ARTESIA GREAT BOULEVARD

JASON STACK, TE, PTOE
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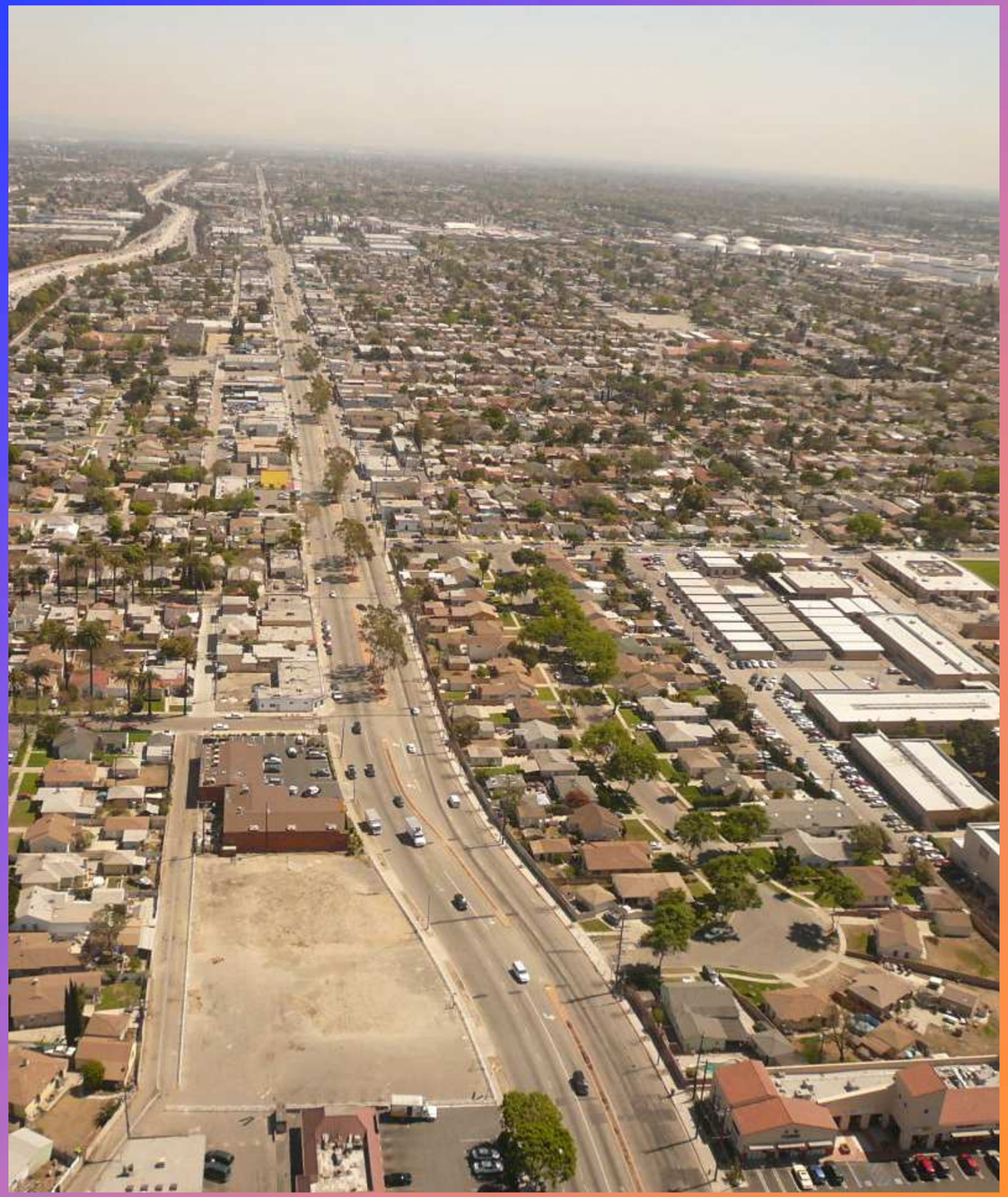
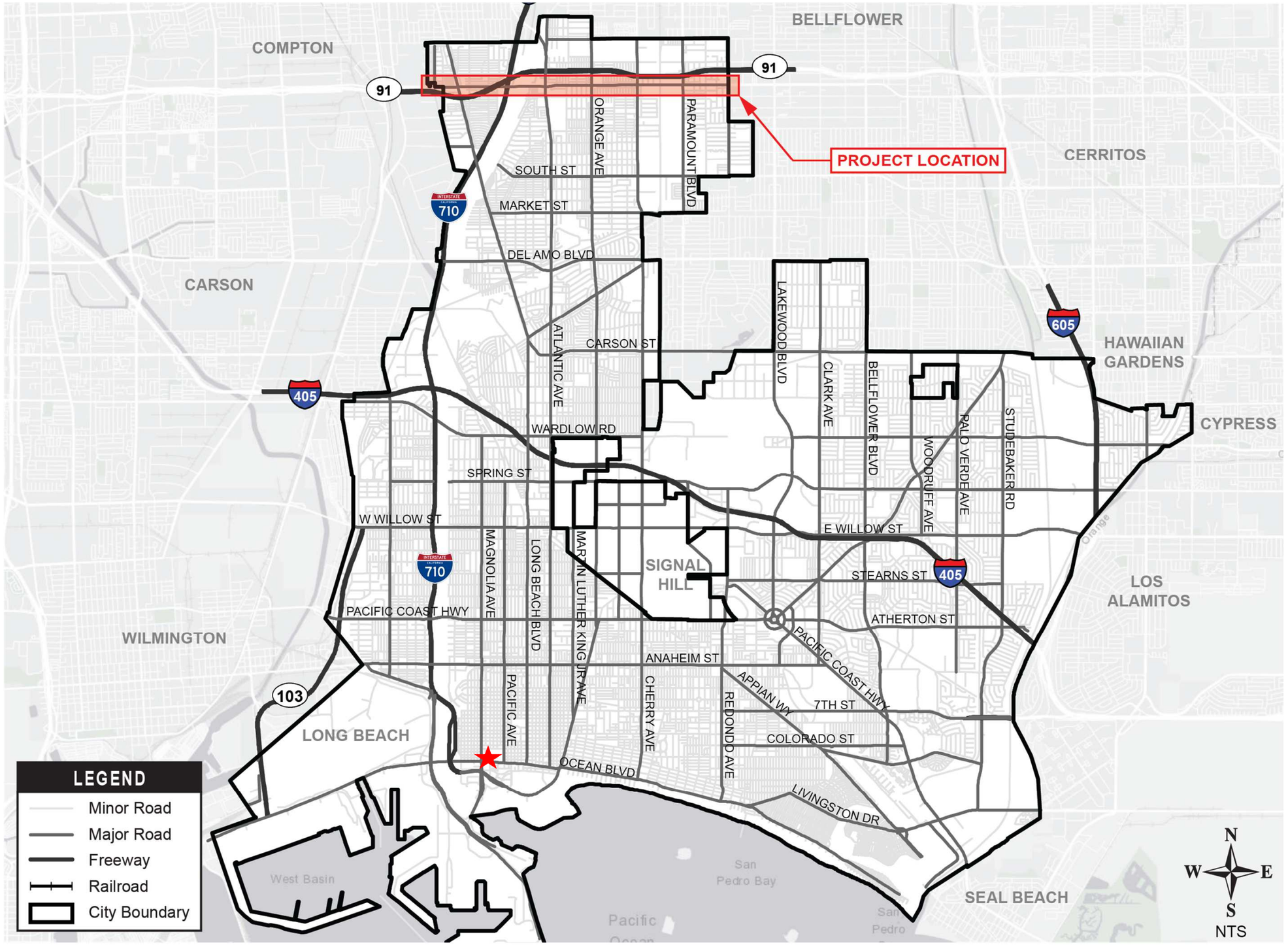


PROJECT INTRODUCTION

- Multimodal improvements on Artesia Boulevard in City of Long Beach between Harbor Ave and Downey Ave (approx. 3.25 miles). Blending of streetscape with active transportation, transit, and ITS to deliver a complete corridor.

“Everything and the kitchen sink.”

PROJECT LOCATION



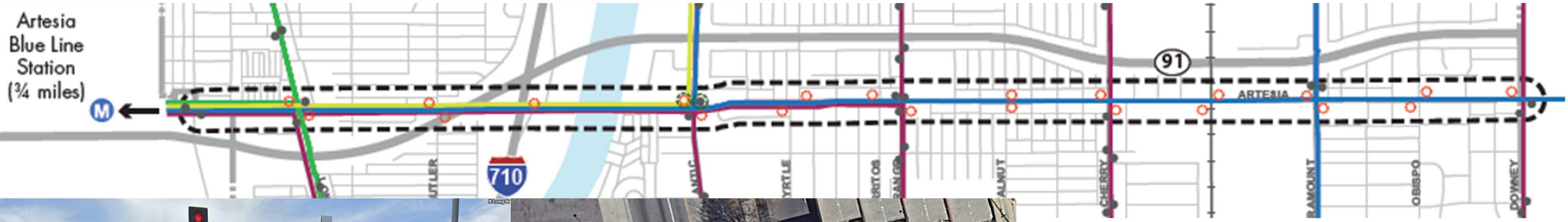
PROJECT NEED

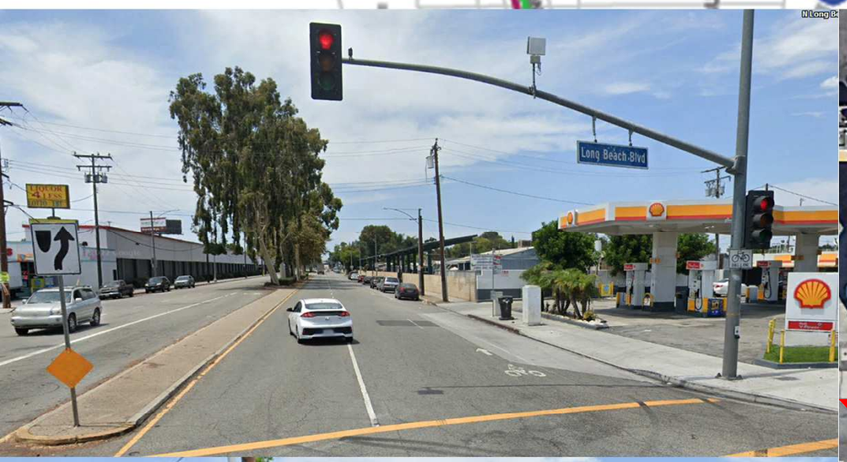
- Traditional urban primary arterial – built to serve cars
- No major improvements, routine maintenance and spot improvements over time (intersection widening and Class II bike lanes)
- Land uses, primarily high density residential and frontage commercial zone with industrial by Paramount Blvd and UPRR tracks
- Schools adjacent to corridor
- Safety issues identified with the community, unfriendly to bicycles, pedestrians, and transit

