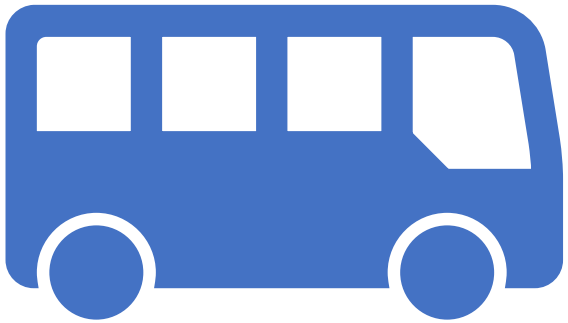

Transit Priority Board Workshop

SR 23-347

August 30, 2023

Presented by Jim Cunradi, Transportation Planning Manager

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Transit Priority, The Strategic Plan & Major Corridors Study

Strategic Plan Values, Goals, Initiatives

- Core Value: Environmental Sustainability
- Goal: Convenient and Reliable Service
- Initiative: Service Quality

Major Corridors Study

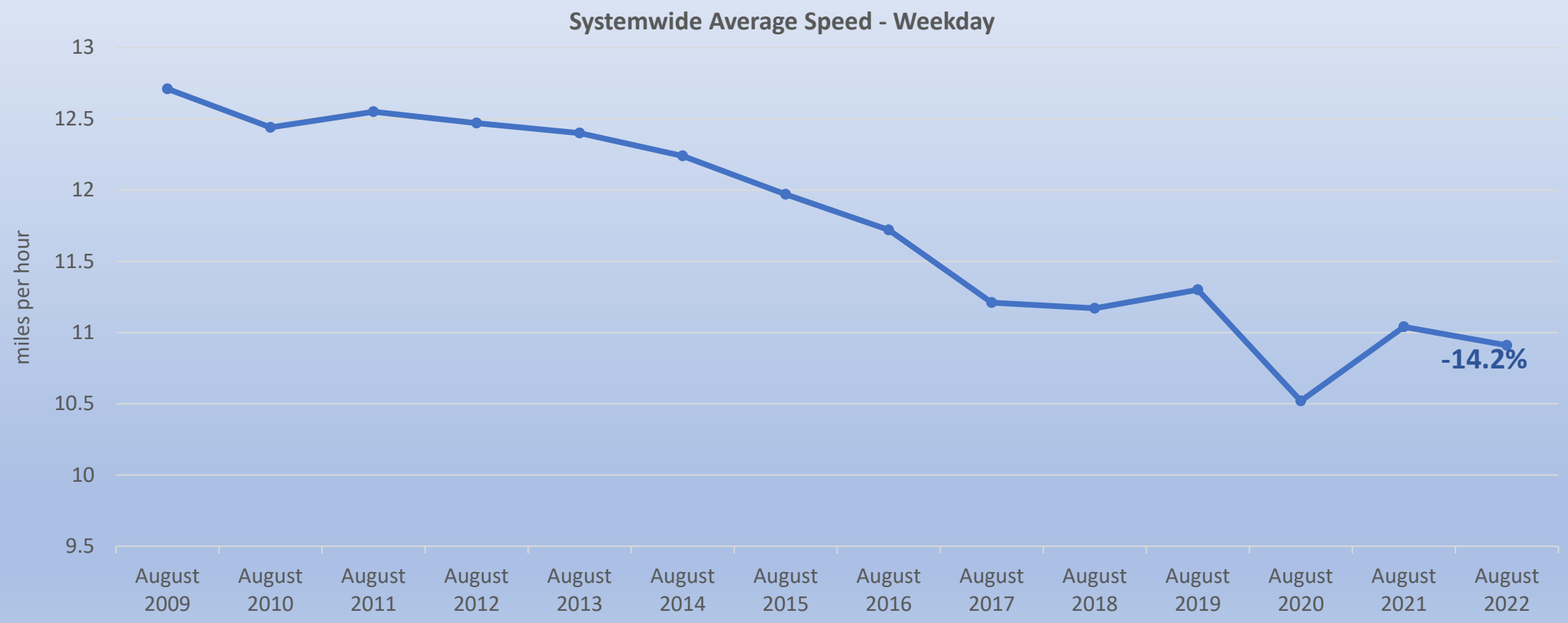
- All transit priority projects completed and underway were recommended in the MCS

