Downtown Sacramento Transit Circulation and Facilities Plan Concept

Final Report

June 29, 2012

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1 Introduction

1.1 Downtown Study Area

The study area was initially identified as the downtown Central City area bounded by the American River to the north, the Sacramento River to the west, Alhambra Boulevard to the east, and Broadway to the south. As the study analysis moved forward, emphasis was focused on the Central Business District (CBD) west of 16th Street, where downtown mobility and transit circulation issues are most prevalent.

1.2 Project Approach

Study Purpose

The *Downtown Sacramento Transit Circulation and Facilities Plan Concept* is intended to improve the desirability of transit services to both dependent and discretionary customers through faster travel, enhanced wait facilities, and easier to use services. It is also intended to improve transit operations by increasing service reliability and the ease of supervision while ensuring adequate layover locations for transit vehicles. Expediting the movement of transit service into, through, and out of downtown will reduce travel time for transit customers and decrease conflicts with automobile traffic. Improving transit speeds has a two-fold positive impact: 1) it improves the travel experience for customers, increasing ridership and revenue; and 2) allows for better utilization of vehicles in systems with high-frequency transit service, often reducing both operating and vehicle capital costs while improving service reliability.

Bolstering the profile of transit in downtown is consistent with goals of increasing transit ridership in the city's General Plan. By creating a more appealing and faster travel experience transit's role in downtown mobility can increase. Investing in upgraded transit facilities and service quality in the near term will better position Downtown Sacramento to accommodate and promote future economic development while increasing downtown livability.

The study produced a conceptual plan for overall improved transit operations within the downtown area. Using a broad-based approach, the study aims to incorporate principles necessary to support the development of a sustainable downtown Sacramento community. Moving forward, specific recommendations will require project-level analysis prior to implementation. Additional detailed analysis and design efforts will afford all interested stakeholders the opportunity to contribute to the process, ensuring all concerns are addressed prior to implementation planning.

Role of Rail

The operational impacts of both light rail and planned streetcar were considered throughout the study, although specific recommendations for rail were not developed. Any modifications to light rail service in downtown are constrained by the existing track infrastructure. Light rail service was not a significant focus of this study given the relative permanence of light rail infrastructure and the short term focus of this study's scope. Additionally, light rail service currently enjoys a number of delay reduction features including dedicated right-of-way, signal pre-emption, and reasonable station spacing. The streetcar planning effort took place concurrently with this study and key elements were considered throughout development of the recommendations to ensure compatibility with future plans.

Collaborative Plan

Development of the plan included extensive collaboration with downtown transit operators, downtown stakeholders, and City of Sacramento staff. The effort identified and engaged key stakeholders—including downtown employers, businesses, property owners, residents, and advocates for transit, pedestrian, and bicycle transportation—to provide input on potential solutions to enhance the quality of transit service for customers and improve transit operations and facilities within the downtown area. A Technical Advisory Committee (TAC) was established to engage staff of downtown transit operators and the City of Sacramento.

1.3 Project Overview

The *Downtown Sacramento Transit Circulation and Facilities Plan Concept* began with the development of an extensive planning context for the downtown study area. This planning context was informed by existing and on-going studies, analysis of existing transit and development conditions, analysis of future development and transit conditions, and identification of key study issues.

Based on the understanding generated from the planning context, an extensive process of plan alternatives design, evaluation, and collaboration occurred. This process in turn led to a consensus-preferred plan concept. Subsequent evaluation of the preferred plan concept outlined the impact on overall circulation and level of service. Throughout the development and review of the plan, extensive collaboration with stakeholders and staff occurred.

Following the development and review of the consensus-preferred plan concept, an initial financial analysis was conducted to quantify the operating and capital cost requirements for the plan.

The ultimate outcome of the project is a preferred plan concept ready to move forward in two stages: 1) immediately implementable concepts, and 2) concepts which inform subsequent downtown planning efforts, specifically the City of Sacramento's Downtown Transportation Study.

2 Planning Context: Key Findings

2.1 Existing and On-Going Studies

Previous and existing studies that offered relevant context to the development and transit advancements in downtown Sacramento were examined. These studies included several City of Sacramento and SACOG plans (2009 General Plan Update, Metropolitan Transportation Plan), the short range and long range transit plans of downtown Sacramento transit operators, and various Sacramento Regional Transit District plans, including the TransitAction Plan and TransitRenewal. Numerous redevelopment plans for the Railyards, Old Sacramento, and the River District were also reviewed, as well as the Reintroduction of Vehicles on K Street Plan, and multimodal plans for the study area, such as the recent Sacramento Streetcar Plan. A more detailed description of the review, including an inventory of all included plans, is included in the report Appendix.

Existing and on-going studies called for enhanced transit service within the Central City area, specifically along high-capacity transit corridors. Two major transit projects planned in the study area include a streetcar system to connect West Sacramento and downtown Sacramento and the Green Line light rail project, which adds 12.8 miles of service from downtown through the River District and Natomas to the Sacramento International Airport. Plans also include increased trips into downtown Sacramento by suburban transit operators, efforts to help maximize public transit connections, the reintroduction of cars on K Street, and improved access to the riverfront and Old Sacramento, and Central City efforts to improve bicycle mobility in downtown Sacramento. The development of a downtown arena, the Railyards, and the River District were also examined to determine their impact on the future of downtown Sacramento.

2.2 Existing Conditions

The study area originally encompassed the downtown Central City area. As the Plan moved forward, specific emphasis was placed on the CBD west of 16th Street, where downtown mobility and transit circulation issues are most evident.

Transit Providers

At the onset of the study, 12 operators were providing transit service to downtown Sacramento: e-tran (Elk Grove), El Dorado Transit, Fairfield-Suisun Transit, North Natomas TMA, Placer County Transit, Roseville Transit, Sacramento Regional Transit, San Joaquin RTD, Yolobus, Amador Transit, and Yuba-Sutter Transit. SCT/Link initiated commute service into downtown Sacramento on April 30, 2012.

Transit Service

The majority of local transit service in Downtown is focused on a limited number of corridors and key couplets. Express service is more dispersed along different alignments, offering more opportunity to concentrate service to maximize infrastructure investment.

Transportation Infrastructure

Many streets in the core of the Central City carry heavy traffic and operate in a one-way configuration with good traffic signal progression. There is no current transit infrastructure to specifically address bus service delay, although the LRT has some signal priority. Currently, RT has responsibility for all transit stop and station infrastructure working in coordination with the City of Sacramento. Existing stops are shown in the *Task 3 & 4 Report* in the Appendix.

All Day Ridership Patterns

Bus ridership is concentrated along the major north-south downtown corridors of 7th/8th Streets, 29th/30th Streets, and the east-west corridors of J/L Streets. Light rail ridership is also concentrated along 7th/8th Streets, 12th Street, and R Street. Weekday transit boardings by stop for the various types of service are shown in figure *Existing All Day Downtown Ridership*.

Bus Speeds

During the AM Peak period (7-9 AM), bus operating speeds are ten miles per hour or less within the northwest sector of the Central City area, particularly along 5th Street, 7th/8th Streets, I Street, J/L Streets, and Q Street. Figure *Existing RT Bus Speeds Mid-Week AM Peak Period* illustrates the AM Peak example.

During the Midday period (1-2 PM), bus operations are still at AM Peak speeds of less than ten mph, particularly along I Street, J/L Streets, 7th/8th Streets, and 29th/30th Streets.

During the PM Peak period (4-6 PM), bus speeds remain slow (less than ten mph) along 7th/8th Streets, 9th Street, 19th Street, 29th/30th Streets, I Street, and J/L Streets.

