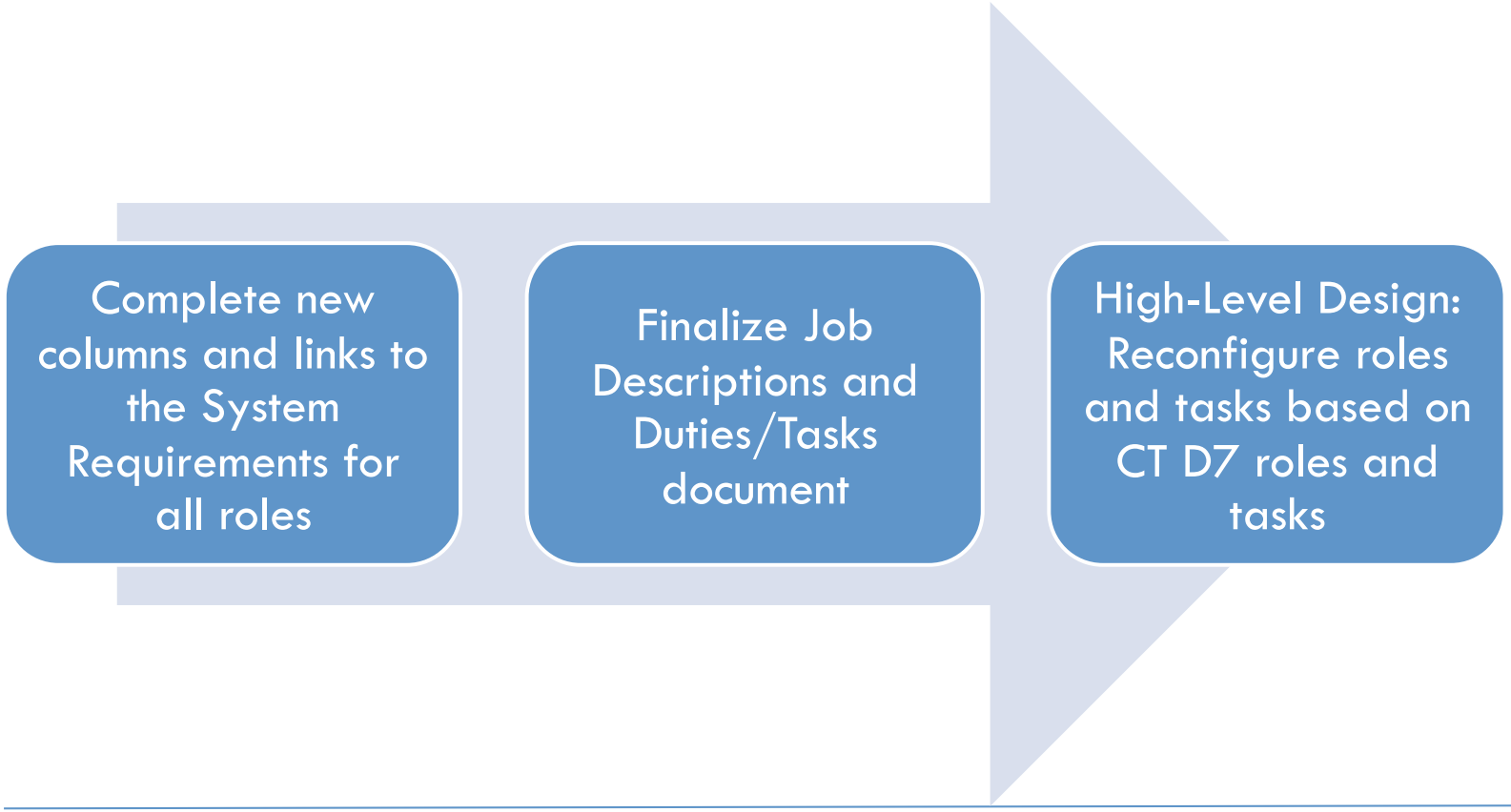
Update/refine the system based on new reqmts.

Model management tasks related to estimation and prediction

Outreach (shared with CT)

Job Descriptions and Duties/Tasks, continued

- **Timeline:**



Education and Training

- **Gathering information from Caltrans (IT/HQ Ops/D7), University and various consulting partners**
- **Seeking top 10-15 classes that would provide essential skills in:**
  - Data Analysis
  - Modeling
  - Cloud Computing
  - Software Engineering
  - Collaboration and Outreach
- **Also speaking with University about new Undergraduate and Masters programs**
- **Provided with contacts at NIT**

High Level Implementation Schedule

	2016	2017				2018			
	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Quarter	4th Quarter
Personnel	Define	Design	Assign	Assign	Assign	Ready	Deploy	Release	Run
Training	Define	Design	Build	Build	Build	Train	Train		

