



Bike Detection: MTC Meeting

Michael G. Montoya

Iteris, Inc.

Bicycle Detection: The Need

- Agencies are requiring to have bicycle detection
- California signed law in 2012
 - All new and upgraded traffic signals are required to:
 - Effectively detect bicycle and motorcycle traffic
 - Provide appropriate timing
- Other states and regions are requiring more preference for bicycles
 - University towns, bike friendly communities
 - All need bicycle detection
- Bicycle advocacy groups are gaining momentum and turning up the volume



Bicycling Growing in Popularity

- Between 2000 and 2011, bicycle commuting grew 47 percent nationwide.
- In 2012 about .64% of commutes were made by bicycle (10% increase from 2011).
- 864,883 bicycle commuters in 2012.

Mother Nature Network, Bicycle Commuting, <http://www.mnn.com/green-tech/transportation/blogs/bicycle-commuting-sees-strong-growth-in-american-cities-over-the>

The League of American Bicyclists, ACS: Bike Commuting Continues to Rise; <http://bikeleague.org/content/acs-bike-commuting-continues-rise>

Bike Sharing is big!

- Allows members to borrow/return bicycles to multiple locations
- Over 80 cities in North America have bicycle sharing locations
- This number is constantly growing
- Even in Bangkok, Thailand!



More Bikes = More Injuries & Fatalities

- Bicyclist deaths in 2012: 726 (NHTSA Traffic Safety Facts)
- Bicyclist injuries in 2012: 49,000 (NHTSA Traffic Safety Facts)
- The total cost of bicyclist injury and death is over \$4 billion per year (National Safety Council).



Pedestrian and Bicyclist Crash Statistics
http://www.pedbikeinfo.org/data/factsheet_crash.cfm

Towards Zero Deaths (TZD)



- A National Strategy on Highway Safety rolled out March 2015
- The U.S. version of Vision Zero; Vision Zero essence is:

***“In every situation a person might fail,
the road system should not.”***

- TZD provides a platform of consistency for state agencies, private industry, national organizations and others to develop safety plans that prioritize traffic safety culture and promote the national TZD vision

USDOT Mayor's Challenge

- Safer People, Safer Streets
 - “...take **significant** action to improve safety for bicycle riders and pedestrians of all ages...”
- Complete Streets Approach
- Gather bicycling and walking data
- Make streets safe and convenient
- Mayors Challenge Summit – March 12, 2015



Safety Issues

- **Pattern:** 40% of bicyclist fatalities in crashes occur at intersections (NHTSA Traffic Safety Facts, 2008)
- **Strategy:** Reduce intersection conflicts among vehicle & bicycle
- **Countermeasure:** Use enhanced detection systems to extend traffic signal green phase for bicyclists



Bicycle Detection: The Need

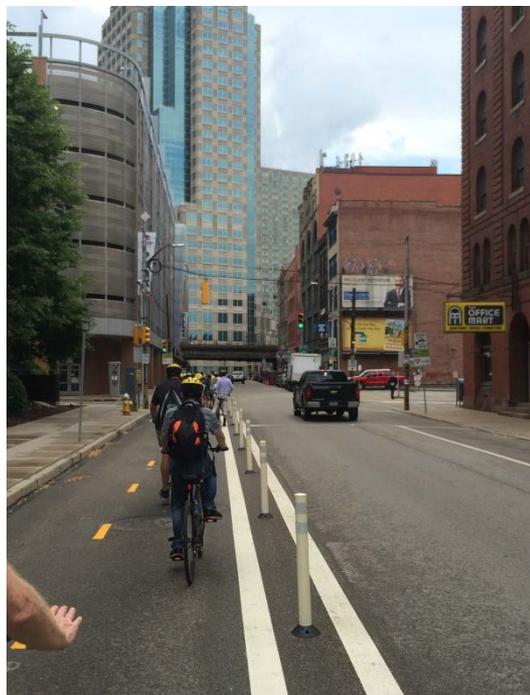
- More bikes on the road = Increase in bicycle fatalities
- Agencies are requiring bicycle detection to help reduce crashes
- Several states in USA require bicycle detection at intersections
- Bicycle advocacy groups are pushing the issue effectively



Lots of Roadway Treatments



Lots of Roadway Treatments



But what happens....

- ...when all those bikes get to the intersection?



Some Intersection Treatments



Historical Signal Timings

- Traffic Engineers like to:
 - Maximize arterial green time
 - Minimize minor movement green time
 - Eliminate motorist delay
 - Coordination
- Designed for vehicles not bicycles
 - Short Initial green times
 - “Snappy” gap-out times



Why Not Bicycles?

- Historically no Differentiation from Motor Vehicles
- Slower than Vehicles – Faster than Peds

No special accommodation means:

Bicyclists cannot safely get through a large intersection with too-short initial or extension times



How can intersections be safer for cyclists?

- Only with **Differentiation!**
- Design the signal system to operate differently when the system **knows a bicycle is present**
- Key Benefits
 - Add Min Green Time for Bikes
 - Improve efficiency – special timing for bikes only when they are present
 - Enhanced data collection