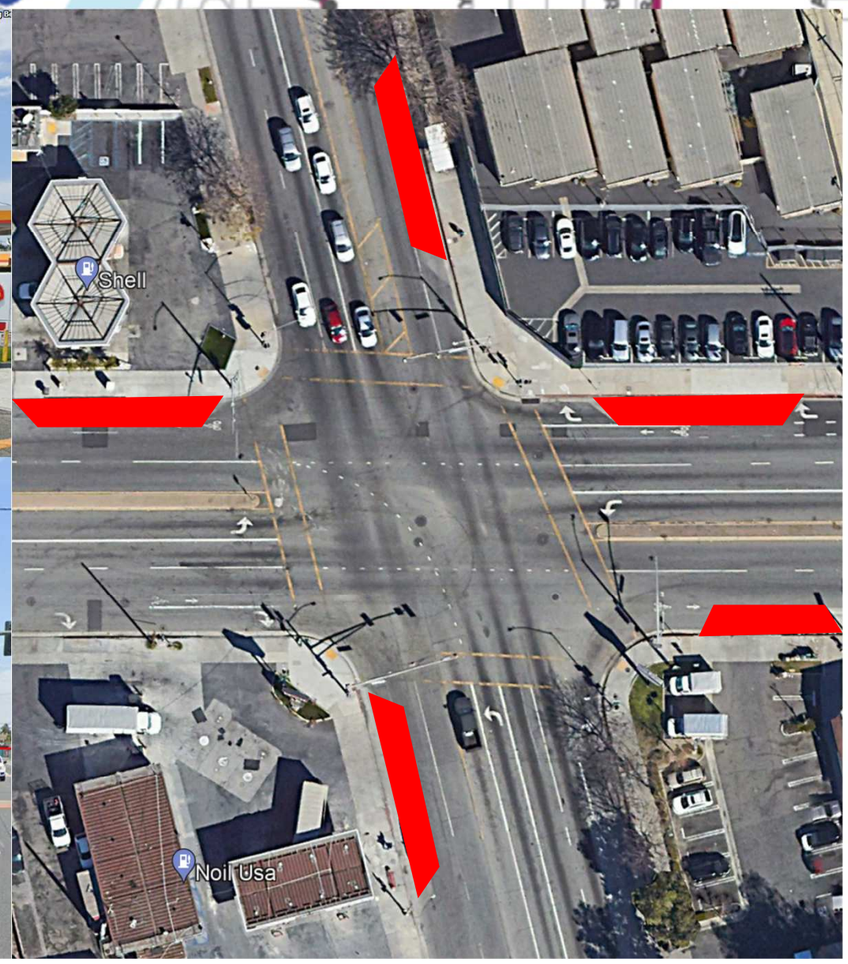
BIKE NETWORK

- Bike facility gaps
- Class II & IV
- Crossing Bike Routes

TRANSIT NETWORK



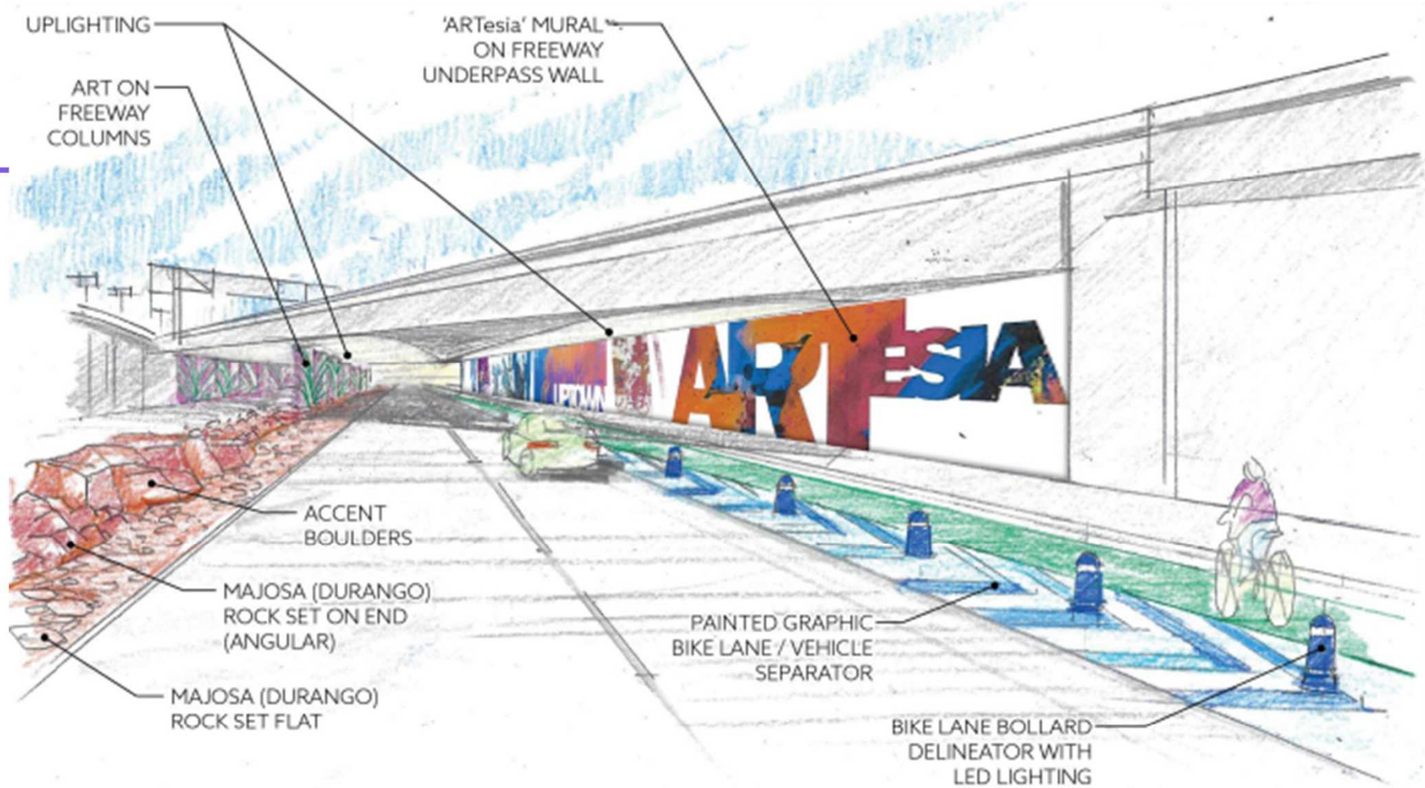


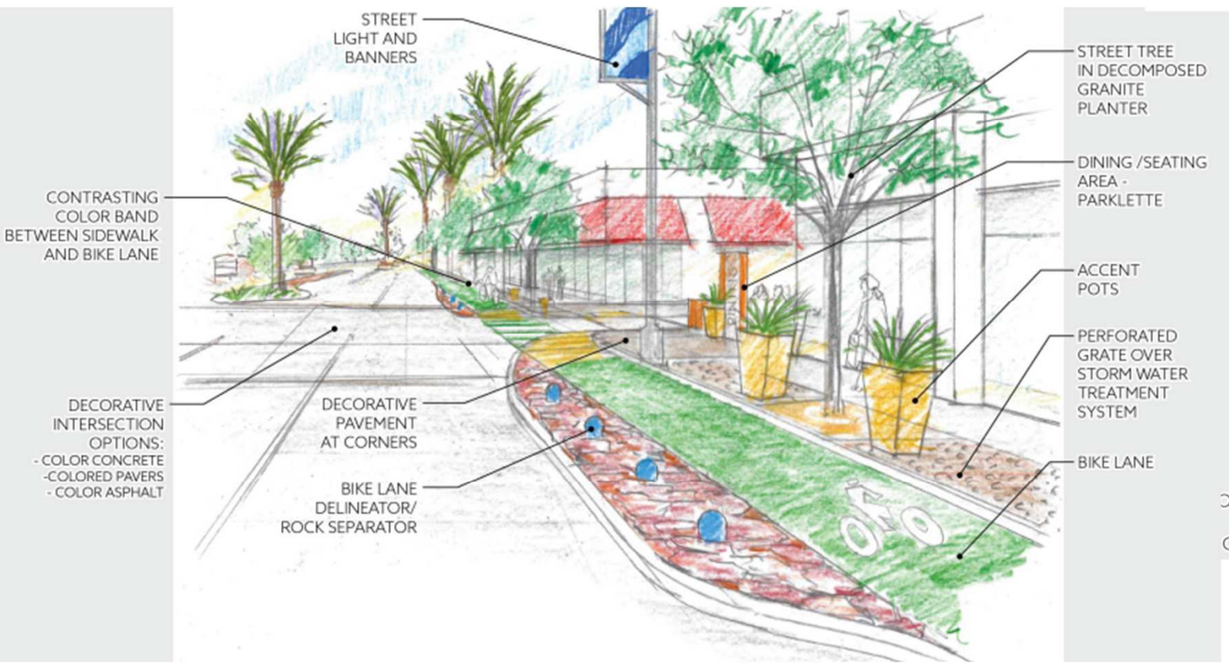


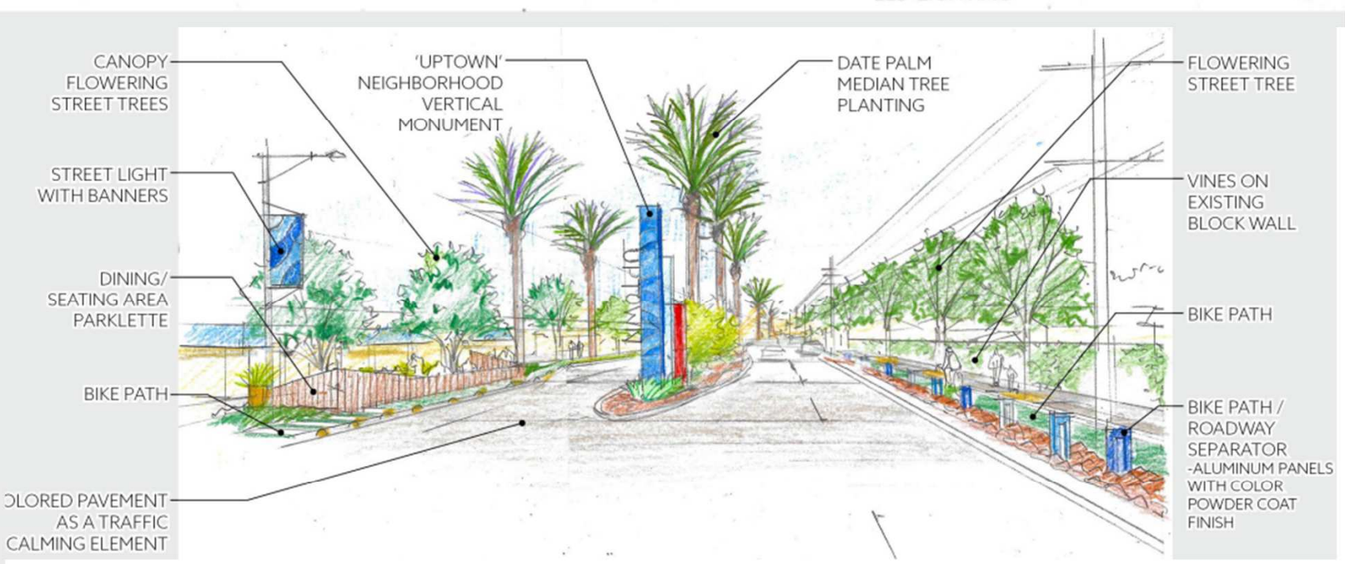
- Artesia 4 Bus Lines
  - Metro BRT
  - Metro to Downtown LA
  - Metro local Long Beach
  - Long Beach Transit Local

PROJECT GOALS

- Improve safety (all users/ modes)
- Improve multimodal mobility and access
  - Promote transit
  - Promote active transportation
- Economic development and revitalization
- More attractive and livable







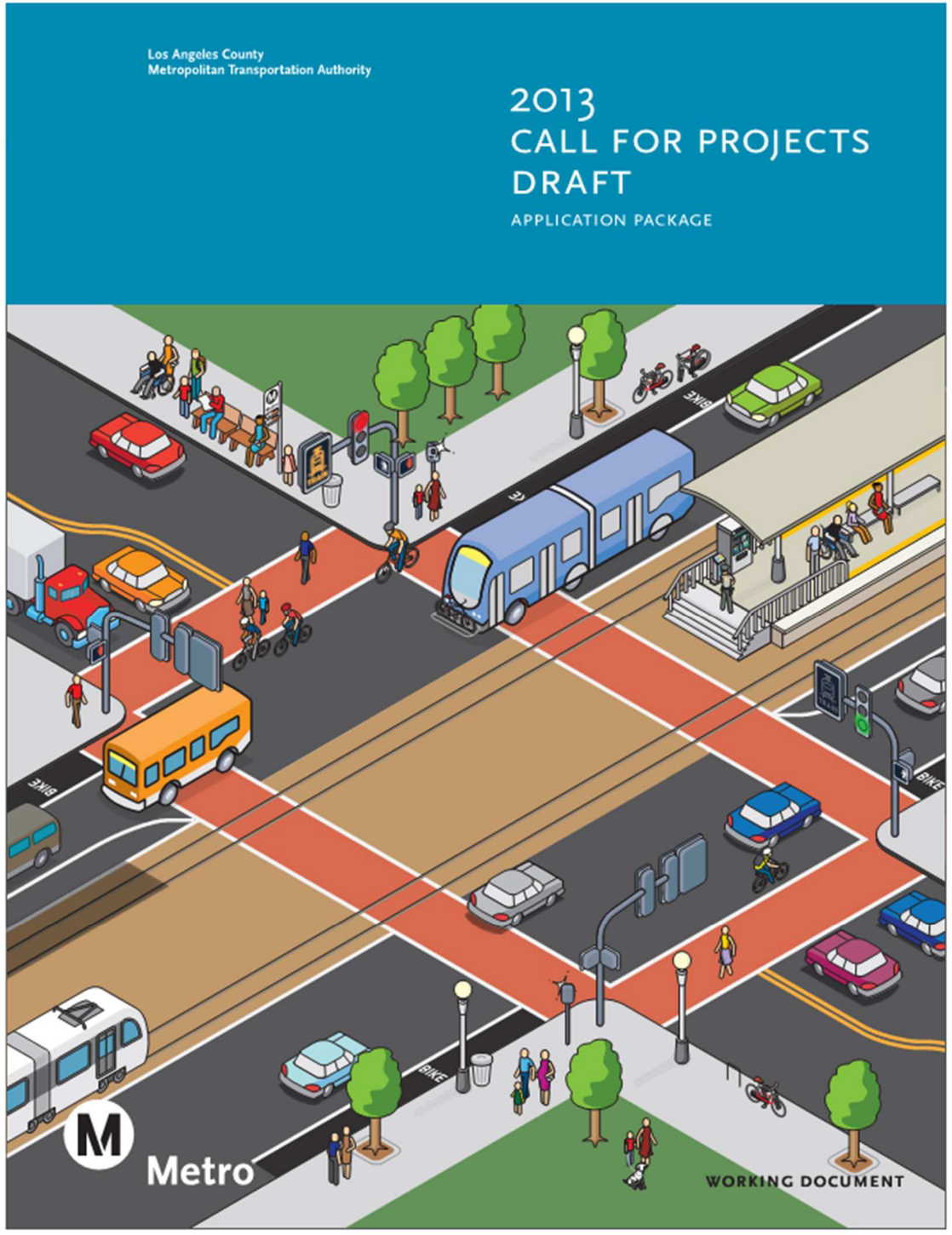
PROJECT FUNDING

- Metro Call for Projects
  - Artesia Corridor ATCS Signal Enhancements (Metro CFP 2013)
  - Artesia Great Boulevard (Metro CFP 2015) – Street lighting, Pedestrian-Transit Improvements, Street Furniture, and Landscaping