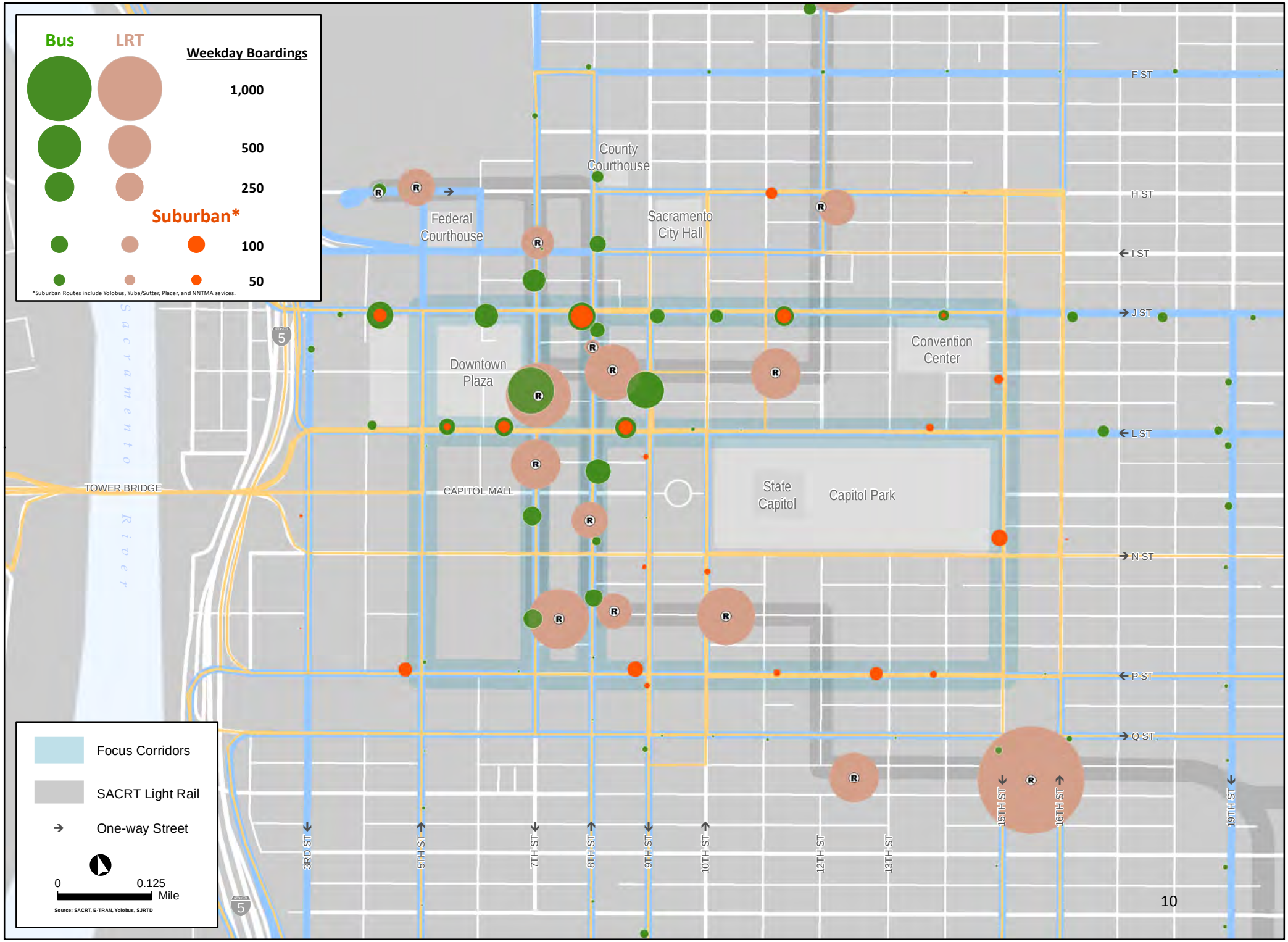
Transit Vehicle Delays

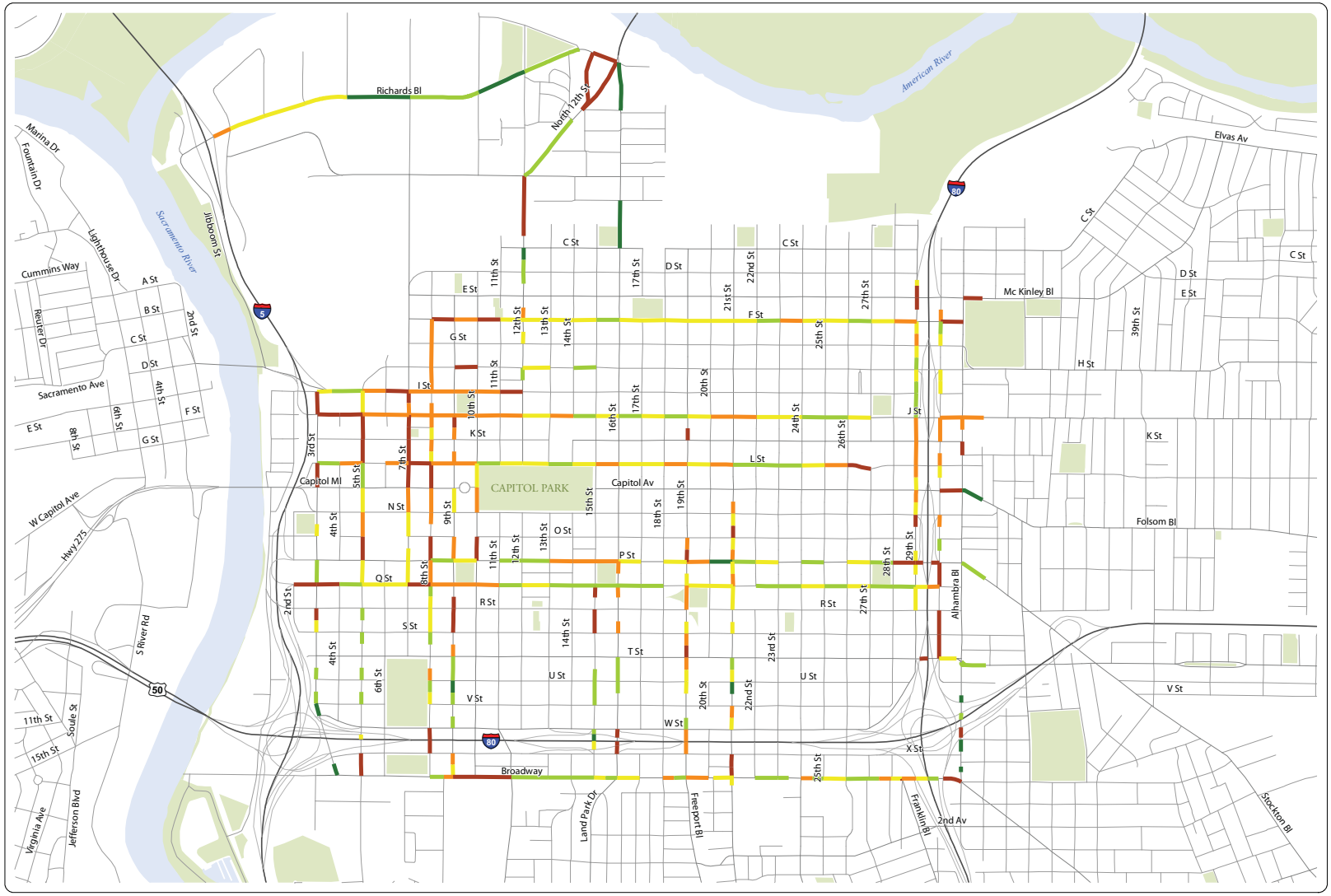
There are several factors that create transit vehicle delay, which increases wait and travel time for downtown travelers. These factors include: traffic signal timing preferences for major commute routes, which often create delays for crossing traffic; at-grade prioritized LRT crossings; congested conditions at bus stops which result in buses waiting in queues to reach the boarding platform; increased transit stop/station dwell time, often caused by the single file one-door boarding practices common on most express services; congestion at freeway ramp intersections; and heavy pedestrian flow at key crossing locations, which cause right turn queues delays for through transit.