Problem Statement

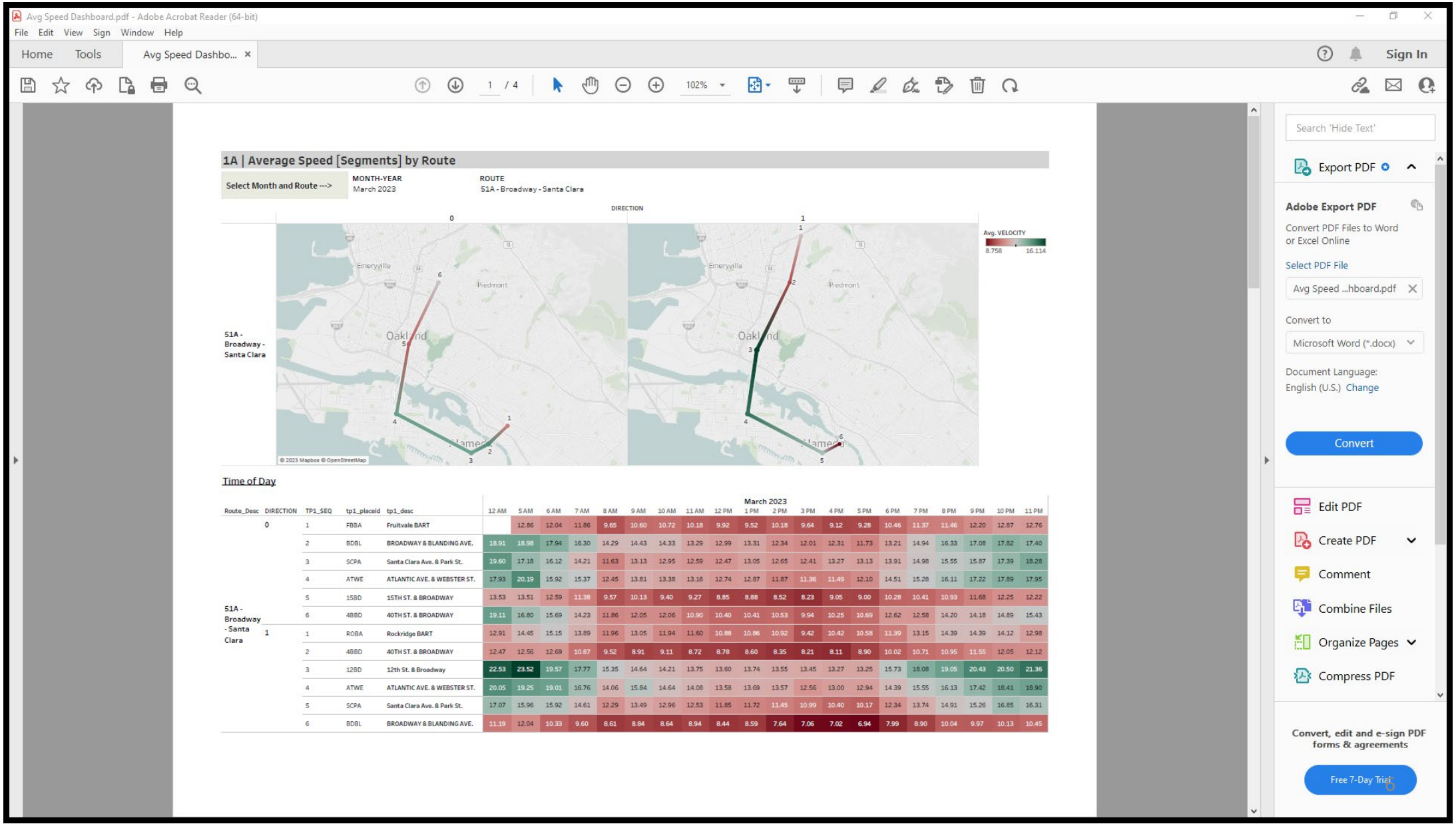
Roadways and Traffic Signals Primarily Designed to Serve Cars, not Buses.