- Measure R – Regional sales tax for LA County transportation project acceleration

- Measure A – Local sales tax for infrastructure investments

- **Total funding = $36M**



DESIGN TEAM

Owner

Civil Lead (Prime)

Jason Stack, TE, PTOE
Principal

Traffic Engineering & ITS Lead

Planning & Outreach Lead

Christian Lambarth, PE, TE, PTOE

Project Manager

IMPROVEMENT ELEMENTS

Roadway Improvements

Landscape/ Irrigation Improvements

Class IV Bikeway (Median Separated)

Bioretention Planters

Bus Stop Improvements (Islands and Shelters)

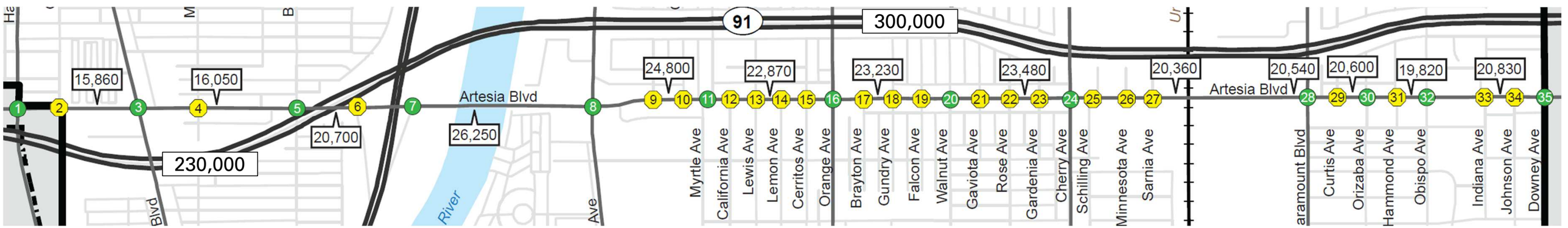
Traffic Signal/ ITS Improvements

Curb Extensions

Street Furniture/ Public Art

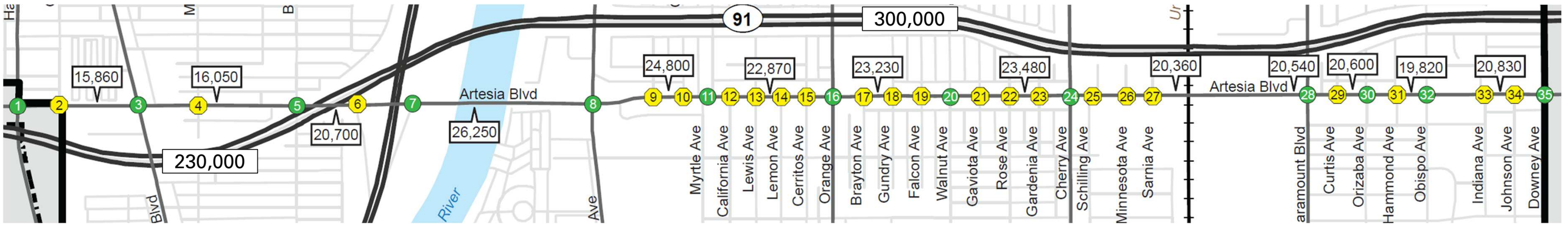
CONCEPT VALIDATION

- Most critical part of the early engineering phase was concept validation
- Traffic Operations Analysis required
- Critical for consensus (owner, third party, public, design team)
  - Advanced bike facility design concepts
- Corridor Stats
  - 13 signalized and 22 unsignalized (two-way stop)
- Big challenge with median openings
- Too many closely spaced openings
- Closures needed to improve safety and operation



TRAFFIC OPERATIONS ANALYSIS

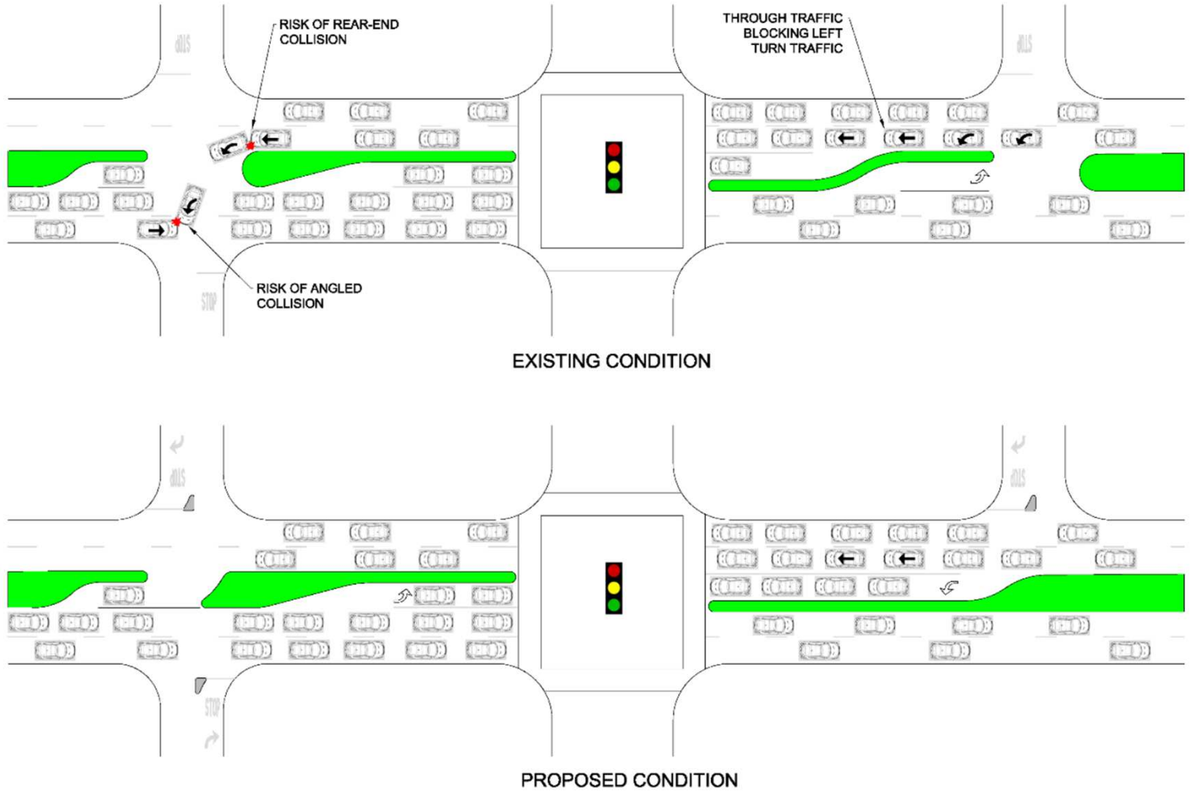
- No standard study guidelines for these specific improvements
- COVID conditions data collection
  - Complete corridor count during shutdown
  - Recount intersections near schools after back in session
  - Adjusted to pre-COVID conditions using a growth factor derived from historical and current counts – followed ITE “What a Transportation Professional Needs to Know about Counts and Studies during a Pandemic“. (0.65%)
- Existing (2021), project year (2026) and horizon year (2031) [no-build and build]
  - Chasing volumes around access closures.
- Analysis included delay, LOS, queue, travel time and speed, warrants (signal and phase), safety



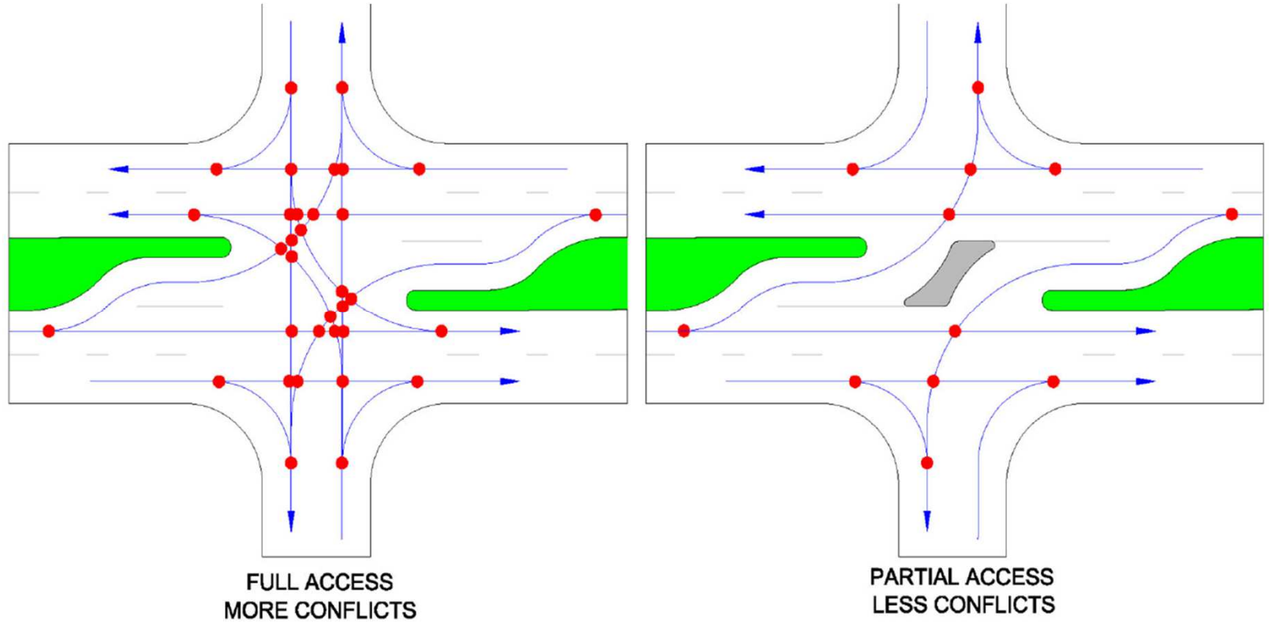
MEDIAN CLOSURE CRITERIA

Safety and Operations

Openings Near Signals



Full vs Partial Access Conflict Points



MEDIAN CLOSURE CRITERIA

No.	Criteria	Full	Partial
1	A left turn lane on Artesia Boulevard exists on one approach only.	X	X
2	Opening is located too close to a signalized intersection.	X	-
3	High crash history.	X	X
4	Low volume turning from or into the side street.	X	X
5	Rerouted traffic has no adverse effect on the adjacent intersection.	X	X
6	Opportunity to extend left turn pocket at adjacent signalized intersection.	X	-

CHASING THE VOLUMES

- Four corridor alternatives
  - Limited: few closures mostly near signals
  - Moderate: one full access midblock only
  - Restricted: partial median closures and few full
  - All: No unsignalized openings

- Traffic Reroutes

FINAL CONCEPT

Medians

- 11 full closures
- 7 partial access
- 3 partial access with new pedestrian traffic signals
- 1 new full traffic signal

10 U-Turn Restrictions

- Wherever there are bulb-outs (Class 4 median island buffer)
- Impacts evaluated based on volume, destination, alternate route