Software

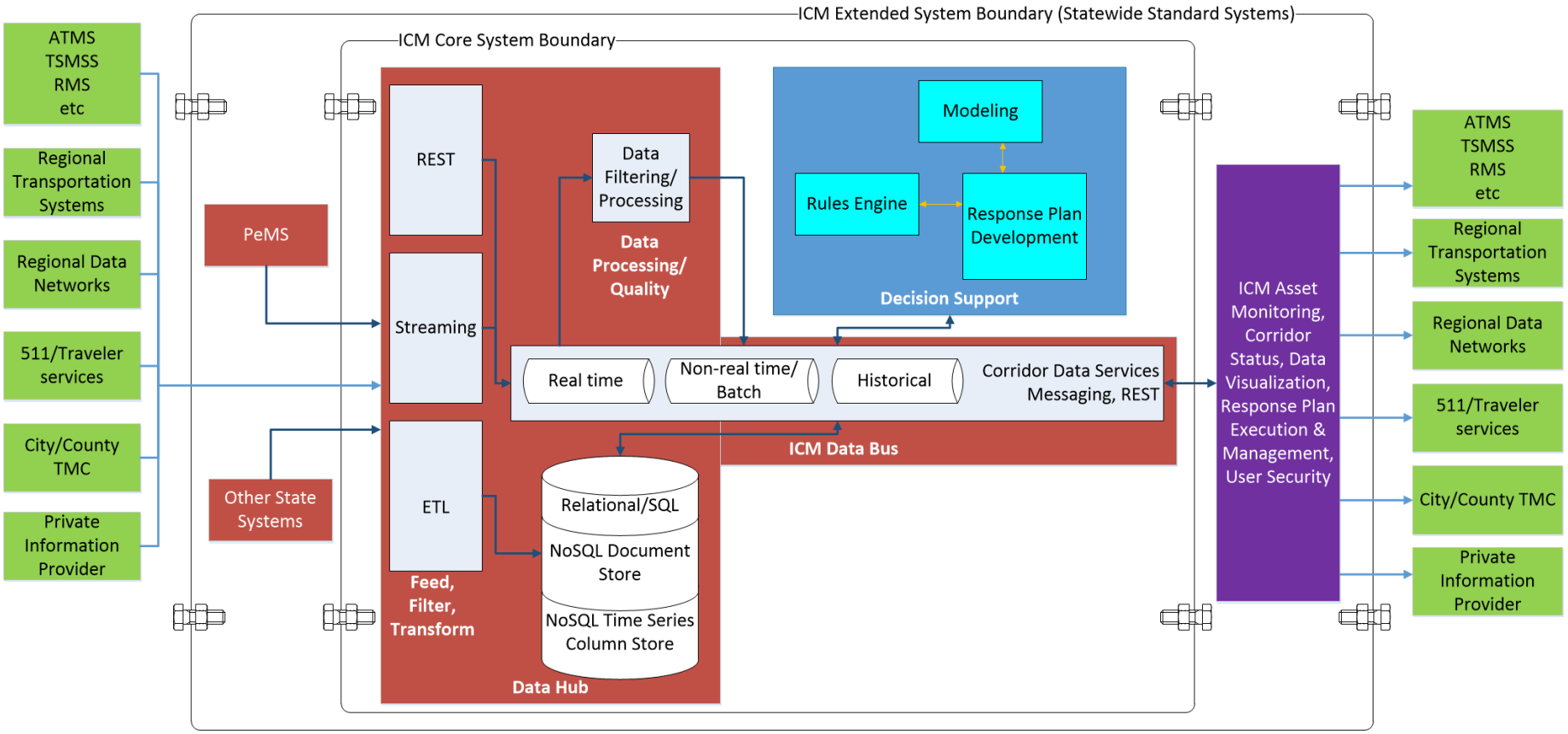
Updates

- **Requirements being broken apart into technical components**
  - Detailed review
  - Sequence diagrams
  - Definition of exactly what goes in each box
  - Preparation for Proof of Concept
- **Engagement with Caltrans IT**
  - POC – Mike Nguyen
  - Meeting on 9/16/16 with IT Managers to review CC Architecture
  - Very successful meeting
- **Engagement with possible "purple box" vendors**
  - Telegra and Kapsich meetings planned for November
  - Plan to setup meeting with Parsons for November or December

Software

	2016	2017				2018			
	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Quarter	4th Quarter
ATMS	Define	Design	Contract	Build	Build	Test/Int	Deploy	Release	Run
IEN	Define	Contract	Build	Build	Build	Test/Int	Deploy	Release	Run
Closures	Sample	Decision	Implement	Implement	Test	Test/Int		Release	Run
Call for Projects (SW)	Contract	Design	Build	Build	Build	Test/Int	Complete	Release	Run
TSMSS	Design	Build	Test/Int				Deploy	Release	Run
Data Hub	Design	Build	Build	Build	Build/Load	Test/Load	Deploy	Release	Run
PEMS	Specs	Design	Contract	Build	Build	Build	Test/Load	Release	Run
I-210 Project	Build	Build	Build	Build	Test/Int	Deploy		Release	Run
Rules Engine	Define	Design	Build	Build	Build	Test/Int	Deply	Release	Run
Rules	Determine	Determine	Determine	Determine	Determine	Load/Test	Deploy	Release	Run
Purple Box	Design	Contract	Buiild	Build	Build	Test/Int	Deploy	Release	Run
511 Integration	Define	Design	Build	Build	Build	Test/Int	Deploy	Release	Run
RIITS Integration	Define	Design	Build	Build	Build	Test/Int	Deploy	Release	Run
System Integration		Build	Build	Build	Build	Build	Test	Release	Run

