Connected Corridors
Face-to-Face Meeting

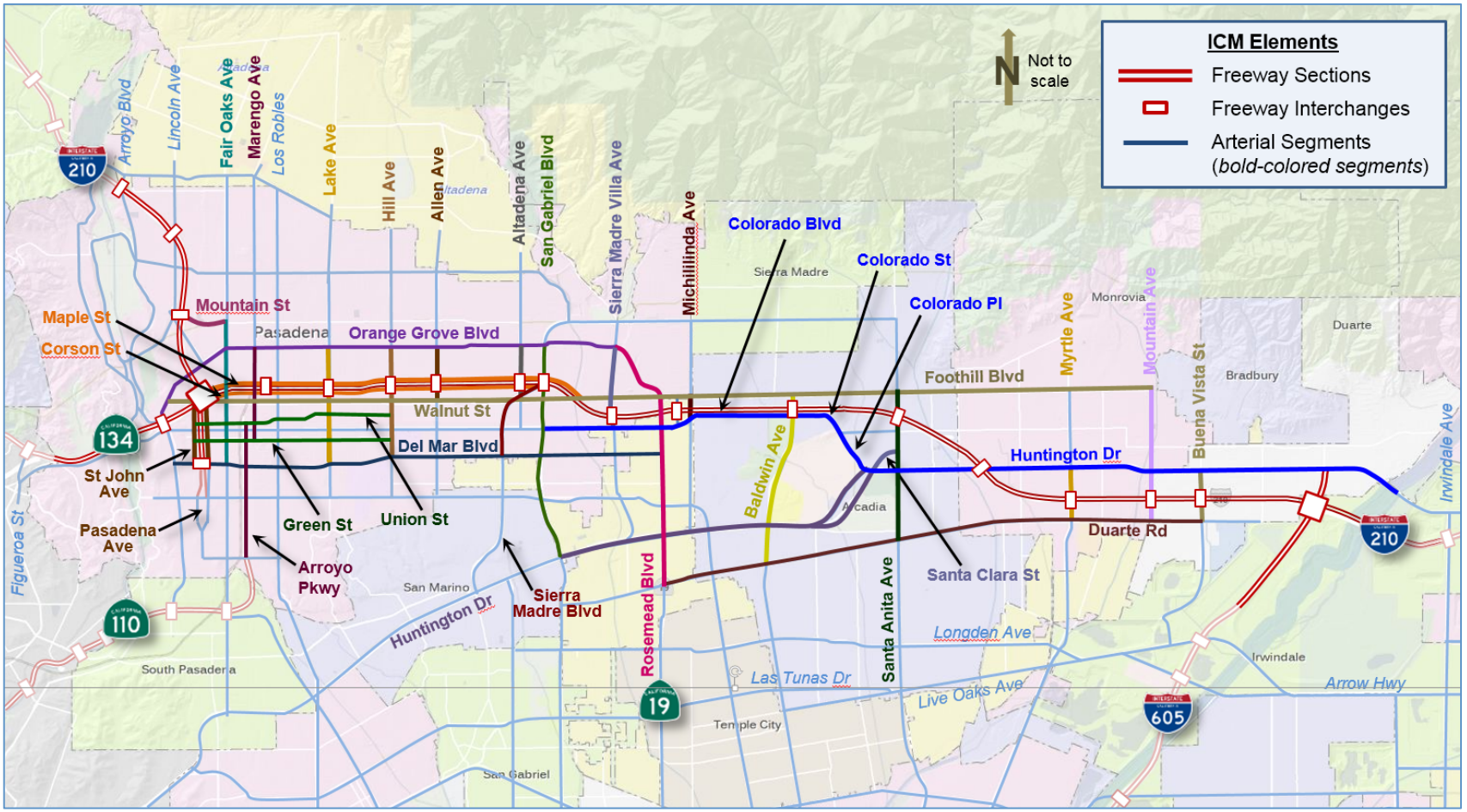
Tuesday, May 2nd, 2017 – 1:30 – 3:30 pm
LA TMC

May 2nd, 2017

Agenda

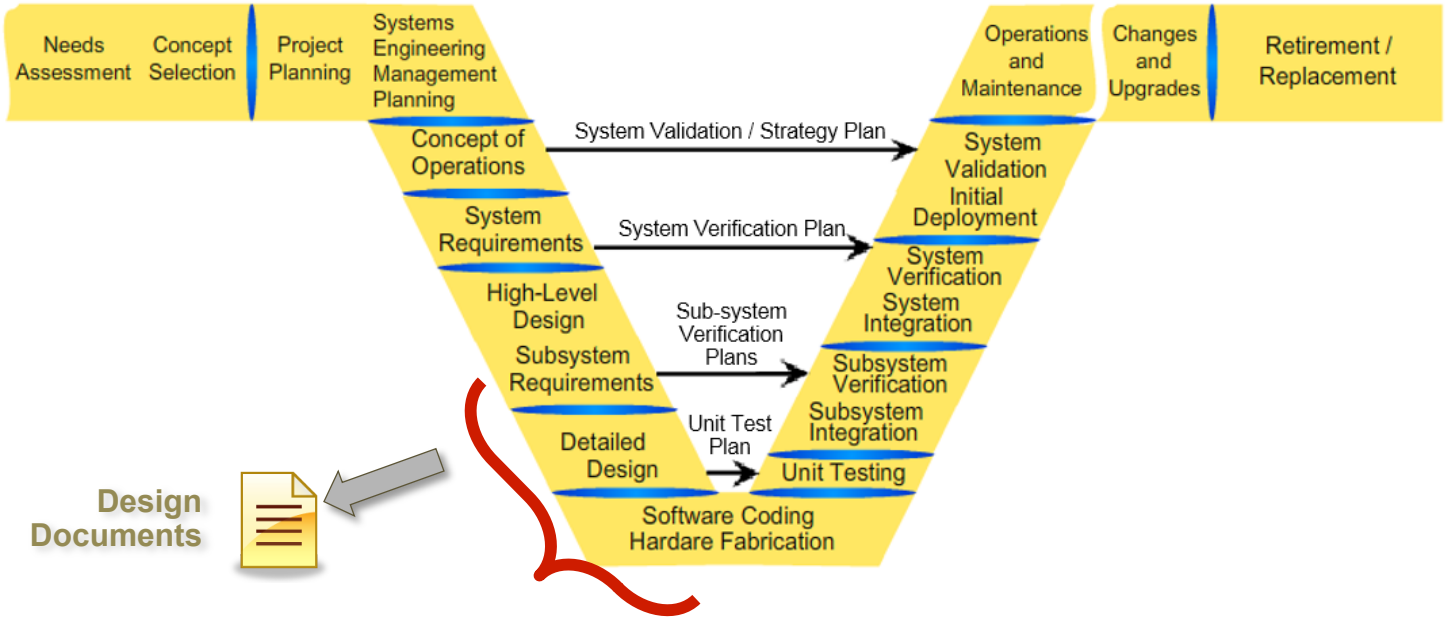
- Introductions
- Schedule Review
- Outreach
- High Level Design and Implementation
- Data Quality and Estimation
- Modeling and Response Planning
- Action Items and Closing

Our Corridor: The I-210

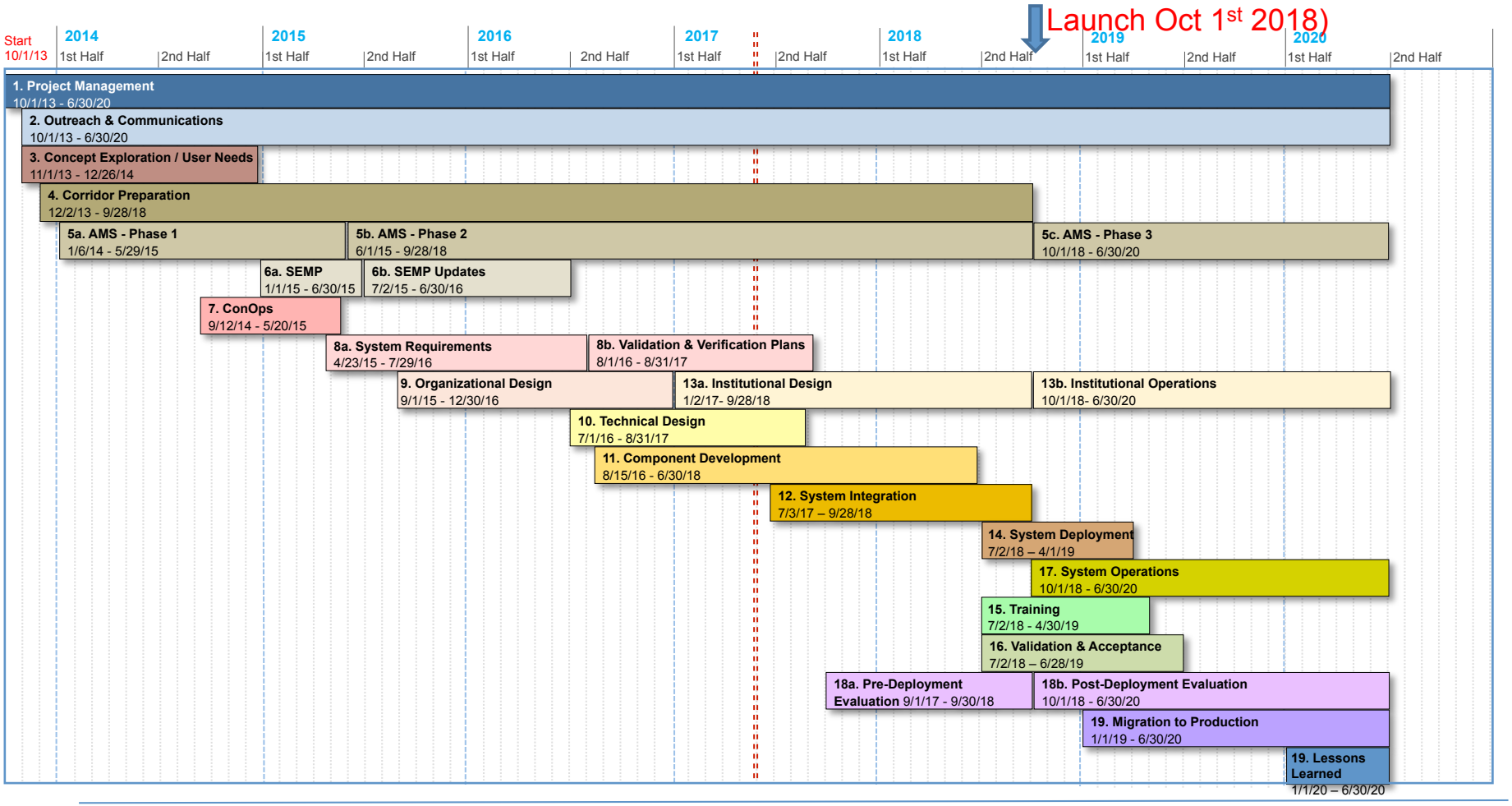


Systems Engineering Next Steps

- **Design Documents – How will the requirements be met**
- **Hardware and Software – Building the system**



Schedule



Caltrans Metro SGVCOG Foothill Transit

6

Outreach and Communications

Stakeholder Involvement and Communication

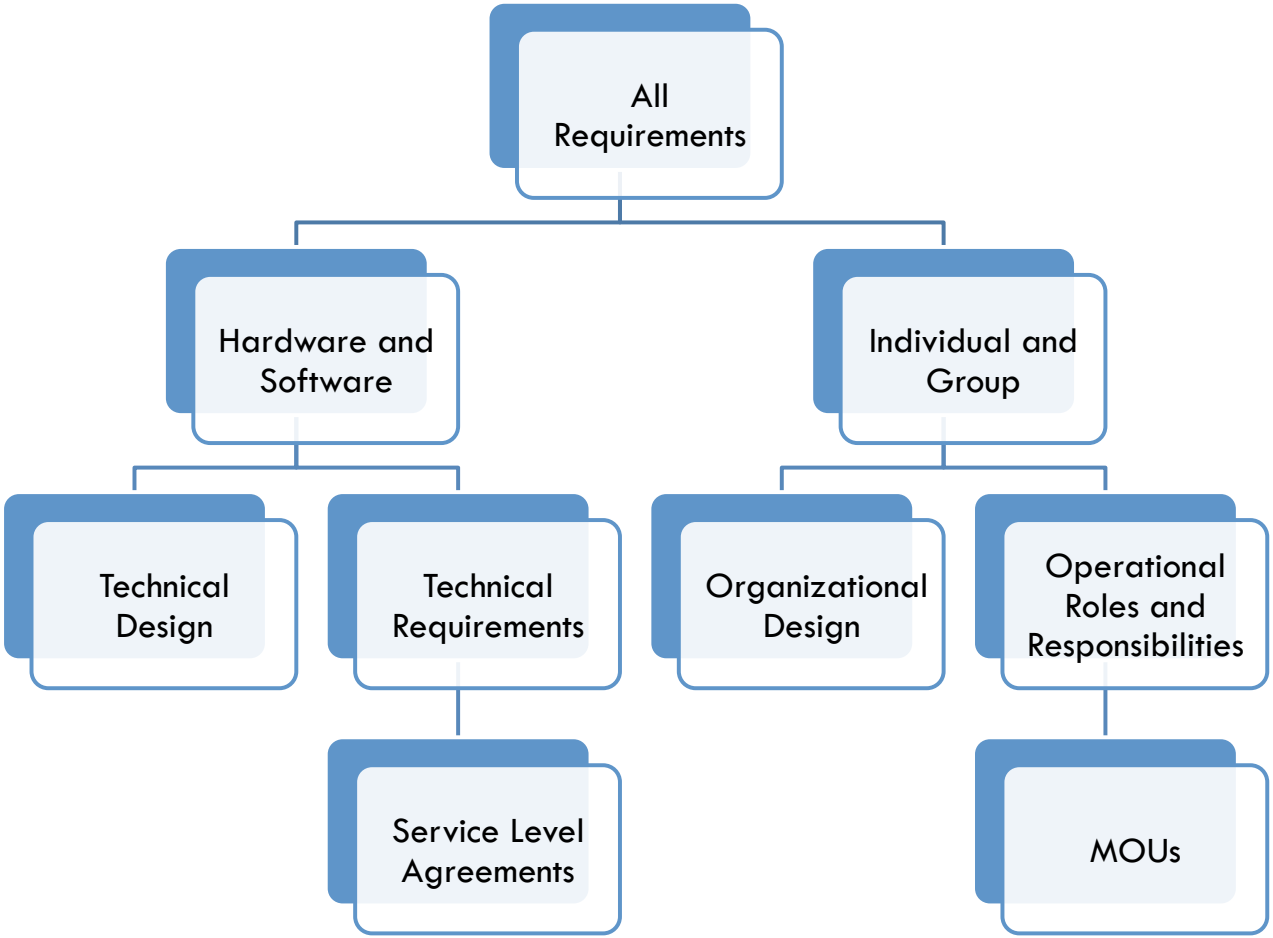
- **We are now in a phase where we will be more involved with stakeholders**
  - Call for Projects Installation details
  - Communications upgrades
  - Data Quality Improvements
  - Model Reviews/Response Plan Generation
  - Software Installations
  - Memorandum of Understanding
  - Roles and Responsibilities
- **Proactive communication is important**
  - Let each other know ongoing status and heads up of any issues
- **Resources will be required**
  - Caltrans and other stakeholders

