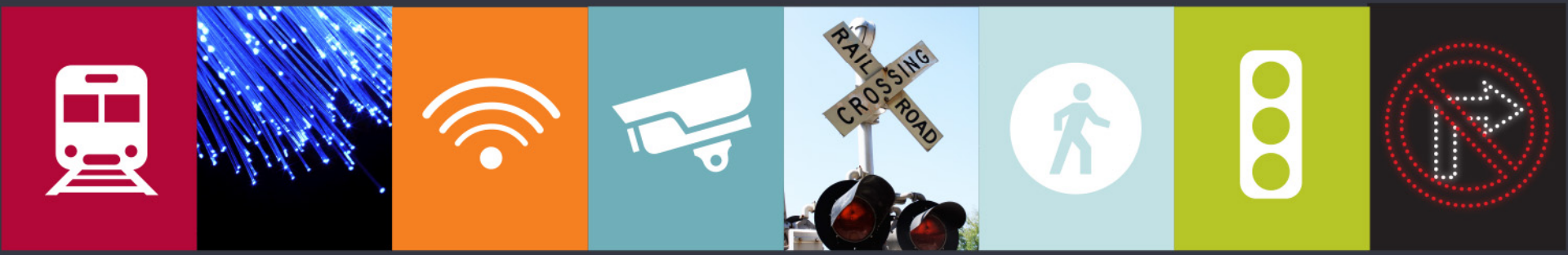

At-Grade Railroad Crossings

Lessons Learned on the Design and Operations of a New Commuter Rail System into Downtown San Rafael

May 17, 2017

Caltrans

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Expect More. Experience Better.

SONOMA-MARIN SMART AREA RAIL TRANSIT

Today's outline

- Background
  - Project Elements
  - Stakeholders
- Process
  - Design
  - Operations
  - Testing
- Lessons Learned

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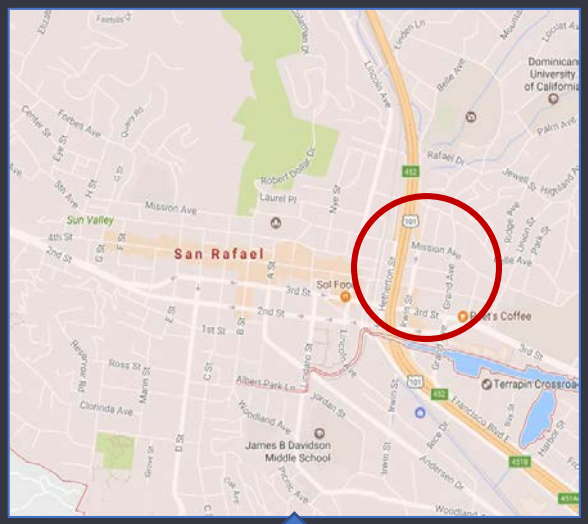
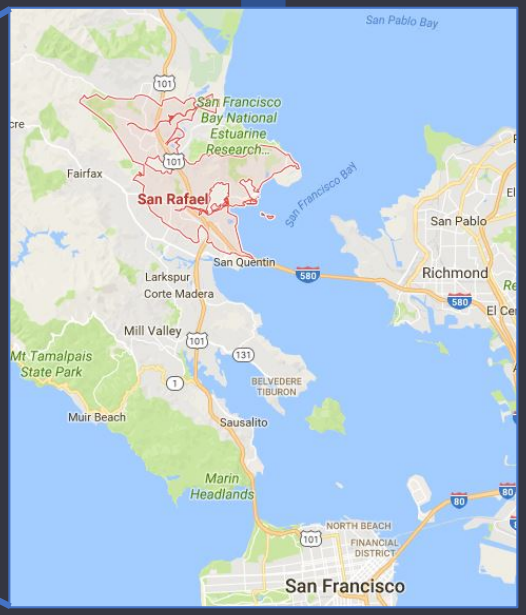
RAILROAD
CROSSING


SONOMA-MARIN
SMART
AREA RAIL TRANSIT
SMART PASSENGER RAIL & MULTIUSE PATH
Project Length: 70 Miles
SMART Stations
SMART Rail Phase 1
SMART Rail Phase 2
SMART Owned Railroad Right-of-Way
Urban Areas
MENDOCINO CO.
SONOMA CO.
Cloverdale
Cloverdale(planned)
Geyserville
Healdsburg
Healdsburg(planned)
Phase 2 - North
Windsor (planned)
Windsor
Guerneville
Sonoma County Airport
(Operations & Maintenance Facility)
Santa Rosa Guerneville Road
Santa Rosa - Railroad Square
Santa Rosa
Russian River
Sebastopol
Rohnert Park
Rohnert Park
Cotati
Cotati
Sonoma
Petaluma - North (planned)
Petaluma - Downtown
Petaluma
Bodega Bay
SONOMA CO.
MARIN CO.
Lombard
Phase 1
Novato - San Marin/Atherton
Novato
POINT REYES
Novato - Hamilton
DRAKE'S BAY
San Rafael - Marin Civic Center
San Rafael - Downtown
Larkspur Ferry(planned)
San Rafael
Larkspur
Mill Valley
Phase 2 - South
Bolinas
Tiburon
Sausalito
PACIFIC OCEAN
Oakland
San Francisco Bound Ferry Connection
San Francisco