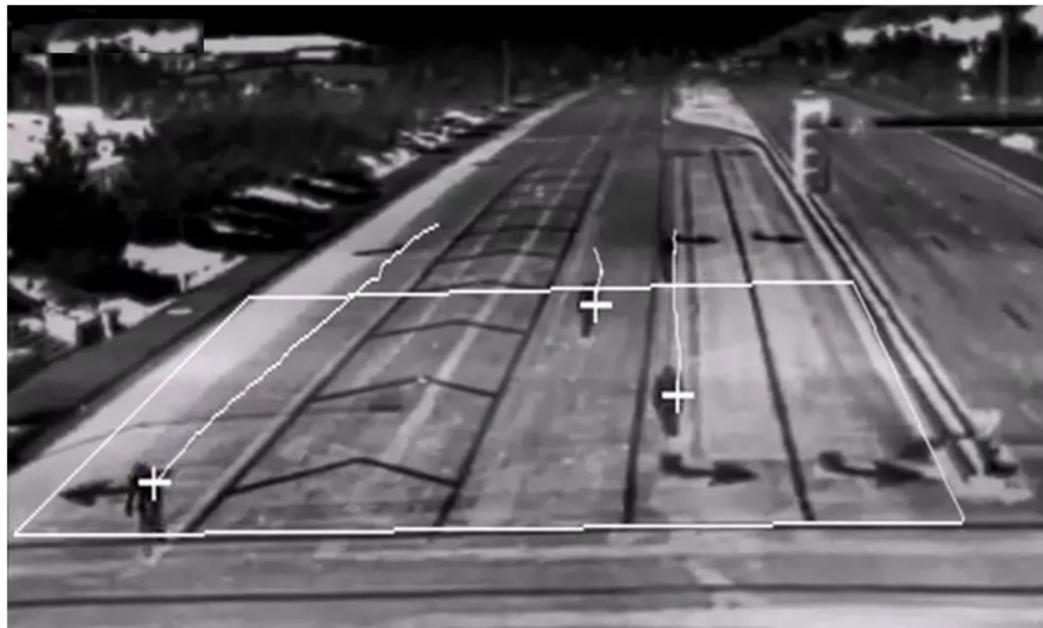


Bicycle Detection Technologies

- In order to create special timings it is necessary to detect bicycles at intersections.
- Detection manufacturers are providing tools to allow engineers to take action.
- It is now possible to not only detect a bicycle but differentiate a bicycle from other motor vehicles.

Thermal Detection

- Detectors installed overhead
- A virtual zone is created
- Outputs are put into the controller based on the set up of the zones



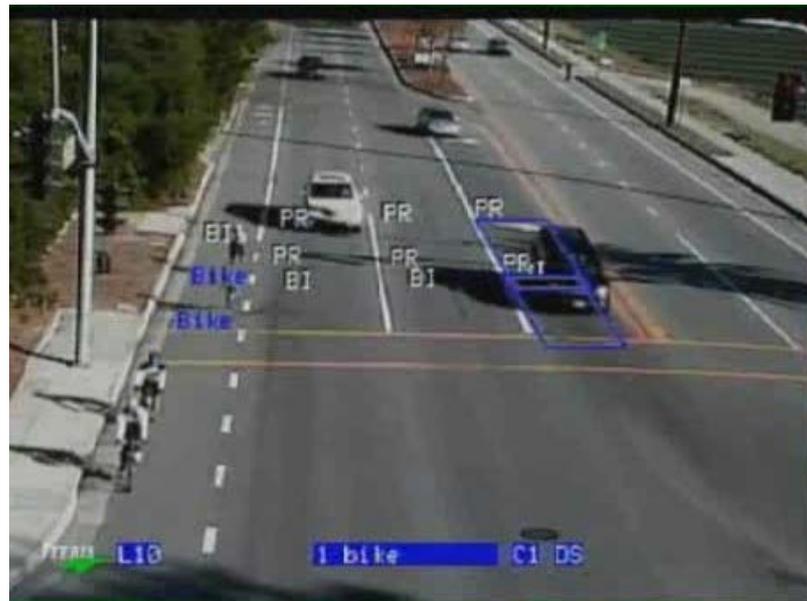
Loops & Micro-Radar

- Installed in the pavement
- Creates a detection zone above the detector
- Outputs are put into the controller based on the set up of the zones



Video Detection

- Using video to **differentiate** bicycles from cars
- Performing bicycle **concurrently** with stop bar detection
- Providing for both bicycle and vehicle count zones



SmartCycle®

Bicyclists Deserve Safer Intersections

- Bikes start and move slower than cars
- What can we do to prioritize a traffic safety culture?
 1. Implement differentiating bike detection to optimally operate signals
 2. Set Initial & Gap times to safely accommodate bicycle crossings



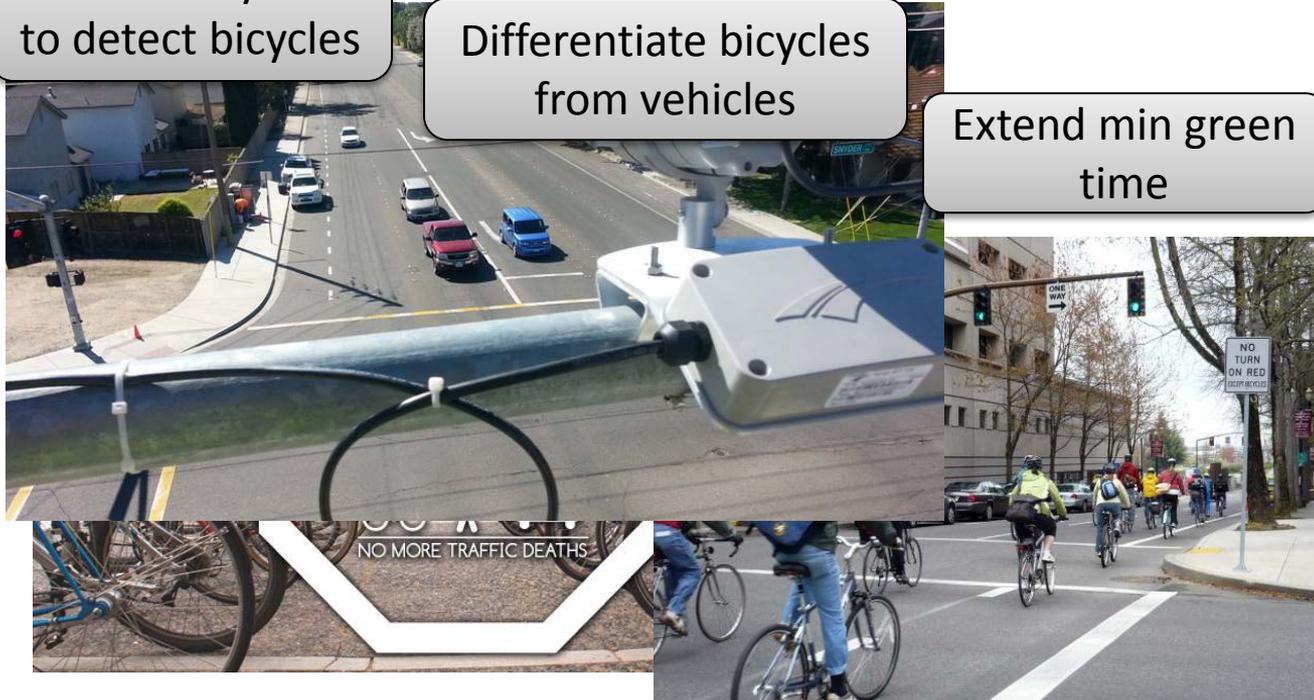
Summary

Provide a system to detect bicycles

Differentiate bicycles from vehicles

Extend min green time

Safer intersections



Thank You



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for better mobility*



Michael G. Montoya

Iteris, Inc.