Delay Segments

Various corridor segments within downtown operate below designed capacity for general traffic and often display slow to very slow bus speeds of less than ten miles per hour. These corridors were determined to be high priority and second priority segments. High priority segments operate along key corridors that experience significant ridership, including the following streets: I Street, J/L Streets, and 7th/8th Streets. Second priority segments operate along corridors that display moderate ridership: P/Q Streets, 5th Street, 9th/10th Streets, and 15th/16th Streets. These priority segments are prime candidates for potential time-saving initiatives. These priorities for delay reduction are noted in *Key Study Corridors* figure.

Downtown Sacramento Boardings - Weekday





LEGEND

Average Speed

- < 5 mph
- 5-10 mph
- 10-15 mph
- 15-25 mph
- > 25 mph

Park

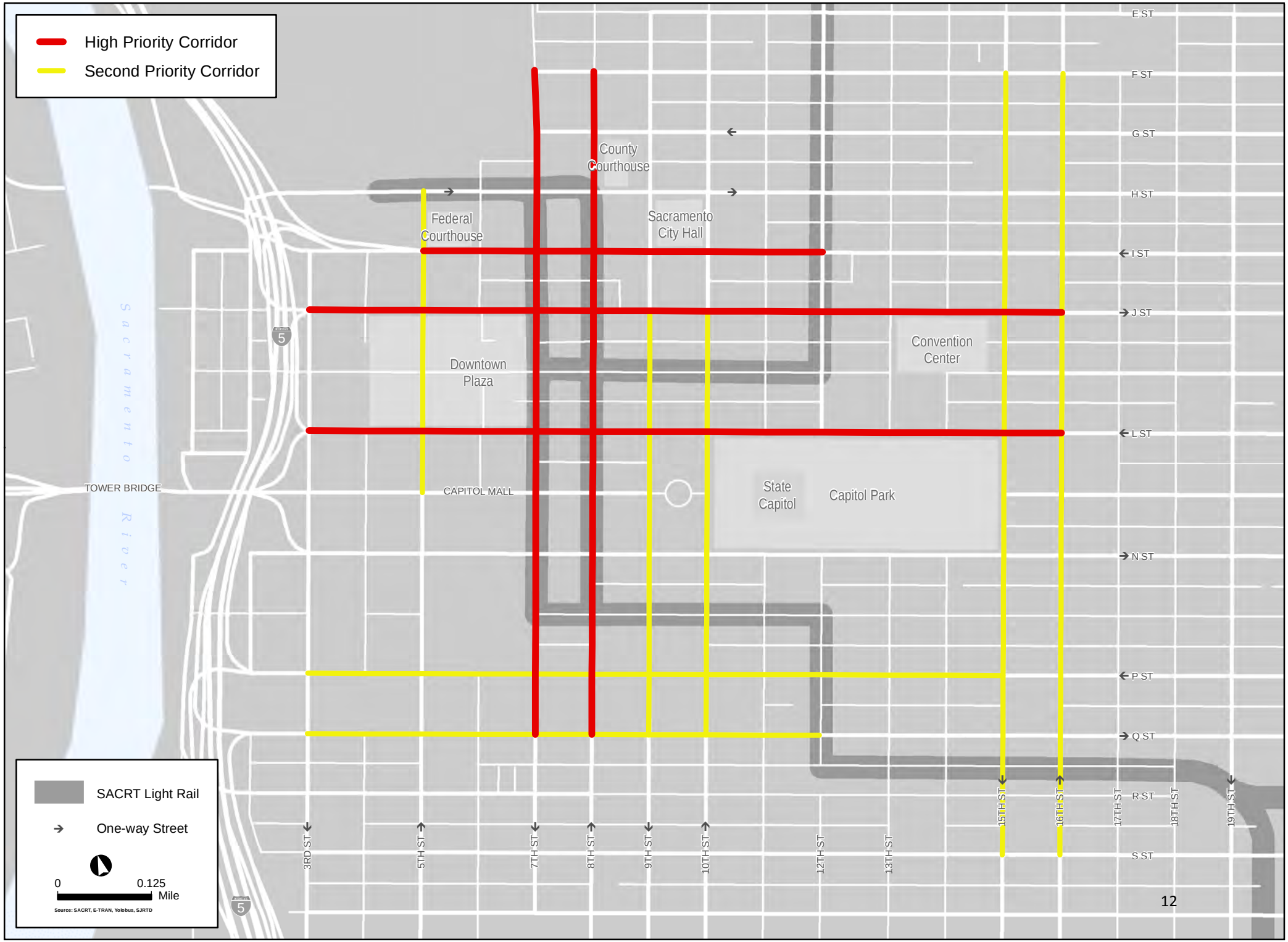
N

Not to Scale

FEHR PEERS

EXISTING RT BUS SPEEDS
MID-WEEK AM PEAK PERIOD
FIGURE 11

Key Study Corridors



2.3 Future Conditions

Transit Improvements

As employment densities continue to grow in downtown Sacramento and more emphasis is placed on residential development, there will be more all-day, all-week demand for sustainable transportation, such as transit, biking, and walking. Future focus on transit is necessary to accommodate such growth, and transit plans reflect that need. For example, 7th/8th Streets and J/L Streets will see service levels increase to every ten minutes, and studies examining the interaction of light rail, planned streetcar, and general traffic on K Street display a focus on transit developments in this plan's study area. The Sacramento Intermodal Transportation Facility, the Green Line Light Rail Extension, and Downtown LRT Station Enhancements also reflect planning efforts to raise the profile of transit in downtown Sacramento. Future plans create a strong need to balance growth with future transit investments.

2.4 Key Study Issues

Integration with Concurrent Planning Efforts

The *Downtown Sacramento Transit Circulation and Facilities Plan Concept* aims to develop recommendations in concert with ongoing planning efforts within the CBD focus area, including: the reintroduction of cars on K Street, future development of the Railyards and associated activity centers, incorporation of TransitRenewal and Sacramento Streetcar Planning Study recommendations, and promotion of multimodal coordination. Further, it is anticipated that this work will help inform the upcoming City of Sacramento Downtown Transportation Plan, which will provide a comprehensive evaluation and vision for all transportation in the downtown.

Transit Stop Locations

Securing preferred downtown bus stop locations poses a number of issues for downtown transit operators and stakeholders. There are often problems encountered in utilizing curb space for bus stops instead of revenue-generating street parking. Utilizing bus stop space can also be difficult if business owners oppose a bus stop near their storefront, out of concern over visibility issues or the desire to not have transit patrons concentrated in front of their business. Another complicating factor is that far-side bus stops are safer for pedestrians and more operationally efficient; however, they may lead to intersection backups if overscheduled.

This plan concept recommends bus stop locations that meet the customer and operational needs for transit operators while minimizing the impact on other downtown stakeholders. It is anticipated that the stop locations will be finalized following additional collaboration between RT and the City of Sacramento during subsequent planning efforts.

Downtown Bus Routing

Strategic bus routings can result in reduced delay and increased service reliability. Transit customers and operators alike benefit from bus routings that minimize travel times through downtown while also providing transit access within a short walk to downtown destinations. The plan identified downtown corridors that balance walking access with streamlined operations. Elements that affect the selection of downtown bus routings include: proximity to major downtown activity centers, coordination with rail services (both light rail and future streetcar), and the potential to implement transit enhancements on selected corridors.

