CITY OF BELMONT

C/CAG TAC Meeting – Dec. 2022

**Ralston Avenue
Adaptive Traffic Control
System (ATCS)**

RALSTON CORRIDOR

12 signals along Ralston Ave between Christian Drive and Hiller Avenue

- Deploy an adaptive system along corridor
  - 9 City signals, 3 Caltrans signals
- Funded with TFCA C/CAG Funds
- Major East-West arterial between US-101, SR 82 (El Camino Real), & SR 92/I-280 – major thoroughfare through Belmont and SM County
- Ralston Middle School, Notre Dame High School, Notre Dame de Namur University, and Merry Moppet Pre-School located along corridor
- High variability of traffic volumes due to above conditions
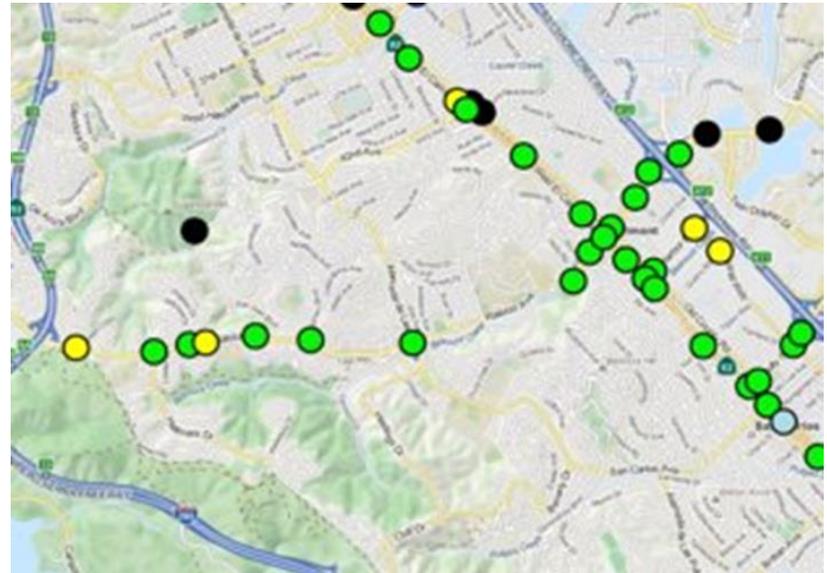
PROJECT GOALS
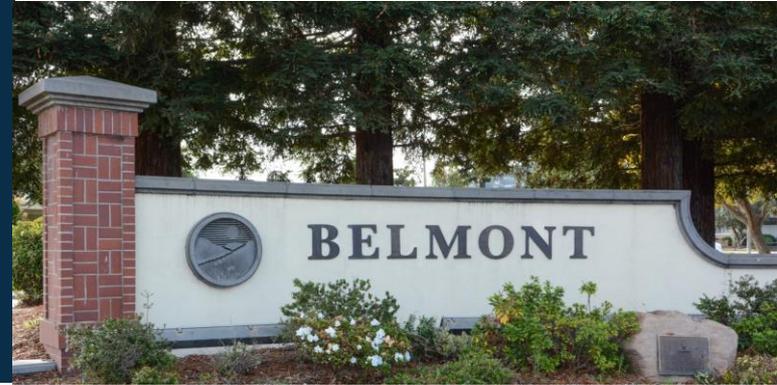
- Adjust signal timing to real time traffic conditions – timing more appropriate for actual conditions:
  - Reduce congestion, improve access to schools/jobs, decrease intersection dwell time
  - Reduces intersection delays, reduces pollution and GHG's by decreasing vehicle engines running time
  - Improves health by providing improvements to bicycling and pedestrian modes of transportation which encourages physical activity
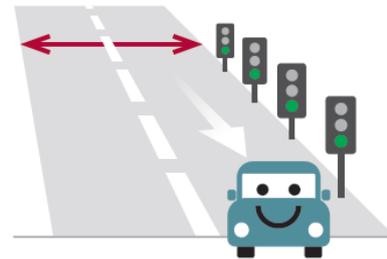
Kimley Horn

WHY KADENCE?