Outreach

- **Project Charter Amendment**
  - Request to add 511 and RIITS – how to move forward – 2 options
    - Change current Amendment #1; add 511 and RIITS; have all stakeholders sign (this Amendment was still awaiting signature from Duarte)
    - Wait until Duarte signs Amendment #1; proceed with Amendment #2 to add 511 and RIITS
- **Meeting with Monrovia (after this meeting)**
- **Meeting with Duarte, council presentation**
- **Spring Connected Newsletter – distribution soon!**
- **Copy of signed I880 MOU**
- **ITS CA conference in September in SF**
  - Changing the State One Corridor at a Time (Update on the I-210 Pilot) – this abstract was accepted and will be in a session moderated by Alan Clelland (Iteris)

High Level Design

High Level Design



Requirements Allocated for Traceability

- **Institutional Roles and Responsibilities**
  - Caltrans
  - County
  - Cities
  - PATH
  - RIITS
  - 511
  - Safety
- **Hardware and Software**
  - Corridor Management Subsystem (Purple Box)
  - PEMS
  - Data Hub
  - Decision Support
  - Communications
  - TMC Systems
  - RIITS
  - 511

Requirements Traceability

	constants based on network configuration are updated			
CM-3.5	**The Corridor Manager shall ensure any changes to designated reroutes around incidents or events are communicated to all system stakeholders**	**H**	**4, 5**	**Institutional Job Tasks**

9.2.2. ASSET INVENTORY AND HEALTH MANAGEMENT

ID	Description	Criticality	Related User Need(s)	Related Subsystem
CM-4.1	**The ICM Core System shall continuously assess the health status of devices used to monitor traffic conditions**	**H**	**3**	**Data Hub**
CM-4.1.1	The ICM Core System shall monitor for fault and error messages that may be sent by individual traffic detection devices.	H	3	
CM-4.1.2	The ICM Core System shall monitor for fault and error messages that	H	3	
CM-4.4	**The ICM Core System shall continuously assess the health status of communication networks used by participating agencies to exchange information**	**H**	**3**	**Data Hub**
CM-4.4.1	The ICM Core System shall monitor and record fault or error messages that may be sent by the IEN communication network	H	3	
CM-4.4.2	The ICM Core System shall monitor and record fault or error messages that may be sent by the RIITS communication network	H	3	
CM-4.5	**The ICM Core System shall report on identified operational problems with devices used to monitor and manage travel within the corridor.**	**H**	**3, 13, 17**	**Corridor Managemt**

Risk Register - Partial

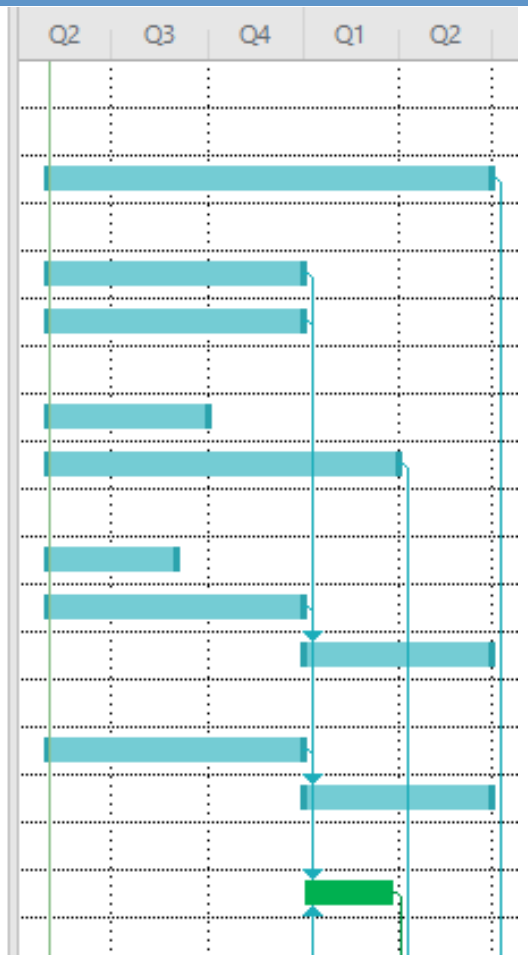
1													
2	LEVEL 1 - RISK REGISTER				Project Name:	Connected Corridors Pilot		D7/HQ		Project Manager	Nick, Allen, Joe		
3	Risk Identification							Risk Rating		Risk Response			
4	Status	ID #	Type	Organizational	Title	Risk Statement	Current status assumpti	Priority Rating	Rationale for Rating	Strategy	Response Actions	Risk Owner	Updated
5	Active		Opportunity	Organizational				Very High		Mitigate			
6	Dormant		Threat	Organizational				High		Transfer			
7	Retired		Threat	Organizational				Moderate		Transfer			
8								Low					
9								Very Low					
10			Threat	Organizational	Caltrans Personnel	As a result of Caltrans personnel not being available to fill critial roles in the CC pilot, the pilot will fail		High	Current experiences indicate that personnel are explicitly stating that they will not fulfill the personnel requirements.	Mitigate	Clearly identify the roles and the personnel who will fill them. Ensure those personnel agree to the roles. PATH to provide backup where roles are not filled.	PATH/Caltrans D7/Caltrans HQ (Lisa, ??, Nick)	
11	Active		Threat	Organizational	Education, Training and Culture	As a result of Caltrans personnel not having the proper technical and cultural education and training the CC pilot will fail		Medium	As the people who will fill certain roles are not identified there is a real risk that they will not have the proper education and training	Mitigate	Provide education and training to personnel. PATH to provide back up expertise.	PATH/Caltrans D7/Caltrans HQ (Lisa, ??, Nick)	
12			Threat	Organizational	SHOPP Funding	As a result of the possible need for funding for a number of software items there is a risk of those not being funded in time		High	Contracting is overwhelmed at Caltrans	Mitigate	Funding allocated for ATMS. Still needed for PEMS.	Caltrans D7/Caltrans HQ (Ali, Nick)	5/1/2017
13			Threat	Organizational	ICM 3 Funding	As a result of the next PATH contract not being funded personnel will not be available for the pilot launch and the pilot will fail		Medium	There is always some risk with new contracts and the funding of these contracts. No contract has great impact and cannot be easily mitigated.	Accept	Allocate funding, ensure executive support and follow through on process	PATH/Caltrans D7/Caltrans HQ (Joe, Nick)	

Risks - Summarized

- **Significant Risks**
  - Call for Projects On Time Completion
  - Network Communication
  - Caltrans contract administration (ATMS, Video, PEMS, PATH)
  - Temporary sensing during construction on the I-210
  - Final MOU
  - Organizational readiness
  - Overall integration of systems and people
- **Secondary Risks**
  - C2C Purchasing and installation
  - Challenges in some aspect of software development
  - Integration of purple box systems
  - Corridor wide data quality
  - General stakeholder communication frequency and content

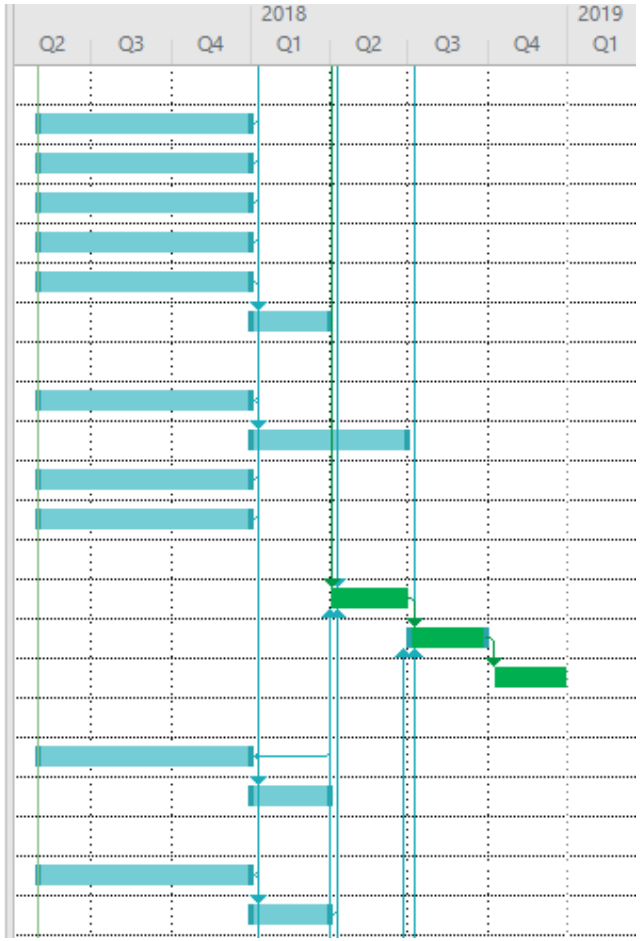
Gantt Chart – 1 of 3

	Assist	Responsible	Task Name
1			
2			
3	Cal, PATH	Cal, PATH	**Personnel/Orgs**
4			
5	PATH, Cal	PATH	**Cloud Architecture**
6	RIITS, Cty, City	Cal	**Network Communication**
7			
8	Cal	Cal	**Freeway SHOPP**
9	All	Cal	**Call For Projects**
10			
11		PATH	**Internal Data Hub Path**
12		PATH	**Data Hub Interfaces**
13	Cal	PATH	**Data Hub Internals**
14			
15		PATH	**Choose COTS**
16		PATH,COTS	**First Cots Integration**
17			
18		PATH, All	**Integrate with Data Hub**
19			



Gantt Chart – 2 of 3

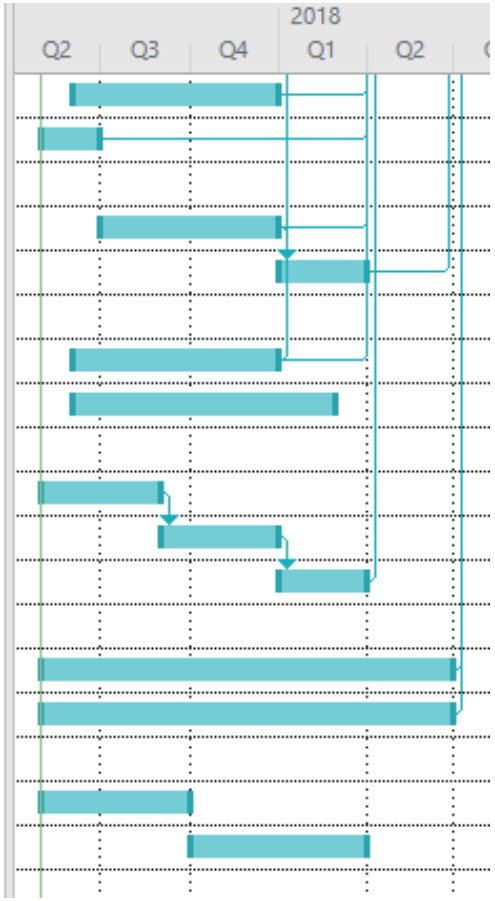
	Assist	Responsible	Task Name
19			
20	PATH	Cal	Closures
21	RIITS,PATH	511	511
22	CTY, PATH	RIITS	RIITS/Transit
23	RIITS	Cal	RIITS Video
24		Cal, PATH	PEMS Interfaces
25	PATH	Cal	PEMS
26			
27	PATH	Cal	ATMS Interfaces
28		Cal	ATMS Functional
29	RIITS	PATH	Environmental
30	Cty, City	PATH	Travel Time
31			
32	All	PATH	Integrate System
33	All	PATH	Test System
34	All	PATH	Launch System
35			
36		PATH	C2C Interfaces
37	All	PATH	C2C Working
38			
39	PATH	Cal	Sign Control Interface
40		Cal	Sign Control Completed



Gantt Chart – 3 of 3

GANTT CHART

	Assist	Responsible	Task Name
43	PATH	Cty/City	City Data
44	PATH	Cal	Caltrans' Data
45			
46		PATH	Estimation Interfaces
47	PATH	PATH	Estimation Working
48			
49		PATH	Prediction Interfaces
50		PATH	Prediction Working
51			
52		PATH	Rules Engine Beta
53		PATH	Rules Engine Interfaces
54		PATH	Rules Engine Working
55			
56	All	PATH	Rules
57	All	PATH	Response Plans
58			
59	PATH	Cal	PATH Contract Update
60	PATH	Cal	Next PATH Contract