Building Stakeholder Ownership in Plan Concept

The outcome of this downtown planning effort will need the support of both key downtown stakeholders and the transit operators to move forward. These groups played an integral role in the discussion of key issues, necessary improvements, and in prioritizing the downtown plan concept for transit.

2.5 Key Study Corridors

The delay segments identified as key study corridors were advanced to the alternatives phase of the project as the primary candidates for delay reduction improvements. While all corridors in the study area were screened for improvements, travel analysis results suggested that focusing efforts on the identified corridors would realize greater benefits for transit operators and transit customers in the downtown.

Following the existing and future conditions analyses, road segments were prioritized for improvement based on several criteria, including:

- Severity of observed bus and general traffic delay
- Concentration of existing and future transit services
- Volume of existing transit ridership
- Potential for maximum return on investment

The following roadway segments were recommended for consideration in the development of transit enhancement strategies and the resulting alternative packages.

<u>High Priority Road Segments</u>

- I Street – 5th to 12th Streets
- J Street – 3rd to 16th Streets
- L Street – 3rd to 16th Streets
- 7th Street – F to Q Streets
- 8th Street – F to Q Streets
-

Other Road Segments for Consideration

- P Street – 3rd to 15th Streets
- Q Street – 3rd to 12th Streets
- 5th Street – Capitol Mall to H Street
- 9th Street – J to Q Streets
- 10th Street – J to Q Streets
- 15th Street – H to S Streets
- 16th Street – H to S Streets

2.6 Downtown Transit Delay

Slow operating speeds are the result of excessive transit delay. Over the past decade, transit industry best practices related to operating speeds have continued to evolve based on successful campaigns to reduce delay in Bus Rapid Transit. These techniques have potential applications in reducing transit delay in downtown circulation:

- Traffic congestion can delay transit in free movement down the street, egress from curbside stops into through-lanes,and behind right-turning queues. As noted in the analysis, a number of downtown Sacramento street segments show both slow transit and general traffic speeds, indicating that congestion mitigation efforts for transit should be considered.
- Traffic signal delay can be a significant issue, especially with nearside bus stops. On one-way streets, as found in downtown Sacramento, normal signal progression typically results in less delay; consequently, downtown Sacramento may not benefit significantly from active transit signal priority.
- Stop access/egress delay is typical in congested conditions, which are endemic on many downtown Sacramento streets during peak periods. Access delay is further compounded by the downtown transit stop strategy where each route stops at each stop, resulting in queues of buses waiting to access the limited passenger boarding and alighting space. Alternative stopping strategies in combination with congestion mitigation will have a significant impact on reducing this type of transit delay.
- Stop dwell time delay is the time to board and/or alight passengers. Typically, boarding takes longer for express services due to fare payment and dwell times for the high platform, single door commuter express coaches. Local services use regular low-floor multi-door transit buses and experience shorter dwell times. While the delay differential between service and vehicle types can be managed by separating the stops, boarding time reduction would require changing vehicle types and fare payment methods.

3 Development of Plan Alternatives

3.1 Plan Objectives

Prior to the development of specific delay reduction recommendations, overall design principles and guidelines were developed based on downtown's planning context. The project alternatives were developed through a collaborative brainstorming process with the Technical Advisory Committee (TAC) and vetted with the Downtown Stakeholders Group. The project alternatives are inclusive of both overall downtown goals and objectives and specific detailed considerations. The initial phase of alternative development included development of broad-based design principles and guidelines, followed by a second phase of refining specific improvements recommendations. Using this approach informs detailed decision making on specific recommendations to ensure they fit within a broader context of downtown.

Design Principles and Guidelines

- **Provide coverage to key existing and future markets.** These markets typically generate a significant volume of trips and create an opportunity for transit services to grow ridership. It is important to respond to the Railyards and River District Plans and focus on new Midtown development to fully maximize market potential in each area. Additionally, providing a connection to the new intermodal facility and integrating with Streetcar plans will further ensure that key existing and future markets receive reliable transit service.

- **Consolidate service to maximize investment in new infrastructure.** The consolidation of transit service allows for streamlined, direct, and reliable service for transit customers and more effective and efficient transit operation. Service consolidation also creates the opportunity for carefully implemented transportation infrastructure investments and helps to minimize delay, thus minimizing customer travel times.

- **Simplify downtown operations to improve operating speeds, customer experience, and reliability**. Creating coordinated, cohesive, direct transit service will simplify transit operations in downtown Sacramento, enhance the customer experience, and allow for more cost-effective service delivery.

- **Design service to minimize delay.** Numerous factors often play a role in creating transit delays and lengthening a customer's wait and travel time. Such factors include at-grade LRT crossings, lengthy transit stop/station dwell times, and high volume pedestrian traffic and key crossing locations. Design strategies that help alleviate such delay and improve the customer experience include the minimization of turning movements, utilization of right turns rather than left turns, separated service stops to reduce dwell times, improved travel lane access and egress from stops, and synchronizing bus speeds with train speeds. These strategies minimize delay, improve transfer connections, and help reduce operating costs.

- **Implement tailored delay reduction strategies to accommodate corridor constraints.** Various factors are responsible for delay—for example, heavy automobile traffic accompanied by bus overcrowding at transit stops can easily create delay. Tailored delay reduction strategies—such as grouping transit stops, creating bus only lanes and/or queue jumps, and installing bus bulbs—help reduce a passenger's wait and travel time, and alleviate traffic bunching on a given corridor. Tailored delay reduction strategies also often create room for additional parking and stop amenities while increasing the overall quality of the transit experience.

- **Minimize conflicts with other uses.** Mobility in an urban environment should operate in a manner conducive to not only transit but to all transportation modes, including personal automobile, bicycle, and pedestrian. Transit improvements should be designed to minimize conflicts with other transportation modes and complement a sustainable environment in downtown Sacramento. Effort will be given to ensure that parking, loading zones, taxi stands, and driveways are not negatively affected by transit design plans. The net parking supply downtown Sacramento will be sustained to minimize impacts on other uses.

- **Recognize the walk shed.** Transit users will walk further for faster, more frequent and reliable transit service, up to 0.6 miles in other cities. Currently bus stops are as close as every block in downtown Sacramento, contributing to slow operations. A walk shed of approximately ¼ mile (stops approximately every 3 blocks) will result in faster transit service while providing customers with access that encourages a walkable, livable downtown environment.

- **Maintain efficient layover locations.** Layover locations should be optimized at route terminals to minimize wasted "deadheading," provide adequate space for the planned vehicle staging, and have nearby operator rest facilities.

3.2 Improvement Toolbox

An understanding of the key causes of transit delay in downtown was developed during the analysis. With that understanding in mind, delay reduction and transit priority strategies were identified from current transit industry best practices and experience. The strategies were assembled into an "Improvement Toolbox" and classified into four separate groups: right-of-way enhancements, intelligent transportation systems, stops, and service design and operating practices. The toolbox informed the development of specific delay reduction and travel time savings recommendations applied to the candidate corridors.