- *The roadway system including traffic signals have, for the last 75 years, shifted away from the primary transit focus established by the Key System and the Interurban Electric Railway System, toward accommodating growing private vehicle use.*
- *The result for AC Transit riders has been longer travel times year-over-year.*
- *System-wide delays mean rising costs or reduced frequency to provide the same level of bus service and increase the likelihood of service cuts during economic downturns.*
- *Slowing or reversing this trend can help AC Transit retain customers and become more environmentally and financially sustainable.*

Systemwide Average Fleet Speed (2009-2022)



Sample Bus Speed Dashboard (Line 51A)



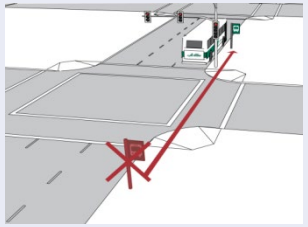
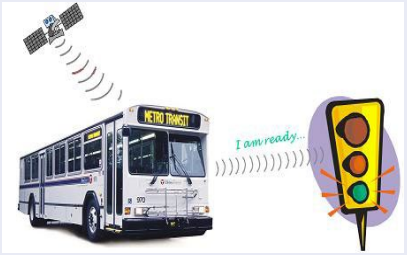
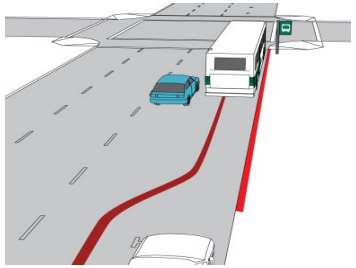
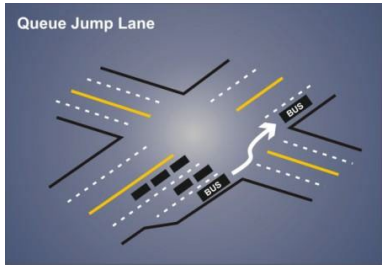
Definitions

Signal Timing. Used by traffic engineers to distribute green time for each traffic movement and provide appropriate pedestrian walk signal length.

Transit Signal Priority (TSP). Gives special treatment to transit at signals. Two types of priority are used in the District. “Passive priority” uses signal timing alone and “active priority” requires communication between the bus and traffic signals.

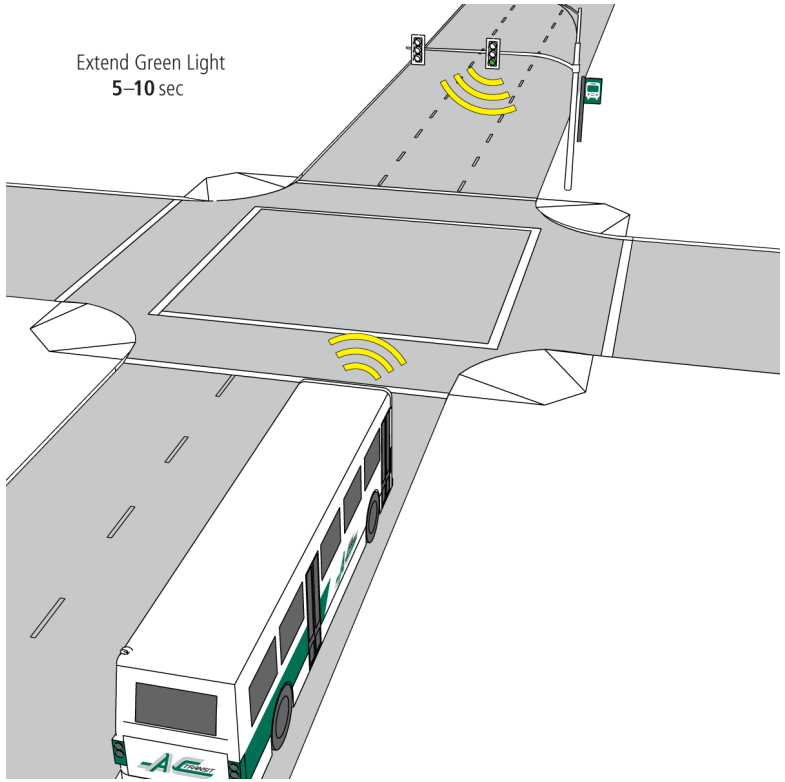
Transit Priority Infrastructure. More general term that includes bus lanes, bus/pedestrian bulbs, boarding islands or other similar features.