Traffic Signal Phasing

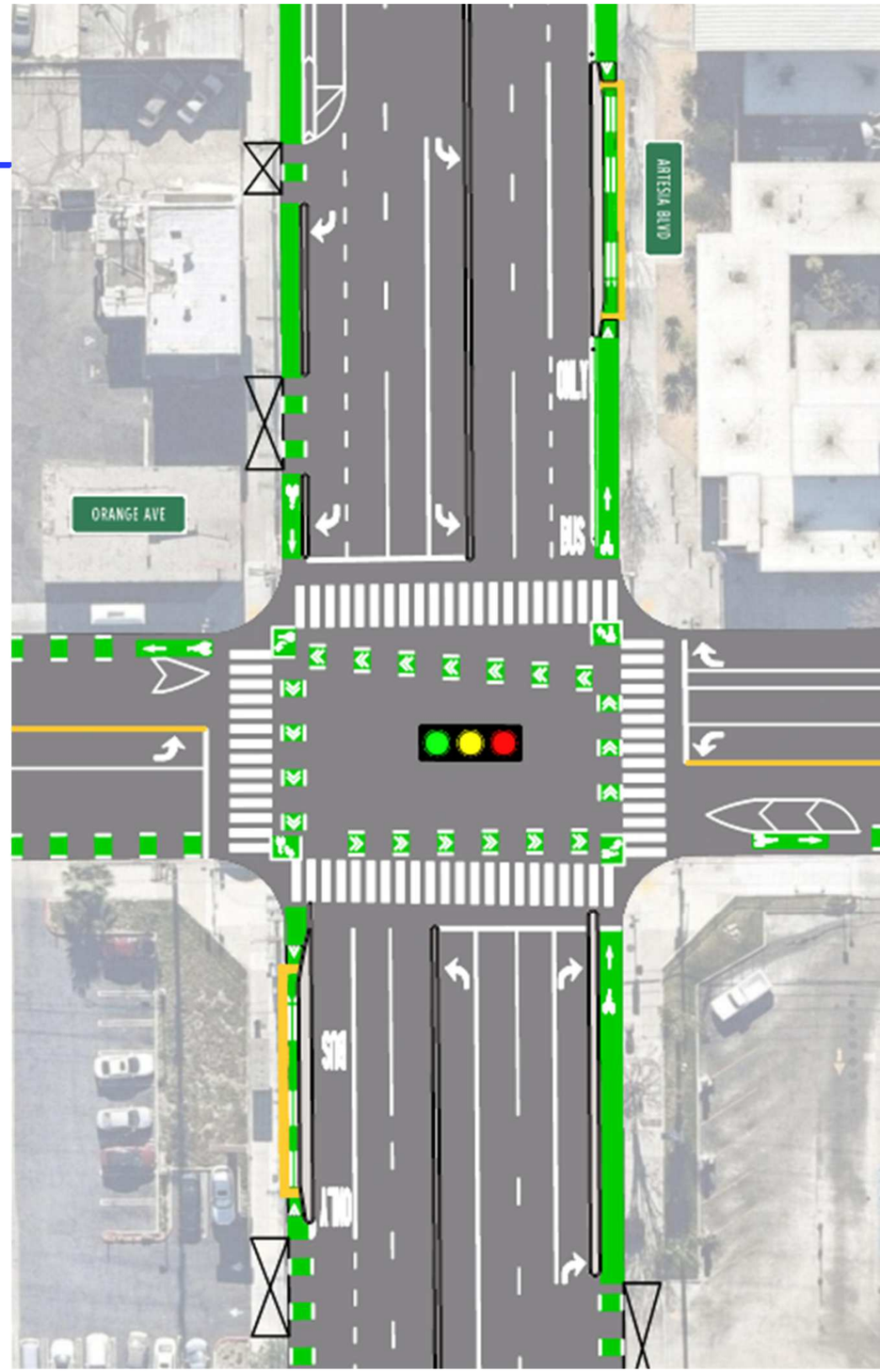
- 6 permissive phasing to PPLT FYA phased signals
- 1 permissive phase to protected
- 7 new right turn overlaps
- FY RTA at Right Turn Lanes

Lane Modifications

- 37 Right-turn movements (dedicated and de-facto) removed (island buffer)
- 1 right turn pocket extension
- 14 left turn pocket extensions
- 2 second left turn pockets (dual lefts)

Performance Analysis Results:

- Existing travel time is 9 to 10 minutes and average speed 20 to 22 MPH
- Horizon Year without 9 to 12 minutes and average speed 19 to 21 MPH
- Horizon Year with 10 to 12 minutes and average speed 18 to 20 MPH

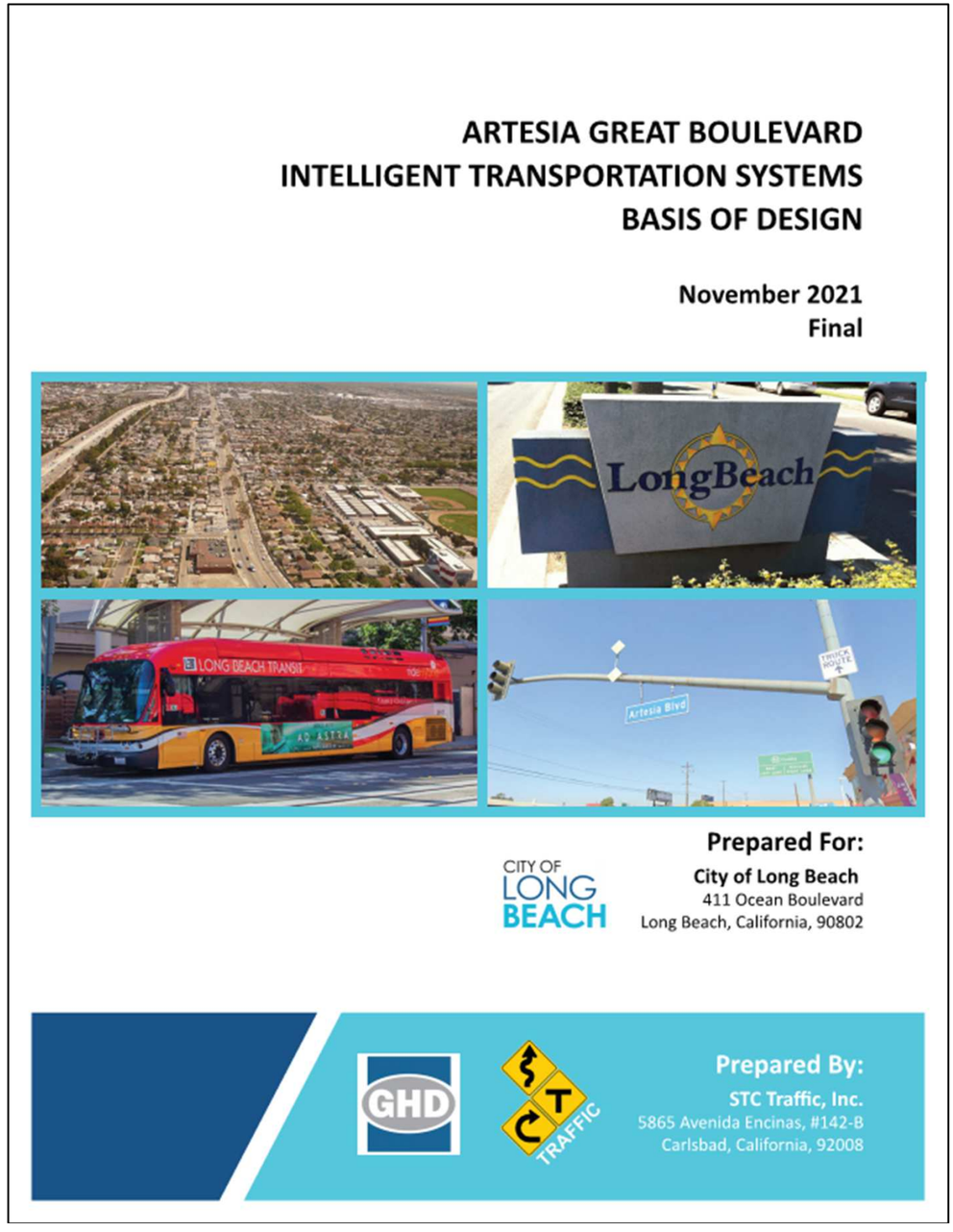


TRAFFIC SIGNAL & ITS DESIGN

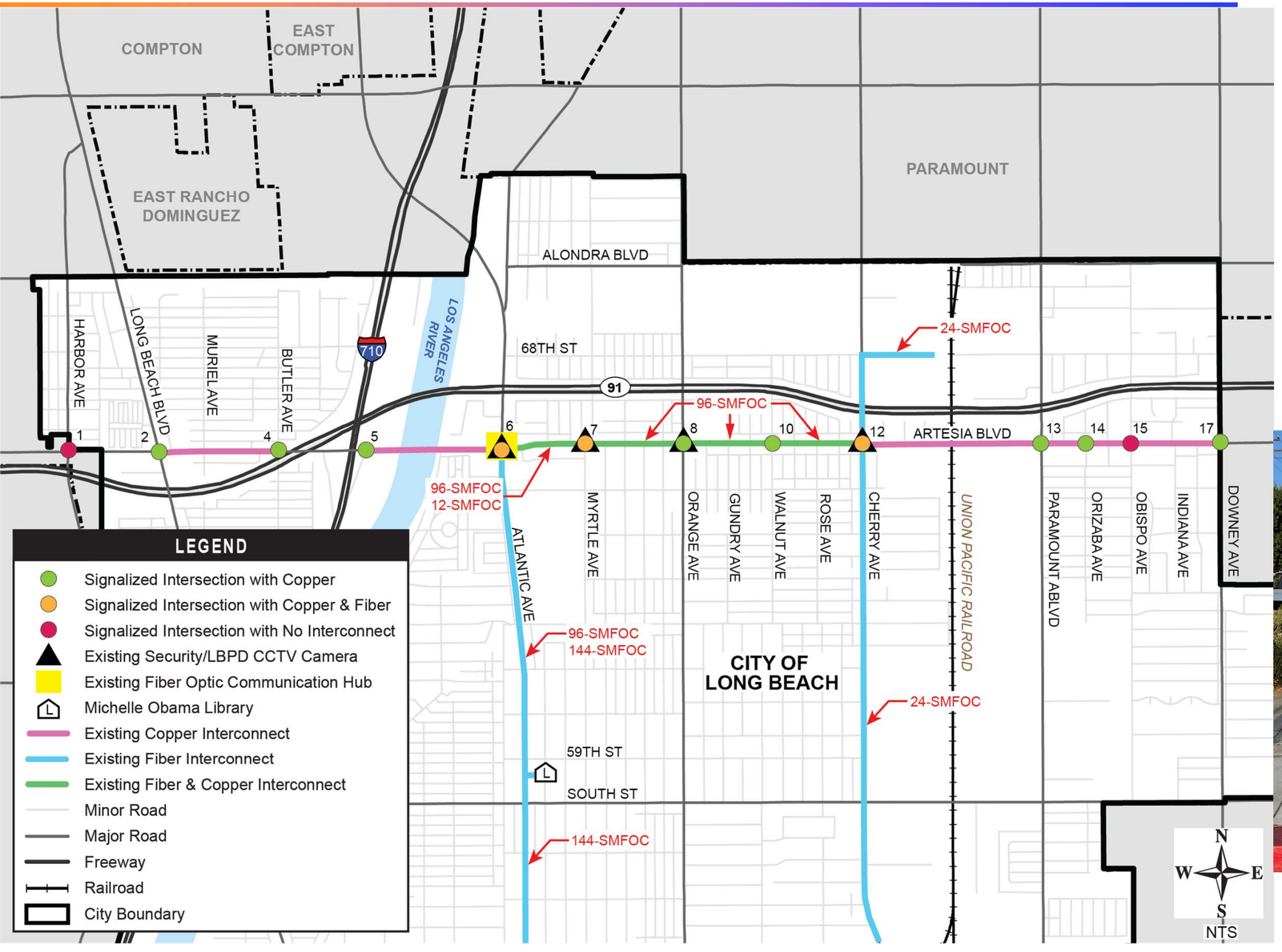
- ITS system is a core feature and focus of first Metro grant.
  - Bus travel time improvements.
- Implement concept recommendations and a build ready plan set.
  - Modify and install new traffic signals, pedestrian traffic signals, and modified traffic signals.
- Integrate the traffic signal ITS and bus signal priority improvements.

- Key Elements
  - Communications system
  - Traffic signal control, management, and operation
  - Traveler information system
  - Transit signal priority
  - Adaptive traffic signal operation

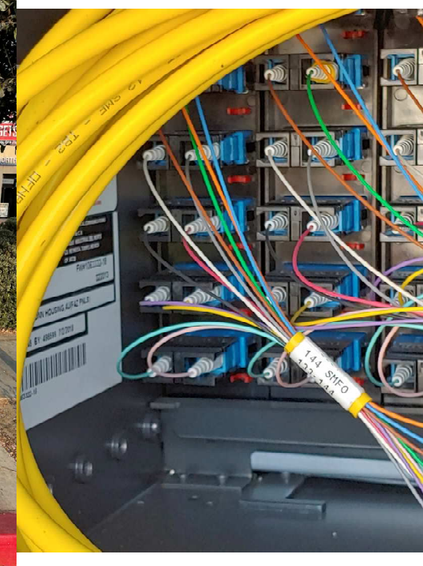
- Starting Point
  - Meet with City to discuss goals and available record data
  - Extensive field review of existing traffic signal and ITS infrastructure
  - Basis of Design for traffic signal and ITS systems