408-442-4537

mgm@iteris.com

www.iteris.com

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Image Detection Systems

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Metropolitan Transportation Commission
Video Detection Systems

Jaime Rodriguez

Founding Principal, Traffic Patterns

20 Years Experience

Public Sector Experience

- City of Palo Alto Chief Transportation Official
- City of Milpitas City Traffic Engineer
- City of San Jose Traffic Signals/ITS
- City of Walnut Creek Traffic Tech

Private Sector

- Traffic Patterns Founding Principal 2008
- Western Pacific Signal Director of ATMS

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Video Detection Systems

Discussion Topics

Video Detection Basics

- Channel Detection Strategies
- Sample Applications

Video Detection for Bicycles

- Experiences
- Video vs Microwave

Alternative Bicycle & Pedestrian Detection

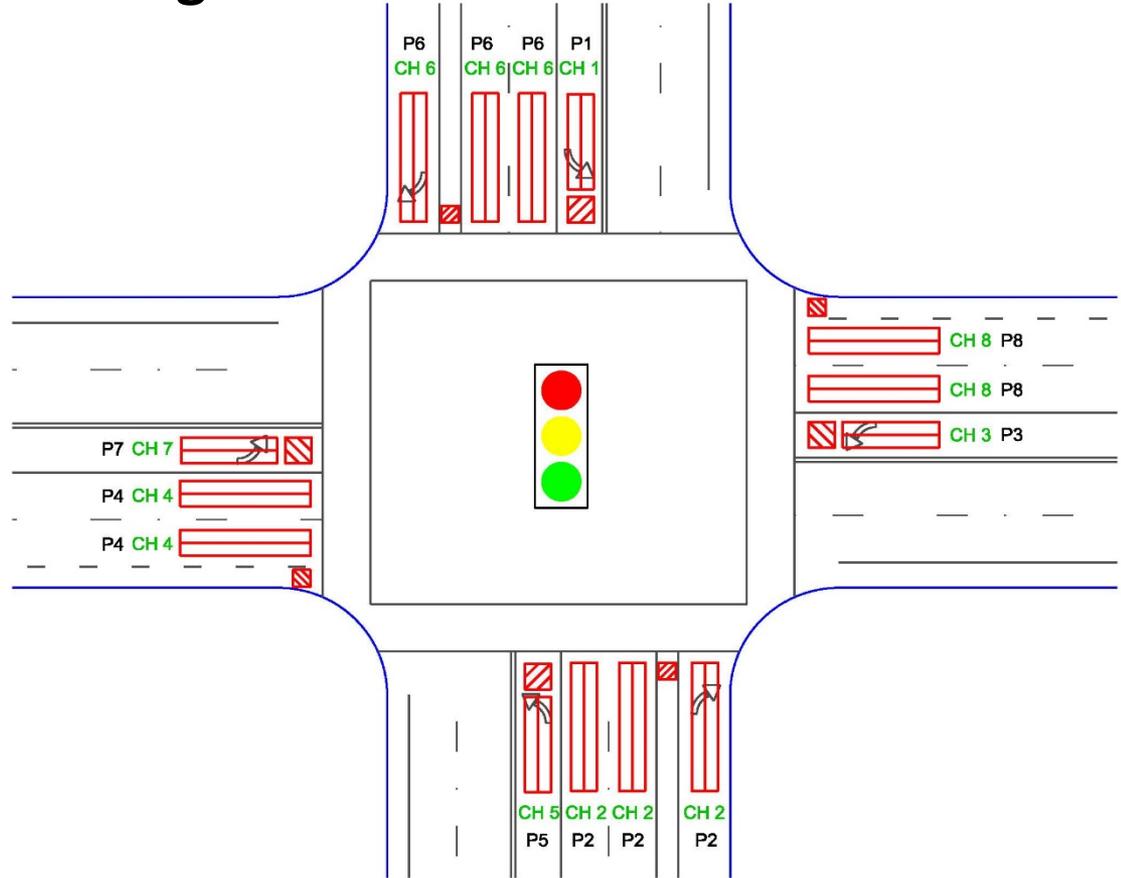
- Internet of Things (IoT) Applications



Video Detection Channel Assignments

Traditional Detection Channel Assignments

- VEH Phase 1 DET Channel 1
- VEH Phase 2 DET Channel 2
- VEH Phase 3 DET Channel 3
- VEH Phase 4 DET Channel 4
- VEH Phase 5 DET Channel 5
- VEH Phase 6 DET Channel 6
- VEH Phase 7 DET Channel 7
- VEH Phase 8 DET Channel 8