Bus Stops and Train Stations
Level Boarding Platforms: Level boarding platforms provide easier boarding for customers, particularly those with mobility challenges, wheelchairs, strollers, or carts. Use of low-floor buses will also speed passenger access/egress.
Passenger Pre-Queuing: Infrastructure, such as simple leaning posts, can guide passengers to wait close to the area where the door will open on an arriving bus.
Enhanced Transit Information Major stops should provide well-presented transit information, including real time departure, daily schedules, system maps, area maps, and fares.
Off-Vehicle Fare Payment: On-vehicle fare payment has been a significant source of delay for transit services. Providing the capacity to purchase fares at the bus stop, from a ticket agent, or a ticket vending machine rather than on the vehicle can help reduce boarding delay.
Stop Amenities: Providing adequate amenities at bus stops, including shelters, benches, trash cans, and lighting, enhances the wait environment and safety for customers.
Bus Shelters: The provision of attractive functional bus shelters with distinctive design will enhance the passenger wait experience, raise the profile of the service, and integrate with streetscape design. In situations with new curbside development, passenger wait areas can be embedded into the building frontage rather than use limited sidewalk space.
Branding: Clear marking of bus stops with highly visible service branding logos or colors helps establish a more consistent customer experience. Branding can also be used as a marketing tool for enhanced service products, helping to attract additional customers.
Right of Way Enhancements
Bus Lanes: Bus lanes provide dedicated right-of-way for bus-only operations to reduce conflict between buses and general traffic. Peak-only bus lanes minimize all day traffic impacts while the lower non-peak traffic often allows for full-time bus lanes with little additional impact.
Queue Jumps: Queue jumps provide a special signal priority that allows curb lane buses to "jump the queue" and cross the intersection to merge into the through-lanes before general traffic. Queue jumps are more effective where right turns are not allowed, as that queue may block the buses' forward progress even with the signal advance.
Bus Bulbs: Bus bulbs allow for transit vehicles to remain in the travel lane, avoiding the resulting delay from entering/re-entering traffic. This physical form of transit stop provides an opportunity to reduce delay and provide better service, while also creating room for additional stop amenities.
Bus Stop Length: Bus stops should be long enough to accommodate all transit vehicles serving the stop, preventing blocked traffic and transit delay. Ample capacity is required to allow buses to enter stops without having to wait for other vehicles.
Bus Stop Spacing: Well-spaced stops (1/4 – 1/2 mile) balance operational efficiencies while maintaining customer access. Stops placed too close together greatly increase transit travel times and significantly increase customer perception of slow travel.
Bus Stop Location: Use of farside stops at intersections allow the transit vehicle to clear an intersection before stopping. This can be optimized with the use of transit signal priority.

Bus Stop Grouping: Under existing downtown transit operations, all buses stop at all stops. This leads to long bus queues competing for limited curb space at stops and exacerbates conflicts stemming from different dwell times between express and local buses. Creation of an “A” “B” “C” set of stop groups will speed transit travel and improve the passenger wait experience.
Intelligent Transportation Systems
Transit Signal Priority (TSP): Providing transit priority at intersections can reduce transit delay. This typically takes the form of an early or extended green time to allow a transit vehicle a clear passage through an intersection, ideally to a farside stop where only green extensions are programmed. The normal signal progression on the one-way streets found in downtown Sacramento typically results in less delay and may not benefit significantly from active transit signal priority.
Real Time Information: Provision of real time information further enhances the passenger wait experience by reducing uncertainty about the next available transit service. This further builds passenger confidence in the system’s ability to deliver reliable service.
Automated Vehicle Location (AVL)/Radio Communication: AVL information provides operators with real time vehicle information. It assists in managing service delivery, allowing operators to better maintain service reliability for the customer.
Service Design & Operating Practices
Route Alignment: Straight alignments, minimized turns, and wider stop spacing while maintaining suitable access create efficient transit service. Designing efficient route terminals prevents excessive time spent circulating at the ends of routes to the layover location.
Policing of Transit Priority: Monitoring private vehicle compliance with transit lanes, including double parking, keeps stop space free for transit.

3.3 Plan Alternatives

The strategies identified in the improvement "toolbox" were applied to the candidate improvement corridors in two separate groups: routing scenarios and infrastructure improvement options. Following collaborative working sessions with the staff and the TAC as well as extensive field work, three separate routing scenarios and improvement options were developed. Through the combination of routing scenarios and improvement options, nine distinct alternatives of improvements were considered. The following section outlines the three routing scenarios and infrastructure options.

Routing Scenario A

- Express Corridors: J Street, 15th Street, P Street, 5th Street
- Local Corridors: J Street, L Street, 7th Street, 8th Street

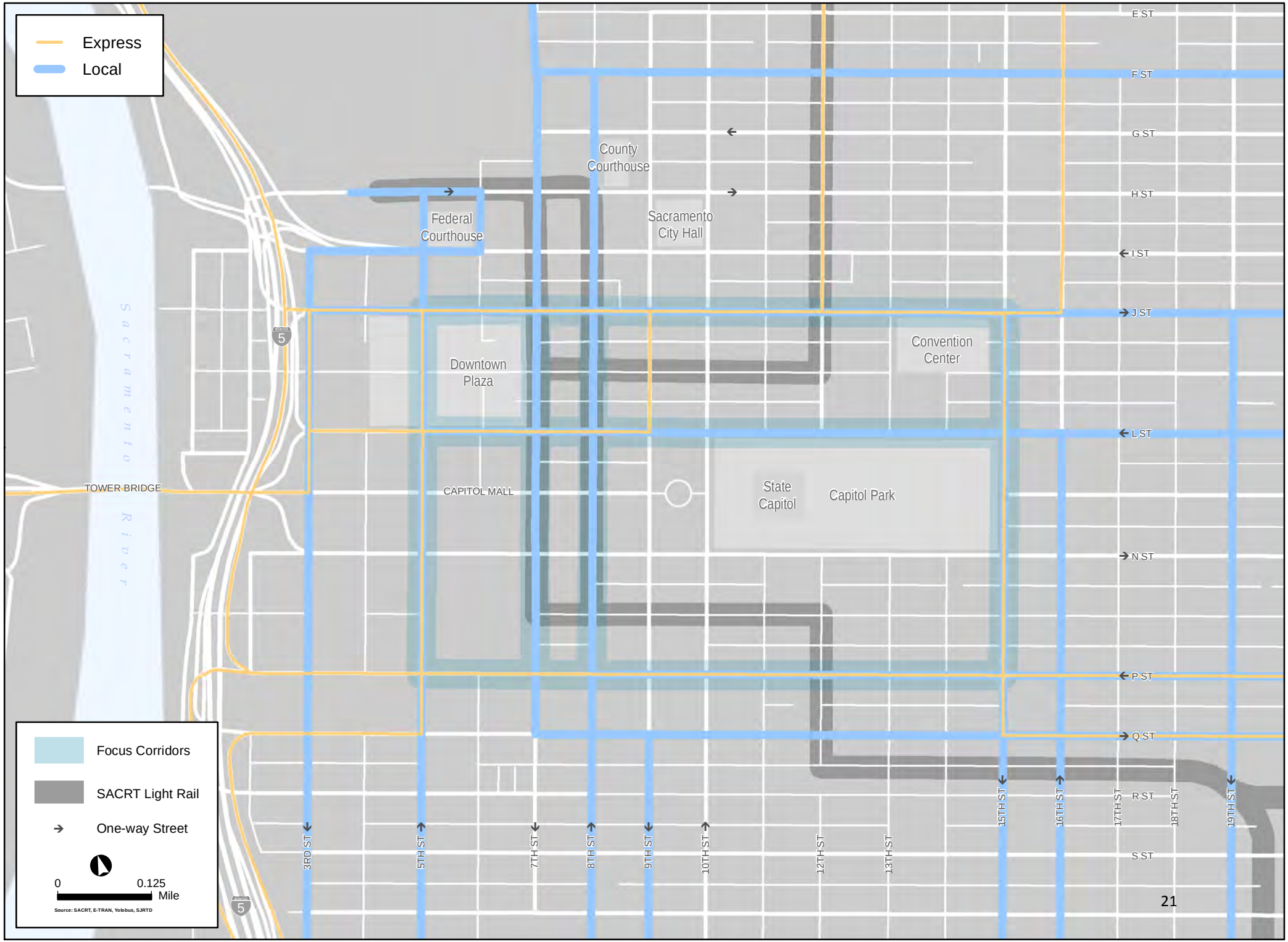
Routing Scenario B

- Express Corridors J Street, 15th Street, P Street, 5th Street, 7th Street and 8th Street
- Local Corridors: J Street, L Street, 7th Street, 8th Street