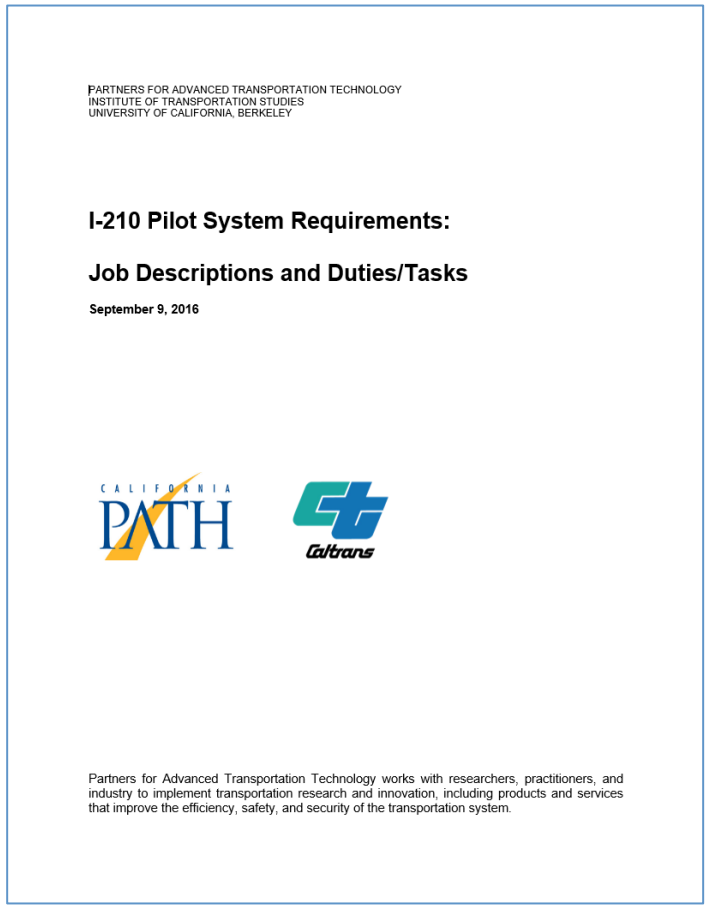
Subsystem schedules

			2017				2018			
			1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
Personnel								Integrate System	Test System	Run and Refine System
	D7 Ops,PATH	**Personnel/Orgs**	Design	Assign	Assign	Assign	Trial Ops			
Hardware and Construction	D7, RIITS, HQ, PATH	**Fiber Comm & Cloud**	Design	Design	Build	Build	**Integrate Subsystems using specs and sample implementation and hardware** **Complete software and hardware**			
	D7, Cities, County, Metro	**Arterial Call For Projects**	Design	Build	Build	Build				
	D7	**Freeway Shopp**	Build	Build	Build	Complete				
Core SubSystems	PATH, HQ	**Cloud Infrastructure**	Design	Build	Build	Build				
	PATH, HQ	**Data Hub**	Build	Build	Build	Build				
	PATH, Vendors	**COTS (Purple Box)**	Contract	Select	Design	Build				
New systems or Significant Upgrades	LAMetro	**RIITS Video**	Design	Design	Build	Build				
	D7 Ops	**Caltrans Video**	Contract	Install	Test					
	HQ	**PEMS**	Design	Contract	Build	Build				
	D7 Ops, HQ	**ATMS**	Design	Contract	Build	Build				
	D7, Cities, County	**Sign Control**	Design	Build	Build	Build				
C2C Interfaces	PATH, D7, Pasadena	**McCain**	Design	Build	Build	Build				
	PATH, D7, LA County	**Kimley-Horn**	Design	Build	Build	Build				
	PATH, D7, Arcadia, HQ	**Transcore**	Design	Build	Build	Build				
	PATH, HQ	**TSMSS**	Design	Build	Build	Build				

Subsystem schedules

			2017				2018			
			1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
							Integrate Subsystems using specs and sample implementation and hardware	Integrate System	Test System	Run and Refine System
Mostly Interfaces	HQ, PATH	**Closures**	Deploy	Test	Choose	Refine				
	LAMetro, PATH	**511**		Design	Build					
	LAMetro, PATH	**RIITS/Transit**		Design	Build					
	LAMetro, PATH, D7	**Environmental**	Design	Design	Build	Build				
	Cities, County, PATH	**Travel Time**	Design	Design	Build	Build				
Data	PATH, Cities, County	**City Data**	Add	Add	Quality	Quality	Load Data and Integrate with Data Hub			
	D7,PATH	**Caltrans' Data**	Quality	Quality	Quality	Quality				
AMS/DSS	PATH	**Estimation**	Build	Build	Complete	Update				
	PATH	**Simulation**	Build	Complete	Update	Update				
	PATH	**Prediction**	Build	Build	Complete	Update				
	PATH	**Rules Engine**	Design	Build	Build	Build				
	PATH, D7, Cities, County	**Rules**	Gather	Gather	Gather	Gather				
	PATH, D7, Cities, County	**Response Plans**		Design	Design	Design				
PATH Contracts	HQ	**Data Hub**	Contract	Contract	Award					
	HQ	**Next Contract**	Contract	Contract	Contract	Contract	Award			

Job Descriptions and Duties/Tasks



PARTNERS FOR ADVANCED TRANSPORTATION TECHNOLOGY
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
- TMC/TCS Operators
- Transit Field Supervisors
- Public Information Officers
- First Responders
- Outreach and Communications Manager

Job Desc. and Duties/Tasks (continued)

- PATH is working on consolidating the Stakeholder tasks as there is some duplication
- Prioritize Stakeholder tasks into high, medium, low
- Meeting with CT D7 (verbal report)
- Continue working on items identified in the "Schedule for Continued Work"

Job Descriptions and Duties/Tasks Schedule for Continued Work

	Caltrans D7	PATH	By When
Finish adding the color-coding for the 4 roles identified by CT and update the appendix		Fred	Done
Add a legend to explain the color-coding		Fred	Done
Determine whether STE or ITS is someone from the System Management and Evaluation Office or the ITS group (the "Who" column currently has both listed in some cases)	Rafael		5.15.17
Further delegate CT tasks to new hires in D7	Rafael		ASAP
Review initial job titles drafted by PATH and match job titles to CT personnel	Rafael	Lisa	5.15.17
Identify transition plan for the PATH (P) tasks (who will do the task at CT D7)	Rafael		5.15.17
Determine when the tasks above would transition from PATH to D7 (Q/Yr)	Rafael		5.15.17
Write summary of what the four D7 offices do (so that other CT districts can use similar office functions in their Corridor projects)	Rafael		5.15.17
Review the Stakeholder (S) tasks and determine if they will stay with Stakeholders for the duration of the project (or transition)		Lisa	5.15.17
Review the Job Descriptions document and determine when D7 personnel will be on board and trained to perform CT tasks in the document (prior to the launch of the I-210 Pilot in late 2018).	Rafael	Lisa	5.15.17

Metro Call for Projects

- **Contract Status**
  - Metro will start processing the agreement
  - Caltrans still awaiting approval from purchasing (Risk)
- **Final Equipment List**
  - Close to confirmation
- **Design**
  - ??
- **Procurement**
  - Planning on using a Service Contract to deliver project elements
  - Awaiting word from DPAC
- **Caltrans would like estimates for permit charges**

Manual on Uniform Traffic Control Devices

Manual on Uniform Traffic Control Devices for Streets and Highways
Official Ruling No. 6(09)-42 (I) – Signing for Rerouting Due to Traffic Incidents

A.) Acceptable signs for rerouting due to traffic incidents.

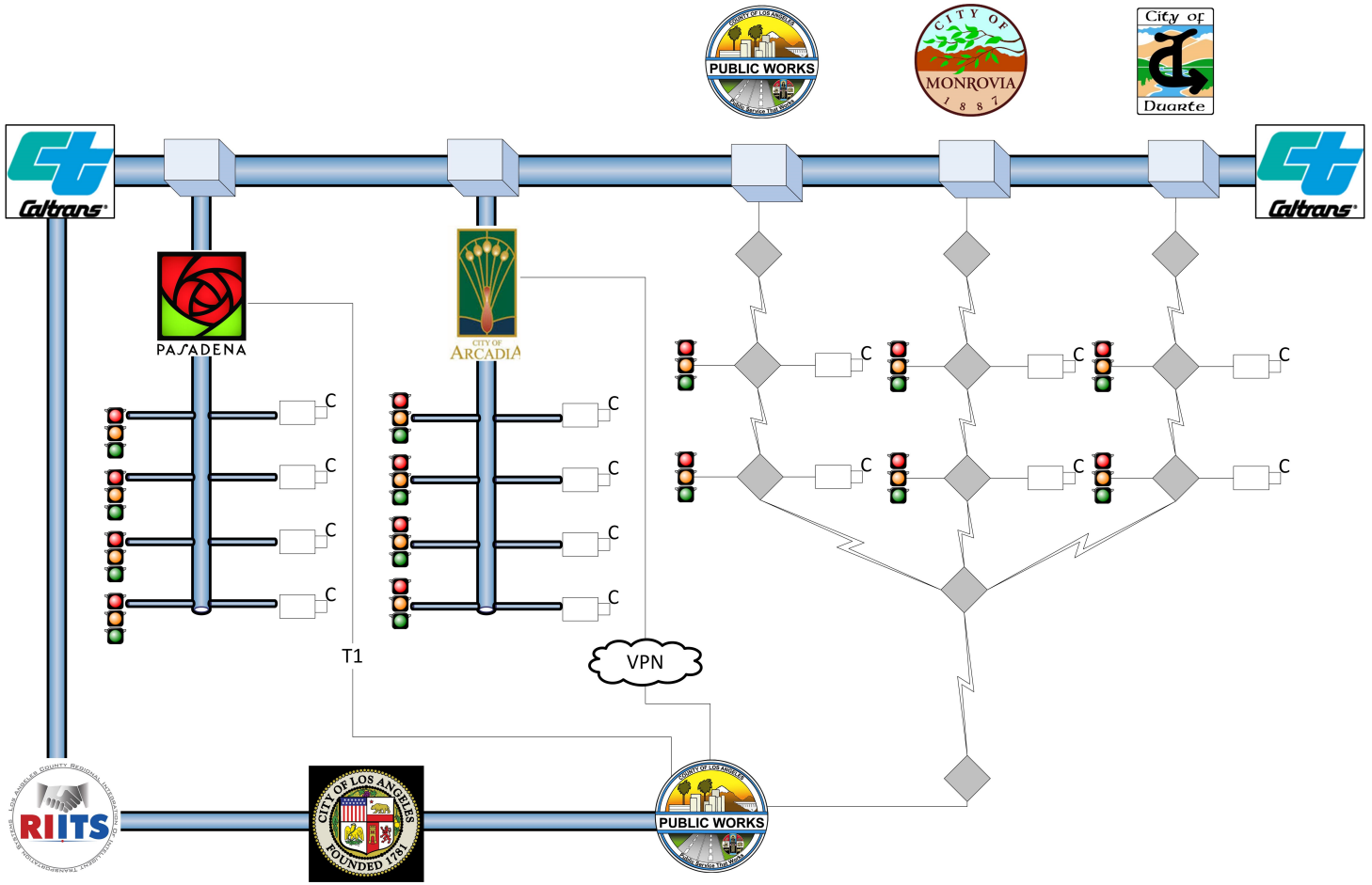
1. Permanently installed guide signs with white legend on green background. May include portion of legend* in black on yellow panel as conspicuity enhancement.

2. Directional signs with white legend on green background. May include portion of legend* in black on yellow panel as conspicuity enhancement.

* Excluding destination or directional information.

3. Directional assembly with supplemental plaque with white legend on green background or black legend on yellow background.

Communication Schematic



Backbone and Logical Communication

- Agreement on connection points from Pasadena and Arcadia
- Connection point identified for LA County
- Working with RIITS on details
- We have wireless communication reliability problems for Monrovia and Duarte
- Awaiting Caltrans Connection from TMC to Amazon cloud
- Other risks?