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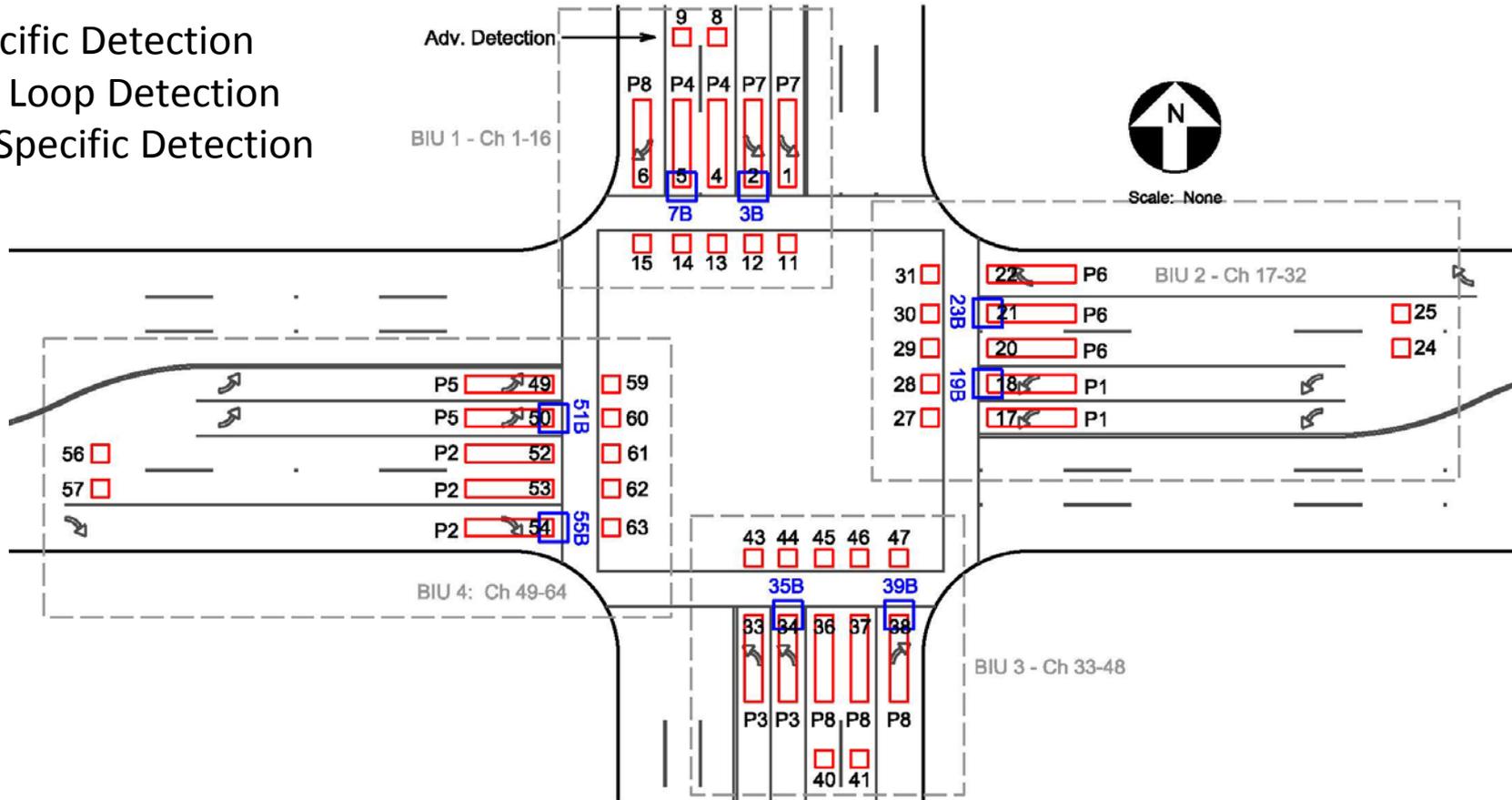


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Video Detection Channel Assignments

Bicycle Specific Detection

- Lane Specific Detection
- Adaptive Loop Detection
- **BICYCLE** Specific Detection