- Integrated into the City and San Mateo County KITS ATMS Smart Corridor
- Fully integrated with City's current D4 controller firmware
- Fully integrated with Caltrans TSCP firmware
- Caltrans is also deploying Kadence along El Camino Real – provide cross coordination
- Full support with existing detection
- Cost effective
- Achieves the project goals and objectives

Kadence Meets a Variety of Objectives
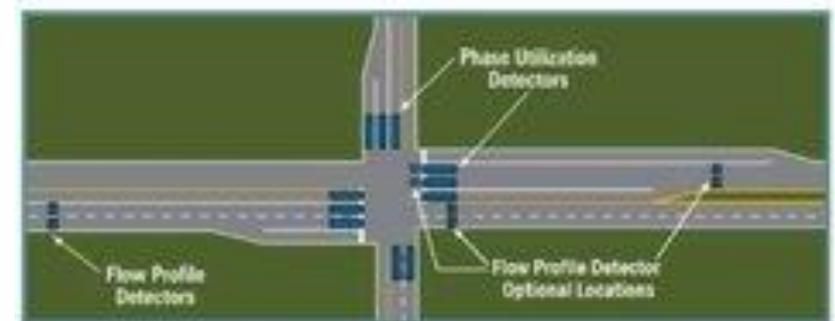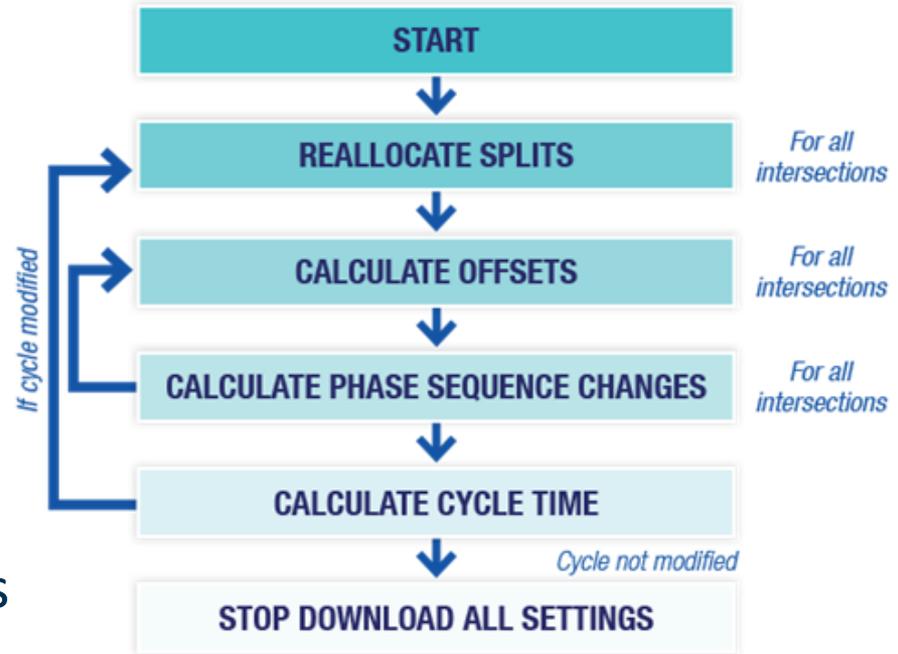