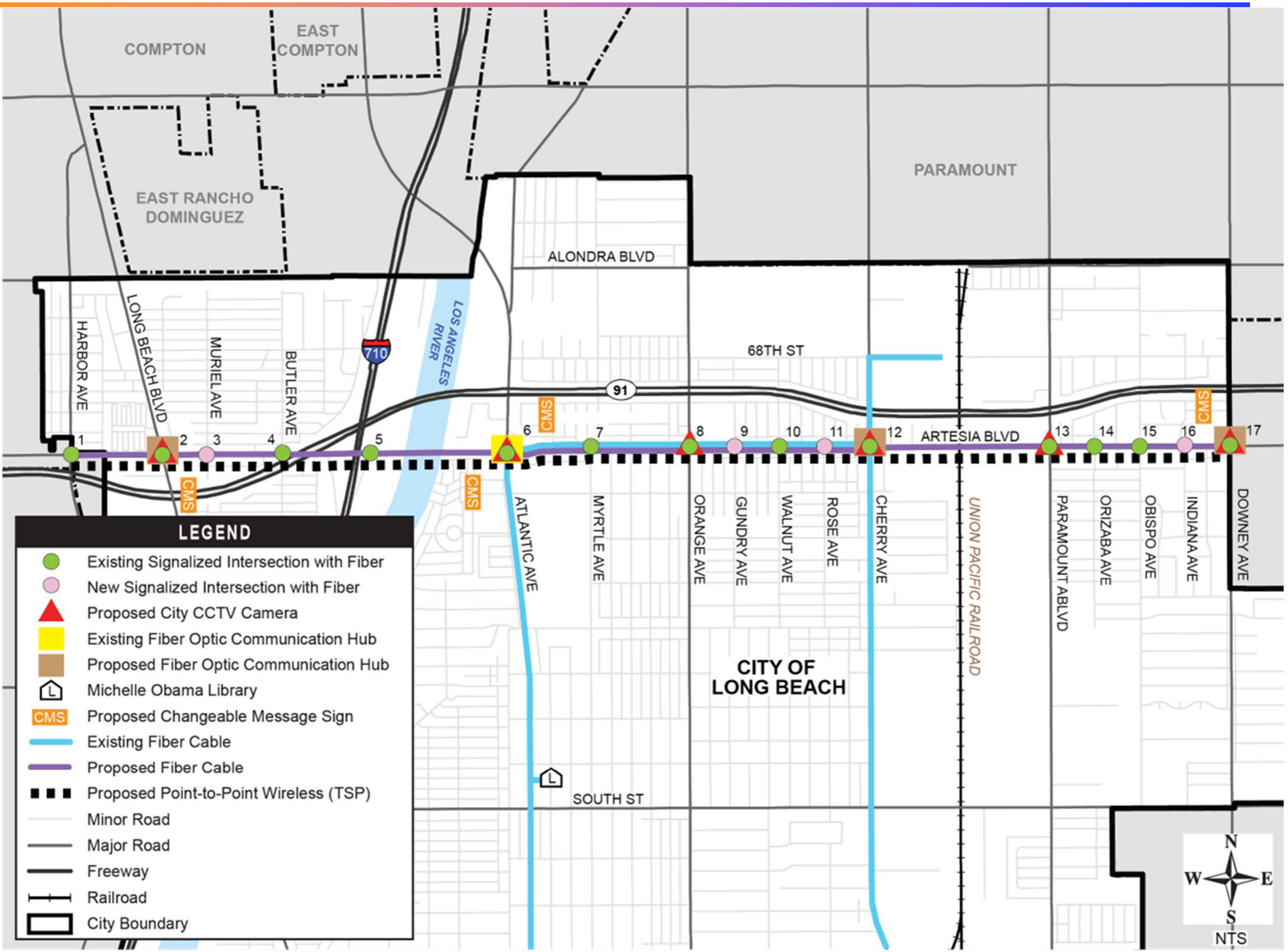
EXISTING ITS ELEMENTS



- 96-Strand SMFOC (Atlantic Ave to Cherry Ave).
- 3 traffic signals connected to existing fiber.
- Connection to City Hall via Atlantic Ave and Cherry Ave.
- 1 communication hub.
- 4 LBPD CCTV camera communicating wirelessly.



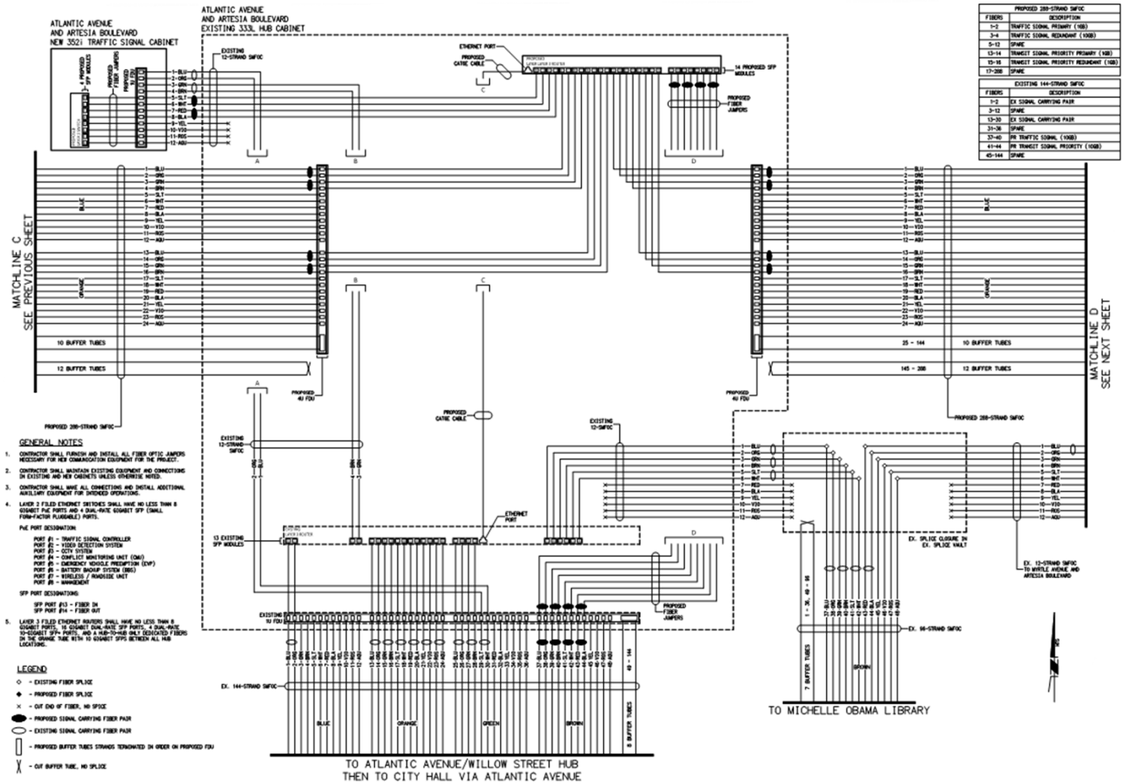
PROPOSED ITS ELEMENTS



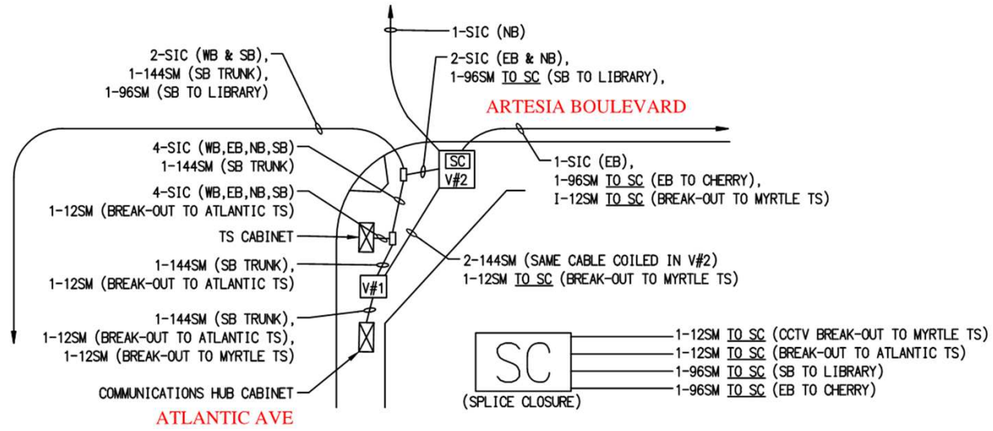
- 288-strand SMFOC in dedicated conduit.
- 17 traffic signals connected to new fiber.
- 3 new hub cabinets.
- 4 new CMS signs.
- 5 new CCTV cameras.
- Connection to City Hall via Atlantic Ave and Cherry Ave (physical ring).

PROPOSED ITS ELEMENTS

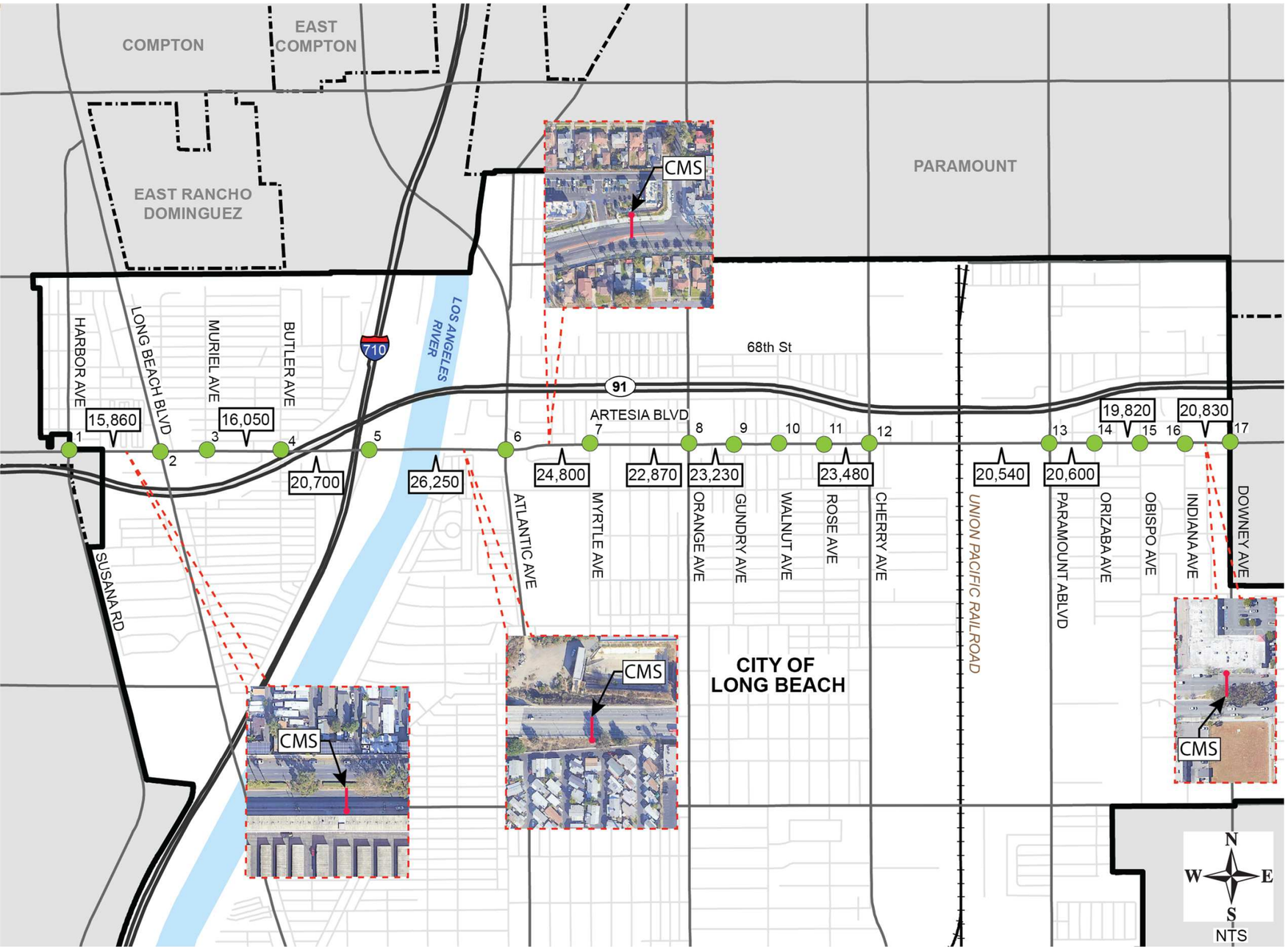
Fiber Splicing

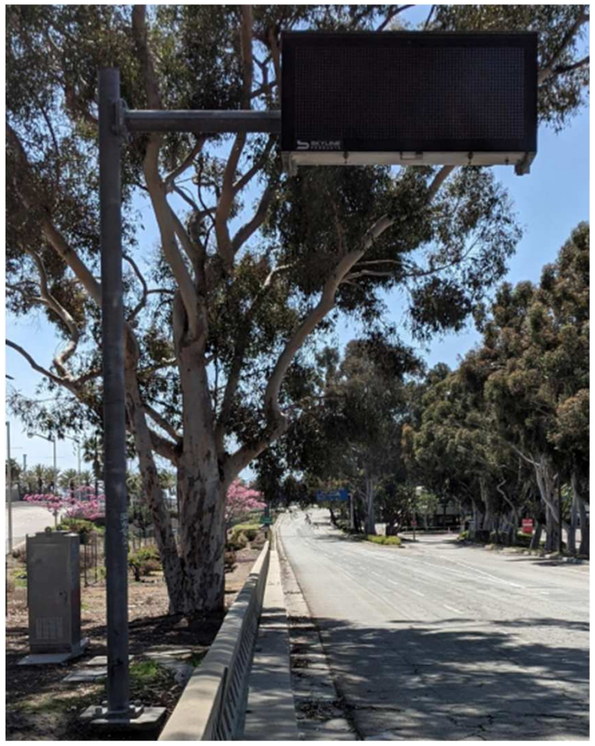


Cable Routing



TRAVELER INFORMATION SYSTEM



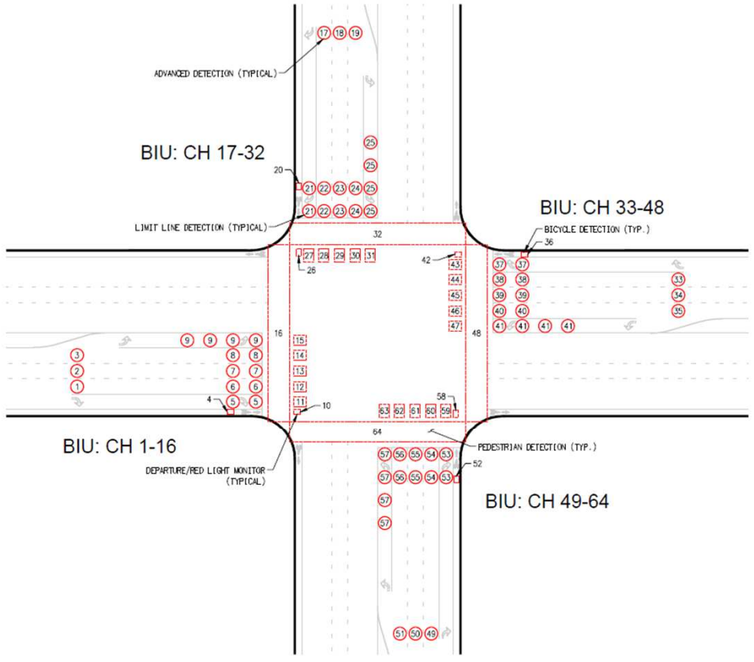


- CMS signs placed strategically on segments with high volumes prior to decision points.