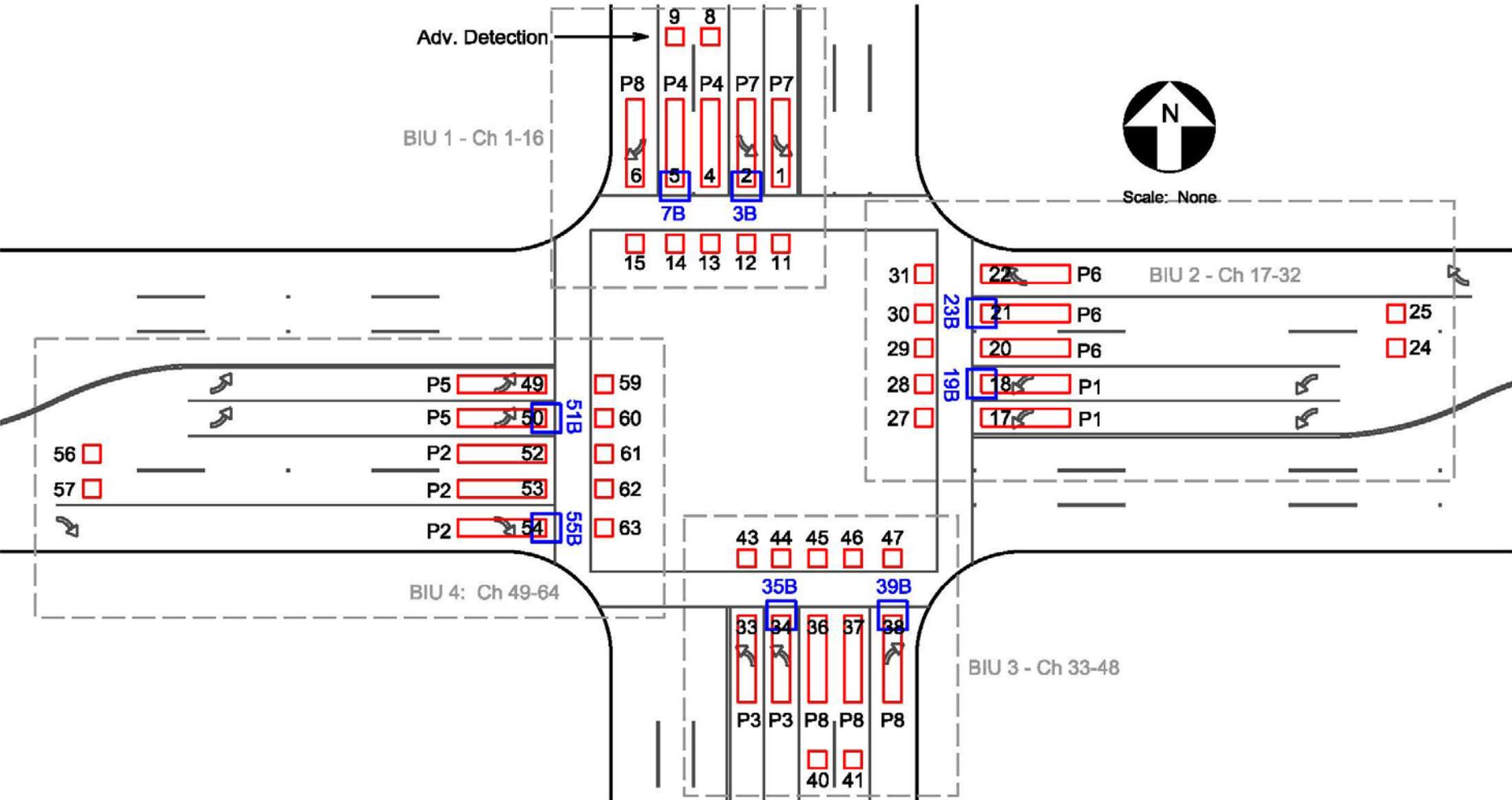


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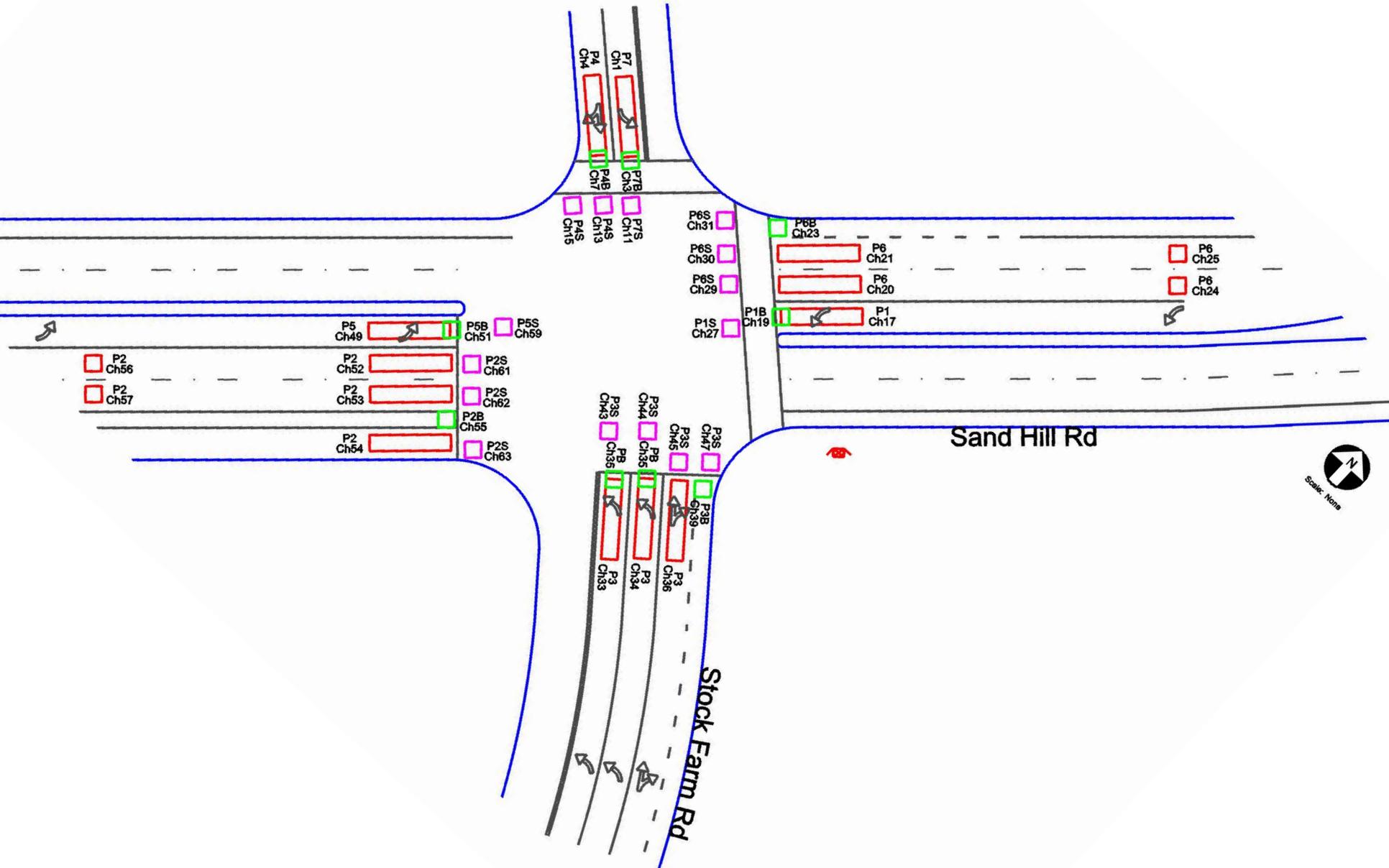
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Palo Alto – 64 Channel Detection Standard