Current Proposed ICM Architecture

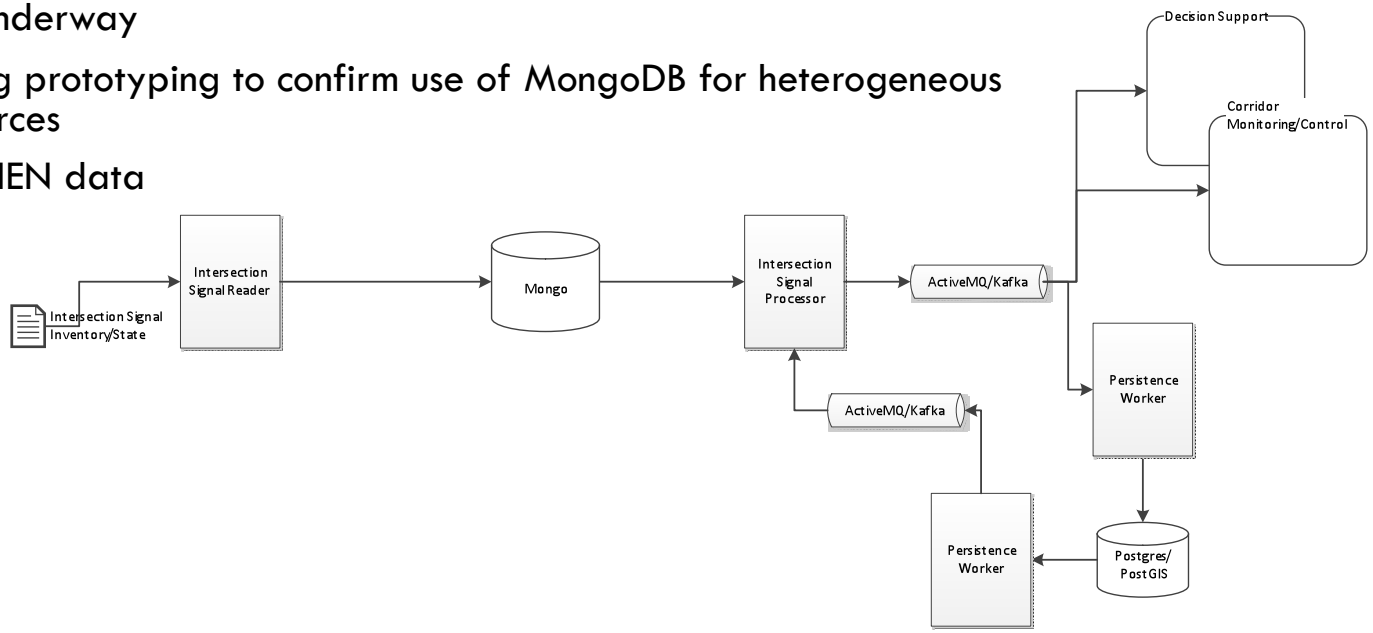


Caltrans IT discussions – Productive meetings

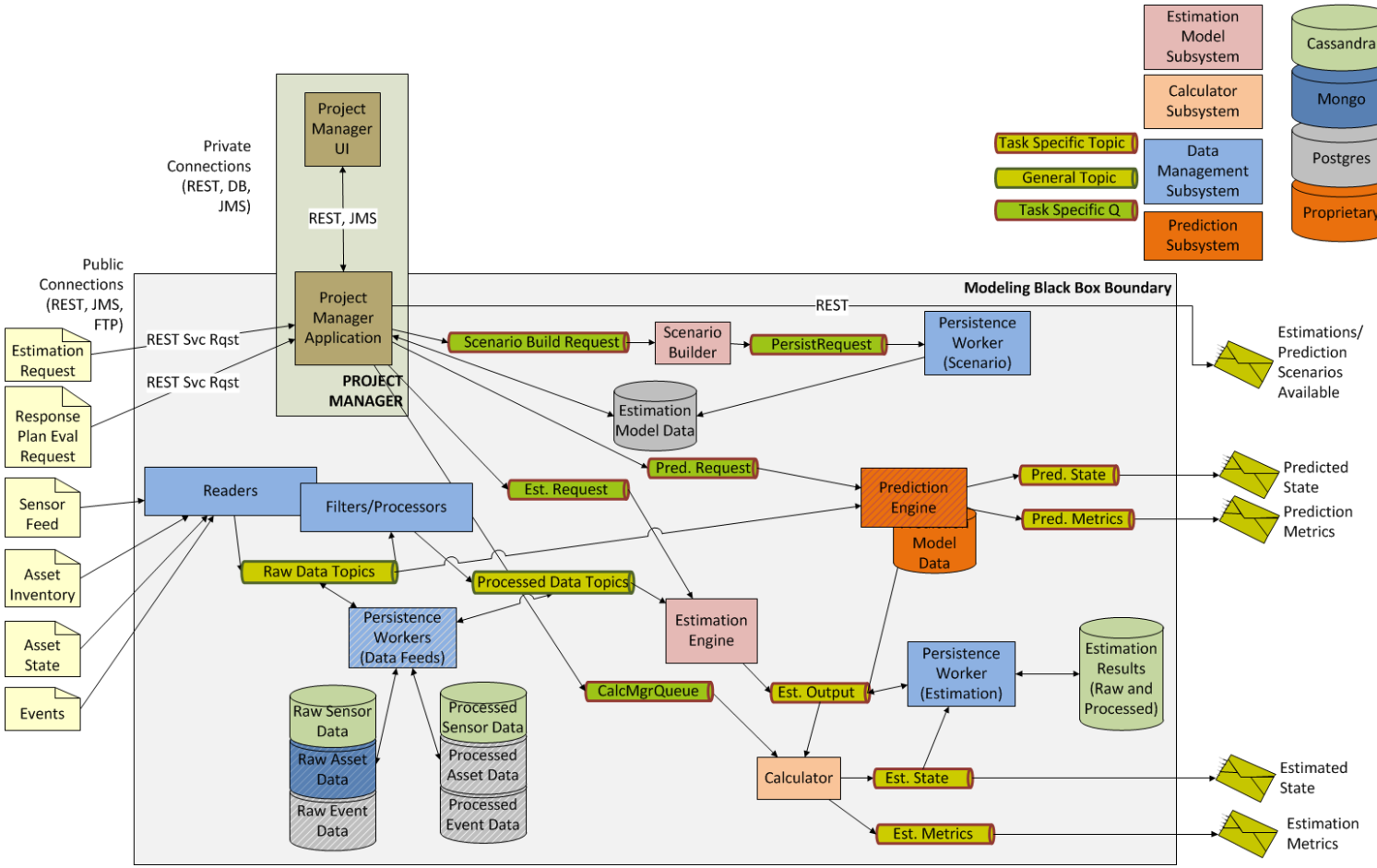
- **Review of System Architecture and current modeling architecture**
- **Will work with Caltrans and AWS to address CT-IT training needs**
- **Began acquiring connections to Caltrans data sources beyond PeMS**
- **Discussions regarding Security (Design, Policy, Practice)**
  - AWS AMIs
  - Network
  - OS
  - Data (in transit and at rest)
  - Application
  - Authentication/Authorization
  - Policy

Data Hub

- **Resources acquisition underway**
  - Personnel
  - Consultants
- **Design**
  - Design underway
  - Beginning prototyping to confirm use of MongoDB for heterogeneous data sources
  - Loading IEN data



Modeling Component Architecture



Modeling Subsystem

- **Freeway Estimation running 24 hrs/day in test cloud environment**
- **Working with TSS – Aimsun now able to run in cloud environment**
  - Working now to integrate it with other modeling components and set up automated scaling
- **Arterial Estimation technique being developed by research team**
  - Basic approach completed
  - Working on additional needs to pass estimation results to prediction (Aimsun)

Caltrans Systems

- **TSMSS**
  - Plan to have interface by end of year
  - CC access to TSMSS through IEN – Requested to be added to IEN functions
- **Lane Closure System**
  - Proof of Concept to be setup in corridor (Validate)
- **PEMS**
  - Decision made to use PEMS
  - Corridor PEMS will be expanded to the I-210
  - Must determine level of integration of Corridor PEMS with COTS interface

LA County – IEN

- **Agreed to meet basic CC requirements**
  - Some details still under discussion
  - Provided response to County's questions/comments on CC requirements
- **Schedule Risk**
  - In February 2017, LA County will indicate schedule for IEN upgrades
  - If County cannot deliver functions in time for CC launch
    - CC will use IEN for reading of data
    - CC will potentially develop interfaces/software for
      - Requesting signal plans
      - CMS signs
      - Travel Time
  - We all hope County will be able to meet CC launch schedule

RIITS and 511

- RIITS:
  - Transit information from Metro, Foothill and Pasadena Transit
  - Waze information
  - Here information
  - Possibly environmental data
  - Possibly vide sharing
- 511:
  - We will send information to 511 describing our reroutes. This will include a general message and a specific message for I-210 commuters.
  - We will use RIITS APIs to send an update at least once every 15 minutes.
  - We should be able to test this out beginning in January of 2017.
  - Agreed to provide call box locations for environmental sensors

Hardware

I-210 SHOPP Funds – Current Status (Draft)

Stage 1 - 134 to 605					
134 Split to Sierra Bonita					
CMS					
A1380	Drill and Pour CIDH #1 Sta 1454+40	01-Mar-17*	5d	07-Mar-17	71d
A1920	Set Sign Structure (Truss) #1 Sta 1454+40	08-May-17	3d	10-May-17	29d
A1950	Install CMS #1 Sta 1454+40	11-May-17	5d	17-May-17	29d
Arcadia					
A1220	Pothole - Arcadia	03-Nov-16	22d	07-Dec-16	2d
A2270	Conduit Verification - Arcardia	02-Dec-16	22d	04-Jan-17	89d
A1230	Exc/Lay/BF Conduit - Arcadia	08-Dec-16	32d	25-Jan-17	2d
A1240	Install Boxes - Arcadia	26-Jan-17	8d	06-Feb-17	56d
A1250	F/P Cabinet Controller Foundations and Pads - Arcadia	26-Jan-17	8d	06-Feb-17	56d

I-210 SHOPP Funds – Phase 1 Completion (Draft)

A1150	Install Loops - Stage 1 Wide	02-Aug-17	5d	08-Aug-17	37d
A1120	Pull Cable - Stage 1 Wide	02-Aug-17	15d	22-Aug-17	2d
A1130	Splice Mainline Cable - Stage 1 Wide	23-Aug-17	10d	06-Sep-17	2d
A2380	Splice Breakouts and Terminate Fiber - Stage 1 Wide	07-Sep-17	15d	27-Sep-17	2d
A1140	Fiber Integration (HUB and LARTMC) - Stage 1 Wide	28-Sep-17	10d	12-Oct-17	2d
A2360	Test Period - Stage 1 Wide	13-Oct-17	10d	26-Oct-17	2d

Call for Projects – Hardware Components

- **Awaiting Final Funding Agreement with Metro**
- **Refining final scope**
- **Caltrans has met with all cities and LA county**
- **Refining exactly what it takes to purchase and install the hardware components**
- **Schedule being developed**

Hardware and Equipment

	2016	2017				2018			
	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Quarter	4th Quarter
Call for Projects (HW)	Contract	Design	Build	Build	Build	Complete	Test/Int	Release	Run
I-210 Project	Build	Build	Build	Build	Test/Int	Deploy		Release	Run
System Integration				Build	Build	Build	Test	Release	Run

Data

Corridor Data

- **Freeway**
  - Good progress being made on configuration and basic hardware issues
  - Weekly hour-long meetings
  - Tracking of reasons for challenges in data quality
- **All cities and LA County**
  - Arcadia continuing to improve

	2016	2017				2018			
	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Quarter	4th Quarter
City Data	Pasadena	Mon/Dua	Quality	Quality	Ready	New Data	Quality	Ready	
210 Data	Quality	Quality	Quality	Ready					