Any type of detector is supported

- Ralston and ECR is the bottleneck with the highest volumes

- School drop off and pick up = peak demand

Belmont already possessed KITS software system in our cabinets, thus deploying Kadence, Kimley-Horn's ATCS is cost effective and seamless
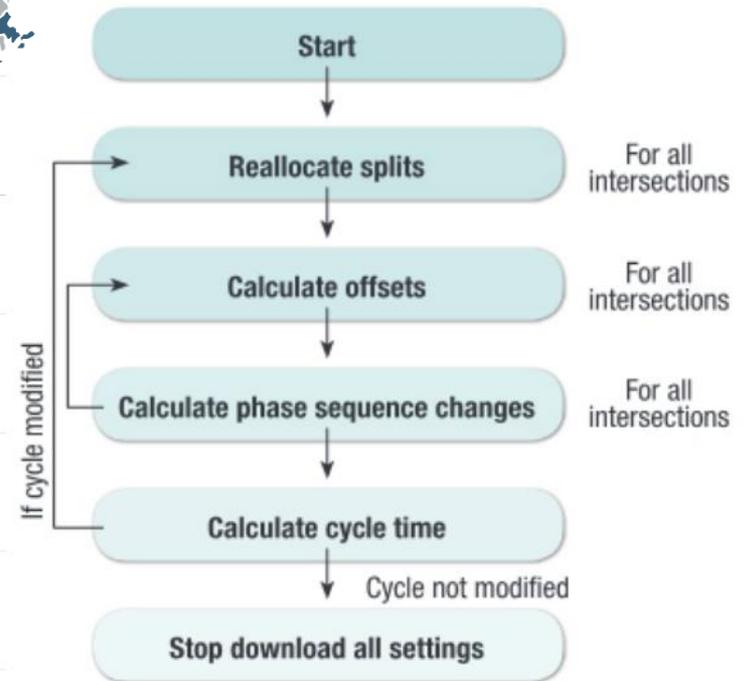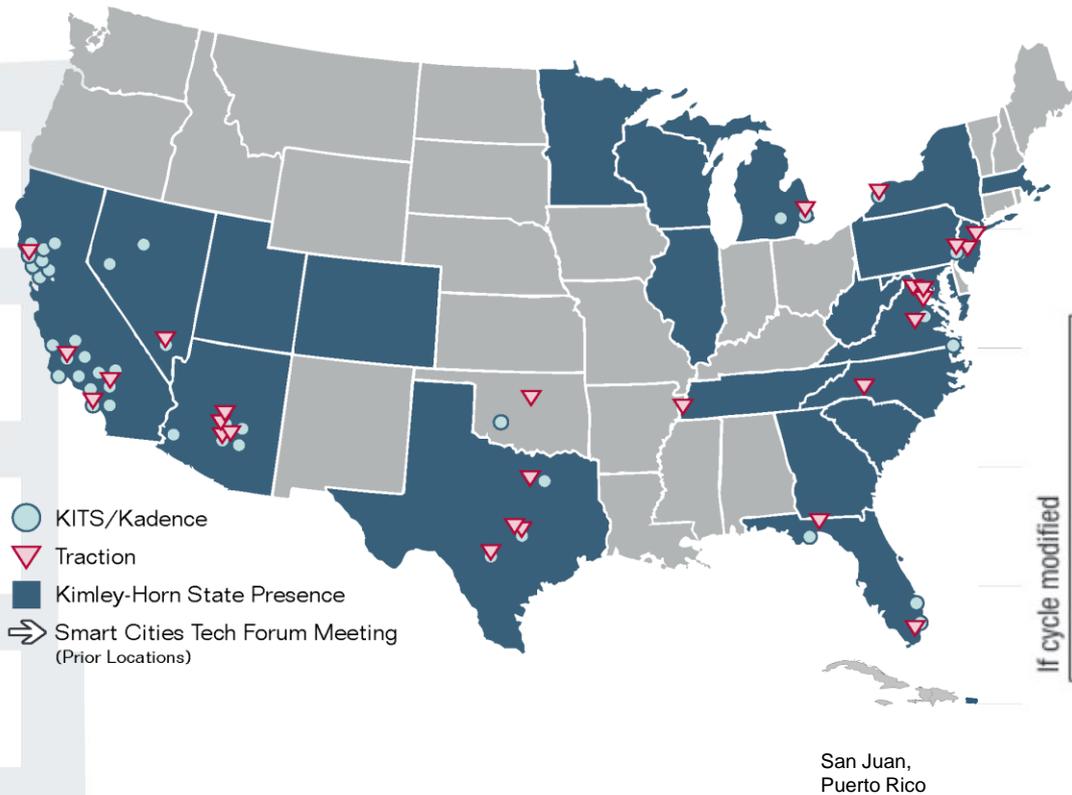
HOW KADENCE WORKS