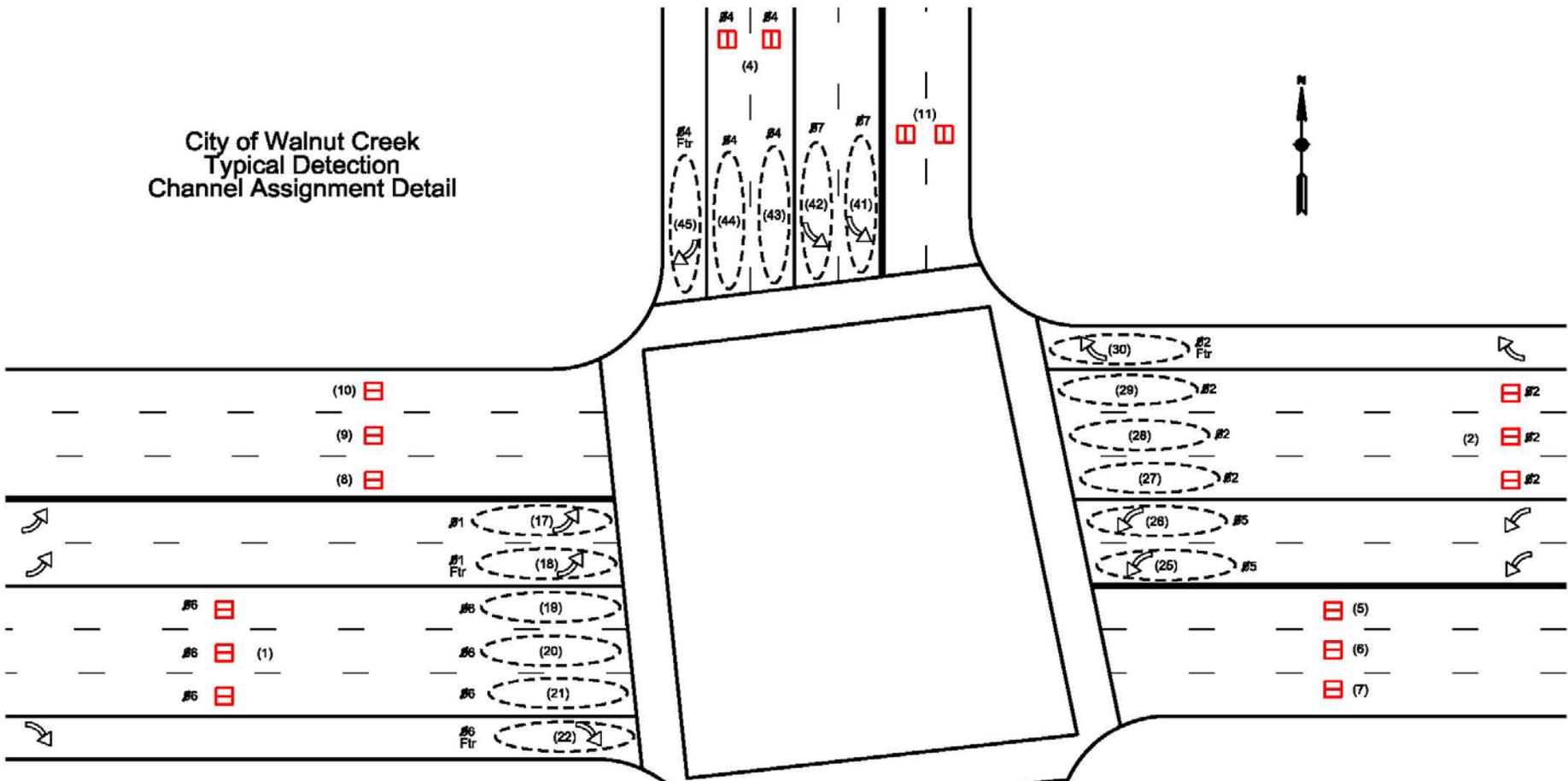


Sand Hill Rd & Stock Farm Rd

- Channel Assignment Example



City of Walnut Creek Typical Detection Channel Assignment Detail

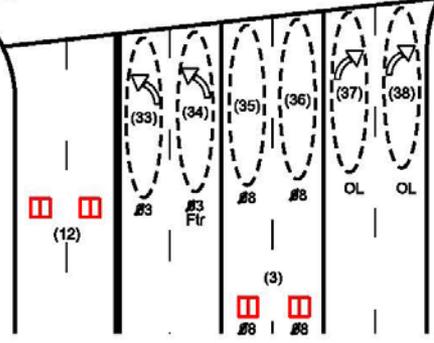


Channel Assignments by BIU

BIU	Approach	Channel Assignments	Notes
1	Adv Loops & System Loops	1 - 4	12 Det Channels Remain in BIU-1 with Video Det Equip in Slots 13-18.
		5 - 12	
2	EB	17 - 24	Virtual BIU thru Video Unit
	WB	25 - 32	
3	NB	33 - 40	Virtual BIU thru Video Unit
	SB	41 - 48	