C2C Communication for Signal Systems

- Have initial quotes from Transcore and Kimley-Horn Initial Evaluation of McCain's product nearing completion
- PATH will be handling the purchasing of all three software upgrades
- PATH is awaiting Call for Projects funding approval to move forward
- PATH has begun pre purchasing work to speed up purchasing process
- PATH – Need to workout ownership issues
- We still hope to have delivery of software by end of year
- Must tie in with backbone communication (Risk)

Proof Of Concept – COTS (Purple Box)

- On Track
- 16 Companies requested information
- We held two questions sessions
- 9 Companies attended the question sessions
- Several have already indicated that they will respond
- Generally positive statements about documents and process

Companies responding to Solicitation

- Brisk Synergies
- -Cambridge
- Citilog
- +Irvine Global Consulting
- +Kapsch
- +McCain
- +Parsons
- Telegra
- TransCore
- Catt Lab
- Transmetric America
- Virgina Tech
- Stantec
- Aegis
- Information Logistics
- Carma

Proof of Concept Dates

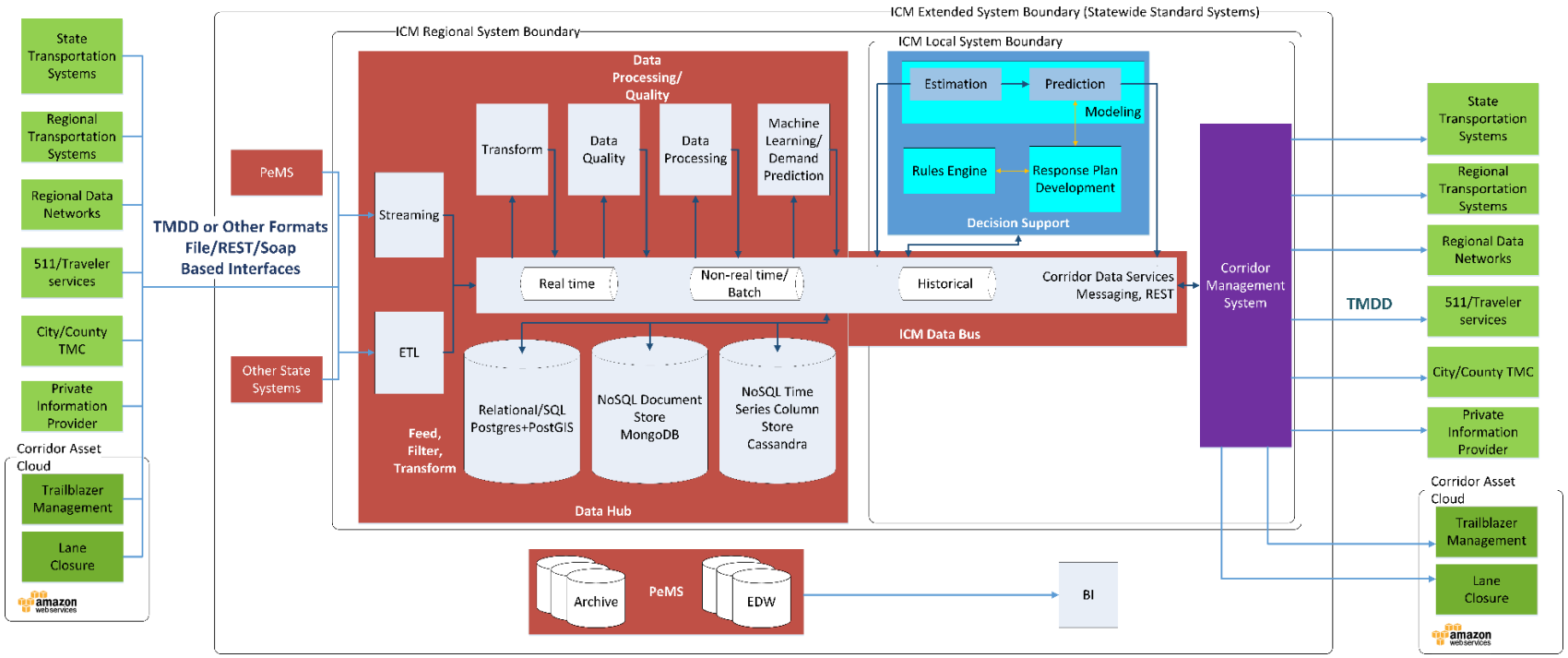
- March 2017 – Release of this document
- April 2017 – Outreach event to address questions
- May 22nd 2017 – Receive responses from vendors
- June 2017 – Choose vendors who will participate in pilot
- August 2017 – Complete agreements with vendors as needed
- Sept 2017 – Begin integration planning with vendors
- Nov 2017 – Begin integration of vendor COTS products
- Oct 2018 – Launch pilot utilizing COTS software of first vendor
- Feb 2019 – Complete Integration of second vendors COTS software
- May 2019 – Complete Integration of third vendors COTS software

- The anticipated schedule for Caltrans procurement is:
-
- May 2018 – Caltrans will begin internal procurement process
- Oct 2019 – Procurement document released
- April 2020 – COTS vendor chosen
- July 2020 – Complete contractual negotiations
- Nov 2020 – Install production software

ATMS, PEMS, Lane Closure

- **ATMS Upgrades – (High Priority, High Risk)**
  - Procurement cycle may result in late contract start
  - HQ trying to accelerate contract
- **PEMS**
  - Setting up design meeting with Caltrans, Iteris and PATH
  - Karl Petty will be joining PATH as a part time employee
- **Lane Closure**
  - Mike Jenkinson should be providing a link in the near future

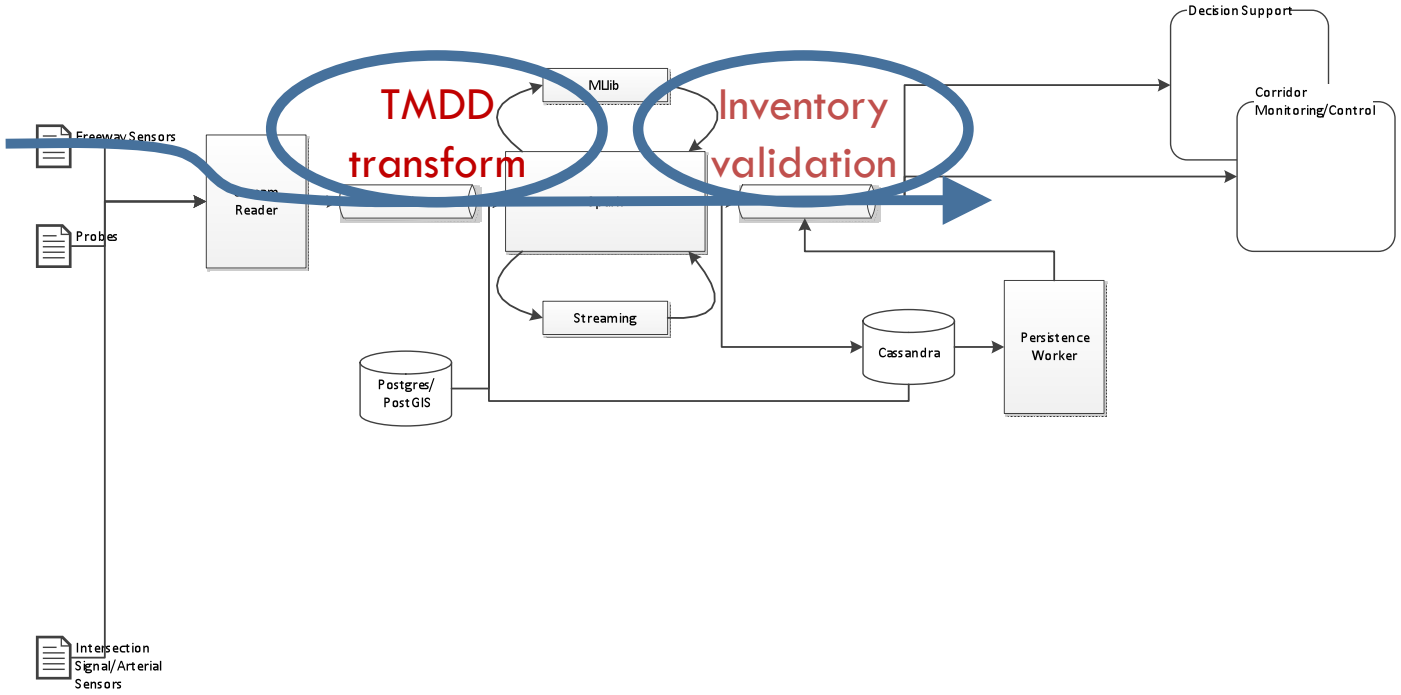
Data Hub and DSS within the cloud



Update

- **Caltrans HQ IT dedicated security discussion**
- **Freeway sensing streaming path first version complete**
  - TMDD transformation of PeMS data
  - Sensor inventory validation of incoming data
- **Furthering design of C2C communications, Corridor Management System interface**
  - Corridor TMDD system upgrades
  - Reviewing detailed data needs for estimation and response plan prediction
  - Working to update data dictionary to accommodate findings, inform vendors

First Sensing data path

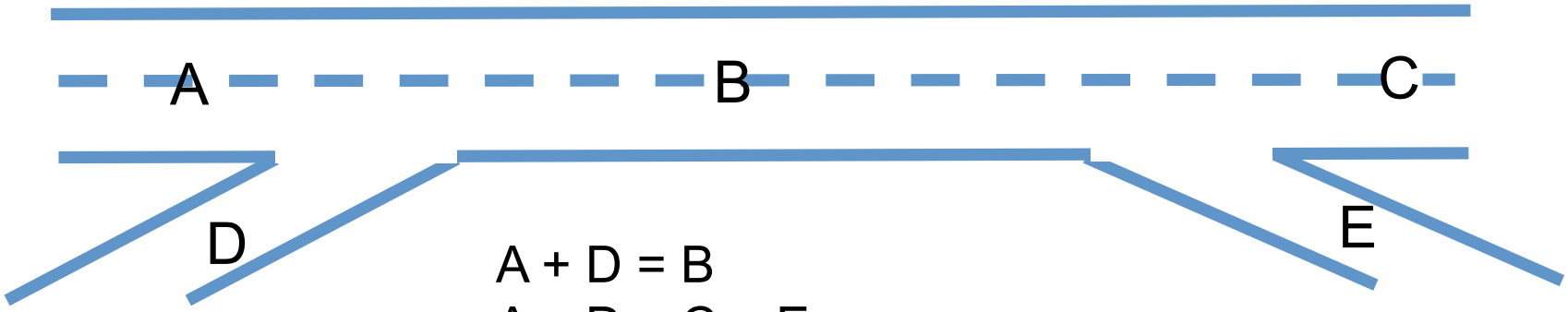


Update

- **System AWS configuration started**
  - Development environment Virtual Private Cloud created
  - Data Hub environment/subnets in place
- **Additional staffing**
  - Data Engineer – contract
  - Data pipeline developer
  - QA engineer