Freeway data quality

Weekly Average Data Quality	Eastbound I-210 PM 25 to PM 43.25						Westbound I-210 PM 25 to PM 43.25					
	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
Jul3-9	66.7%	70.2%	79.2%	70.0%	89.3%	77.4%	75.0%	60.2%	72.1%	77.0%	86.7%	72.3%
Jul10-16	64.3%	78.0%	87.1%	68.6%	92.3%	83.4%	75.0%	65.0%	76.5%	77.0%	88.3%	75.8%
Jul17-23	47.6%	81.2%	87.7%	71.4%	93.5%	84.4%	85.7%	63.2%	73.0%	74.7%	82.1%	72.9%
Jul24-30	61.9%	75.1%	80.2%	60.0%	74.4%	76.0%	100.0%	63.9%	72.0%	71.4%	73.0%	71.4%
Jul31-Aug06	33.3%	77.6%	82.2%	64.3%	82.7%	78.2%	100.0%	66.9%	75.3%	74.7%	77.6%	74.7%
Aug07-Aug13	33.3%	82.9%	87.7%	70.0%	92.3%	84.0%	100.0%	75.2%	83.2%	83.9%	91.3%	83.2%
Aug14-Aug20	33.3%	78.4%	85.8%	71.9%	87.5%	81.9%	100.0%	73.3%	80.2%	81.1%	86.7%	80.3%
Aug21-Aug27	33.3%	86.5%	90.5%	78.6%	92.9%	87.3%	100.0%	72.6%	78.3%	84.3%	84.2%	79.2%
Aug28-Sept3	33.3%	86.5%	91.1%	78.1%	92.3%	87.5%	100.0%	71.8%	78.4%	86.2%	83.2%	79.2%
Sept4-Sept10	33.3%	84.5%	90.5%	73.8%	91.1%	86.2%	100.0%	72.6%	79.6%	86.2%	85.7%	80.3%
Sept11-Sept17	33.3%	86.5%	91.4%	78.1%	89.9%	87.5%	100.0%	73.3%	81.3%	87.1%	86.7%	81.7%
Sept18-Sept24	33.3%	87.8%	92.4%	81.0%	91.7%	88.9%	100.0%	72.6%	78.8%	87.1%	88.3%	80.1%
Sept25-Oct1	33.3%	84.9%	90.2%	74.3%	91.1%	86.3%	100.0%	69.5%	76.9%	86.2%	85.2%	78.1%
Oct2 - Oct8	33.3%	86.1%	88.4%	77.1%	93.5%	85.9%	100.0%	66.9%	75.8%	84.8%	84.2%	76.8%
Oct9 - Oct15	33.3%	84.5%	86.1%	82.6%	95.8%	85.2%	100.0%	66.2%	72.3%	88.0%	83.7%	74.8%
Loops in Category	6	35	148	30	24	243	8	38	160	31	28	266

This week there is a big improvement on I-605 near the I-210 interchange. Northbound health jumped from 38% to 52% and Southbound health jumped from 25% to 42%

Good News – (Extract from Anthony's Email)

- …the really good news is about recent configuration fixes. The following VDS have been extended to include all five lanes of travel:
  - E of Second
  - San Gabriel River (WB)
  - San Gabriel River (EB)
  - W/O Irwindale
  - Azusa 1
  - Buena Vista
- Thanks to Tadeo, Amahayes, and everyone on the team for making this happen. All these fixes are now confirmed in PeMS.
- The upshot is that we can now obtain a full cross-section of flow at these locations. This is crucial for modeling, calibration, and for accurate performance measures.

Arcadia Arterial Data Quality

Weekly Data Quality (%)	Arcadia								
	Detour Routes			Not Detour Routes			All Detectors		
	Good	Bad	No Data	Good	Bad	No Data	Good	Bad	No Data
12-Jun-2016 To 18-Jun-2016	47.00	47.00	5.99	10.34	34.48	55.17	37.82	43.87	18.31
19-Jun-2016 To 25-Jun-2016	49.05	44.96	5.99	11.33	33.50	55.17	39.60	42.09	18.31
26-Jun-2016 To 02-Jul-2016	51.38	42.63	5.99	8.97	35.86	55.17	40.76	40.93	18.31
03-Jul-2016 To 09-Jul-2016	51.91	42.10	5.99	8.97	35.86	55.17	41.15	40.54	18.31
10-Jul-2016 To 16-Jul-2016	49.84	44.17	5.99	8.97	35.86	55.17	39.60	42.09	18.31
17-Jul-2016 To 23-Jul-2016	50.53	43.48	5.99	8.97	35.86	55.17	40.12	41.57	18.31
24-Jul-2016 To 30-Jul-2016	51.32	42.69	5.99	8.97	35.86	55.17	40.71	40.98	18.31
31-Jul-2016 To 06-Aug-2016	50.99	43.02	5.99	8.97	35.86	55.17	40.46	41.23	18.31
07-Aug-2016 To 13-Aug-2016	51.42	42.59	5.99	8.97	35.86	55.17	40.78	40.91	18.31
14-Aug-2016 To 20-Aug-2016	55.92	38.08	5.99	8.97	35.86	55.17	44.16	37.53	18.31
21-Aug-2016 To 27-Aug-2016	56.98	37.03	5.99	8.97	35.86	55.17	44.95	36.74	18.31
28-Aug-2016 To 03-Sep-2016	53.59	40.42	5.99	11.92	32.91	55.17	43.15	38.54	18.31
04-Sep-2016 To 10-Sep-2016	52.47	41.54	5.99	11.23	33.60	55.17	42.14	39.55	18.31
11-Sep-2016 To 17-Sep-2016	61.95	32.06	5.99	16.06	28.77	55.17	50.46	31.24	18.31
18-Sep-2016 To 24-Sep-2016	63.79	30.22	5.99	16.55	28.28	55.17	51.96	29.73	18.31
25-Sep-2016 To 01-Oct-2016	63.43	30.58	5.99	16.55	28.28	55.17	51.69	30.00	18.31
02-Oct-2016 To 08-Oct-2016	63.20	30.81	5.99	16.35	28.47	55.17	51.47	30.22	18.31