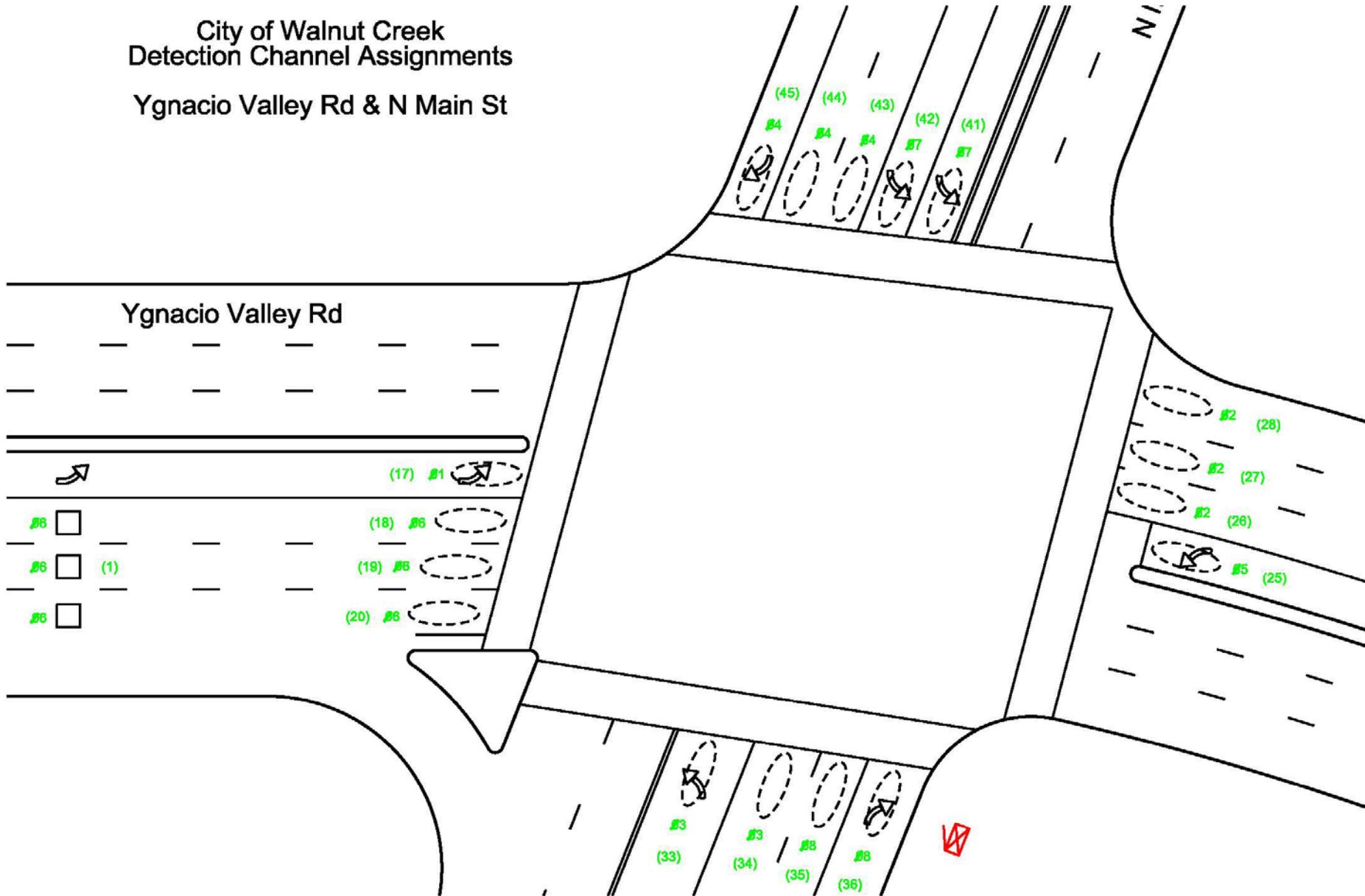
Typical Rack Detail

BIU 1	1	3	5	7	9	11	VIDEO	EMPTY	EV	EV
	2	4	6	8	10	12				



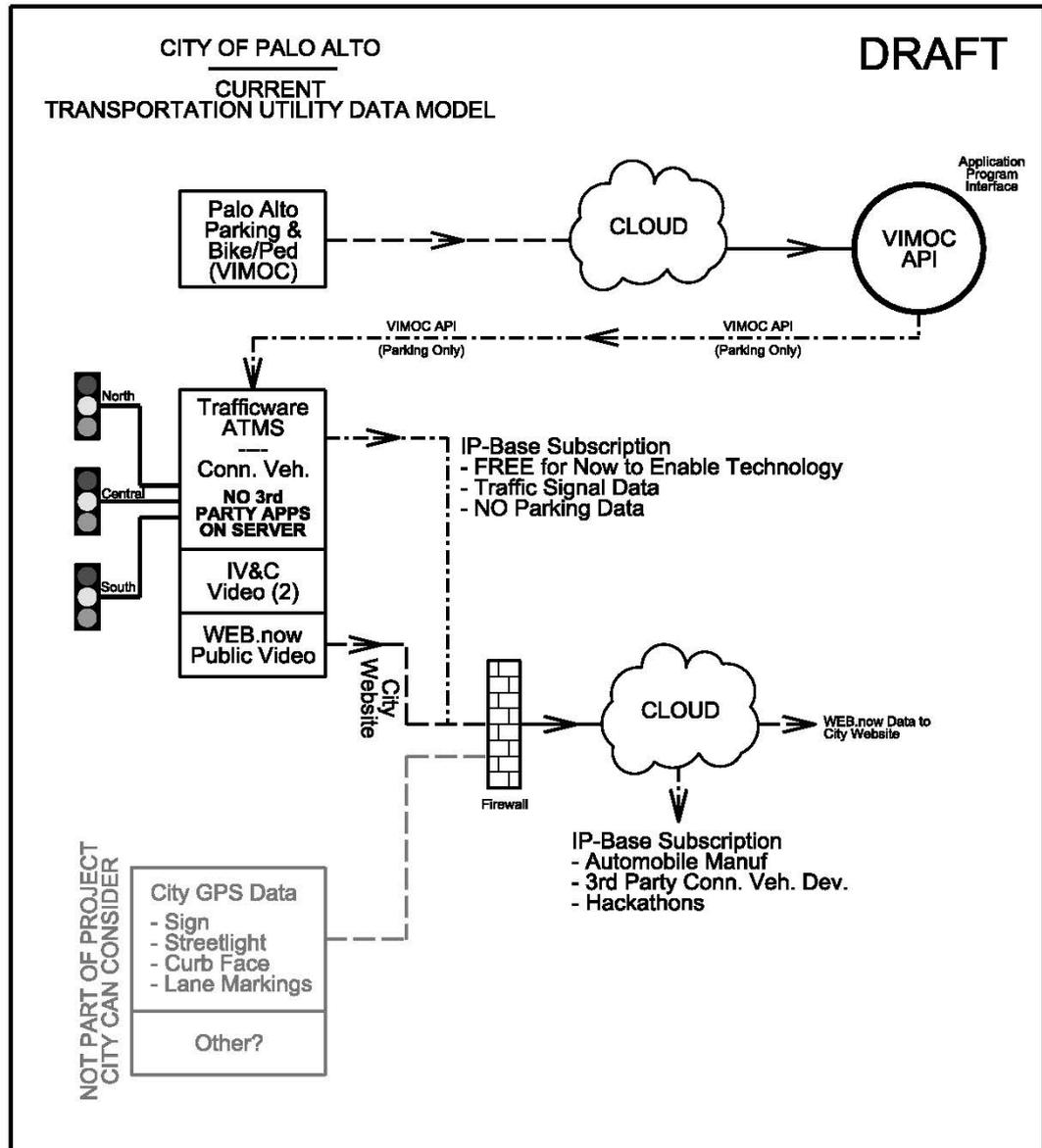
City of Walnut Creek
Detection Channel Assignments

Ygnacio Valley Rd & N Main St



Connected Vehicle Technology

- Industry Standards still Developing
- Palo Alto Standard for ATMS Connected Vehicle Module with Trafficware