San Rafael
Sun Valley
Mission Ave
Rafael Dr
Laurel Pl
Robert Dodge Dr
Dominican University of California
Terrapin Crossroads
James B Davidson Middle School
Albert Park Ln
Ross St
Cloninda Ave
Woodland Ave
Picnic Ave
Andersen Dr
Francisco Blvd E


San Pablo Bay
San Francisco Bay National Estuarine Research...
Fairfax
San Rafael
San Francisco Bay
San Pablo
Richmond
San Quentin
Larkspur
Corte Madera
Mill Valley
Mt Tamalpais State Park
BELVEDERE TIBURON
Muir Beach
Sausalito
Marin Headlands
NORTH BEACH
FINANCIAL DISTRICT
San Francisco

Project Background

- **Traffic Engineering**
  - VISSIM Analysis
  - Alternatives Analysis
  - Traffic Signal Timing/Preemption
- **Traffic Signal Modifications**
  - Controller & Cabinet Upgrades
  - Electrical Service Upgrades
  - Pedestrian Countdown retrofits
  - Railroad Preemption
- **Traveler Information**
  - DMS and CCTV cameras
- **Traffic Signal Interconnect**
  - Fiber optic and wireless interconnect
  - New traffic signal system
- **Civil Design**
  - Curb Ramps
  - Sidewalk Widening
  - Drainage Improvements
- **Environmental Services**
  - PES Form and APE Map
  - CEQA/NEPA Technical Studies
  - Extended Phase I
  - Local Assistance Coordination
  - CEQA/NEPA Approvals
- **Approvals/Permits**
  - Caltrans Encroachment Permit
  - CPUC GO 88-B (two sets)

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Mission City of Marin
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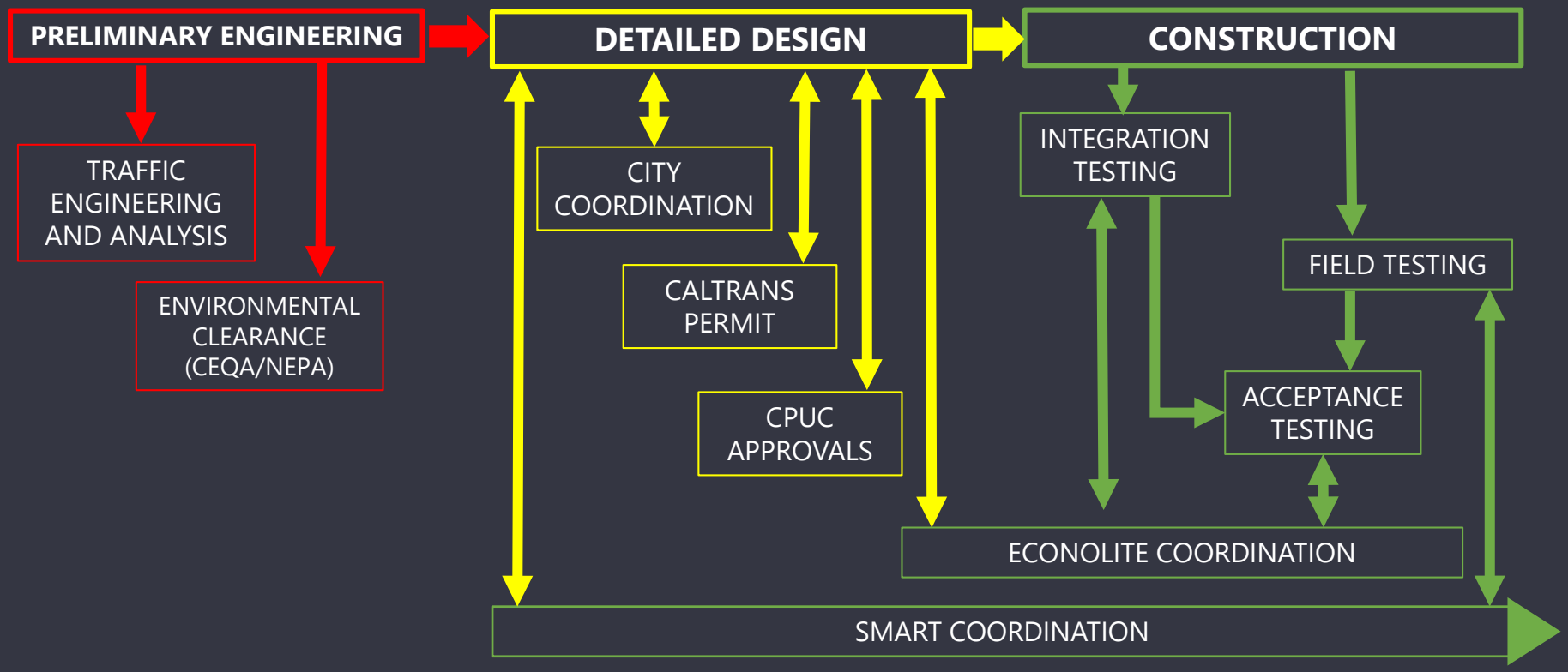
Process