Caltrans - Tracking data improvement requests

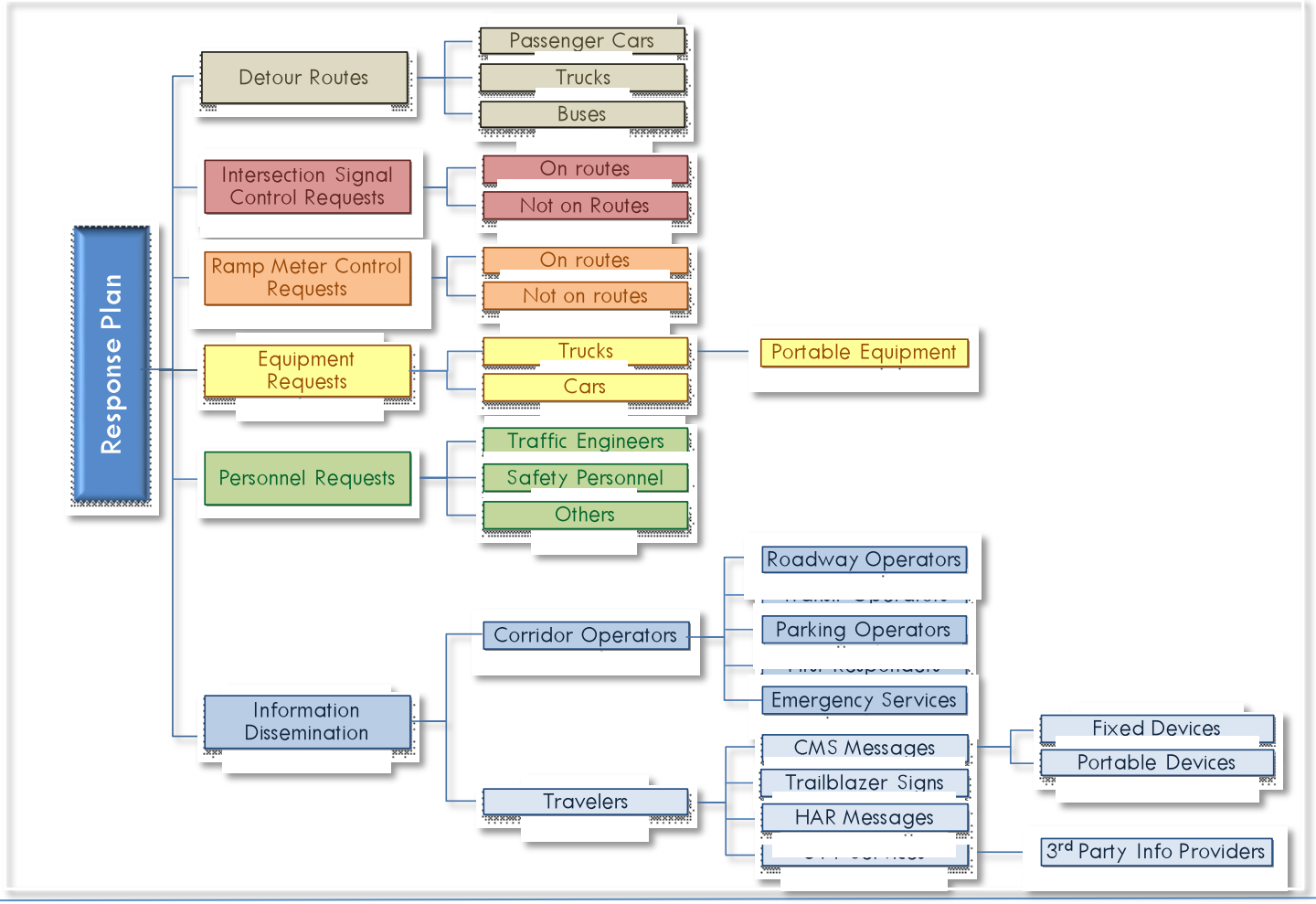
	Carried Over	Opened This Week	Closed By System Mon.	Closed By Mntc.	Total Closed	Remaining Open in Sys. Mon.	Remaining Open in Maintenance	Remaining Open others jforester & btieu	Total Remaining Open
Route 210	31	3	4	1	5	13	12	4	29
Route 605	5	1	1	0	1	0	5	0	5
Route 10	3	1	1	0	1	0	3	0	3
Total	39	5	6	1	7	13	20	4	37
CC: 210 (PM25-43.25)	21	3	3	1	4	8	10	3	21
CC: 605 (PM22.93-28)	2	1	1	0	1	0	2	0	2

Analysis, Modeling and Simulation

AMS

	2016	2017				2018			
	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Quarter	4th Quarter
Modeling	Design	Build	Build	Build	Build	Test/Int	Deploy	Release	Run
Rules	Determine	Build	Build	Build	Build	Load/Test	Deploy	Release	Run
Response Plans	Design	Design	Build	Build	Test	Test/Int	Deploy	Release	Run
System Integration		Build	Build	Build	Build	Build	Test	Release	Run

Response Plan Elements



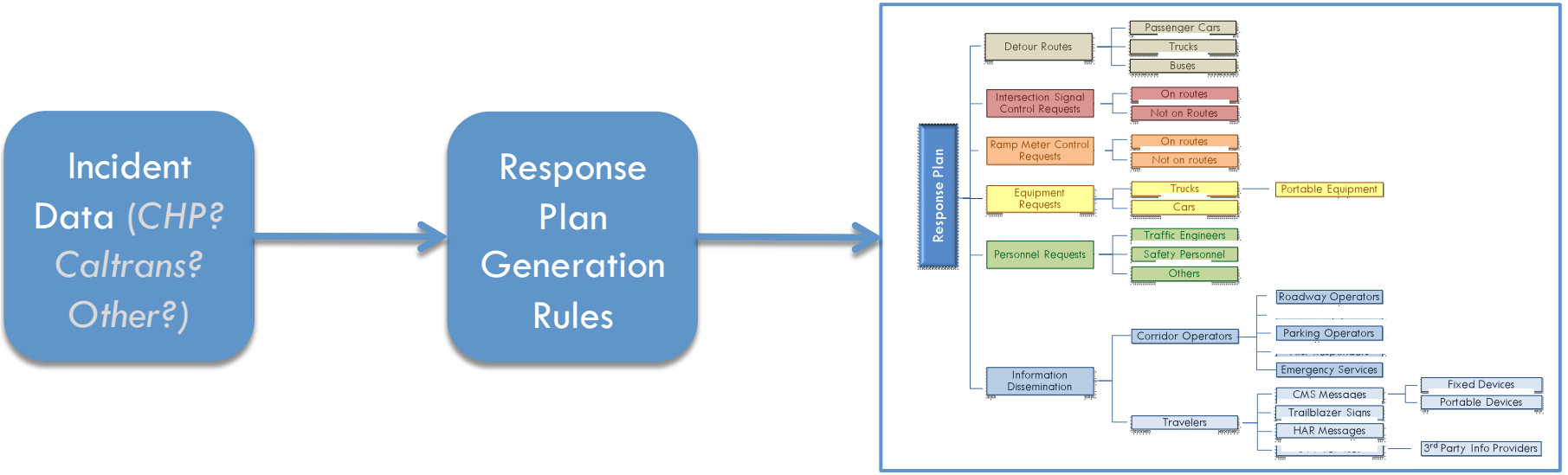
Preliminary Alternate Route "Menu"

- **300 preliminary (i.e. *possible*) alternate routes were identified between Lake and Buena Vista on the approved arterial network.**

- **This set of 300 alternate routes is our "menu" of choices for alternate routes to support an incident at a given location.**

Workflow

- **Registered incident data delivered to response plan generation tool**
- **Response plan(s) created according to pre-established rules**