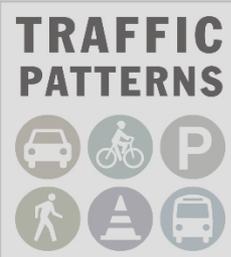


PROJECT	Citywide TB Upgrade		
SCALE:	None	REVISIONS	
SHEET NO.	1	NO.	DESCRIPTION
DRAWN BY:	J. RODRIGUEZ		DATE
REVIEWED BY:	CITY OF PALO ALTO		
APPROVED BY:	CITY OF PALO ALTO		

ENGINEER'S STAMP

Traffic Patterns

P.O. Box 26
Dalyville, CA 94628
D: (925) 918-8141
www.trafficpatterns.net
info@trafficpatterns.net



Detection for Bicycles

Video Detection Example

- Iteris along Sand Hill Rd in Palo Alto for SynchroGreen Adaptive

MS SEDCO Microwave

- Iteris along Sand Hill Rd in Palo Alto for SynchroGreen Adaptive



TC-CK1-SBE

Motion and Presence Sensor



TCIB 2.1 TCIB 4.1 TCIB 4.2

TCIB Interface Boards



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Detection for Bicycles

Dynamic Signal Timing

- Enabled through bicycle-specific detection
- Longer Min. Green by bicycle presence

Bike Traffic Signals- Early Release Bike/Ped
“Flashing Yellow Bike”
Bicycle-Focused Detection



Early Bike/Ped
Release



Flashing Yellow Arrow/Bike
Permissive

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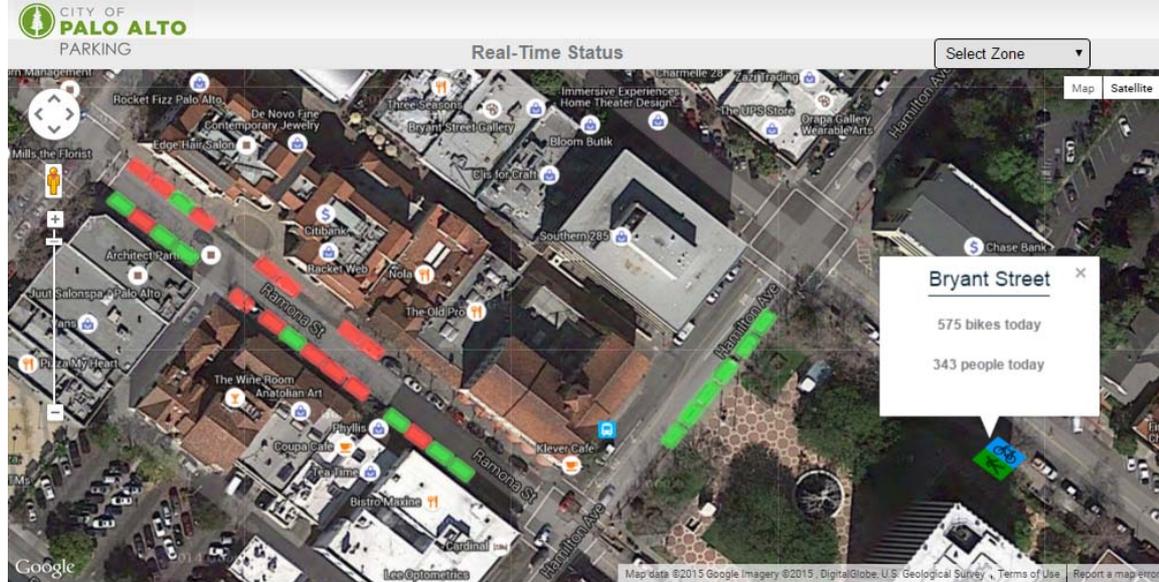
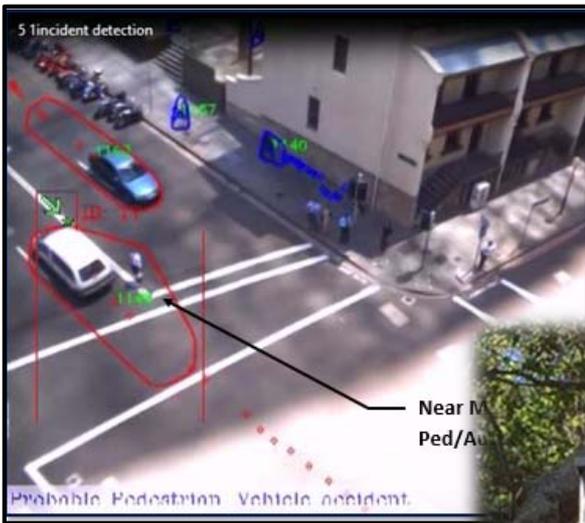
IoT Supporting Transportation

Low-Cost Image Sensors

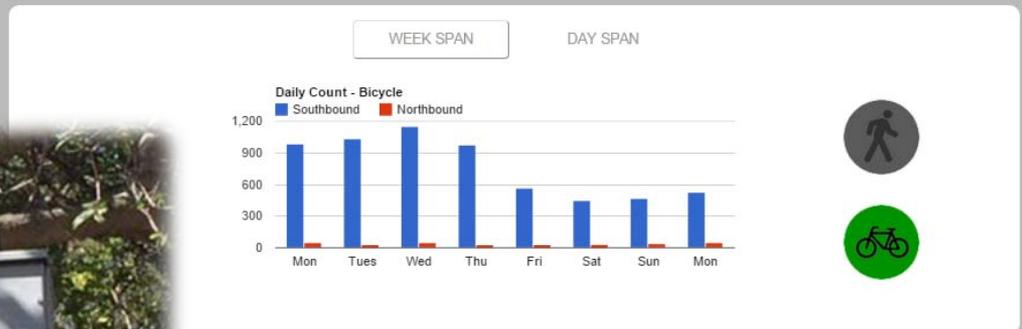
- Bicycle/Pedestrian/Auto Count Stations

Vision Zero

- Near-Miss Detection



BRYANT ST PEOPLE AND BICYCLE COUNTING



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Jaime Rodriguez

jaime@trafficpatterns.net

C: (408) 916-8141