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Project Elements

- 17 traffic signals (11 City, 6 Caltrans)
- 3 queue cutter signals
- Fiber optic and copper interconnect
- Wireless backhaul (with repeater site)
- Econolite Centracs System
- Econolite Cobalt controllers
- Econolite Type OL cabinets
- 7 CCTV cameras
- 4 DMS

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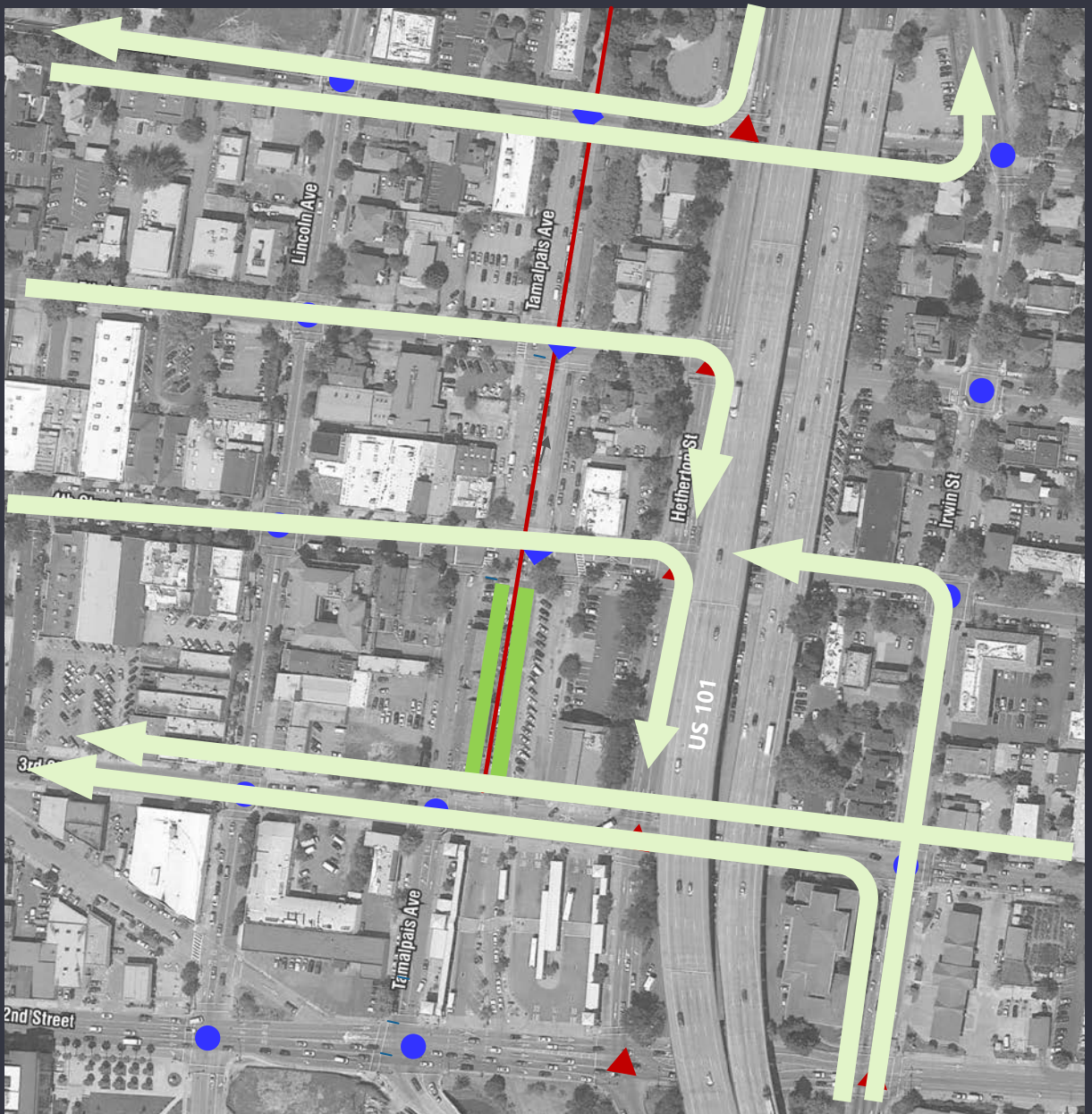
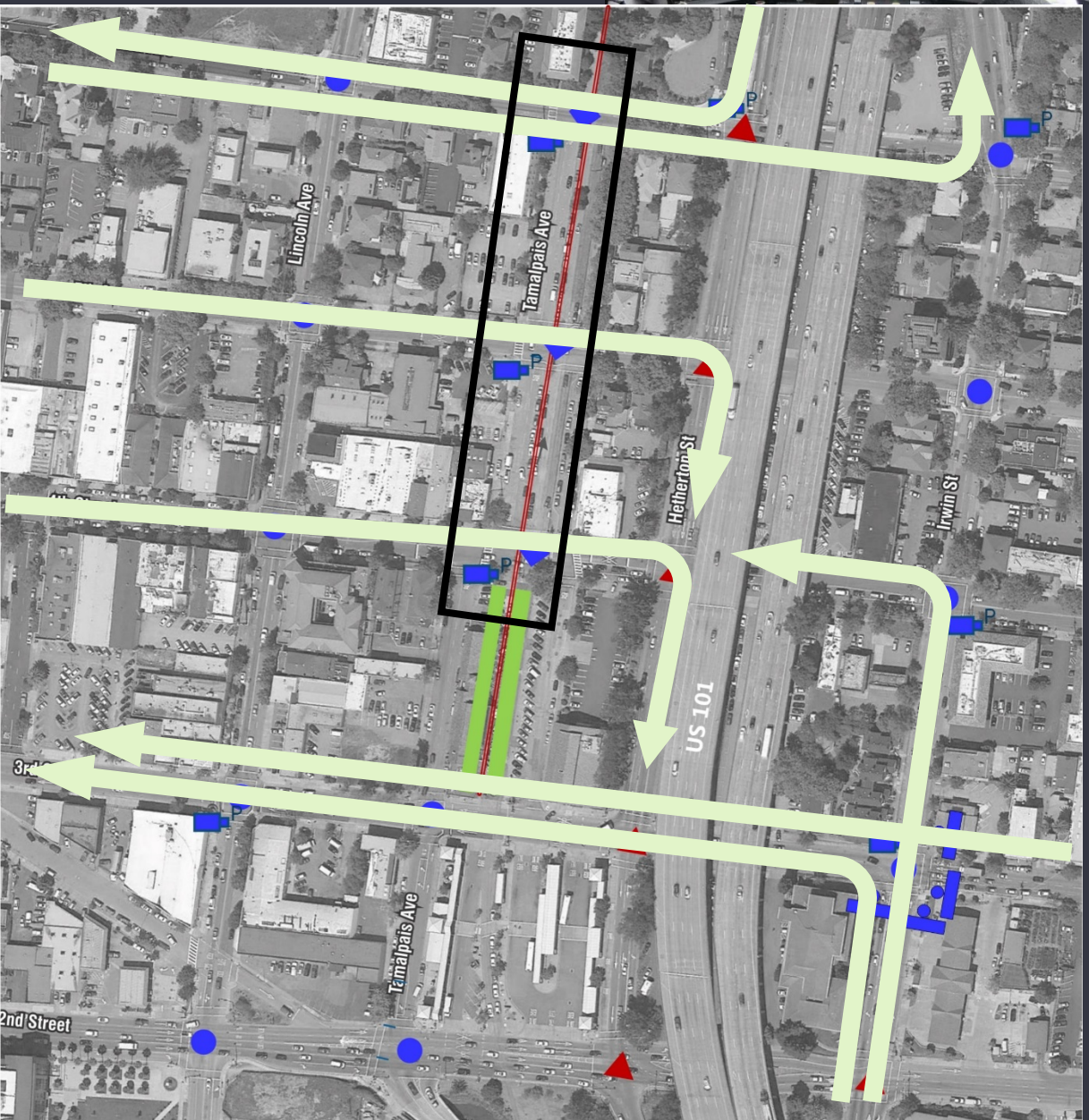