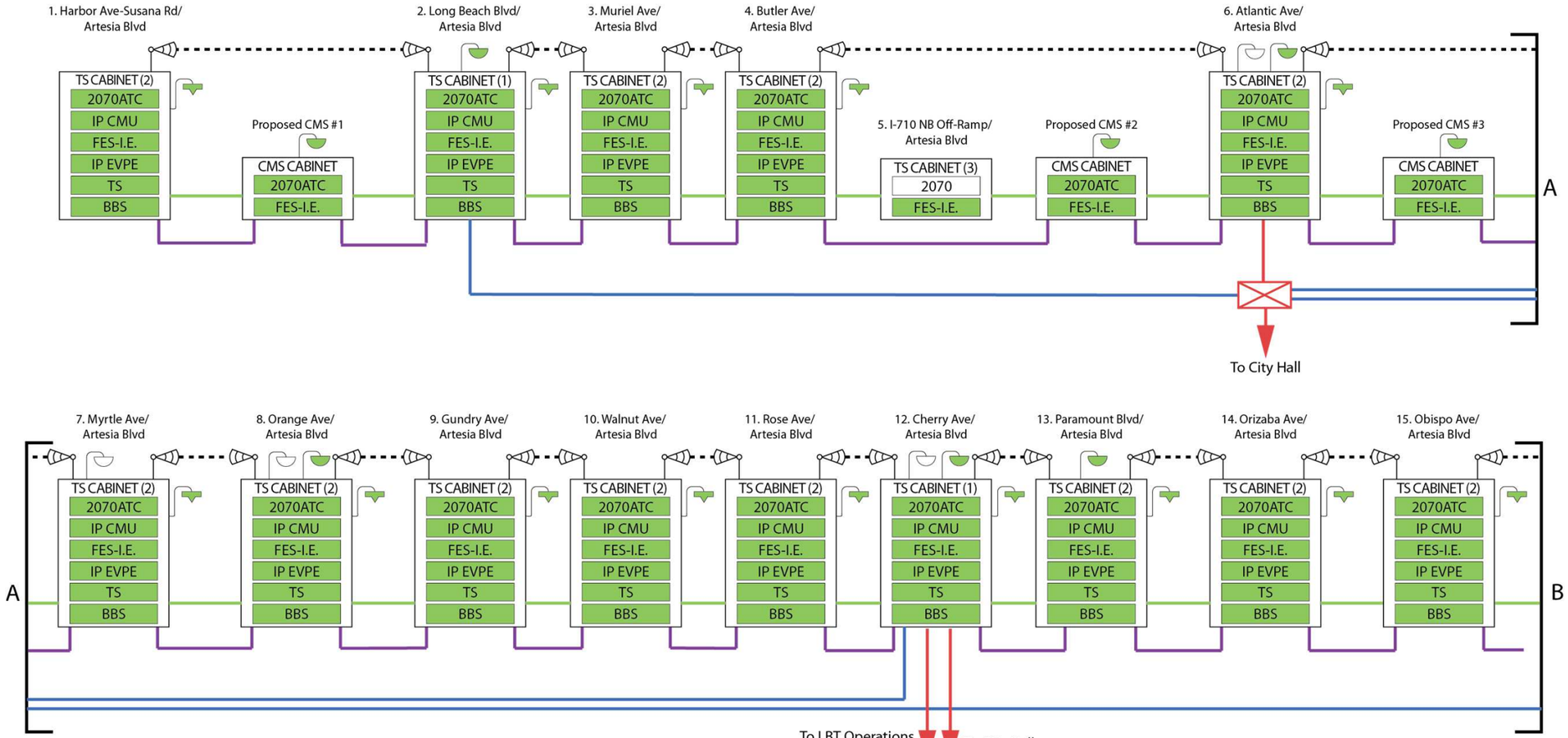
TRAFFIC SIGNAL ELEMENTS

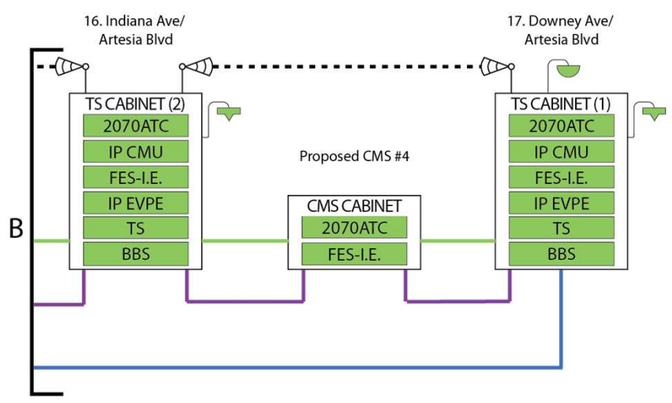
- Existing Infrastructure
  - Type 332 or Type R (NEMA) cabinets
  - 170E (11), ASC/3-2100 (1), and 2070LX (1) controllers
  - 3 locations with EVP equipment
  - 5 locations with battery backup systems
  - 2 signals managed by City's Transparity system

- Proposed Infrastructure
  - 352i ATC cabinets (350i for 3 new hubs)
  - 2070 ATC controller with Omni eX software
  - IR receivers and Opticom 764 phase selector cards for all signals
  - Battery backup systems for all signals
  - Loop detection sufficient for adaptive operation
  - Single camera data collector for SPM's
  - APS push buttons
  - LED Countdown pedestrian heads



NETWORK ARCHITECTURE



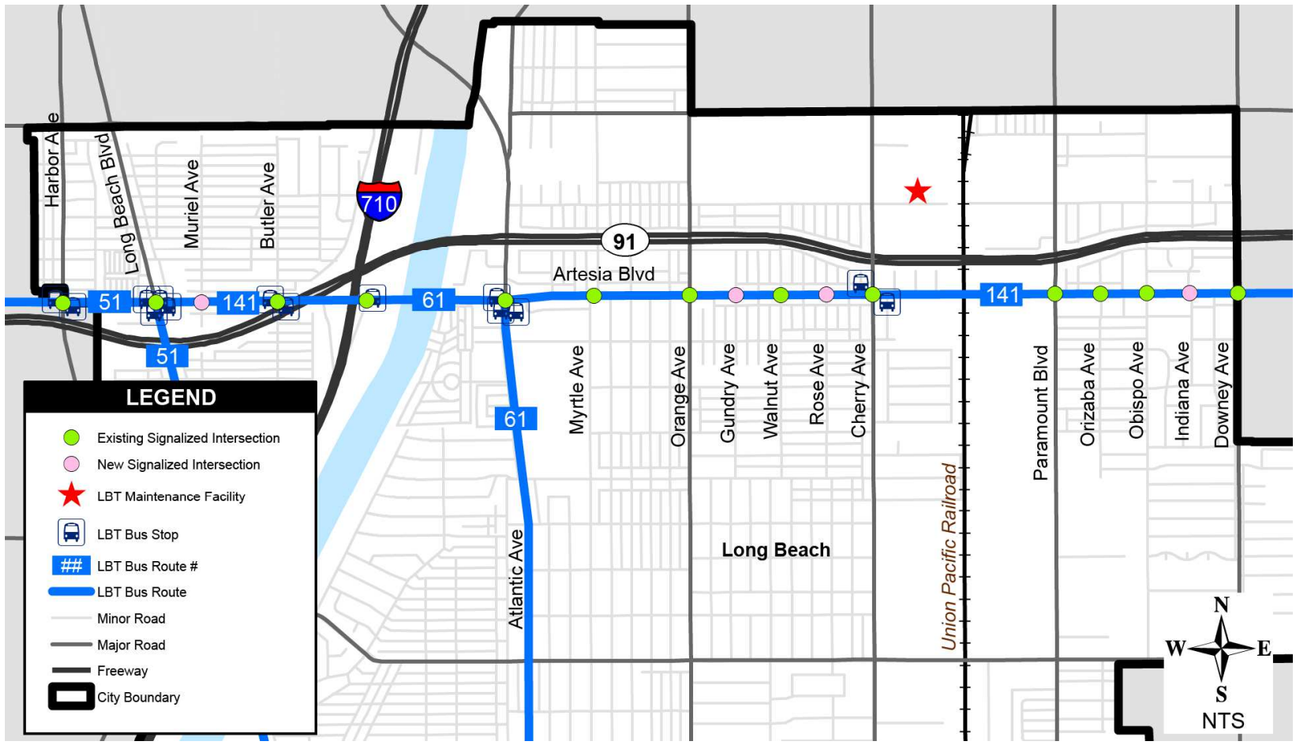


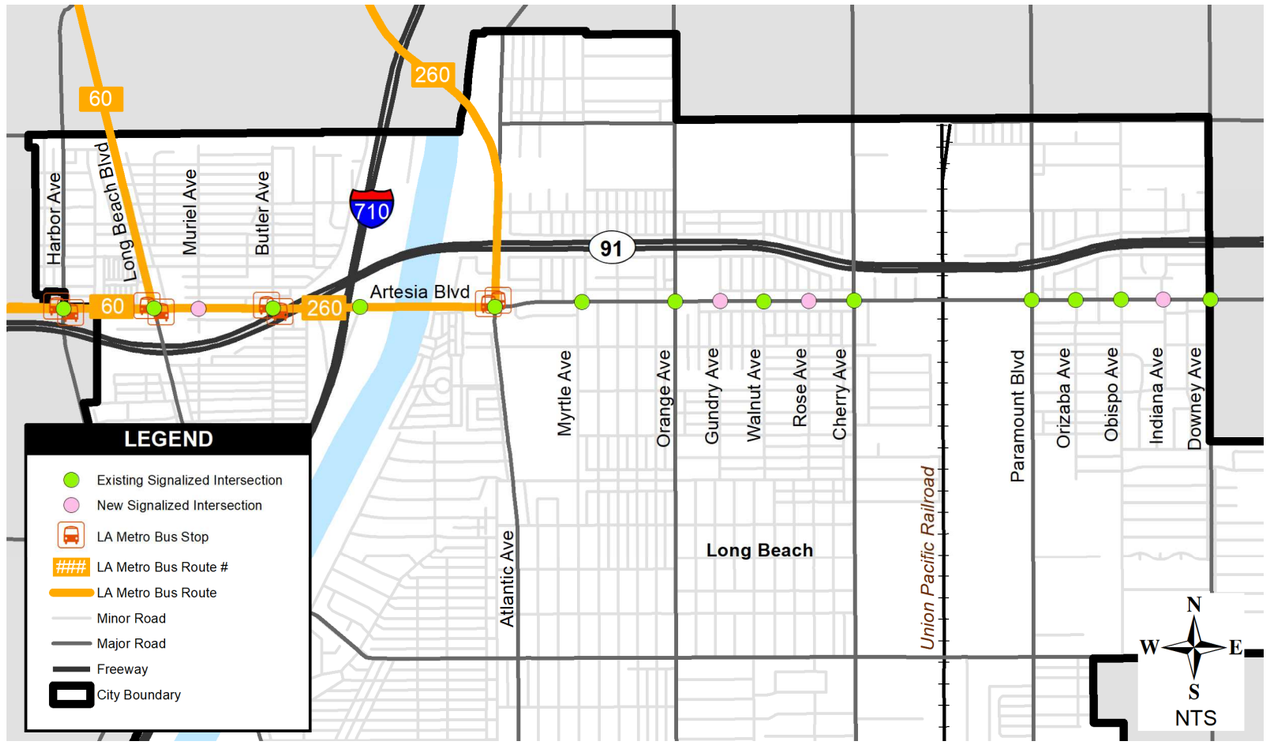
LEGEND

Existing Signal Carrying Fiber Pair	Communication HUB
Proposed Signal Carrying Fiber Pair	TS CABINET (1) — New 350i ATC Cabinet (TS/HUB)
Proposed Signal Carrying Fiber Pair (Redundant)	TS CABINET (2) — New 352i ATC Cabinet
Proposed TSP Wireless Point-to-Point Communications	TS CABINET (3) — Existing 332L Cabinet
Proposed TSP Carrying Fiber Pair (Redundant)	CMS CABINET — New 334 Cabinet
Existing Security/LBPD CCTV Camera	ATC — Advanced Traffic Controller
Proposed City CCTV Camera	IP — Internet Protocol
Proposed Data Collector	CMU — Conflict Monitor Unit
Proposed Wireless Radio (Transit Signal Priority)	FES — Field Ethernet Switch
Existing	I.E. — Industrial Ethernet Switch
Proposed	EVPE — Emergency Vehicl Preemption
	TS — Terminal Server (Transit Signal Priority)
	BBS — Battery Backup System
	CMS — Changeable Message Sign