Transit Priority Features

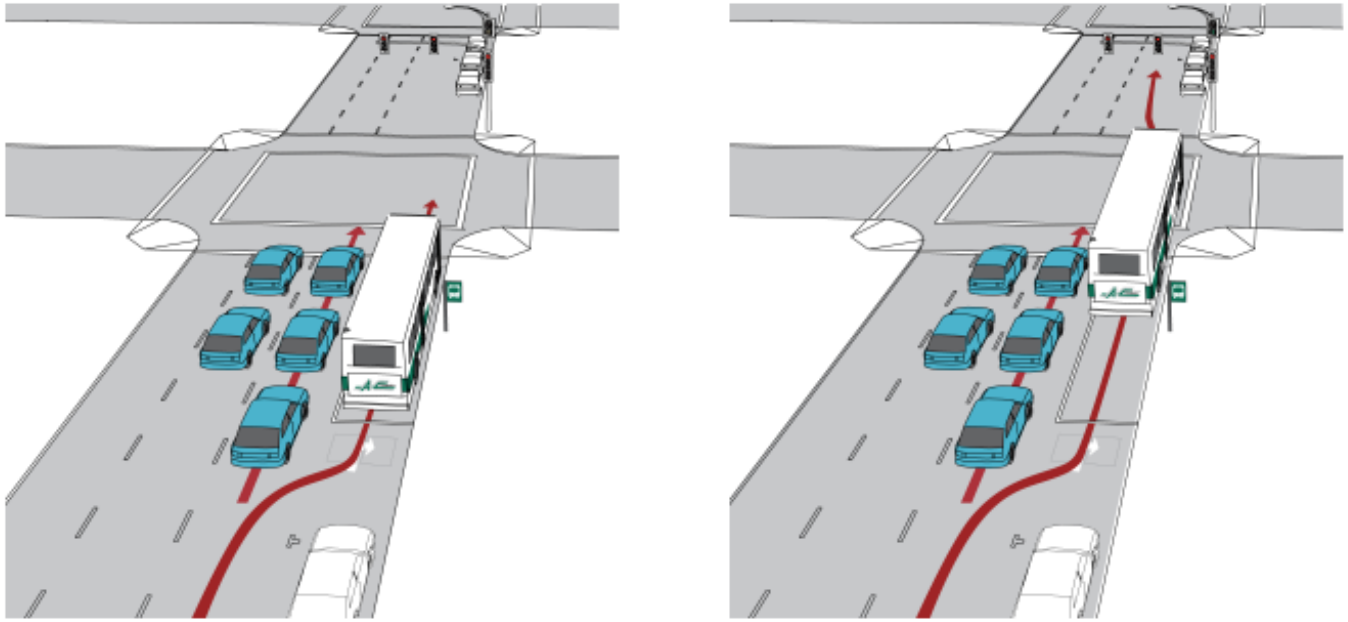
Access & Safety	Delays & Reliability	Smarter System	Amenities
Curb extensions (bus bulbs) 	Stop relocations & consolidations 	Transit signal priority 	Shelters & stations 
Bus stop extensions 	Queue bypass lanes 	Queue jump signals 	Real-time information 
Transit malls, centers 	Bus-only lanes 	Intelligent Traffic Control System 	Signage, wayfinding 

TSP & QUEUE JUMP SIGNALS

Transit Signal Priority



Queue Jump Signal



Bus at near-side bus stop and stopped at queue jump signal phase (left) and bus proceeding through intersection on green queue jump signal phase before traffic (right)

Traffic Signal Timing & Transit Signal Priority Benefits

Traffic - Smoother traffic flow, less stop-and-go

Safety - Improved roadway safety through speed regulation

Environment - Reduced greenhouse gas emissions and reduced particulate pollution

Transit - Shorter passenger travel times, better schedule reliability and less instances of delay, more destinations and opportunities accessible to customers, potentially lower costs