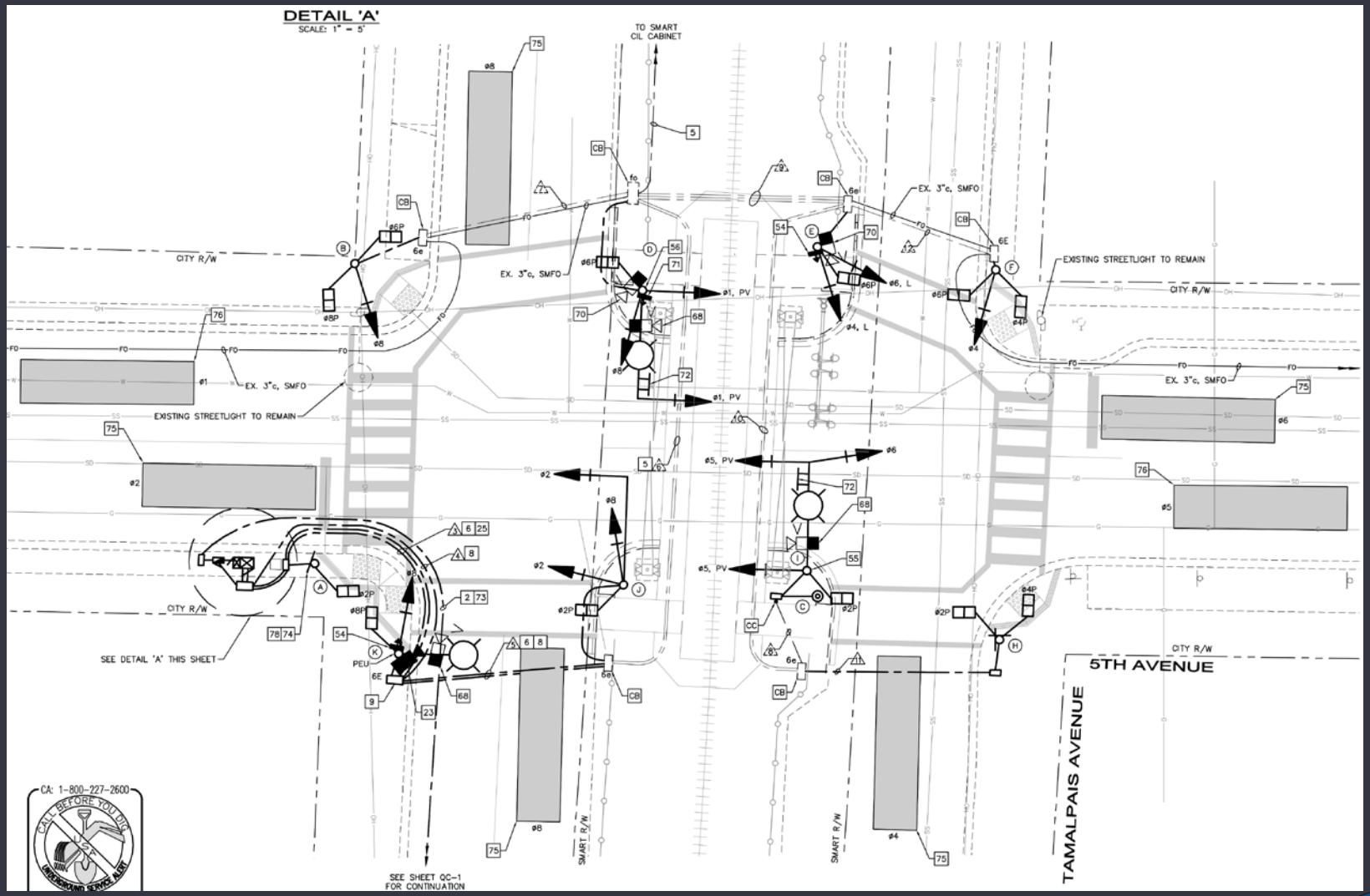
- Existing City signal
- New City signal – Queue Cutter
- Existing Caltrans signal (operated by City)