TRANSIT OPERATIONS

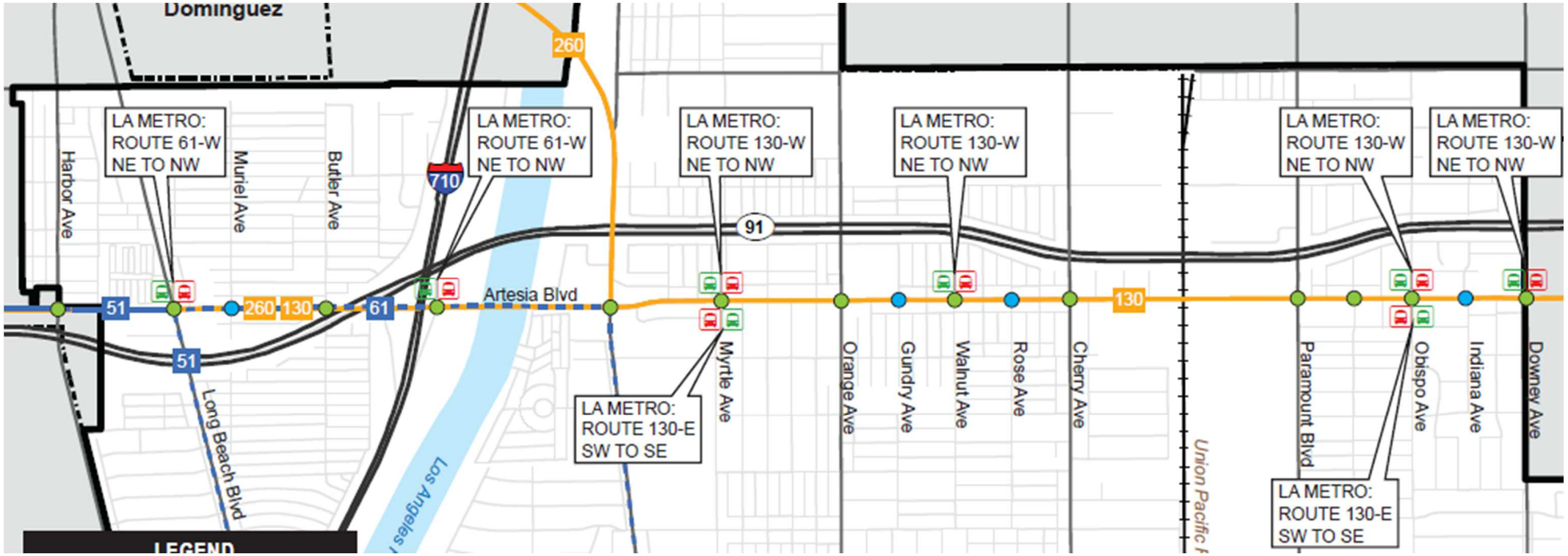
- 11 LBT Stops, 8 Metro Stops
- 5 routes with 15-to-30-minute headways
- 5 AM to 11 PM
- High ridership





TRANSIT IMPROVEMENTS

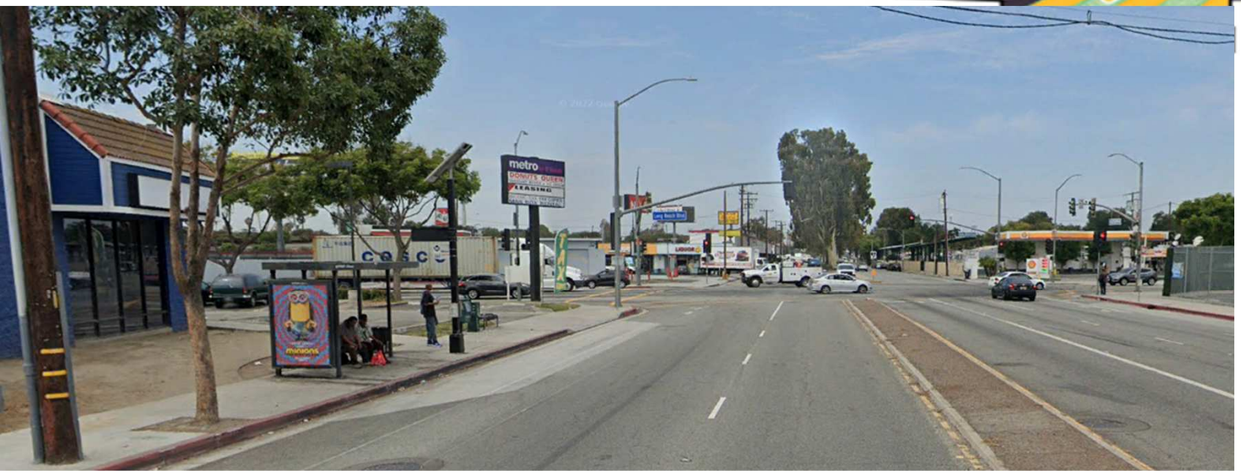
- 8 bus stop relocations
- 1 route consolidation (Metro 130 and LBT 141)
- 19 new stops and 8 bus islands



BUS STOP IMPROVEMENTS

- Side Boarding Island Stop
- High-Viz Crosswalks with Yield Lines
- Bike Channel with Separation Rail
- Bike Parking Near Transit
- Street Trees for Shade
- Flowering Trees for Local Identity
- Parkway Landscape Buffering
- Sustainable Stormwater Strategies
- New or Repurposed Transit Info Boards

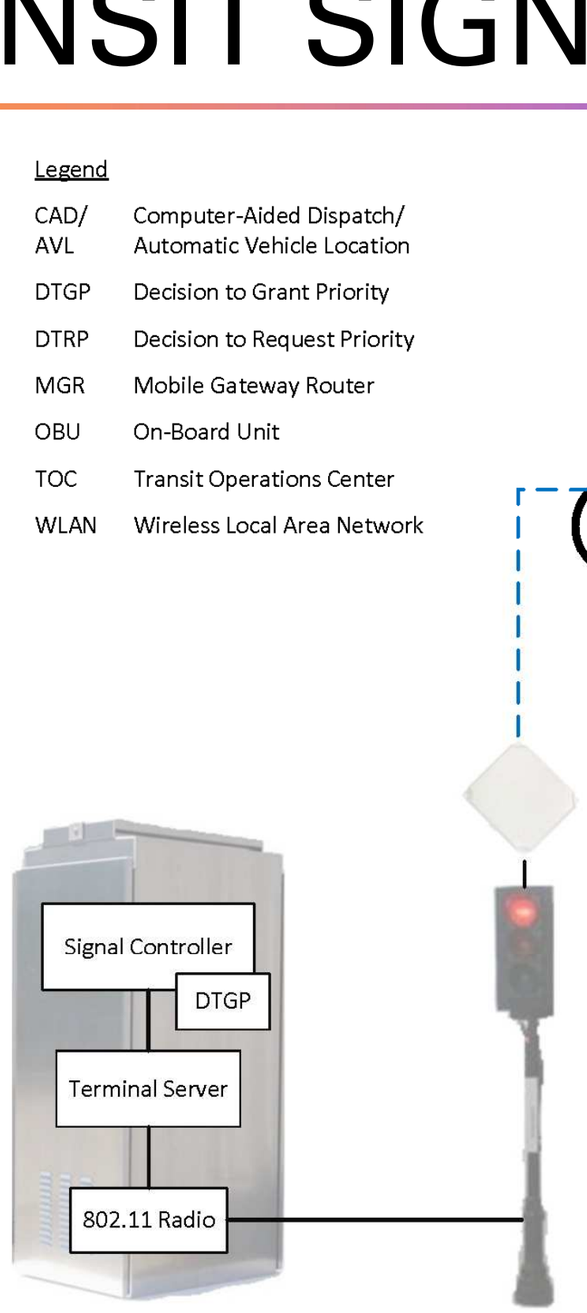
TRANSIT ISLAND | RECONFIGURED + REHABILITATED ROADWAY



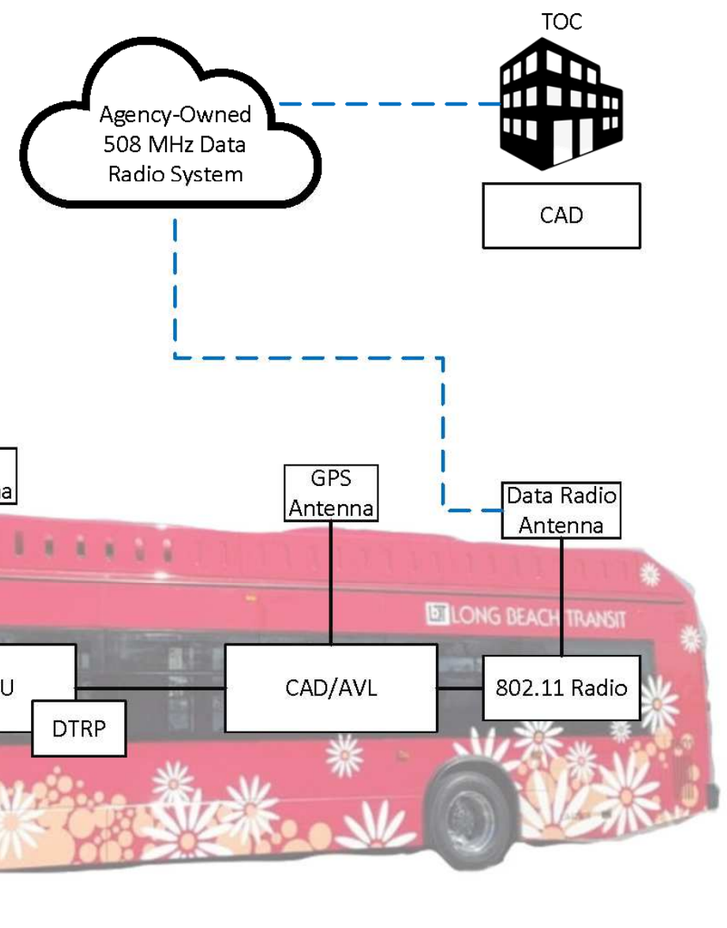
TRANSIT SIGNAL PRIORITY

Legend

CAD/ AVL	Computer-Aided Dispatch/ Automatic Vehicle Location
DTGP	Decision to Grant Priority
DTRP	Decision to Request Priority
MGR	Mobile Gateway Router
OBU	On-Board Unit
TOC	Transit Operations Center
WLAN	Wireless Local Area Network