Status of Completed Transit Priority Projects

General Information

- **Equipment on Buses -** About 550 buses are equipped with TSP, currently integrating Clever & TSP
- **Traffic signals -** Upgraded signal controllers and TSP installed at 450 intersections
- **Queue jumps -** Installed at 13 Traffic Signals, 6 are in design

Early TSP Efforts (infrared Opticom system)

- **San Pablo Rapid 72R** (2003)
- **Telegraph-International Rapid 1R** (2009)

Recently Completed Transit Priority Projects

- **Tempo** BRT (2020)
- **Line 97**, Hesperian Boulevard (2019)
- **Line 51** Corridor Delay Reduction & Sustainability Project, Alameda-Oakland-Berkeley (2018)
- **Broadway Bus Lanes** Phase 1 (Oakland-sponsored)
- **I-80 ICM** (Integrated Corridor Management) project

Status of Transit Priority Projects (in Development)

Projects in Design or Construction

- San Pablo Avenue Rapid Corridor (TSP only)
- Grand Avenue Rapid Corridor (TSP & bus stops)
- Telegraph Avenue Rapid Corridor (TSP, bus stops, & Dana Complete Streets Project)
- Decoto Road/Dumbarton (TSP, queue jumps and bus stop improvements)
- Quick Build Transit Priority Projects: Durant, International, and MacArthur (bus lanes, bus stops, queue jump, lane delineation)

Status of Transit Priority Projects (in Development)

Projects In Planning or Nearing Launch

- Mission Boulevard (TSP only, in design)
- Fruitvale (TSP only)
- MacDonald Avenue (signals, TSP, queue jumps, communications & bus/pedestrian bulbs)
- Foothill Boulevard (study only)
- Initiative for Accessible Transit & High Priority Bus Stops

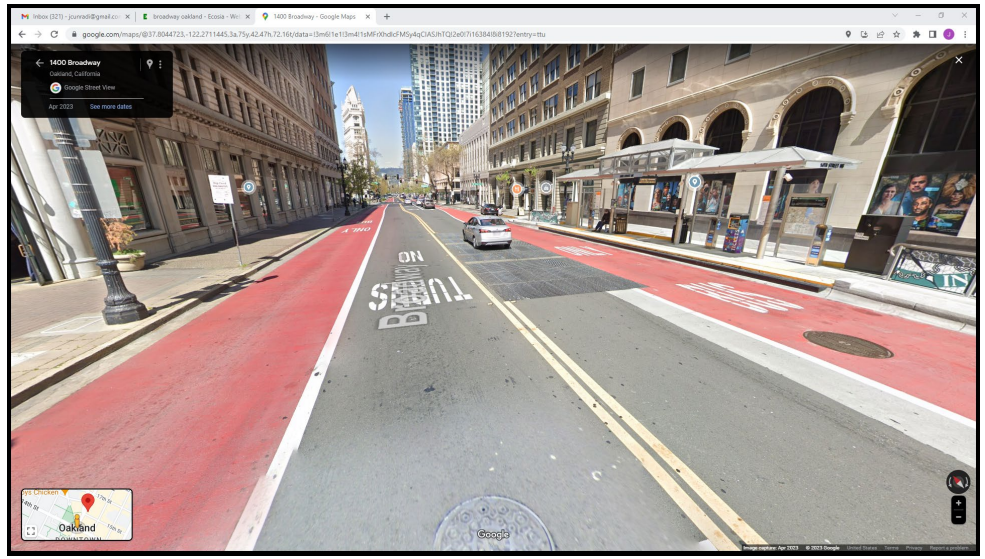
Status of Transit Priority Projects (in Development)