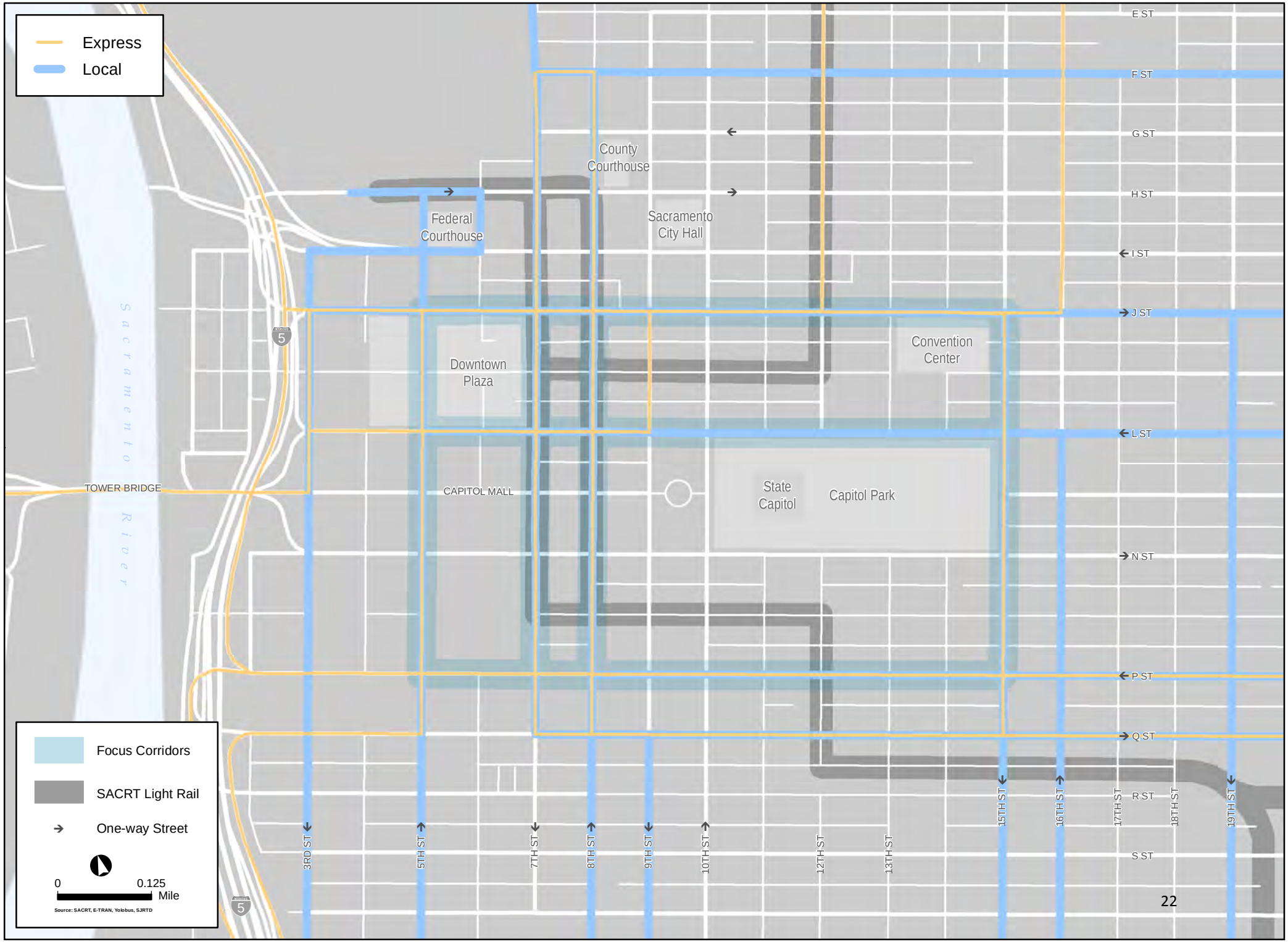
Routing Scenario C

- Express Corridors: L Street, 16th Street, Q Street, 3rd Street, 7th Street and 8th Street
- Local Corridors: J Street, L Street, 7th Street, 8th Street

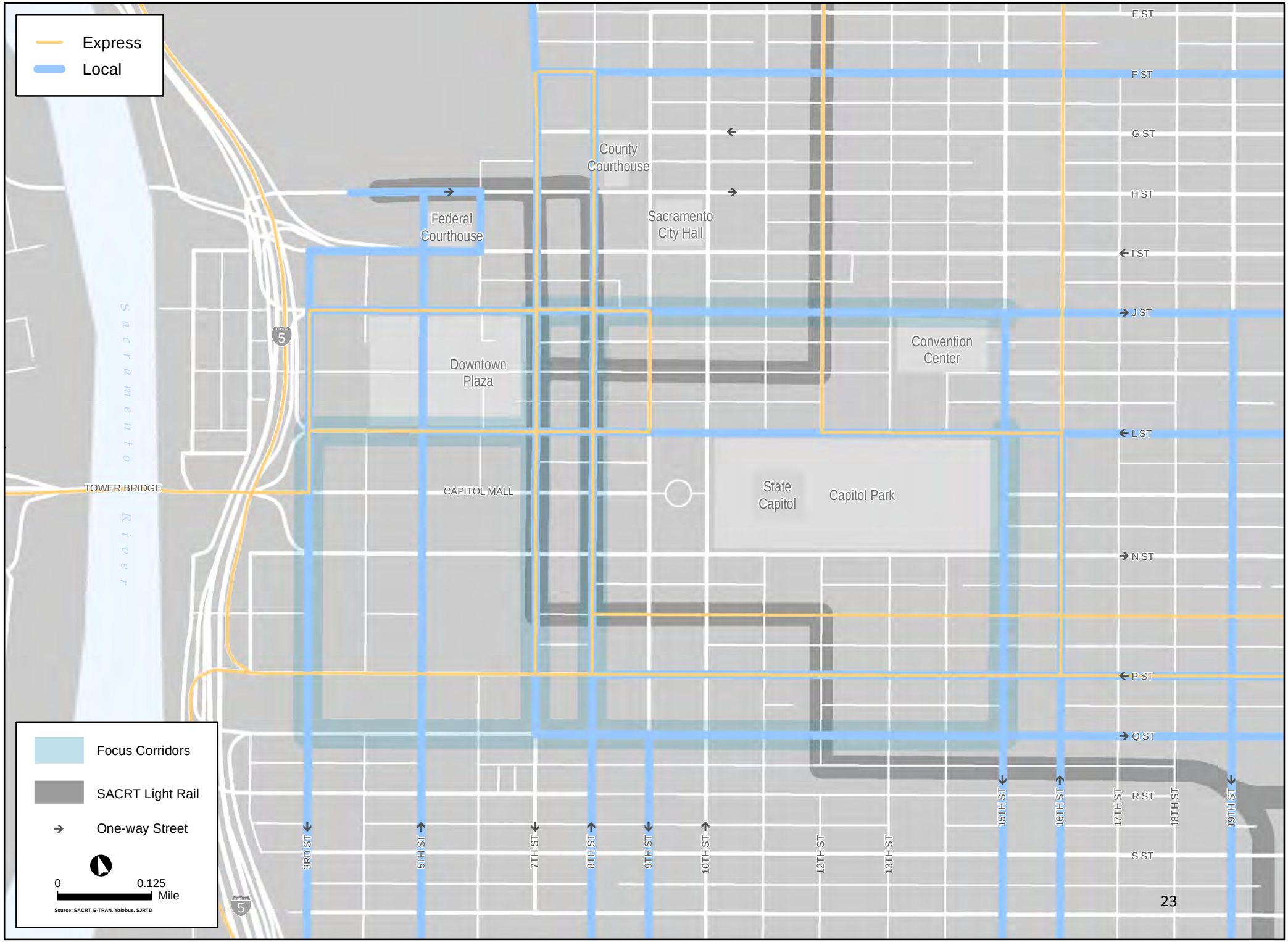
Routing Scenario A



Routing Scenario B



Routing Scenario C



Infrastructure Improvement Option 1

- All-day bus lanes
- Bus Bulbs (Local)
- Curbside Stops (Express)
- Grouped Express Stops