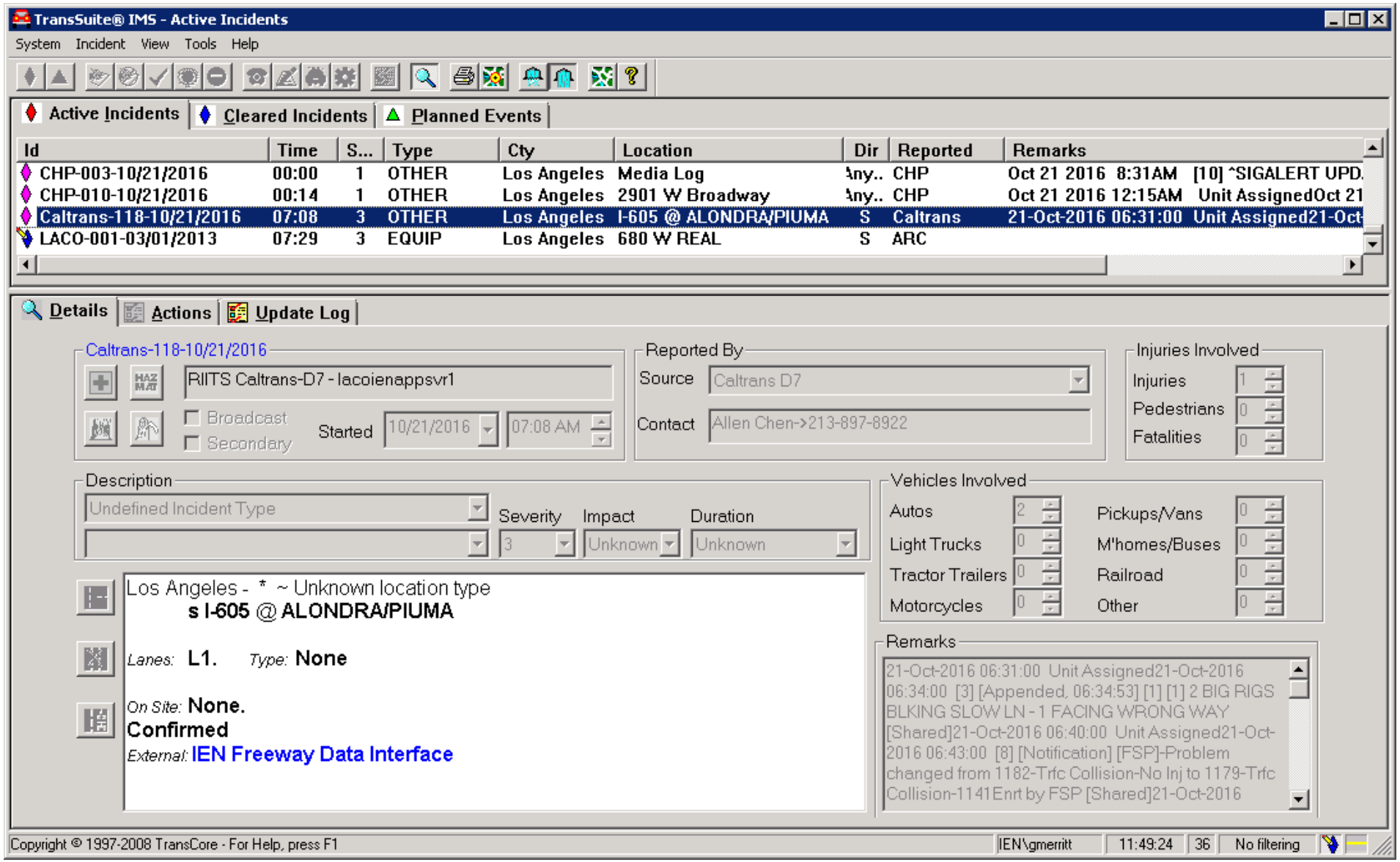
Public CHP CAD data feed


```
Oct 11 2016
1182-Trfc Collision-No Inj
WB 210 JEO SIERRA MADRE
Altadena

5:34PM: [7] BLKING THE 1 LANE  [Shared]
5:34PM: [8] [Notification] [CHP]-[7] BLKING THE 1 LANE  [Shared] [Shared]
5:36PM: [10] 2 1185 GRY MERZ 250  MAJ  REAR END DAMAGE ; 2ND FOR A  BLU  SUBA
         MAJ FNT END DAMAGE  [Shared]
5:40PM: [12] [Rotation Request Comment] 1039 NAVARROS TOW W/2 TKS / 626-338-
         0911 [Shared]
5:43PM: [13] PER B98-065 ROAD WAY CLEAR WILL HAVE PTYS ON THE RS  [Shared]
5:48PM: [14] NAVARROS TOW COPY 1022 1 1185  [Shared]
5:50PM: [15] [Notification] [CHP]-1039 3A / ACAR AUTO REPAIR ETA 20 / SO#15464
         [Shared]
5:53PM: [16] B98-065 CANCEL ONE 1185 FOR THE BLU SUBA AND HAD REQTD TO ROLL 3A
         FOR THE BLU SUBA  [Shared]
5:55PM: [17] [FSP] has closed their incident [161011LAFSP00275]
6:09PM: [18] req 1141 for inj xray w/chest pains -1039 pas fd  [Shared]
```

- **Information captured in Public CHP CAD feed does not match what is needed for response plan tool**

IEN IMS: Incidents via RIITS via Caltrans



Duty Pages from Caltrans

LARTMC@dot.ca.gov via berkeley.edu 11:21 PM (8 hours ago)
to joebutler

INITIAL DUTY PAGE - PHONE (323) 259-1922: (LA CNTY) SB 5, AT RTE 170, HOV, 1-5 LNS BLCKD, FOR APPROX 2 HRS, DUE TO MULTI VEH TC, RESLTNG IN FATALITY. 2 RT LNS TO SB 170 EXIT OPEN. MTCE ROLLING FOR HC. TMC, SHIV.

LARTMC@dot.ca.gov via berkeley.edu 11:49 PM (8 hours ago)
to joebutler

UPDATE DUTY PAGE - PHONE (323) 259-1922: (LA CNTY) SB 5, AT RTE 170, HOV, 1-3 CLOSED, #4 LN OPEN ONLY. BOTH LNS TO SB 170 OPEN. DUR APPROX 3 HRS. TMC, SHIV.

LARTMC@dot.ca.gov via berkeley.edu 12:58 AM (7 hours ago)
to joebutler

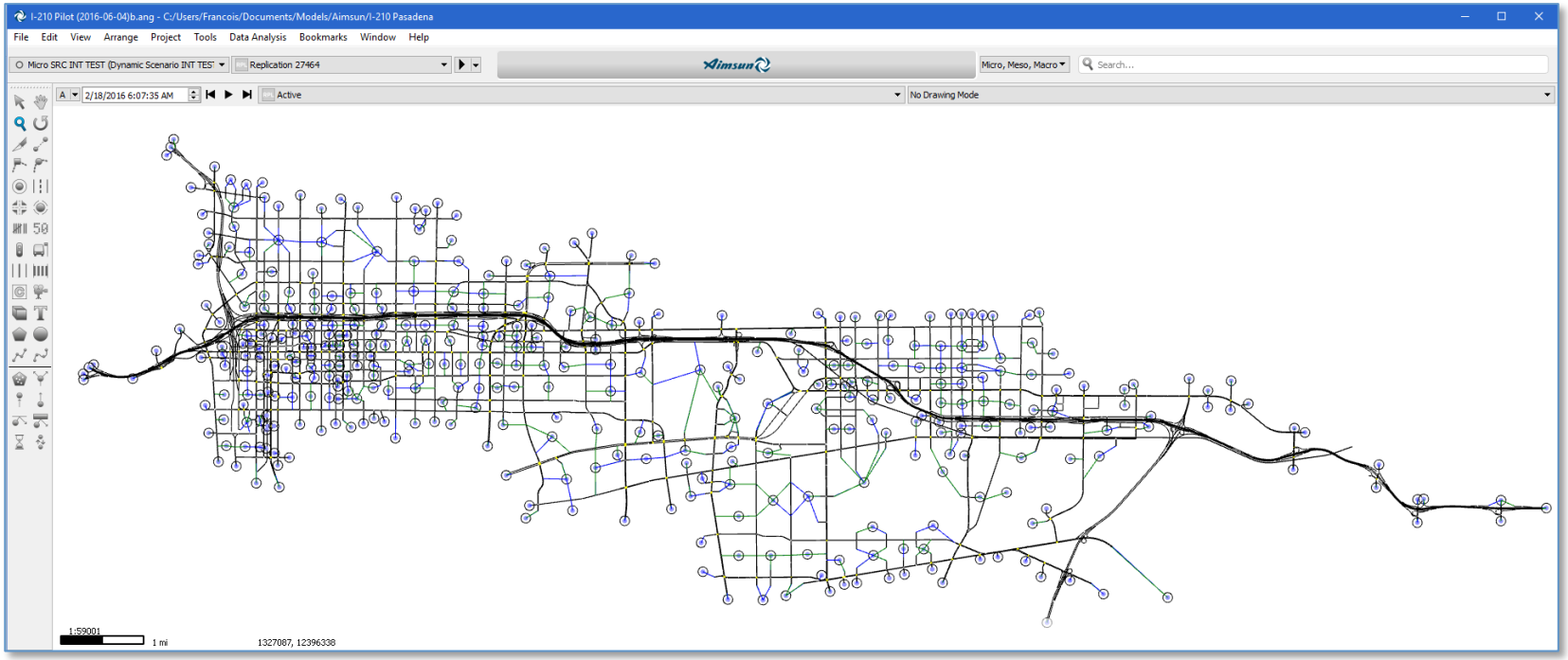
UPDATE DUTY PAGE - PHONE (323) 259-1922: (LA CNTY) SB 5, AT RTE 170, HOV, 1 & 2 CLOSED, #3 & 4 OPEN NOW. DUR APPROX.. TMC, SHIV.