Next steps

- **Add a basic flow balance for freeway sensing quality analysis**

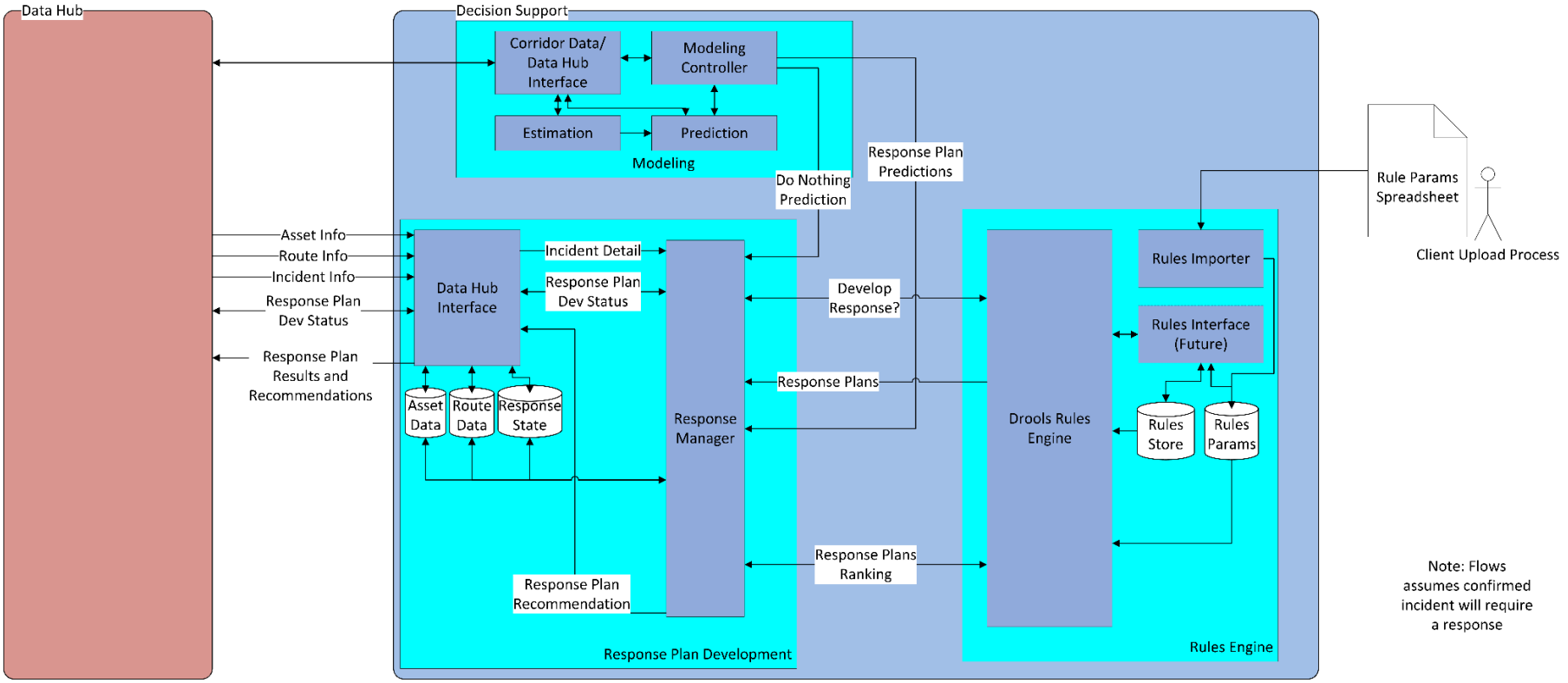


A + D = B
A + D = C + E
4 hour rolling window
6 hour rolling window
Daily

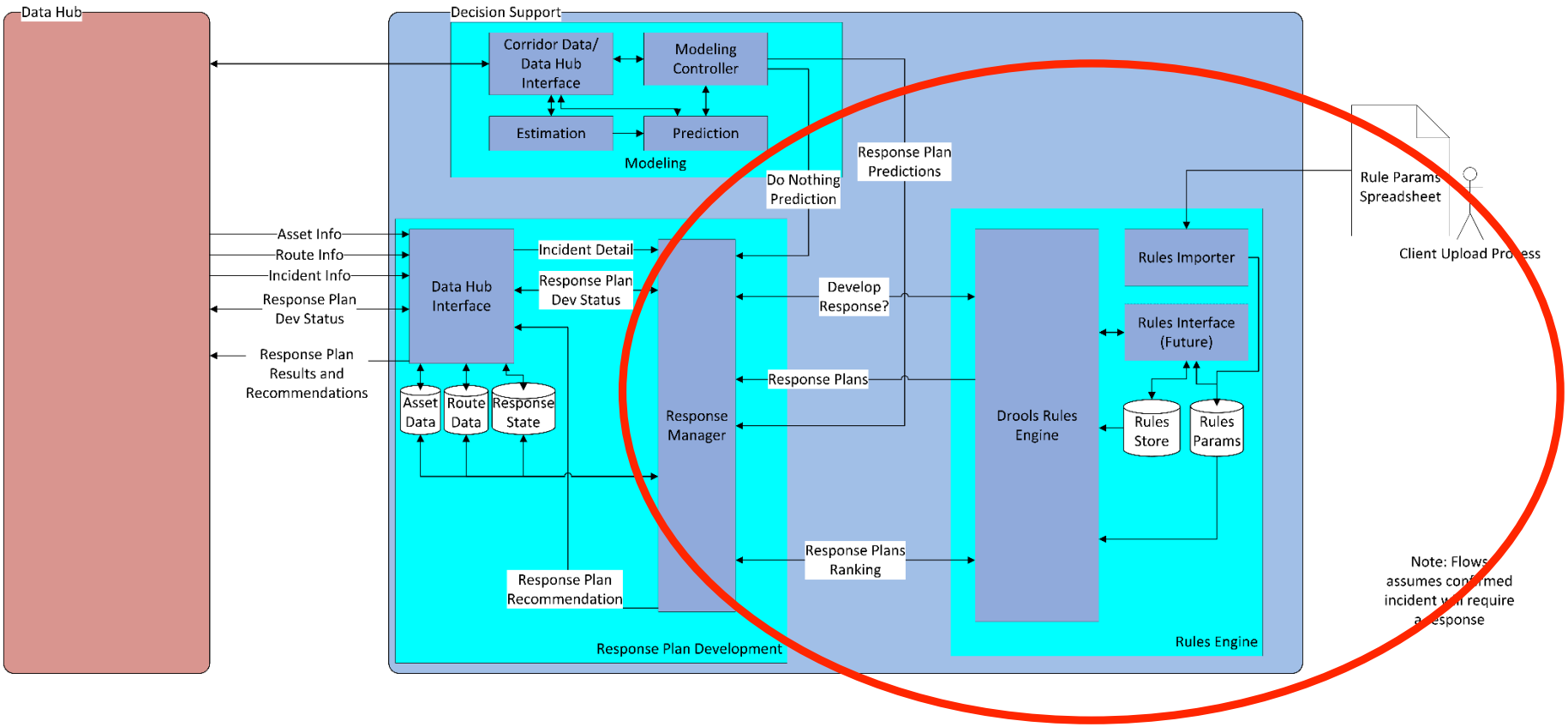
Next steps

- **Attach DSS/Modeling to Data Hub – Attach freeway sensing data stream to estimation, run estimation 24/7 to gain understanding of reliability**
- **Prepare system and AWS security for future additional connections (intersection signals, ramps, etc)**
- **First version data pipeline for intersection signals - use test connections if possible**

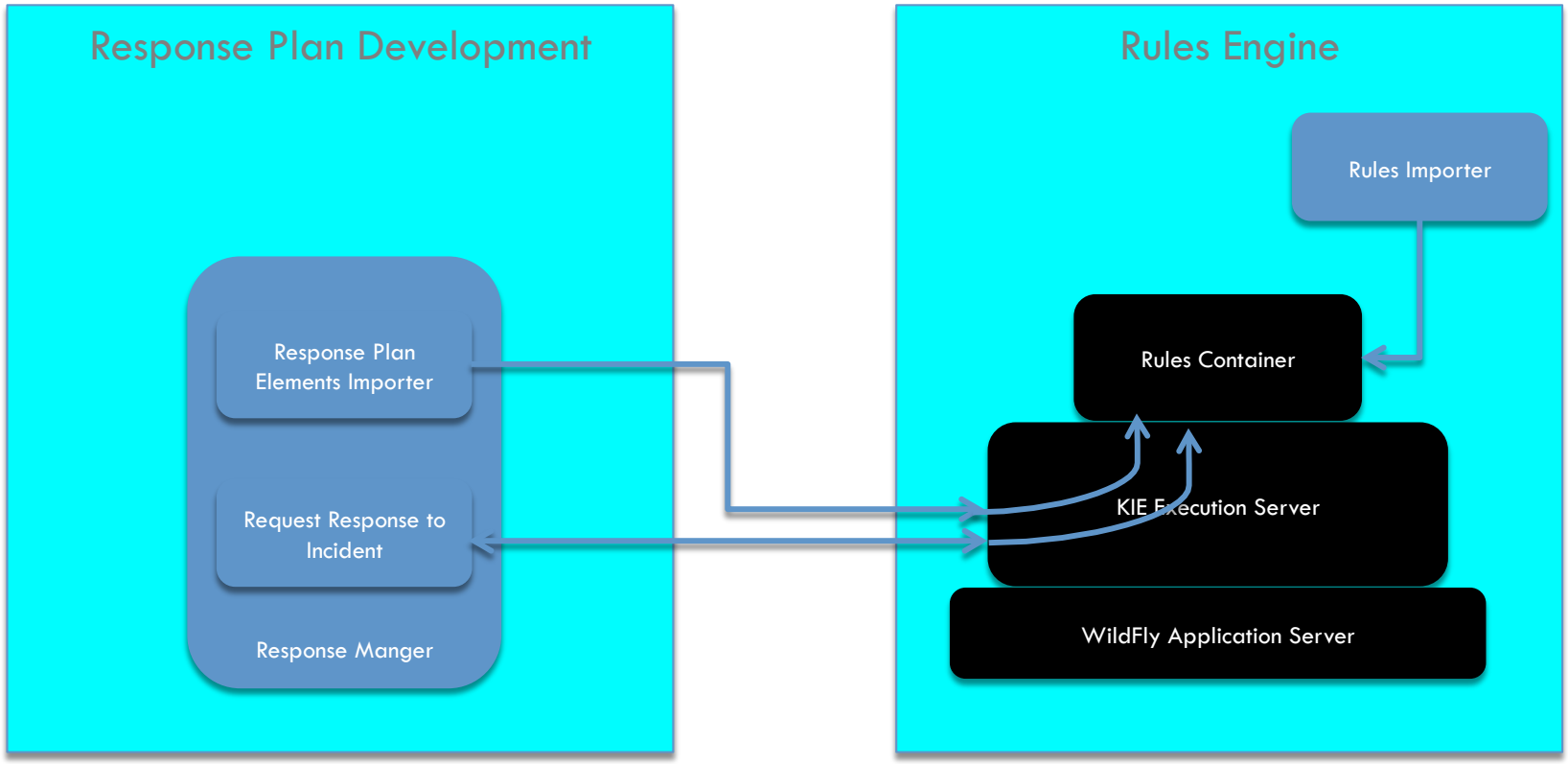
DSS – Design Detail



DSS – Design Detail



Response Plan Development: Rules Deployment



Rules Processing


```
task-32) *** Retracting eliminated onramp: DelMar
task-32) --- Route does not have required ramp support: status -> Eliminated
task-32)       * Route name: EB_Art_210_Connector_DelMar
task-32)       * Route offramp: Connector
task-32)       * Route onramp: DelMar
task-32) *** Retracting eliminated route: EB_Art_210_Connector_DelMar
task-32) *** Retracting eliminated onramp: Marengo
task-32) *** Retracting eliminated onramp: Allen
task-32) --- Route does not have required ramp support: status -> Eliminated
task-32)       * Route name: EB_Art_Corson_Lake_Allen
task-32)       * Route offramp: Lake
task-32)       * Route onramp: Allen
task-32) --- Route does not have required ramp support: status -> Eliminated
task-32)       * Route name: EB_Art_Corson_Lake_Allen
task-32)       * Route offramp: Lake
task-32)       * Route onramp: Allen
task-32) --- Route does not have required ramp support: status -> Eliminated
task-32)       * Route name: EB_Art_Walnut-Foothill_Lake_Allen
task-32)       * Route offramp: Lake
task-32)       * Route onramp: Allen
task-32) *** Retracting eliminated route: EB_Art_Walnut-Foothill_Lake_Allen
task-32) *** Retracting eliminated route: EB_Art_Corson_Lake_Allen
task-32) *** Retracting eliminated route: EB_Art_Corson_Lake_Allen
task-32) *** Retracting eliminated onramp: SierraMadreVill
task-32) *** Retracting eliminated onramp: SierraMadreVill
task-32) --- Route does not have required ramp support: status -> Eliminated
task-32)       * Route name: EB_Art_Walnut-Foothill_SanGabriel_SierraMadreVill
task-32)       * Route offramp: SanGabriel
task-32)       * Route onramp: SierraMadreVill
task-32) --- Route does not have required ramp support: status -> Eliminated
task-32)       * Route name: EB_Art_Walnut-Foothill_SierraMadre-Altadena_SierraMadreVill
task-32)       * Route offramp: SierraMadre-Altadena
```

Data Quality and Estimation

Freeway Sensor Availability

Weekly Average Sensor Availability — I-210 — Eastbound PM 25 - PM 43.25

Hover over cells to view units in detector-days.

		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
April	2 3 4 5 6 7 8			66.7%	76.3%	76.8%	71.9%	71.4%	75.3%
	9 10 11 12 13 14 15			57.1%	80.8%	78.7%	76.3%	75.4%	77.8%
	16 17 18 19 20 21 22			33.3%	89.4%	88.1%	93.1%	92.0%	88.0%

Weekly Average Sensor Availability — I-210 — Westbound PM 25 - PM 43.25

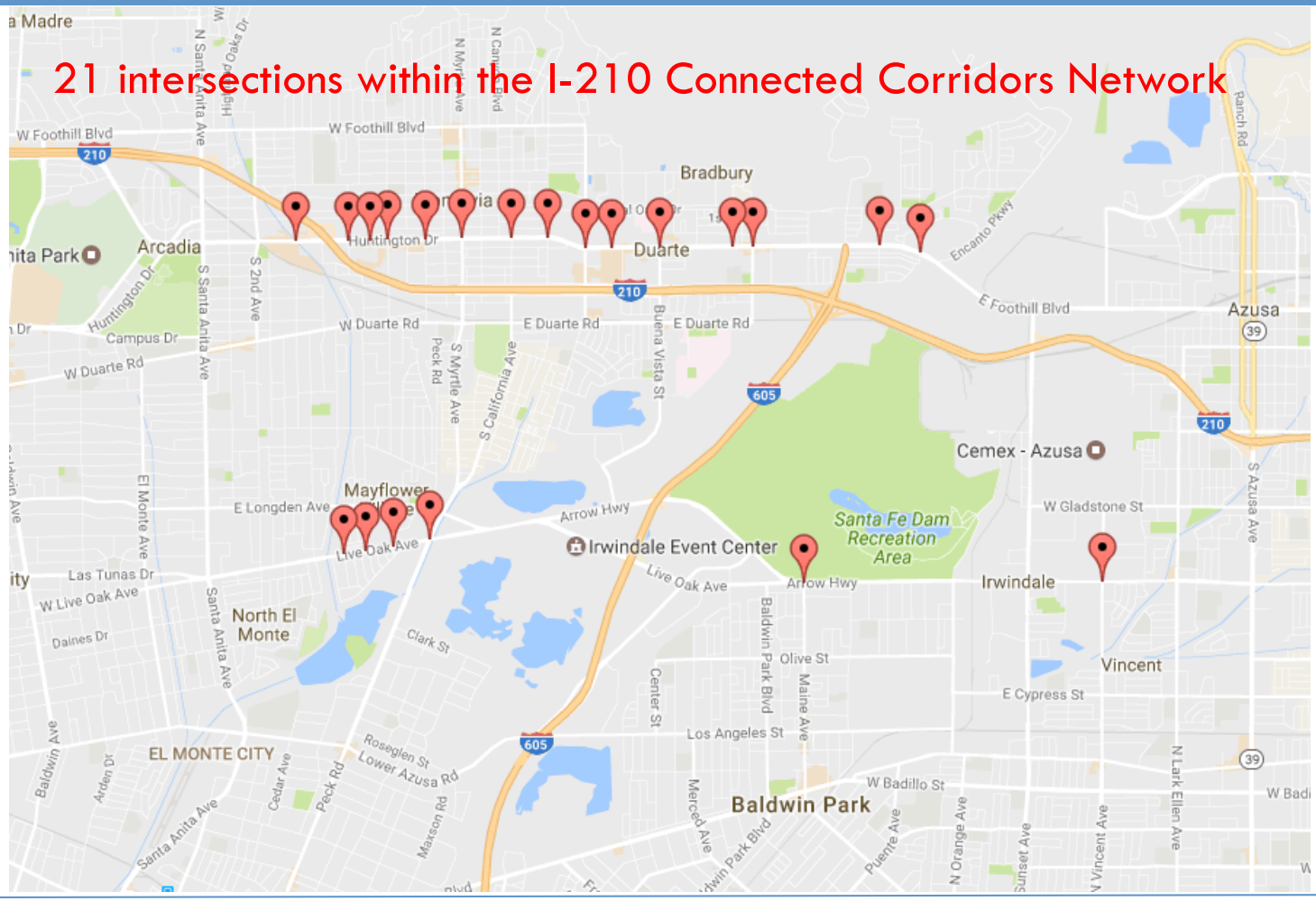
Hover over cells to view units in detector-days.