- Existing City signal
- New City signal – Queue Cutter
- Existing Caltrans signal (operated by City)
- P CCTV Camera
- Dynamic Message Sign

Queue Cutter Design Issues

- Pole placement – conflicts with railroad signals
- Near side head placement
- Trees/Foliage
- Closely spaced signals
- Utilize peer-to-peer communications for preemption
- Video detection for queue cutting – use loops instead



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Queue Cutting

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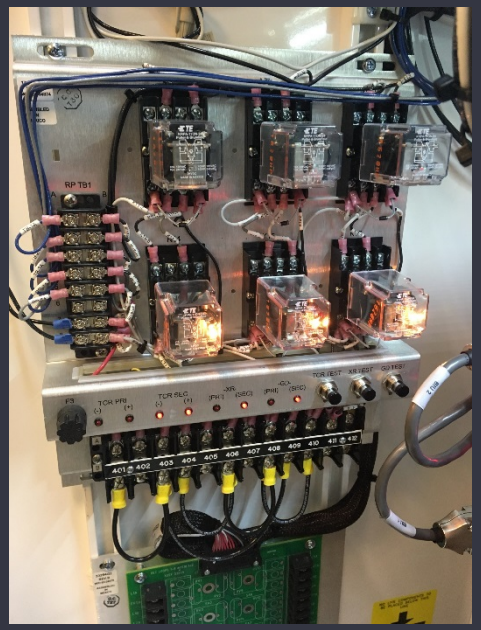
Railroad Preemption

- Quad gates (for quiet zone)
- 12-wire interconnect for queue cutters
- Four circuits total:
  - Advanced preemption
  - Simultaneous preemption
  - Gate Down (cancels track clearance)
  - Health circuit
- Preempt circuits are supervised
- Peer-to-Peer for preempt calls to adjacent signals (controller logic)