LARTMC@dot.ca.gov via berkeley.edu 2:17 AM (5 hours ago)
to joebutler

FINAL DUTY PAGE - PHONE (323) 259-1922: (LA CNTY) SB 5, AT RTE 170, ALL LNS OPEN.. TMC, SHIV.

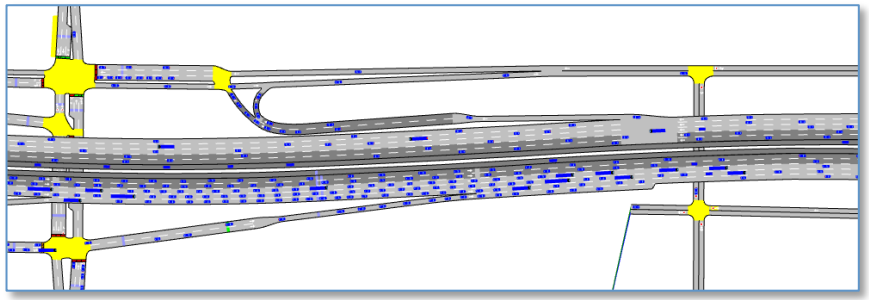
Aimsun Model

- **Modeling of roadways, transit services, and basic control elements complete**



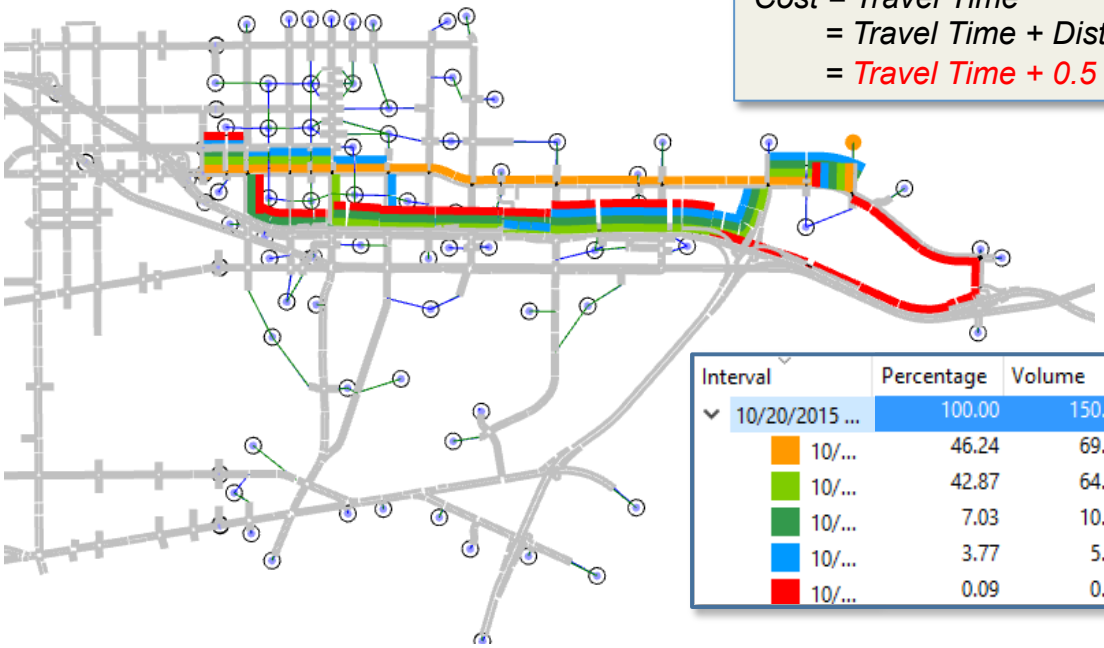
Aimsun Model – Current Activities

- **Demand modeling**
  - Received 2012 SCAG travel demand data – currently processing the data for inclusion in the model
  - Adding traffic count data into the model – to be used for origin-destination demand modeling and calibration
- **Driver behavior calibration**
  - Tweaking driver behavior parameters to better reproduce traffic dynamics at freeway merge, weaving areas, and other bottlenecks
    - Lane changing aggressiveness
    - Acceleration/deceleration
    - Spacing between vehicles
    - Influence of slower traffic on adjacent lanes



Aimsun Model – Current Activities

- **Routing behavior calibration**
  - Evaluating alternate trip cost formulas to ensure realistic route choices under dynamic scenarios



Cost = Travel Time
= Travel Time + Distance
*= Travel Time + 0.5 * Distance + Ramp Meter Costs*

Interval	Percentage	Volume	Flow	Cost	Distance
10/20/2015 ...	100.00	150.00	75.00	20.68	22797.68
10/...	46.24	69.36	34.68	20.67	21324.95
10/...	42.87	64.31	32.15	20.68	24083.83
10/...	7.03	10.55	5.28	20.68	23799.04
10/...	3.77	5.66	2.83	20.68	24133.81
10/...	0.09	0.13	0.06	21.95	32897.57

Video of Simulation of Reroute

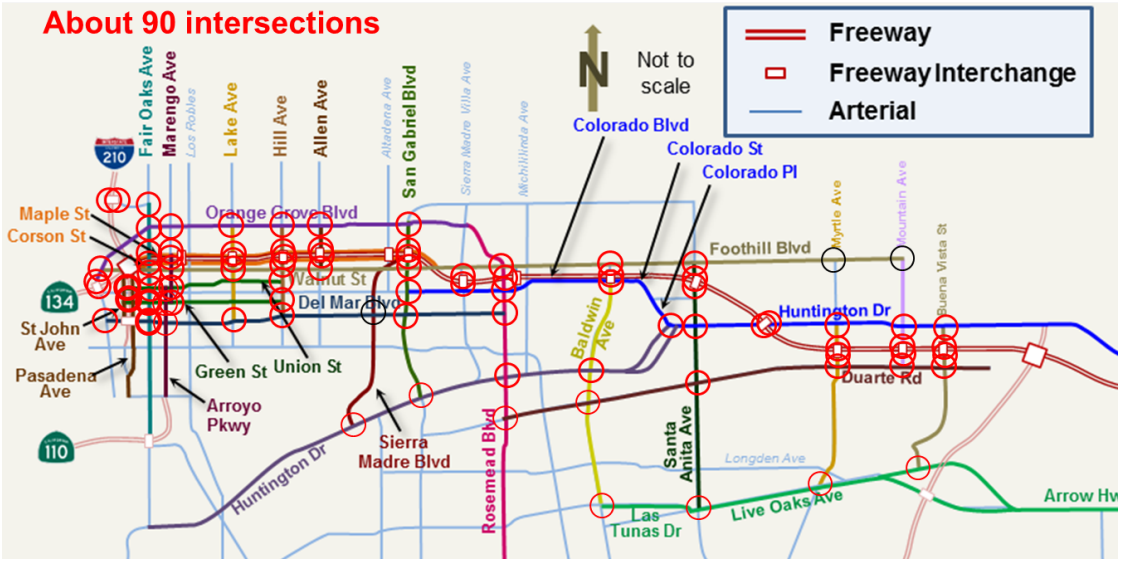
Santa Anita Reroute
4:55 PM

+500 vph
No Optimization

System Evaluation

Facilities

- **I-210 corridor facilities to evaluate include:**
  - I-210 freeway and ramps (by city boundary segments)
  - Key parallel arterials & connecting arterials (by city segments)
  - Key intersections (at least 90 locations)