		CD	CH	Fwy-Fwy	HOV	Mainline	Off Ramp	On Ramp	Total
April	2 3 4 5 6 7 8			100.0%	85.3%	86.8%	79.0%	87.8%	86.2%
	9 10 11 12 13 14 15			100.0%	86.5%	87.3%	79.0%	88.3%	86.7%
	16 17 18 19 20 21 22			100.0%	89.1%	89.2%	92.4%	90.8%	90.1%

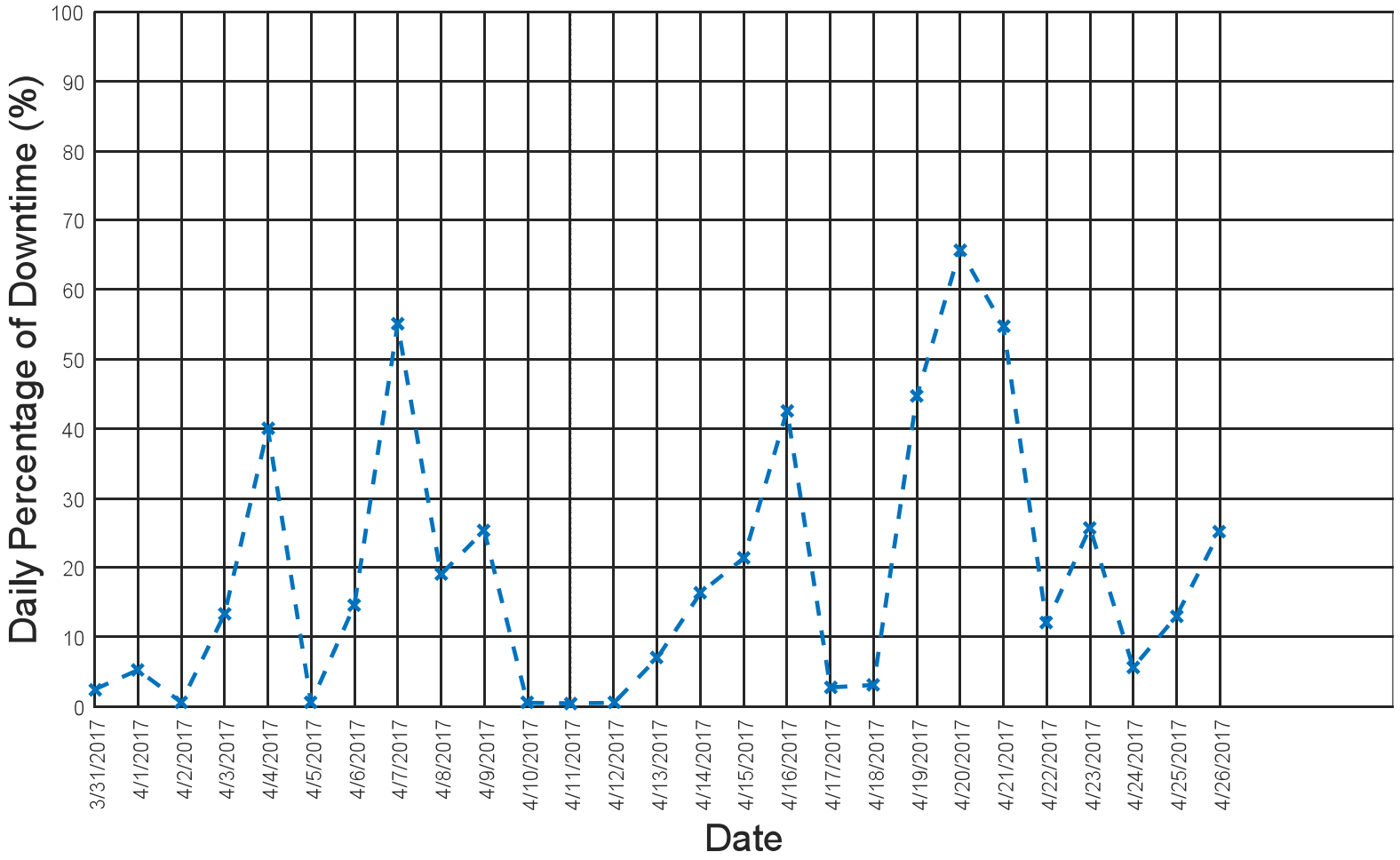
Arcadia

Weekly Average Sensor Availability *Hover over cells to view units in detector-days.*		Arcadia ▾								
		Detour Routes			Non Detour Routes			All Detectors		
		Good	Bad	No Data	Good	Bad	No Data	Good	Bad	No Data
	12 13 14 15 16 17 18	30.6%	63.7%	5.8%	24.1%	20.7%	55.2%	28.9%	52.9%	18.2%
	19 20 21 22 23 24 25	53.5%	40.7%	5.8%	27.6%	17.2%	55.2%	47.0%	34.8%	18.2%
	26 27 28 29 30 31 1	62.5%	31.7%	5.8%	29.7%	15.2%	55.2%	54.2%	27.6%	18.2%
April	2 3 4 5 6 7 8	49.9%	44.3%	5.8%	28.3%	16.6%	55.2%	44.4%	37.3%	18.2%

IEN Available intersections from LACO



IEN - Connection Downtime



Data Collection Plan

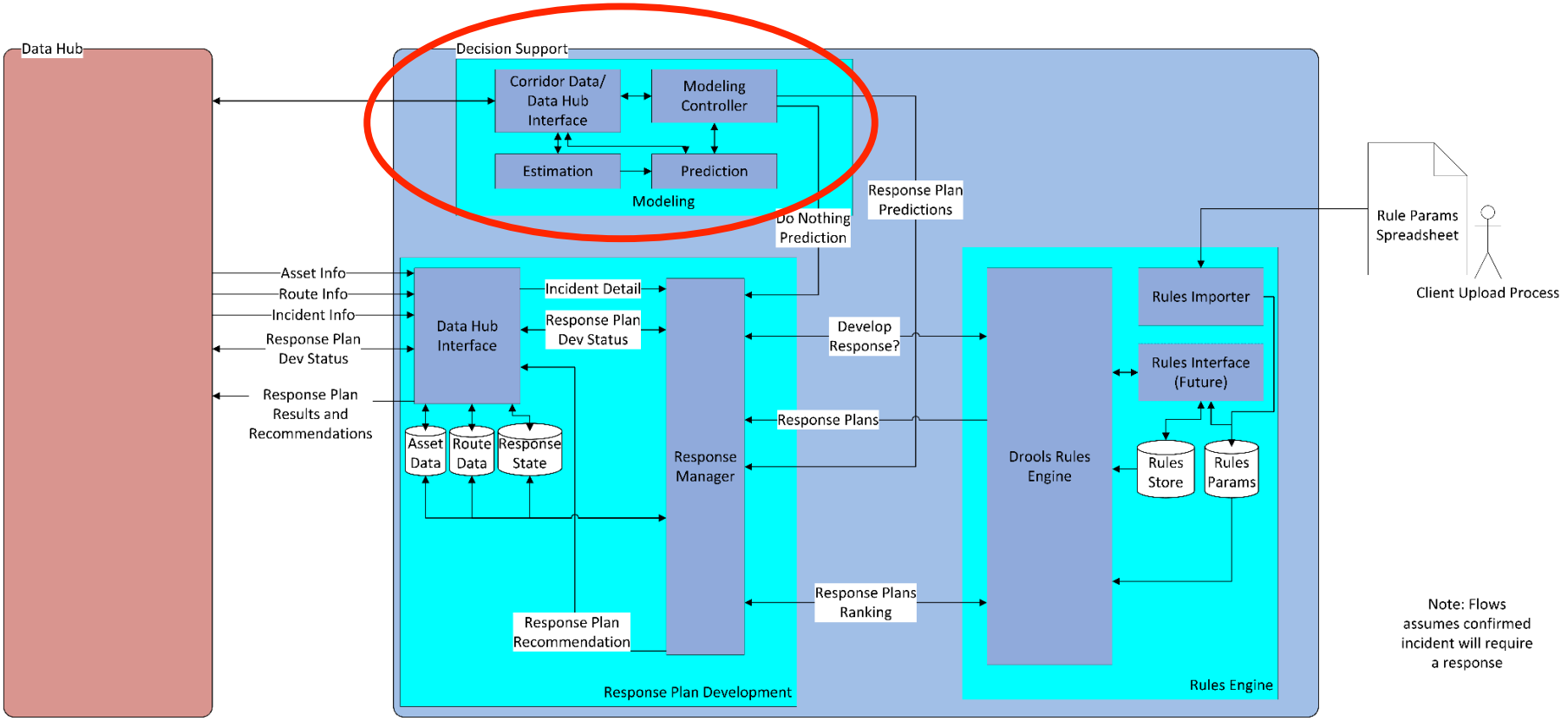
- **IEN is not a practical data source at this time**
- **Direct Non-Real Time Data Feeds**
  - Arcadia – Currently occurring
  - County, Monrovia, Duarte – Can we get KITS data?
  - Pasadena – Can we get a monthly data feed?

Corridor Model update

Response Plan Development Schedule

- **March:** Stakeholders 1st model review
- **April:** Modifications to model to address comments from 1st review
- **May:** Modeling of incidents to be used as showcases / testing of driver response to incidents/ Start of development of response plans
- **June:** Initial set of detailed response plans with proposed signal timings to be reviewed with stakeholders
- **July:** Modifications to the model based on outcome of 2nd review
- **August:** Completions of initial set of approved response plans
- **September and forward:** Response plans for remainder of corridor are generated, modeled and approved

DSS – Design Detail



Real Time Corridor State Estimation

- **As a reminder data quality ultimately is used to:**
  - Indicate where data is missing
  - Indicate bad data for removal
- **Estimation fills in:**
  - Where there are no sensors
  - Where data is missing
  - Where the data was bad
- **Progress on Estimation**
  - Anticipate full estimation of corridor in June
  - Need Pasadena data to complete by that date

Simulation Model – Current Status

- **Completed elements**
  - Road geometry
  - Traffic control elements
    - Traffic signals operations
    - Ramp metering control
    - Truck restrictions
    - School zones
  - Transit elements
    - All bus routes and stops
  - Traffic demand
    - General vehicle behavior
    - Travel cost formulas
    - AM/PM Origin-destination flows
  - Decision-support elements
    - Coding of approved detours

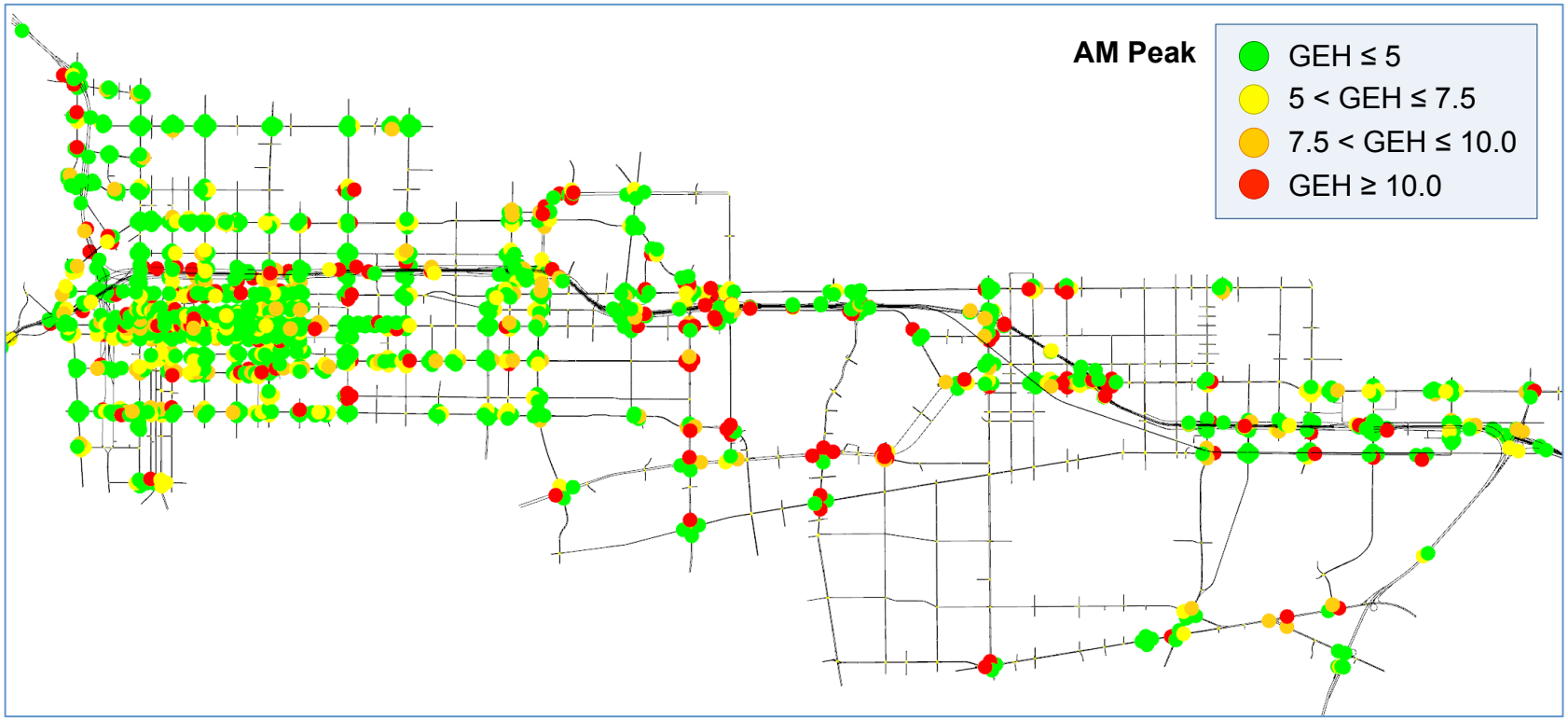
- **Elements being refined**
  - Traffic demand
    - Flow profiles for AM/PM peak
  - Incident modeling
    - Modeling of select major incidents that have occurred in the past year
  - Driver behavior
    - Lane-changing parameters at known bottleneck locations
    - Vehicle route choice behavior in response to incidents
  - Decision-support elements
    - Coding of changeable sign locations
    - Identification of signal control response strategies