Infrastructure Improvement Option 2

- Queue Jumps
- Bus Bulbs (Local)
- Curbside Stops (Express)
- No Bus Lane
- Grouped Express Stops

Infrastructure Improvement Option 3

- Queue jumps
- Grouped Express Stops
- No Bus Bulbs
- No Bus Lane

3.4 Analysis of Alternative Packages

An initial analysis of the extent to which each alternative adhered to the plan's design guidelines, as well as identifying any potential negative impacts, was conducted based on the criteria outlined below. Changes to in-street infrastructure can create positive and negative impacts on mixed-flow traffic and the downtown environment in general. Each alternative routing scenario and infrastructure improvement option was preliminarily screened for significant impacts that would preclude the alternative from moving forward. This initial screening informed the decision-making process for identifying a preferred alternative and highlighted any key focus areas for subsequent impact analysis. The analysis also offered the opportunity for staff and the TAC to reach a consensus on a preferred plan concept.

The initial screening criteria were derived from the plan objectives, including:

- Focus service on key corridors
- Downtown access
- Minimize conflicts
- Stop spacing
- Delay reduction

No-Build Option

A no-build option would maintain existing alignments and stop patterns while not realizing any delay reduction benefits for transit customers and downtown as a whole. As time progresses and downtown evolves into a more complicated and dynamic transportation environment, a no-build option would likely lead to increasing delays and less desirable transit services.

No-Build Option	Effectiveness
Focus Service on Key Corridors	◐
Downtown Access	◐
Minimize Conflicts	○
Stop Spacing	○
Delay Reduction	○

Routing Scenario A

Scenario A consists of a clockwise loop with express focus corridors on J Street, 15th Street, P Street, and 5th Street. The key local corridors under Scenario A are J Street, L Street, 7th Street, and 8th Street.

Routing Scenario A	Effectiveness
Focus Service on Key Corridors	●
Downtown Access	●
Minimize Conflicts	◐
Stop Spacing	N/A
Delay Reduction	◐

Focus Service on Key Corridors

Through consolidation of express service on the J Street, 15th Street, P Street, and 5th Street loop, service is focused under this scenario. While this concentration provides a greatly simplified routing in downtown, the volume of express trips may exceed the capacity of existing stops and create undesirable congestion effects, particularly on J Street.

Local service alignments are slightly modified under Scenario A, most notably removing service from 9th and 10th Streets. This change offers to opportunity to convert existing bus stops into other curb uses to balance potential conversion of curb space into bus stops elsewhere in downtown. Scenario A also recognizes J Street, L Street, 7th Street, and 8th Street as key local corridors for future investment.

Downtown Access

Access to key downtown destinations is maintained for existing and future customers via the J Street, 15th Street, P Street, and 5th Street loop proposed in Scenario A, as the loop traverses the core of the downtown. Generally, key downtown locations will be within a ¼ mile walk of service and virtually any destination within ½ mile access.

Minimize Conflicts

The simplified routing will greatly reduce turning movements compared to existing alignments, which include a large number of right and left turns. Additionally, the design ensures a majority of turns will be right hand turns, further reducing delay. Fewer overall turns and more right turns would have a positive impact to other traffic, as bus turning movements create queue and delay. The scenario also reduces crossing light rail tracks to the largest extent possible.

Delay Reduction

Through reduction of turns and consolidation of routes on to key corridors, transit delay will be reduced overall. The intensity of transit trips focused on the express loop alignment may create undesirable transit bus queuing due to available curb space limitations.

Routing Scenario B

Scenario B consists of a clockwise loop with express focus corridors on J Street, 15th Street, P Street, 5th Street, 7th Street, and 8th Street. The key local corridors under Scenario B are J Street, L Street, 7th Street, and 8th Street.

Routing Scenario B	Effectiveness
Focus Service on Key Corridors	●
Downtown Access	●
Minimize Conflicts	◐
Stop Spacing	N/A
Delay Reduction	●

Focus Service on Key Corridors

Scenario B provides similar benefits from route alignment consolidation as Scenario A and adds 7th Street and 8th Street as focus corridors for express service. The addition of both streets and the opportunity to more evenly distribute express trips mitigates the potential unintended congestion effects from Scenario A.

Local service alignments are slightly modified, most notably removal of service from 9th and 10th Streets, as in Scenario A. This change offers the opportunity to convert existing bus stops into other curb uses to balance potential conversion of curb space elsewhere in downtown. Scenario B also recognizes J Street, L Street, 7th Street, and 8th Street as key local corridors for future investment.

Downtown Access

Scenario B provides similar access to key destinations as Scenario A, with the added benefit of allowing express routes currently using 7th Street and 8th Street to continue operations on their existing corridors. This difference further enhances the accessibility to key downtown destinations while retaining similar patterns of operation for existing customers.

Minimize Conflicts

By separating express service on the J Street, 15th Street, P Street, and 5th Street loop and the 7th Street and 8th Street pair, the volume of buses turning is more dispersed. As with scenario A, the simplified routing will greatly reduce turning movements compared to existing alignments, which include a large number of right and left turns. Additionally, the design ensures a majority of turns will be right hand turns, further reducing delay. Fewer overall turns and more right turns would have a positive impact to other traffic, as bus turning movements create queue and delay. The scenario also reduces crossing light rail tracks to the largest extent possible. Delay Reduction

Scenario B is likely to result in greater delay reduction opportunities by simplifying routings and avoiding potential over-concentration of express trips on any single corridor.

Routing Scenario C

Scenario C reverses the key express loop travel direction to counterclockwise on L Street, 3rd Street, Q Street, and 16th Street. As with Scenario B, 7th Street and 8th Street are included as additional focus corridors for express service. The key local corridors under Scenario C are J Street, L Street, 7th Street, and 8th Street.

Routing Scenario C	Effectiveness
Focus Service on Key Corridors	◐
Downtown Access	◐
Minimize Conflicts	◐
Stop Spacing	N/A
Delay Reduction	◐

Focus Service on Key Corridors

Scenario C offers similar route alignment consolidation results to scenario B, although shifting heavy volumes of express bus trips to 3rd Street could prove problematic and have negative congestion impacts.

Downtown Access

Express routing patterns in Scenario C generally provide coverage to key downtown destinations, but do so less directly than in Scenarios A and B. Shifting the express loop to operate counterclockwise is less ideal than the clockwise configuration.

Minimize Conflicts

The counterclockwise pattern of Scenario C would create additional left turns and necessitate more bus merging across lanes, leading to more conflicts with mixed traffic and limiting stop placement options. Additionally, the close proximity of 3rd Street to key freeway on/off-ramps may create undesirable conflicts with general traffic. From a perspective of minimizing conflicts, Scenario C is less effective than the other scenarios.

Delay Reduction

Delay reduction results may be mixed under Scenario C as a result of increased conflicts from left turn merges and conflicts with freeway on/off-ramps. The left turns also make priority measures like bus lanes and signal priority less effective and more challenging to implement beneficially.