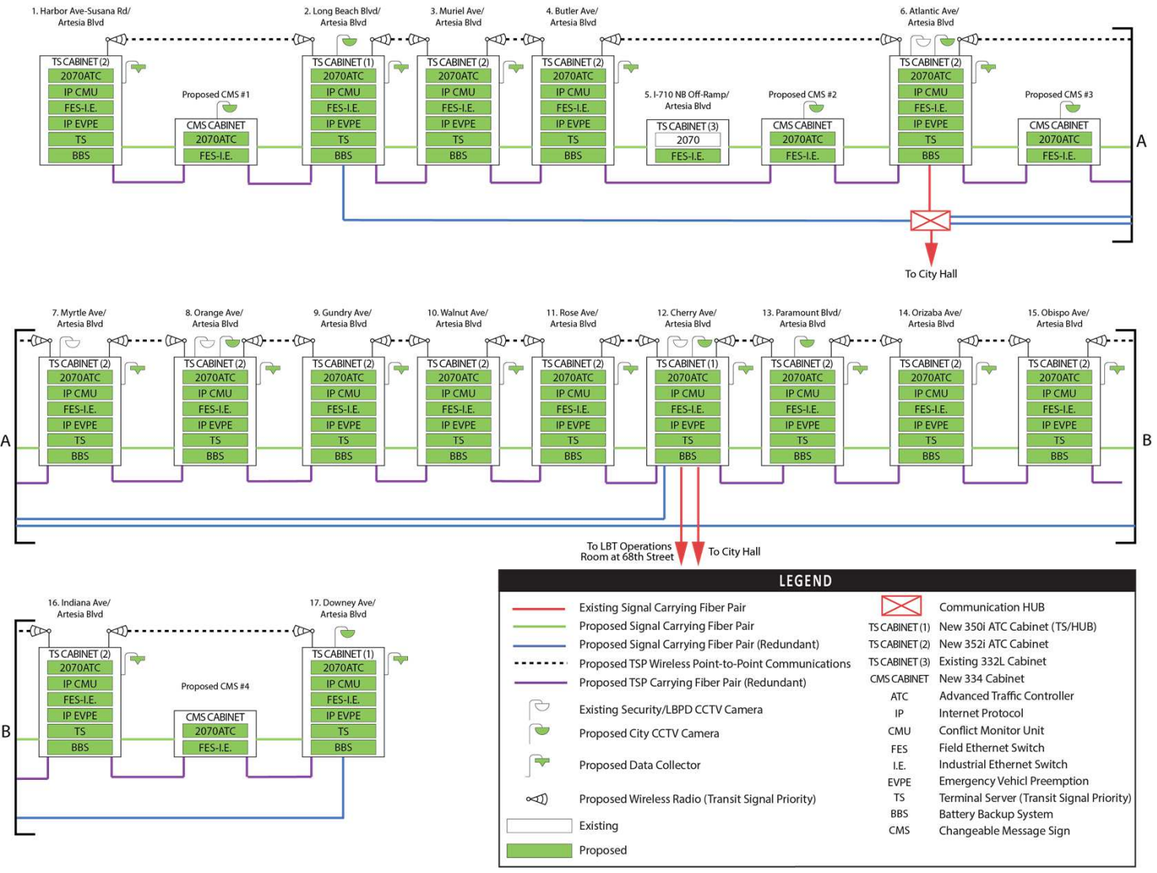


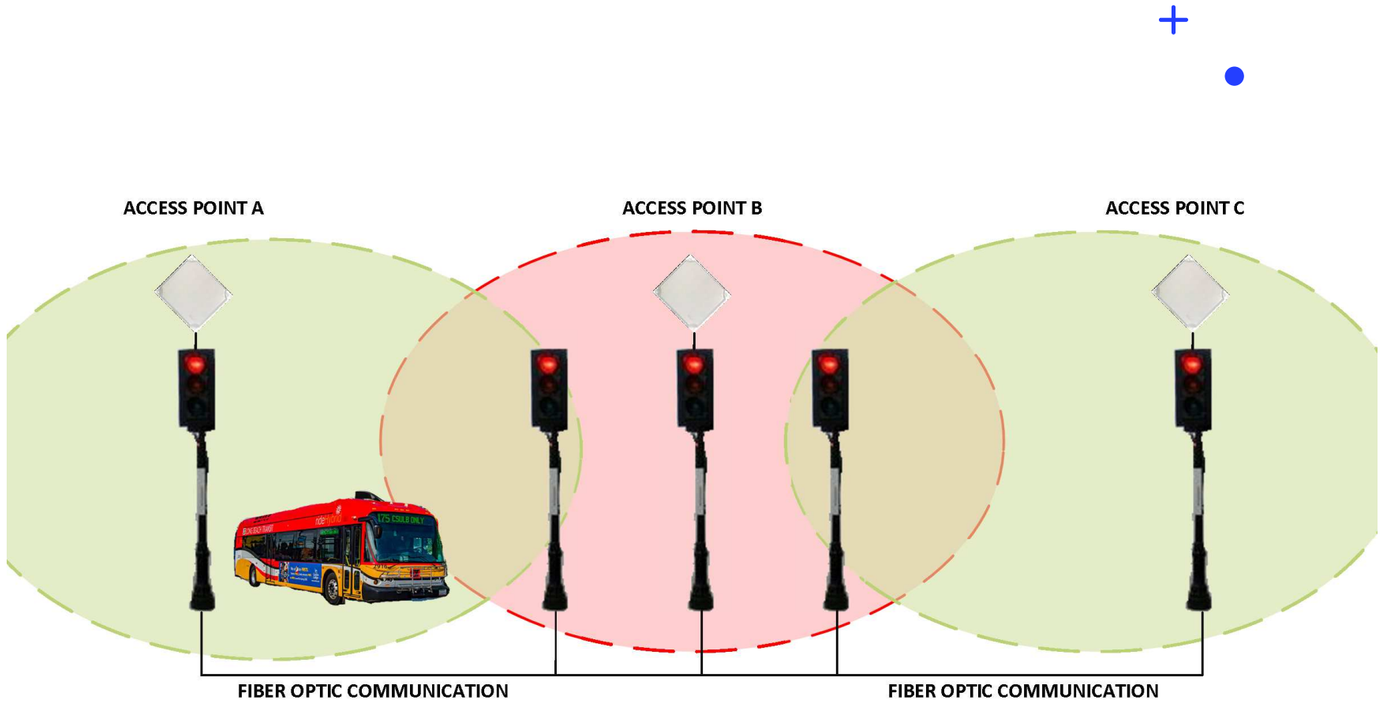
Signal Cabinet



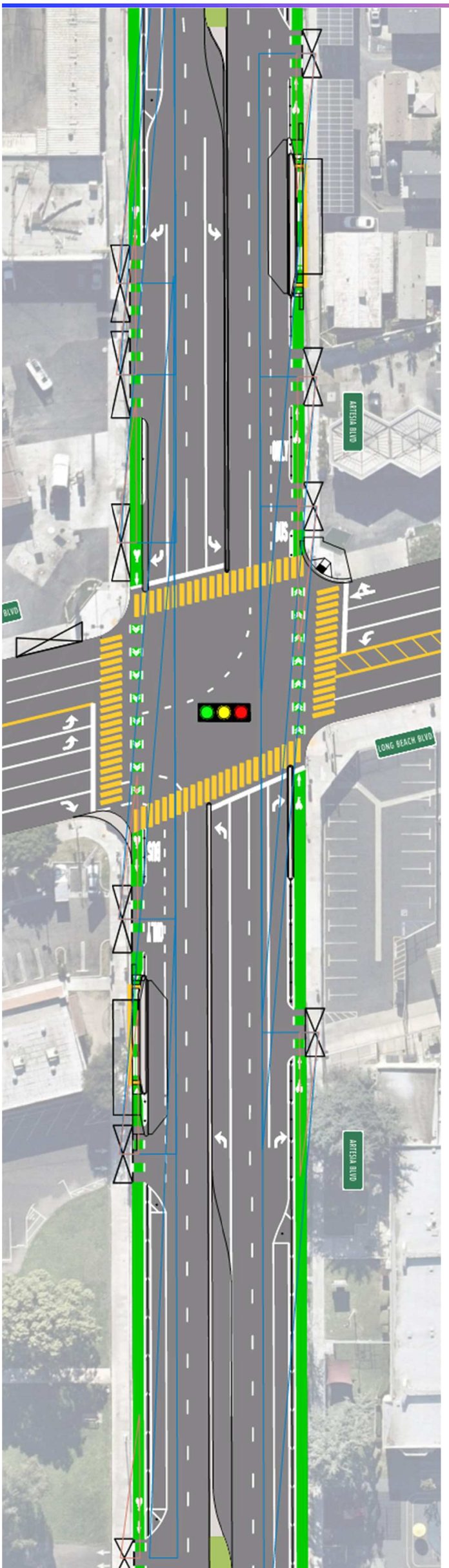
Bus

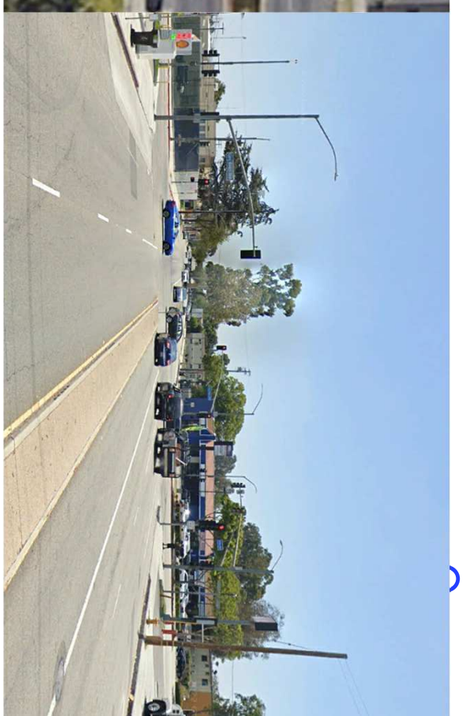
TRANSIT SIGNAL PRIORITY



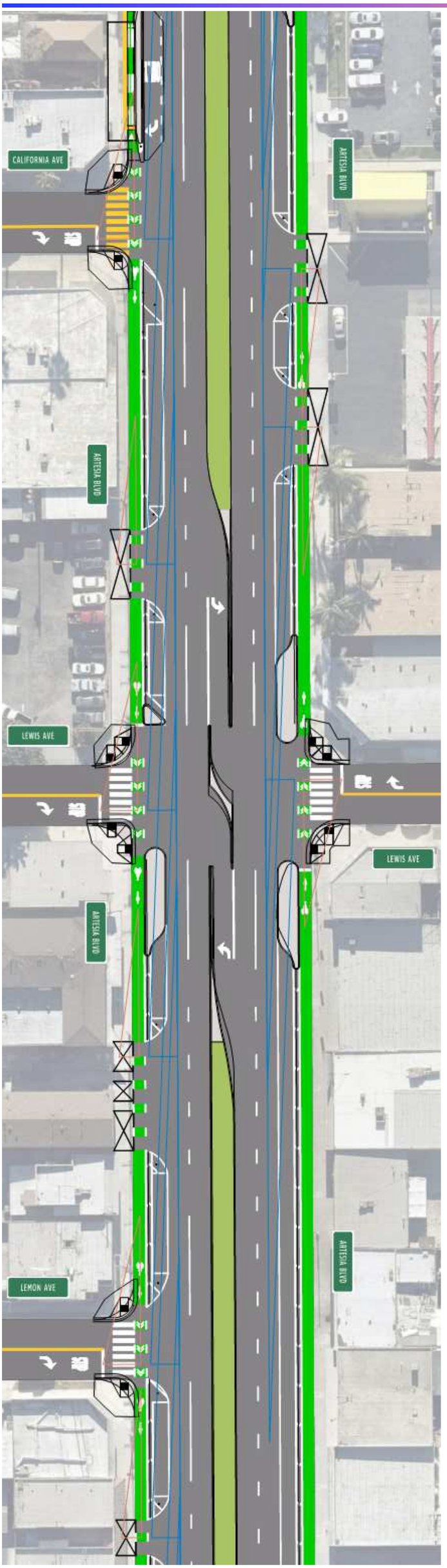


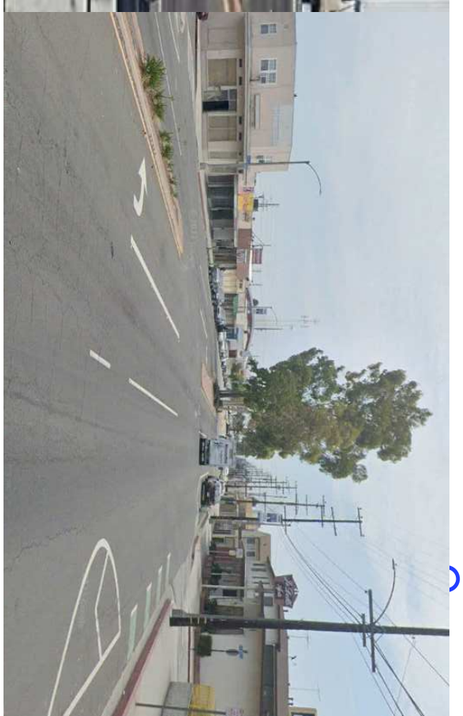
LONG BEACH BOULEVARD



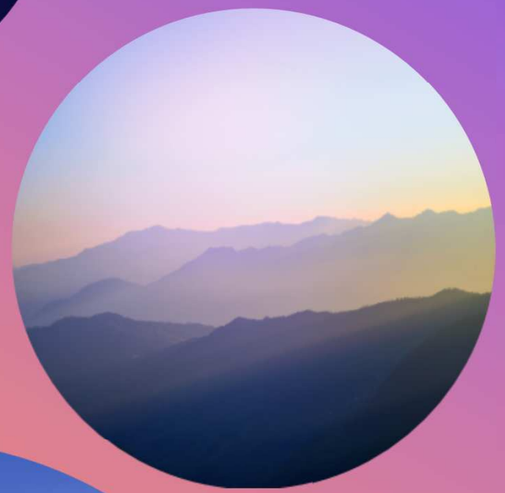


LEWIS AVENUE





INDIANA AVENUE



THANK YOU