Simulation Model – Recent Activities

- **Upgrade from Aimsun 8.1.5 to Aimsun 8.2 (released late March)**
- **Refinement of travel cost calculations**
  - Allowed trip cost calculation to consider the average duration of the red signal associated with each movement
  - Allowed speed on HOV lanes to be affected by speed on freeway mainline
- **Demand modeling**
  - Manual and automated adjustments of cars and HOV trips defined in origin-destination matrices to improve replication of observed flows on freeways and ramps
- **Traffic signal operations**
  - Coding of updated signal timing plans provided by Arcadia and Pasadena
- **Ramp metering API**
  - Correction of a minor bug involving the operation of Q2 queue control on freeway connectors

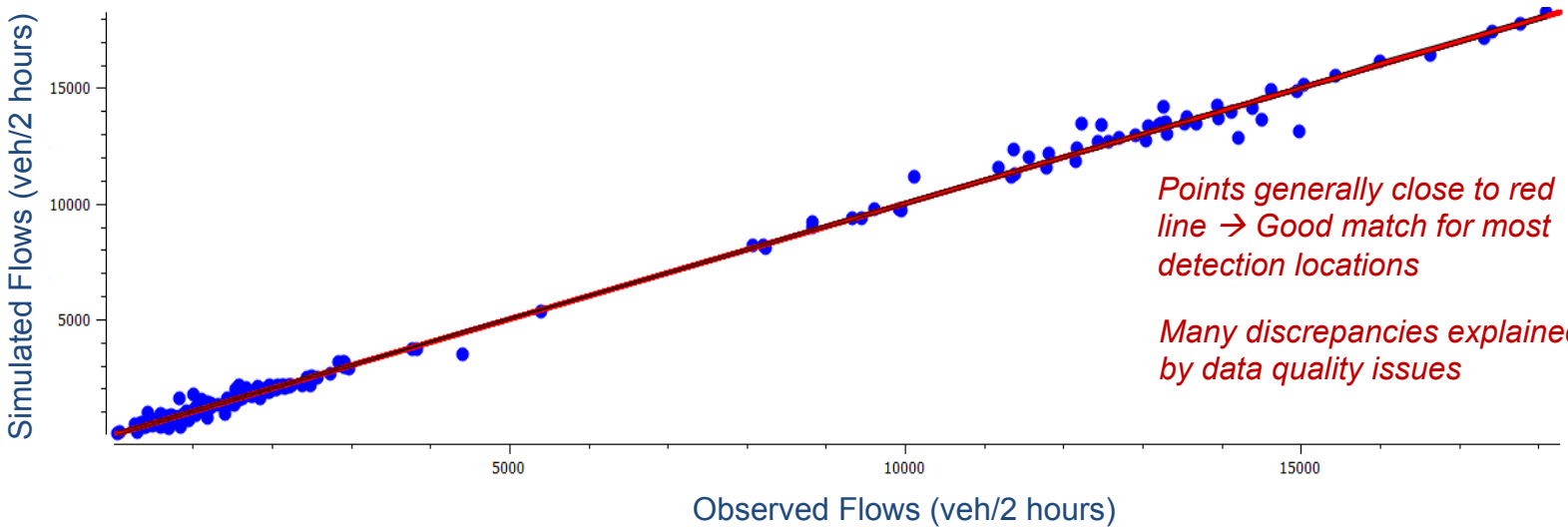
Simulation Model – Current Status

- **Example 1: Verification of simulated vs observed traffic volumes**



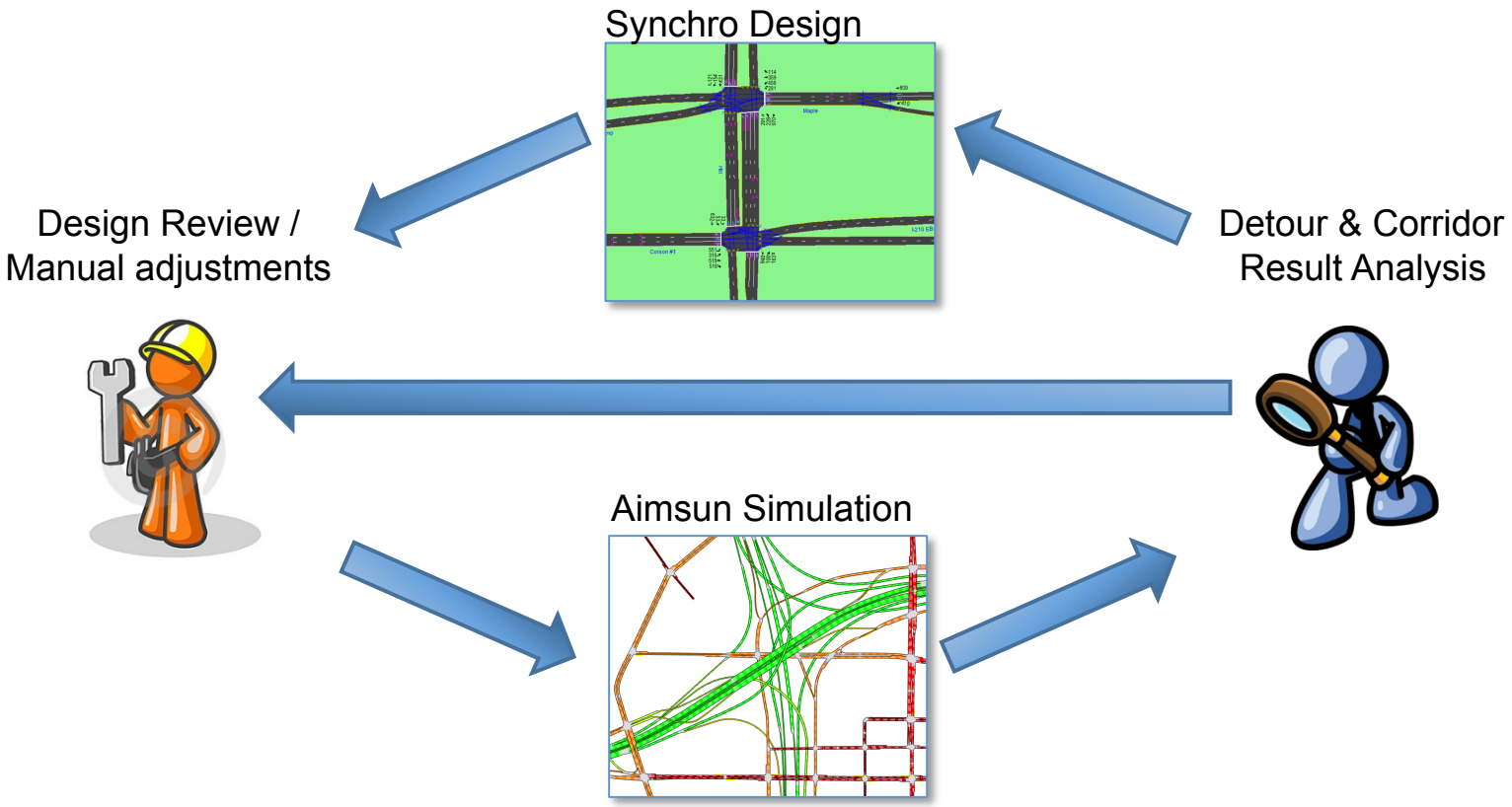
Model Calibration – Current Status

- **Example 2: Replication of observed ramp and mainline freeway volumes along non-congested sections**



Simulation Model – Next Steps

- **Design of traffic management responses for selected incidents**

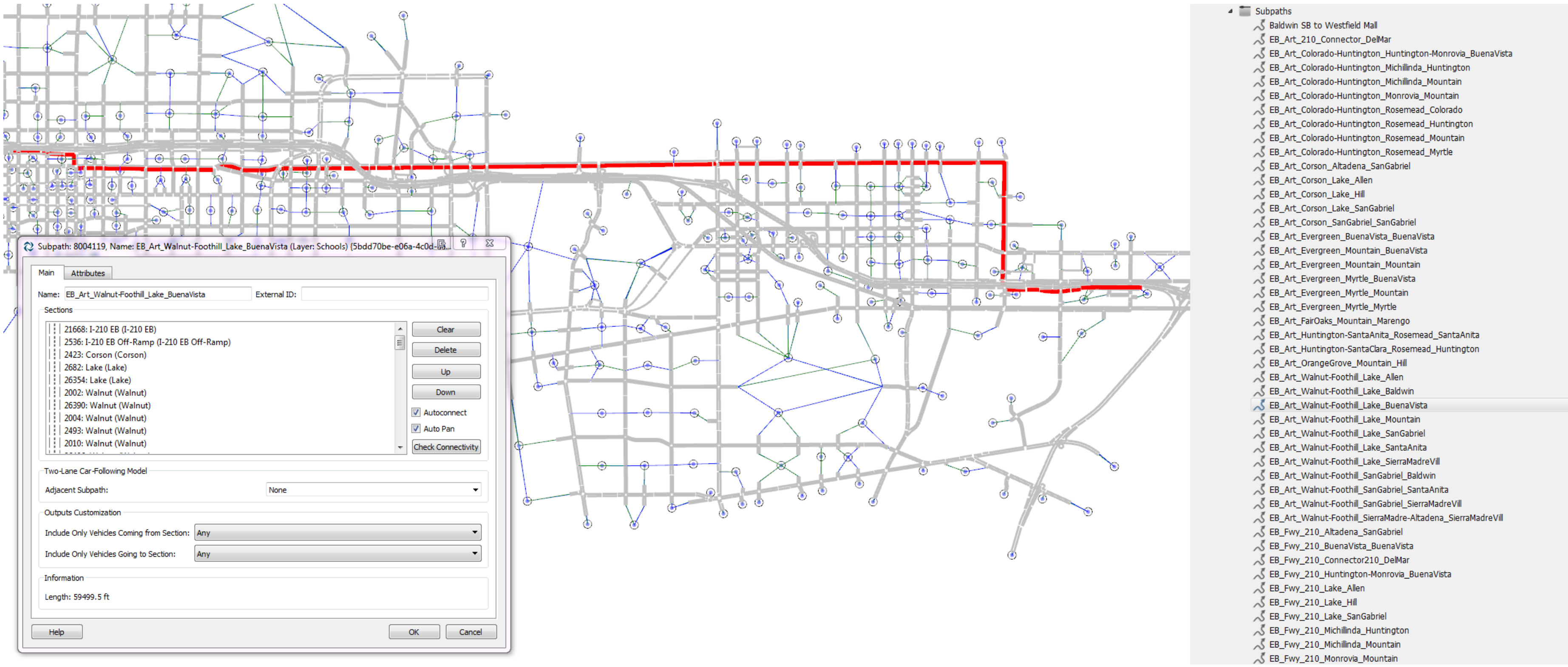


Reroutes entered into Aimsun and Rules

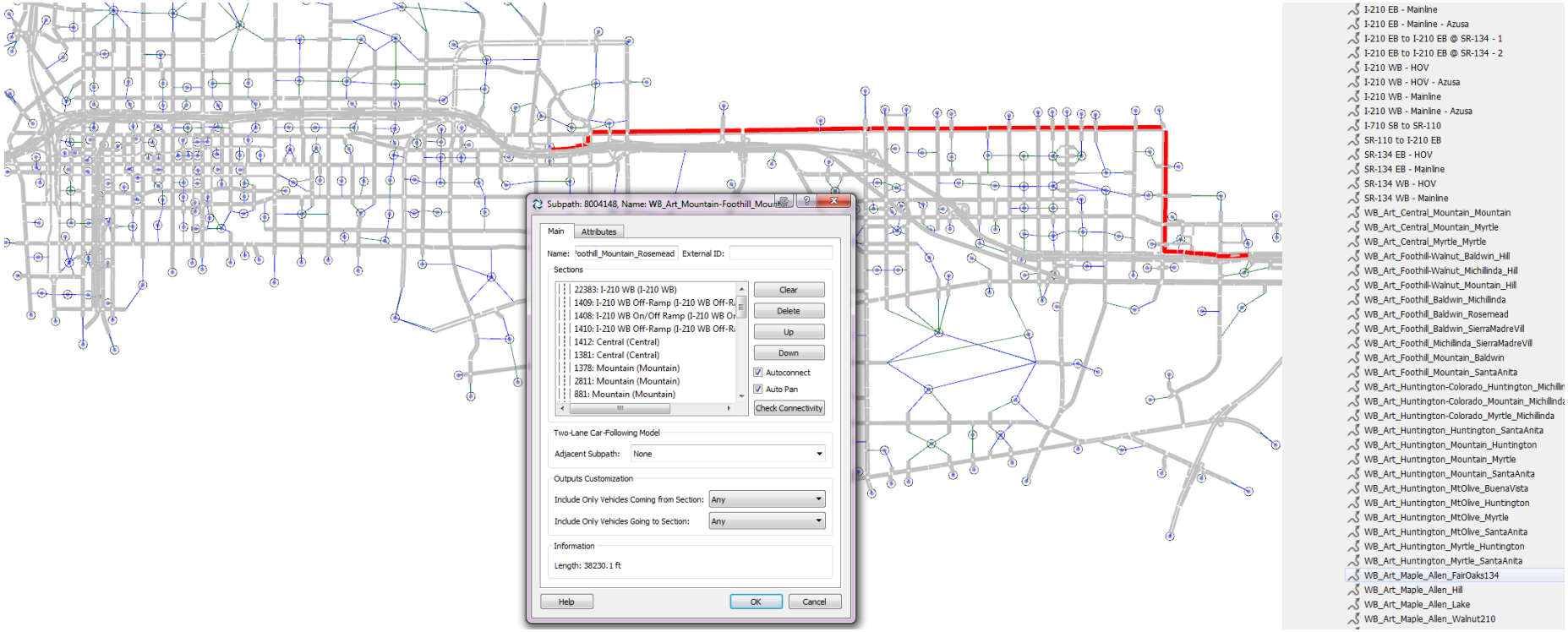
1	Foothill Detour Duarte I-210
2	Foothill Detour Duarte I-605
3	SR-110 to I-210 EB
4	I-710 SB to SR-110
5	I-210 EB to I-210 EB @ SR-134 - 2
6	Baldwin SB to Westfield Mall
7	I-210 EB to I-210 EB @ SR-134 - 1
8	I-210 EB - HOV
9	I-210 EB - Mainline
10	I-210 WB - HOV
11	I-210 WB - Mainline
12	I-210 EB - Mainline - Azusa
13	I-210 EB - HOV - Azusa
14	I-210 WB - HOV - Azusa
15	I-210 WB - Mainline - Azusa
16	SR-134 EB - HOV
17	SR-134 EB - Mainline
18	SR-134 WB - Mainline
19	SR-134 WB - HOV
20	EB_Art_FairOaks_Mountain_Marengo