Transit Priority Projects Sponsored by others

- Decoto Road Multimodal (Bus Lanes & Boarding Areas Fremont-sponsored)
- Dumbarton Forward, TSP/queue jump, part-time bus lanes (MTC-sponsored)
- Alvarado-Niles Bus Lanes (Union City-sponsored)
- Powell Street – TSP/queue jump, bus lanes & HOV ramp (MTC-sponsored as part of Bay Bridge Forward)
- MacArthur/40th Smart City Corridor – TSP, queue jumps, bus stop relocations (Oakland-sponsored)
- MacArthur/Lake Park Bus Lanes (ACTC-sponsored)
- Broadway Bus Lane Extension & TSP (Oakland-sponsored, AC Transit-funded)
- Shellmound/40th TSP (Emeryville-sponsored)
- Fremont Cloud-Based TSP demonstration project (Fremont-sponsored)
- Cutting Boulevard TSP (MTC-sponsored)

Status of Bus Lanes

City	Street	Segment	Length
Oakland & San Leandro	Tempo (11th, 12th, E. 12th, Int'l, E 14th)	Bet. Broadway & Farrelly	+18 miles
Berkeley	Bancroft	Bet. Barrow & Oxford	1,840' (red 950')
Oakland	20th Street (Thomas Berkeley Way)	Bet. Telegraph and Broadway	700'
Oakland	Broadway	Bet. 11th and 20th (red)	5,000'
Oakland	SB Broadway	Bet. 45th and 42nd	430'
Oakland	SB Broadway	At Kaiser	550'
Oakland	EB Macarthur	At 55th	290'
Oakland	NB Telegraph	Bet. 51st and Claremont (red)	110'
Alameda	NB Webster	Bet Atlantic and Stargell	1,240'
Albany	WB Buchanan	Bet. the I-80 on/off ramps	340'
El Cerrito	EB Cutting	Bet. San Pablo and the Del Norte BART	230'
Oakland	WB W. Grand & I-80 Bay Bridge on-ramp	Bet. Maritime and the merge	1,200'
San Francisco	Salesforce Transit Center ramps	Bet. I-80 and STC	4,000'



Queue Jump Locations

Currently Operating:

1. EB Webster/Willie Stargell (Alameda)
2. NB Broadway/Piedmont (Oakland)
3. NB College/Manilla (Oakland)
4. SB College/Broadway (Oakland)
5. SB Broadway/42nd (Oakland)
6. SB Broadway/Kaiser Medical Center (Oakland)
7. SB West Grand/San Pablo (Oakland)
8. WB University/MLK - (Berkeley, currently inactive)
9. WB University/9th (Berkeley)
10. WB Buchanan/i80 SB on/off ramps (Albany)
11. WB Decoto/Paseo Padre (Fremont)
12. EB Decoto/Paseo Padre (Fremont)
13. WB Decoto/Fremont (Fremont)

Queue Jump Locations

Coming Soon:

1. MacDonald Project (number & locations TBD)
2. Fruitvale Project (number & locations TBD)
3. WB Bayfront Exp./University (Menlo Park)
4. WB Bayfront Exp./Willow (Menlo Park)
5. Powell/I-80 SB on/off ramps (Emeryville)
6. MacArthur @ Park, Beaumont & Coolidge (Oakland)

Corridor Transit Priority Elements - Cost, Degree of Difficulty & Effectiveness

Element	Cost	Degree of Difficulty	Effectiveness
Bus Lanes	$$$	- - -	+++
Queue Jump Signals	$$	- -	++
Signal Timing	$$	- -	++
Transit Signal Priority	$	-	++
Bus Stop Relocation & Consolidation	$	-	++
All-Door Boarding	$	- -	++
Bus Bulbs / Boarding Islands	$$	- -	+