Strategies

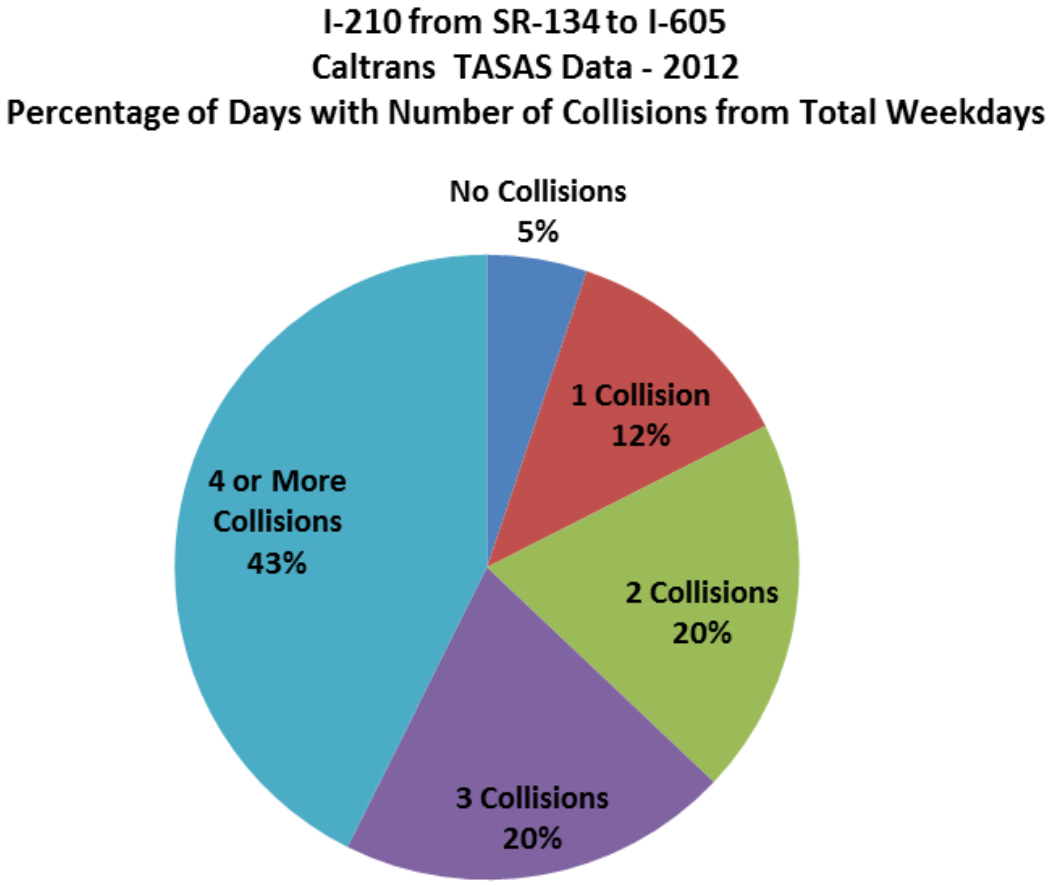
- **Key strategies include:**
  - Non-Recurrent Congestion (focus of the project)
    - Incident Response Planning
    - Advisory Diversion Management and Rerouting
  - Recurrent Congestion & Off-Peak Period (measure residual benefits of project elements)
    - Freeway Adaptive Ramp Metering
    - Arterial Coordinated Signal Operations

Challenges

- **Non-recurrent congestion:**
  - How do we compare conditions before/after incidents?
    - We cannot time accidents
    - Every accident is different and resulting traffic is different
    - Accidents do not occur at same time or like days
    - Incidents are unpredictable
    - ✓ Requires robust detection data
    - ✓ Requires expert analysis
  - Timing of implementation
    - Implementation is not done at one time - it is done in phases
    - When is it truly "after"? (measure in between phases?)
    - When and what is "before"?

Why "Significant" Non-Recurrent Congestion

Not many collision-free days



Suitable Performance Measures

- **Estimated performance measures on other projects:**

PERFORMANCE MEASURE AREAS	San Diego	Dallas	Minneapolis
Annual Travel Time Savings (Person-Hours)	246,000	740,000	132,000
Improvement in Travel-Time Reliability (Reduction in Travel-Time Variance)	10.6%	3%	4.4%
Fuel Saved Annually (in Gallons)	323,000	981,000	17,600
Tons of Mobile Emissions Saved Annually (in Tons) (GHG Emissions)	3,100	9,400	175

Requires use of modeling (e.g., Caltrans Cal-B/C economic model)

Suitable Performance Measures

- **Potential suitable performance measures:**
  - Demand
    - Vehicle Miles Traveled (VMT)
  - Mobility
    - Speeds and Travel Times
    - Delay (vehicle and/or person) and Vehicle Hours Traveled (VHT)
    - Congestion Period (peak period hours)
  - Productivity
    - Traffic Flow (volumes - vehicles an/or persons)
    - Level of Service (intersections)
  - Reliability
    - Travel Time Variability (Buffer Index)
    - Planning Time Index
  - Safety (SWTRS/TASAS data available year or more later)

Suitable Performance Measures

- **Transit (?)**
  - Transit on-time performance *(if transit agency provides data)*
  - Average travel times *(if transit agency provides data)*
  - Transit ridership *(if transit agency provides data)*

- *Need to investigate available Gold Line data*
  - *Time of day*
  - *Accuracy*
  - *Access*
- *Ridership on specific incident days*

Data Sources

- **Data sources:**
  - Available sources (before & after)
    - Caltrans Freeway PeMS (or ATMS) – freeway & all ramps
    - Arterial intersection signal detection
    - Arterial segment speed/occupancy detection
    - Arterial blue tooth readers
    - Caltrans TASAS, CHP SWTRS, CHP CAD; Metro FSP data
    - Local agency collision database (Pasadena Traffic Records System)
    - INRIX or HERE crowd sourcing (Metro/SCAG in process of acquiring INRIX)
  - Potential manual needed (before & after)
    - Arterial link tube and I/S turning movement counts (before & after)
      - select locations where detection is not available
    - Probe vehicle runs to validate INRIX, HERE, PeMS, blue tooth

For Any Manual Data Collection

- **Before**
  - After sensing is installed – This is very important
    - Without waiting for the Call for Projects and other sensing improvements, it is financially and logistically difficult to provide the magnitude of sensing required to do a thorough before study of non recurrent congestion patterns
  - Before implementation of response plans
  - Spring 2018
- **After**
  - After implementation of response plans
  - After refinement of response plans
  - Spring 2019

Action Items and Next Meeting Time

Thank You