- Kadence modifies and adjusts pre-determined timing plans* based upon current traffic conditions

- Collects sec-by-sec data and makes as needed timing adjustments approx. every 5-6 minutes

- Adjusts phase times, progression settings, and cycle lengths to optimize timing in real-time using the last 3-4 signal cycle data/queues

```
START
  ↓
REALLOCATE SPLITS          For all intersections
  ↓
CALCULATE OFFSETS          For all intersections
  ↓
CALCULATE PHASE SEQUENCE CHANGES    For all intersections
  ↓
CALCULATE CYCLE TIME
  ↓              Cycle not modified
STOP DOWNLOAD ALL SETTINGS
```
If cycle modified

***Timing plan** – a coordination plan for a specific time of the day and traffic condition (AM, school, PM, etc.)

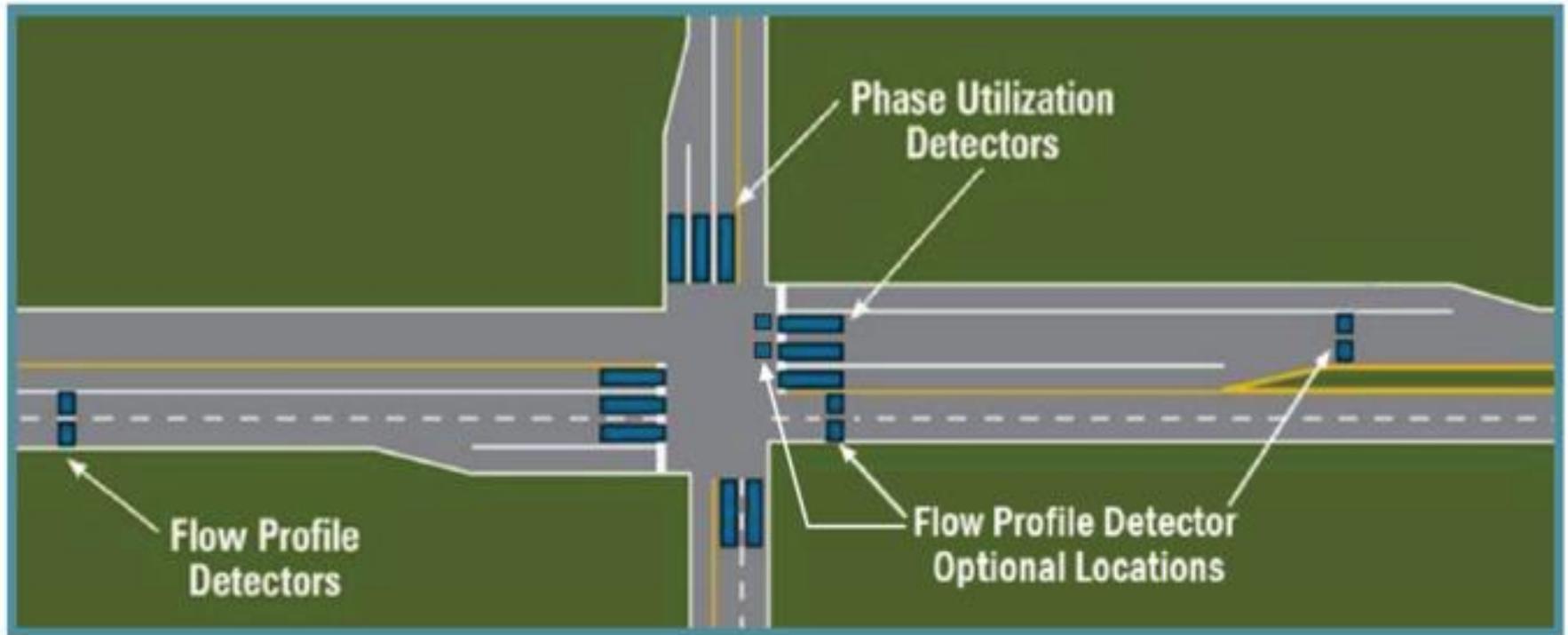# State of the practice technology

How Kadence Works

KITS/Kadence
Traction
Kimley-Horn State Presence
Smart Cities Tech Forum Meeting
(Prior Locations)