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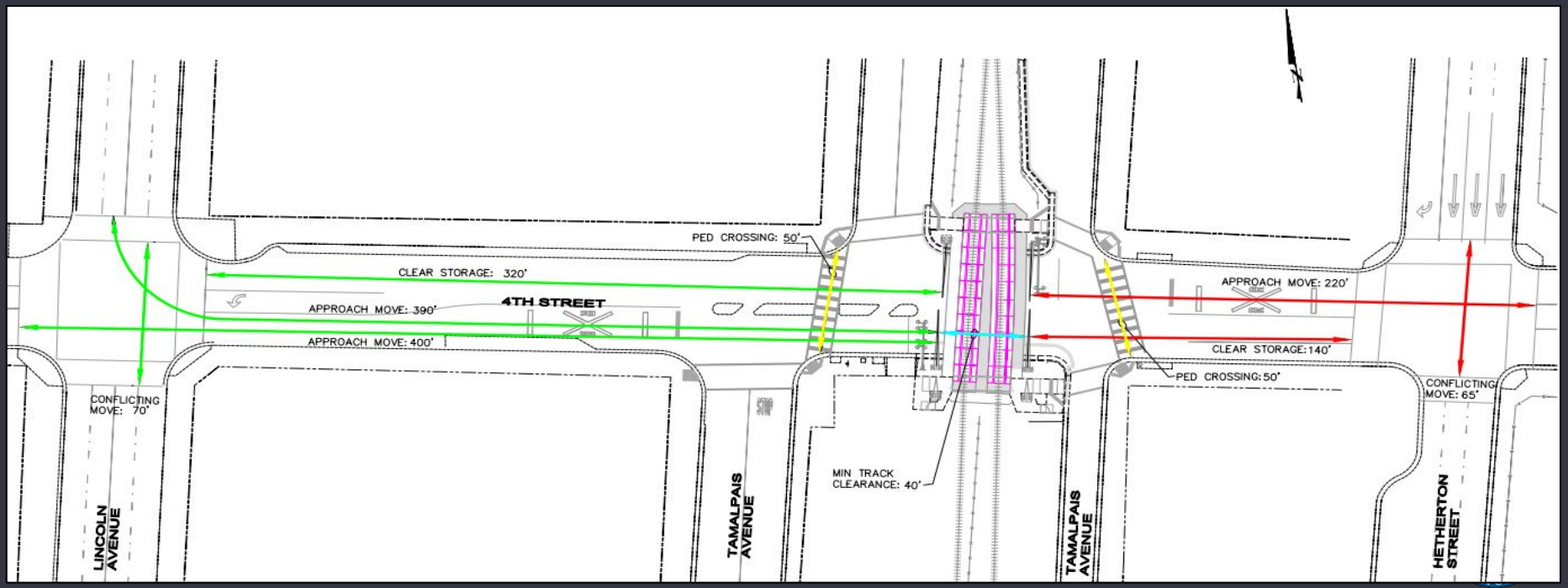
CPUC Approval

- Preemption calculations (LADOT method)
- Nine different sets of calculations
- CPUC required the most stringent values
- Field and office review meetings
- Two sets of GO 88-B applications – SMART and City



Communications System Design Issues

- Fiber optic to wireless backhaul
- Radio repeater installations
- Fiber to copper interfaces
- All IP network
- Testbed

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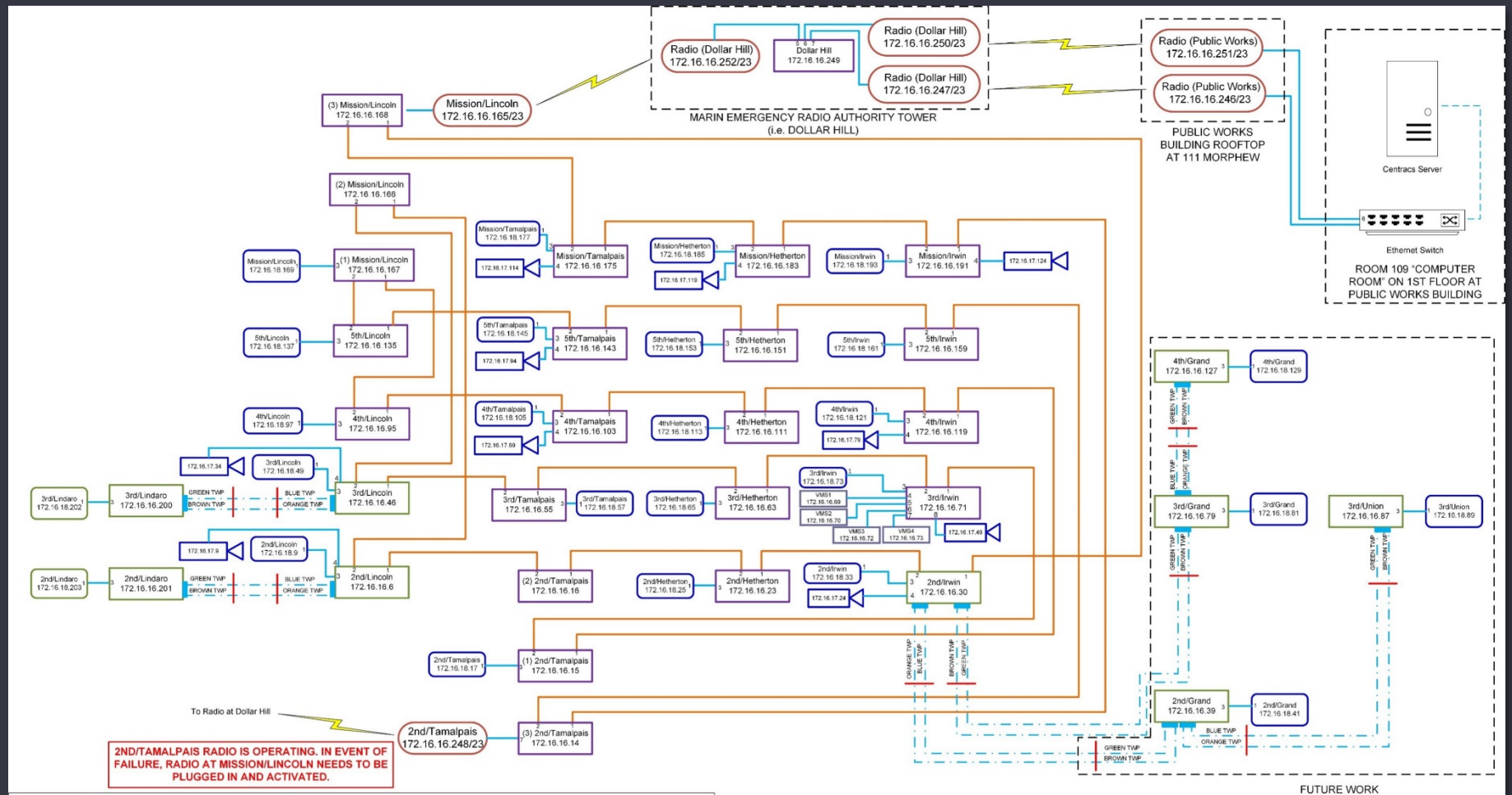