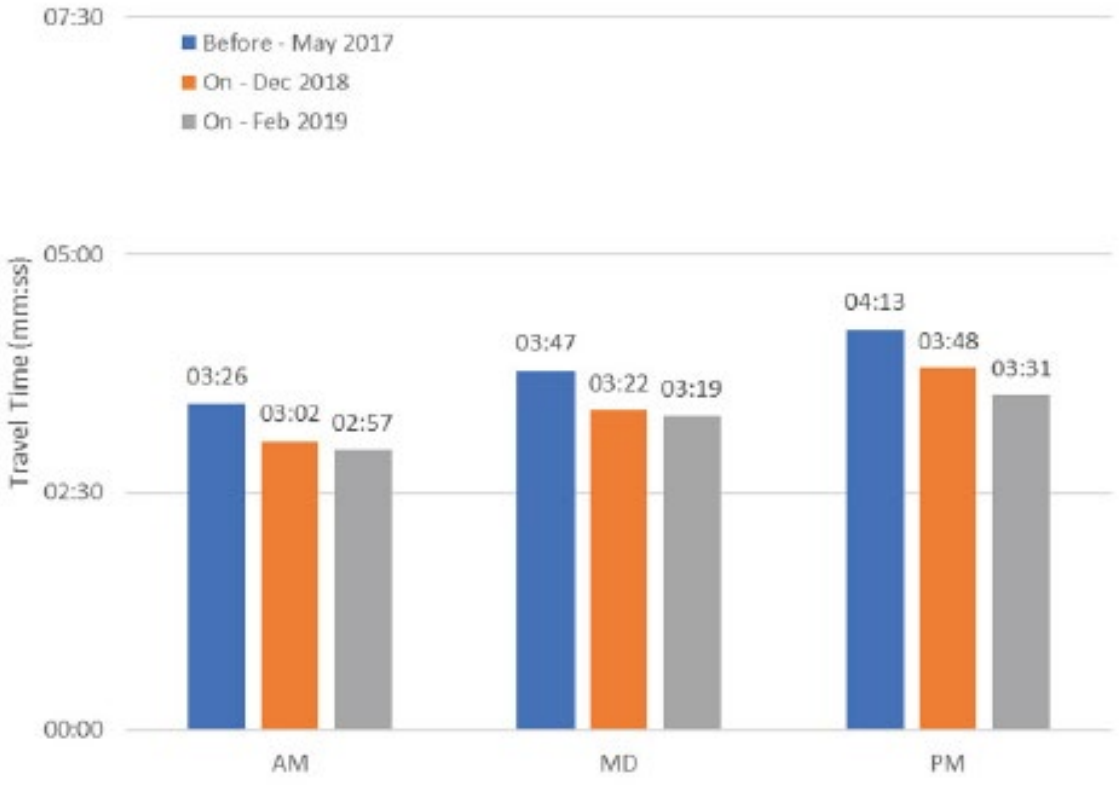
TSP – The National Experience

Agency	Intersections	Buses	Travel Time Savings
SFMTA	450	900	10% (Mission)
Toronto TC	200	2,000	8 sec/intersection, 60 sec/left turn
TriMet*	58	1	20%
NYC DOT & MTA	1,700	6,000	0.7-25%
LA DOT & LA Metro*	211	150	Wilshire 29%, Ventura 33% (12% attributed to signal timing)
King County	200	1,500	2-5%
Chicago TA	500	13	4-15%, 50% less schedule variability

SPEED AND RELIABLILITY RESULTS – Line 51

Performance Indicator	51A	51B	Other Major Bus Lines (excl. International)
Average Speed Improvement	2%	2%	-7%
Reliability (OTP)	74.6%	77.0%	65.0%

SPEED AND RELIABLILITY RESULTS - Line 97



Corridor Vehicle Travel Times

- 7-11% more vehicles arrived on green light
- 14% vehicle travel time improvements
- Indirect evidence (dwell time) of bus travel time improvement for AM and off-peak (14 hours). Worse in PM peak (3 hours).
- Improved headway variability (reliability) for AM and off-peak. Worse in PM period
- Field test shows TSP works at all 8 new county signals installed after Line 97 project. Follow-up study to be done.