139	WB_Fwy_210_MtOlive_Myrtle
140	WB_Fwy_210_MtOlive_SantaAnita
141	WB_Fwy_210_Myrtle_Huntington
142	WB_Fwy_210_Myrtle_SantaAnita
143	WB_Fwy_210-134_Allen_FairOaks134
144	WB_Fwy_210-134_Allen_FairOaks134
145	WB_Fwy_210_Allen_Lake
146	WB_Fwy_210_Allen_Walnut210
147	WB_Fwy_210-134_Hill_FairOaks134
148	WB_Fwy_210_Hill_Walnut210
149	WB_Fwy_210-134_Lake_FairOaks134
150	WB_Fwy_210_Lake_Walnut210
151	WB_Fwy_210-134_SanGabriel_FairOaks134
152	WB_Fwy_210_SanGabriel_Walnut210
153	WB_Fwy_210_Mountain_Rosemead
154	WB_Fwy_210l_Mountain_SierraMadreVill
155	WB_Fwy_210_Rosemead_Lake
156	WB_Fwy_210_SierraMadreVill_Lake
157	WB_Fwy_210_Michillinda_Altadena
158	WB_Fwy_210_SierraMadreVill_Altadena

EB_Art_Walnut-Foothill_Lake_BuenaVista



WB_Art_Mountain-Foothill_Mountain_Rosemead



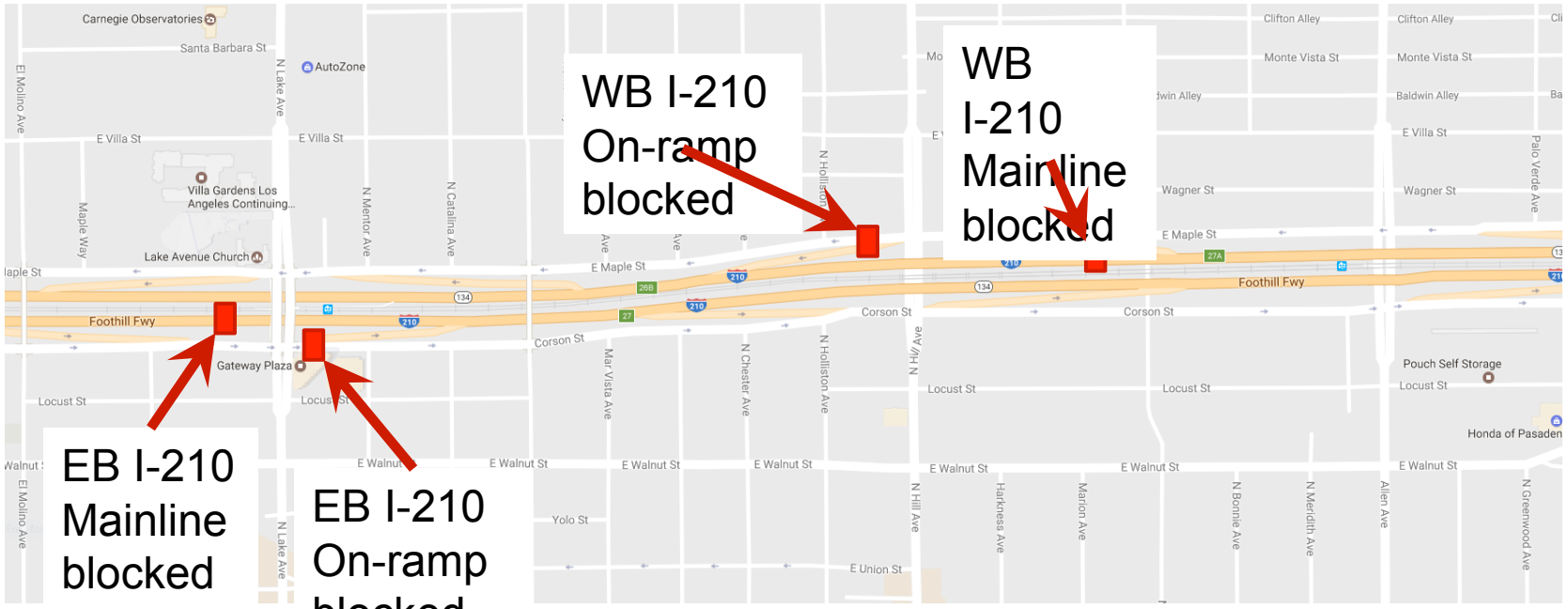
HISTORICAL INCIDENT EXAMPLES

First two noted by city of Pasadena during the meeting

Bomb Scare – AM Pasadena

- **December 7, 2016**
- **Location: EB HOV lane of I-210 at Lake Gold Line stop**
- **Start time:**
  - EB traffic stopped at Lake from 9:06 am
  - WB traffic stopped at Allen a short time later
- **End time: Lanes opened at 10:45 am**
- **Caltrans has supplied incident data**

Bomb Scare – AM Pasadena



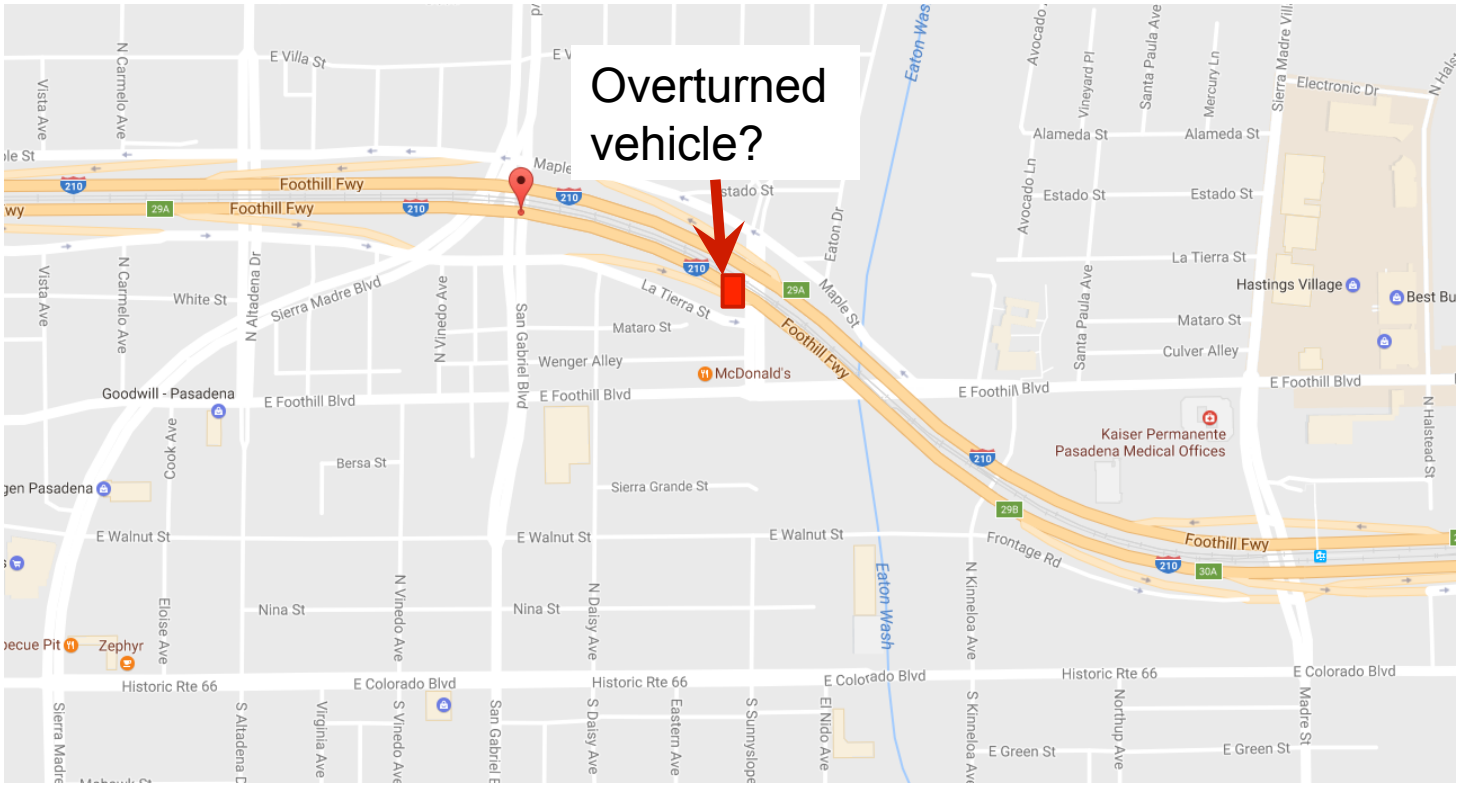
Was Corson also blocked?

Was Maple also blocked?

Big Rig Crash – AM Pasadena

- **December 22, 2016**
- **Location: EB side of I-210 near North San Gabriel Blvd**
  - Overturned SUV on Sierra Madre on-ramp to EB lanes
- **Start time: 4:52 am**
  - SigAlert issued at 5:12 am
  - Some lanes initially reopened
  - Three EB lanes blocked into the afternoon (carpool + 2 ML)
  - Eastbound traffic remained backed up to the 134 Freeway Thursday afternoon. Westbound traffic is slow all the way to Mountain Avenue in Duarte.
- **End time: ??**

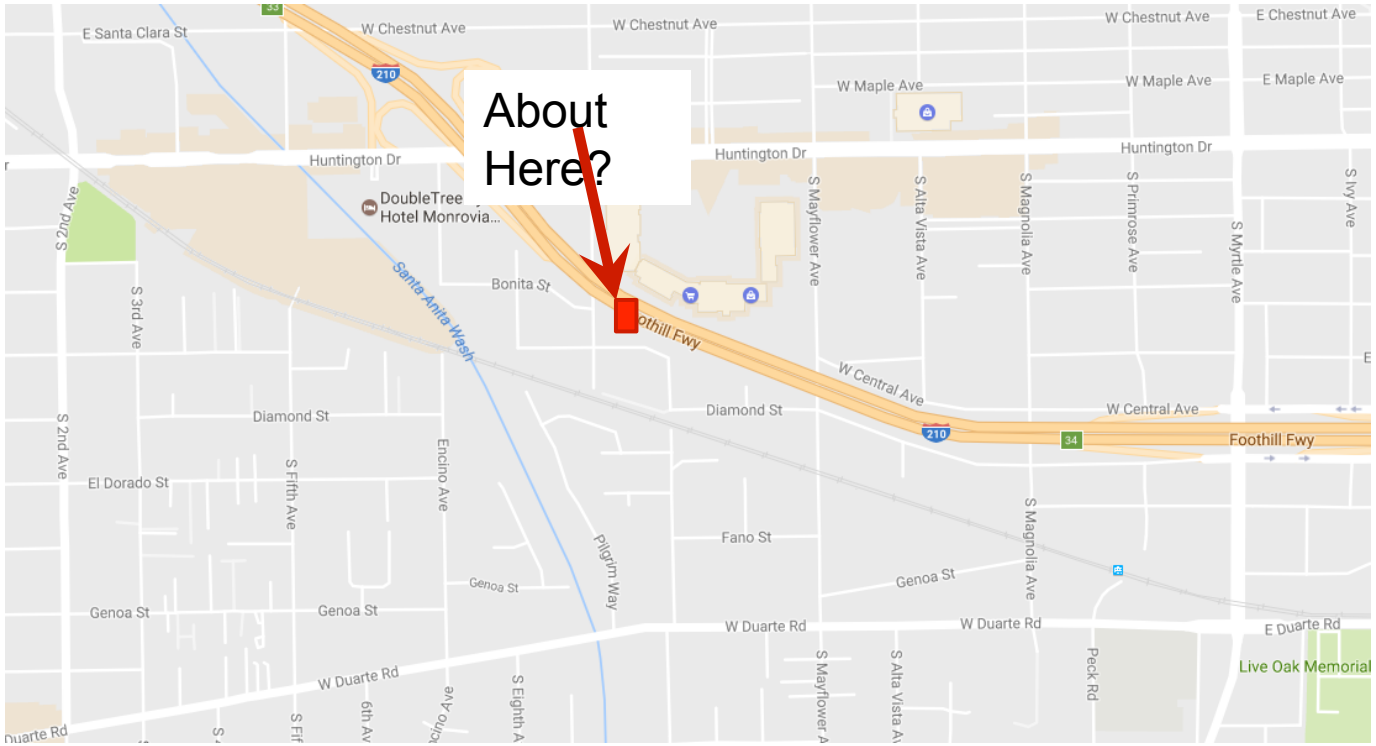
Big Rig Crash – AM Pasadena



Car Trapped – PM Monrovia

- **January 19, 2017**
- **Location: WB side of I-210**
  - 200 yards east of Huntington Dr
  - West of Myrtle
- **Start time: 3:36 pm**
  - Truck pulled away from car at 4:20 pm
- **End time:**

Car Trapped – PM Monrovia



Caltrans Metro SGVCOG Foothill Transit

Thank You
and
Next Meeting