LEGEND:

Mission/Lincoln 172.16.16.168	ACTELIS SWITCH (ML6800F)
2nd/Lindaro 172.16.16.30	ACTELIS VDSL (ML684D)
Radio 172.16.16.165	INTUICOM RADIO
Mission/Lincoln 172.16.18.169	ECONOLITE COBALT CONTROLLER
2nd/Lindaro 172.16.18.203	ECONOLITE ASC/3 CONTROLLER
	NETWORK CABLE (CAT 6, RJ-45 CONNECTORS)
	FIBER OPTIC CABLE
	SIGNAL INTERCONNECT (RJ-45 CONNECTORS ON ONE END)
2	ETHERNET PORT NUMBER
	TERMINATION BLOCK
172.16.17.9	CCTV (PTZ) CAMERA
VMS3 172.16.16.72	VARIABLE MESSAGE SIGN

NOTES:

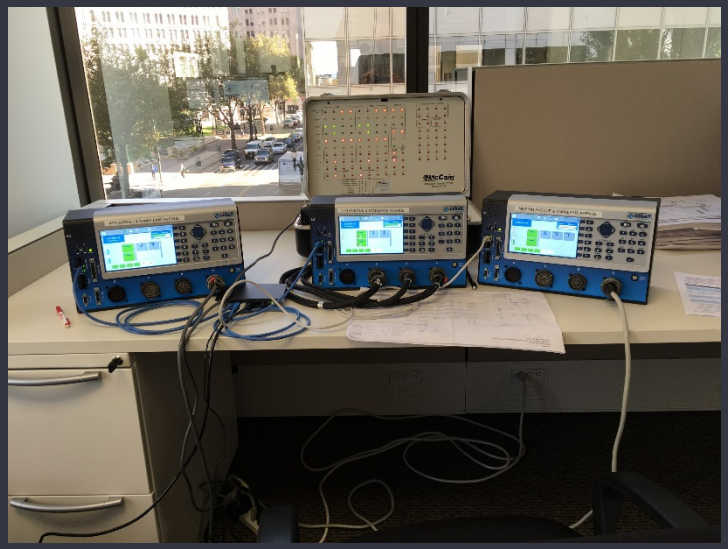
1. FIBER OPTIC AND TRAFFIC SIGNAL EQUIPMENT SHOWN ON THIS PLAN WAS INSTALLED AS PART OF THE REGIONAL TRANSPORTATION SYSTEM ENHANCEMENTS PROJECT, CITY FILE #18.01.76. WITH THE EXCEPTION OF THE EQUIPMENT ON DOLLAR HILL, WHICH WAS INSTALLED AS PART OF THE MARIN EMERGENCY RADIO AUTHORITY (MERA) TOWER RETROFIT PROJECT, CITY FILE #18.14.06.