San Juan,
Puerto Rico

Start

Reallocate splits — For all intersections

Calculate offsets — For all intersections

Calculate phase sequence changes — For all intersections

If cycle modified

Calculate cycle time

Cycle not modified

Stop download all settings

Kadence algorithm computation process

Detection

Phase Utilization Detectors

Flow Profile Detectors

Flow Profile Detector Optional Locations

Any type of detector is supported

SYSTEM DISPLAYS - MONITORING
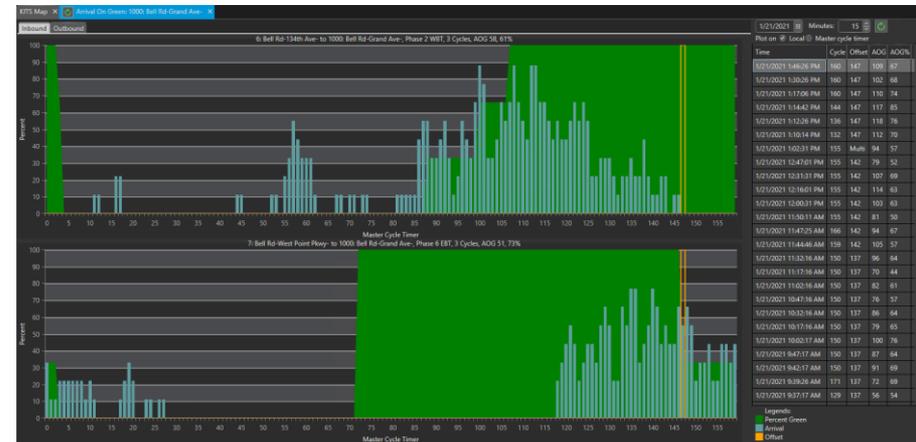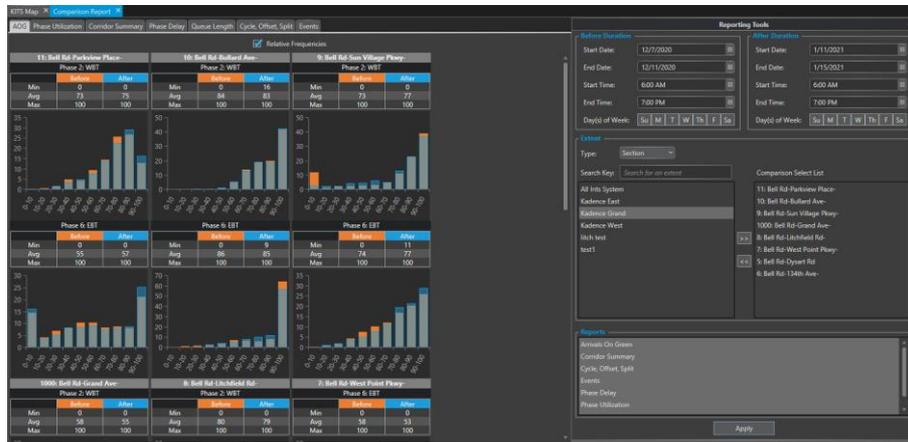
SYSTEM DISPLAYS - MONITORING

PERFORMANCE METRICS

ENHANCED SYSTEM GENERATED METRICS – COLLECTED 24/7

- Log of timing adjustments
- Cycle/phase failures (phase utilization)
- Arrivals on green
- Estimated queue lengths
- Estimated delay

BEFORE/AFTER COMPARISON

ARRIVALS ON GREEN

Ralston Ave Adaptive Traffic Control System

- Project budget: $255k
- $30k of which is Measure I local match

Big thanks to our funding partners at C/CAG and the TFCA – BAAQMD!

Start date July 2021, Completed October 2022, Full integration with CalTrans November 2022

Questions?

Peter Brown, Public Works Director

City of Belmont

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