San Pablo Avenue TSP Performance

Sample data taken at Heinz, Grayson, Parker

Result	Number	Percentage
TSP Grants Green Time Increase	708	36%
TSP Call Rejected	1,266	64%
Total	1,974	100%

Reasons for Rejected TSP Calls

1. Bus stopped at a bus stop, door open
2. Bus out of range
3. Another bus granted priority
4. Signal already green
5. Currently serving pedestrian phase
6. Coordination lock out
7. Overridden by high priority emergency vehicle call
8. Faulty equipment on the bus

Time Savings per Granted Request = 8-35 seconds

San Pablo Avenue TSP Performance

178 Sample Bus Runs between Potrero and Moeser (4 signals)

	TSP Condition		Time Savings	
TSP data collected 7/25/23 – 8/8/23	Off (min.)	On (min.)	Diff. (min.)	Pct Savings (TSP Only)
Average Run Time	2:41	2:25	0:16	10%

Upcoming Before & After Studies

Three new studies will be prepared for Tempo, Rapid Corridors (San Pablo, Telegraph, Grand) and Dumbarton after opening

An updated Line 97 study will be undertaken after completion of County's utility undergrounding and landscaping project, currently years behind schedule

TSP Data & Communications Challenges

Without communication, traffic signal data must be extracted manually at the signal controller.

Once communications problems solved, data can be accessed remotely.

List of communications-related Problems

- 11 separate **fiber optic cable cuts** on Tempo. Cuts on Broadway affect Tempo and Line 51. Line 97 in San Leandro has 2 additional cuts
- **Missing communications segments** on Hesperian due to ongoing construction of streetscape project
- Caltrans controllers are **not** enabled for remote access
- Traffic Management Centers (TMCs) are key to remote access to data, but **half are out of order**
  - Out of Order: Oakland, San Leandro and San Pablo
  - Working TMCs: Caltrans, Richmond and Hayward

Challenges for TSP & Transit Priority Projects

Mixed local record of modernization of signal system

Long, complicated government approval processes

Conflicting values and policies that de-prioritize transit

Cities and Caltrans restrict TSP functionality

Difficult data collection, analysis and management, poor infrastructure

Funding, Policy & Decision-Making

Positive Trends

- All recent projects funded through grants with minimal or no District funding match
- More pro-transit local officials than ever
- More regional attention on TSP and transit priority treatments
- MTC's Transformation Action Plan & BusAID

Negative Trends

Funding

- Lower funding per project
- Difficult to fund supporting improvements, like bus stops, communications, and advanced planning

Local challenges

- ACTC Modal Priorities Plan is no longer followed
- Local jurisdictions have not prioritized transit
- Cooperative agreements required for every jurisdiction

Safety Responsibilities

All parties including cities, counties, Caltrans, and AC Transit are committed to the highest standards of public safety

City is responsible for determining if any new signal meets “warrants” (safety evaluations)

Cities are the gatekeepers for any proposals we make regarding equipment changes, signal timing, pedestrian actuation, etc.

Local traffic engineers are responsible for ensuring that new projects are safe for all road users

AC Transit’s traffic engineer plays a similar role to the local traffic engineer in project development, implementation, and safety assessments

TSP and Pedestrian Safety & Convenience

Pedestrian Push Buttons v. Pedestrian Recall

- Decision on appropriate treatment rests with local jurisdiction.
- Nationally and locally, most cities seem to prefer pedestrian push buttons along arterial streets with low pedestrian volumes and pedestrian recall in areas with high pedestrian volumes, such as downtowns or near university campuses. No cities have hard and fast rules for which approach is used.
- The city's treatment preference does not change with TSP.
- AC Transit staff follows the lead of the cities on this issue.
- Contra Costa County is considering using video detection for pedestrians for all smart signals. Emeryville is pursuing a similar pilot.

Traffic Signal & TSP Impact to Pedestrians

	No Impact	Small Impact	High Impact
Timing for High Traffic Volumes			✓
Protected Left-turn Phases			✓
Split Phases			✓
TSP with No Bus Present	✓		
Passive Priority Only	✓		
Pedestrian Crossing Side Street	✓		
Pedestrian Crossing Mainline, Activates Signal Before Bus	✓		
Pedestrian Phase Crossing Time	✓		
Pedestrian Crossing Mainline, Activates Signal After Bus		✓	

Opportunities to Improve Traffic Signals & TSP

TSP PROTOCOLS & COMMUNICATIONS

ADVANCED DETECTION

CLOUD-BASED TSP AND OTHER NEW TECHNOLOGIES

RENEWED REGIONAL INTEREST IN TRANSIT PRIORITY & NEW FUNDING

INVESTMENT BASED ON TIME SAVINGS