2. FOR THE DAKTRONIC VARIABLE MESSAGE BOARDS AT 3RD/IRWIN, THE FIRMWARE IS DD1425608 VERSION 3.11.4.

CITY OF SAN RAFAEL
REGIONAL TRANSPORTATION SYSTEM ENHANCEMENTS
NETWORK DIAGRAM
3/16/2017

Bench Testing

- All controllers, switches and radios
- Central-to-Field
- Peer-to-Peer
- Redundancy/Failover



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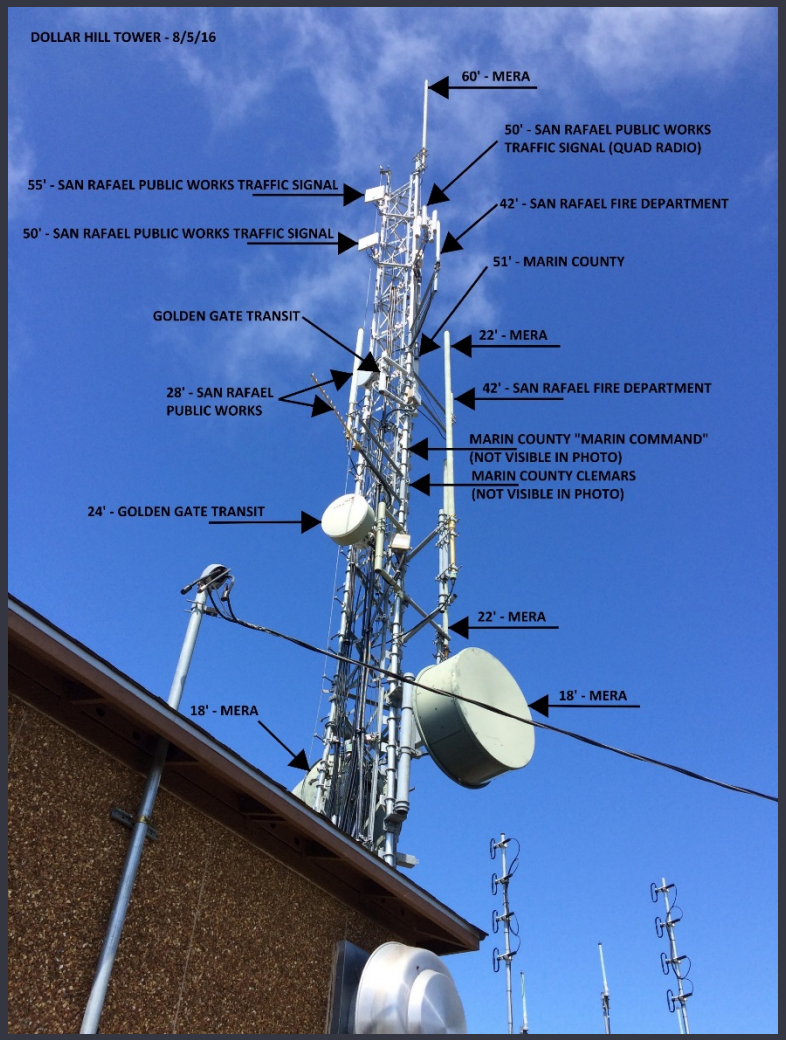

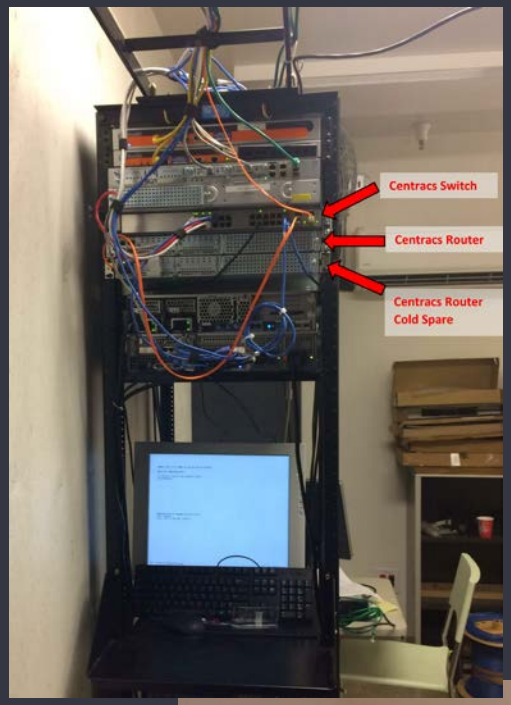

Phase I - Traffic Signal Fiber Optic Communication System and Centracs Advanced Traffic Management System Software Installation

SAN RAFAEL
THE CITY WITH A MISSION

May 2017

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Lessons Learned

- Determine what permits, agreement and approvals will be required from the beginning - Caltrans, CPUC, railroad operator, etc.
- Streamline the procurement and minimize the number of contracts if possible
- Plan out the entire system – communications, traffic signals, preemption (operations and circuits), service
- Conduct bench testing of the controllers and cabinets with the preemption circuits – don’t want to be re-wiring in the field
- Plan up front to be behind. Delays are typical - environmental clearance, construction, approvals, testing and re-testing

Lessons Learned

- Determine sharing of infrastructure early in the process – conduits, railroad cantilevers
- Work very closely with regulatory agencies like CPUC. Meet with them in person if need be
- Be prepared to conduct a lot of testing during several different stages
- Pay attention to stage construction – night construction, business impacts
- Use proven technologies
- Document, document, document!

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Thank You!

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