Infrastructure Improvement Option 1

- All-day bus lanes
- Bus Bulbs (Local)
- Curbside Stops (Express)
- Grouped Express Stops

Improvement Option 1	Effectiveness
Focus Service on Key Corridors	●
Downtown Access	●
Minimize Conflicts	●
Stop Spacing	●
Delay Reduction	●

Delay Reduction

Improvement Option 1 provides a complete package of delay reduction strategies which would work in concert with each other. All-day bus lanes would decrease conflicts between buses and general traffic while increasing free flow travel of transit vehicles. Bus lanes reduce turbulence from mixed traffic moving out of the right lane to avoid queuing bus traffic and eliminates bus bulb stopping conflict with general traffic. Grouping stops by type of route would realize further delay reduction benefits through reducing conflict between vehicles with different dwell times and balancing the number of routes serving each stop, thus eliminating queueing.

Infrastructure Improvement Option 2

- Queue Jumps
- Bus Bulbs (Local)
- Curbside Stops (Express)
- No Bus Lane
- Grouped Express Stops

Improvement Option 2	Effectiveness
Focus Service on Key Corridors	●
Downtown Access	●
Minimize Conflicts	◐
Stop Spacing	●
Delay Reduction	◐

Delay Reduction

Improvement Option 2 represents a more targeted approach to implementing delay reduction improvements to specific points on the improvement corridors. With a reduced scale of improvements, the delay reductions benefits are minimized compared with Option 1. The absence of a bus lane continues the existing condition of general traffic and transit vehicle conflicts with the bus bulb stopping occurring in a general traffic lane potentially introducing a new issue. With the targeted application of bus queue jumps, buses will generally be able to bypass particularly congested intersections and realize a degree of delay reduction, except where high volume right turning traffic is present. Grouping stops by type of route would realize delay reduction benefits by reducing conflict between vehicles with different dwell times and balancing the number of routes serving each stop to eliminate queueing, as in Option 1.

Infrastructure Improvement Option 3

- Queue jumps
- Grouped Express Stops
- No Bus Bulbs
- No Bus Lane

Improvement Option 3	Effectiveness
Focus Service on Key Corridors	◐
Downtown Access	●
Minimize Conflicts	◐
Stop Spacing	◐
Delay Reduction	○

Delay Reduction

Improvement Option 3 is Option 2 without the bus bulbs. The elimination of the bus bulbs will lessen the delay reduction benefit for local transit but reduce the conflict of stopping in a general traffic lane. With the targeted application of bus queue jumps, buses will generally be able to bypass particularly congested intersections, realizing a degree of delay reduction, except where high volume right turning traffic is present. Grouping stops by type of route would realize delay reduction benefits through reducing conflict between vehicles with different dwell times and balancing the number of routes serving each stop to eliminate queueing as in Option 1.

4 Preferred Plan Concept

The analysis of potential plan alternatives and input from the TAC identified a preferred plan concept developed from a routing scenario combined with two infrastructure improvement options. The following section details the specific elements of the concept and demonstrates how they address specific tenants of the design principles and guidelines.

4.1 Preferred Alignment and Stops Concept

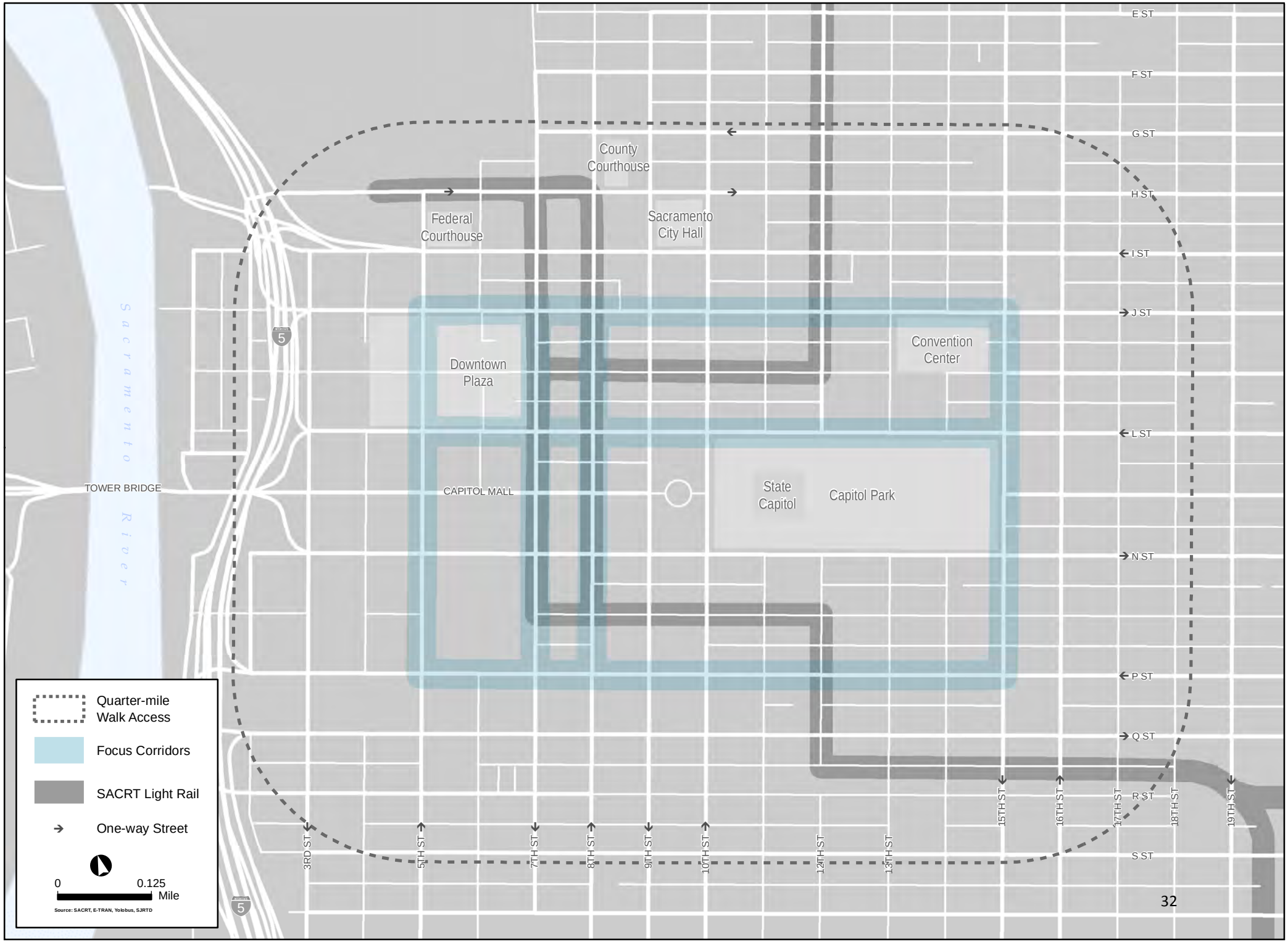
The stop grouping concept is consistent with simplifying downtown operations and designing service to minimize delay. Shifting to a grouped stop pattern with a standard 3-block spacing will reduce the number of times a bus will need to stop in downtown, thus reducing the delay incurred from dwell time. A more balanced stop spacing standard will allow buses to keep moving along the corridor, speeding up service. Furthermore, by grouping common service types, express and local, delays created by unmatched dwell times will be reduced. Buses moving along the corridor will tend to organize into their stop groups and travel as a unit. When vehicles travel in an organized group an additional source of conflict, and thus delay, is reduced.

The overall success of the plan does not hinge on any single stop location decision; therefore all stop locations proposed in the plan should be viewed as part of the broader conceptual vision for transit in downtown to follow a strategy calling for an “A” “B” “C” stop grouping with a standard 3-block spacing between each “A” “B” “C” stop. Final decisions for specific stop locations will be made as part of subsequent planning and implementation efforts inclusive of input from downtown stakeholders.

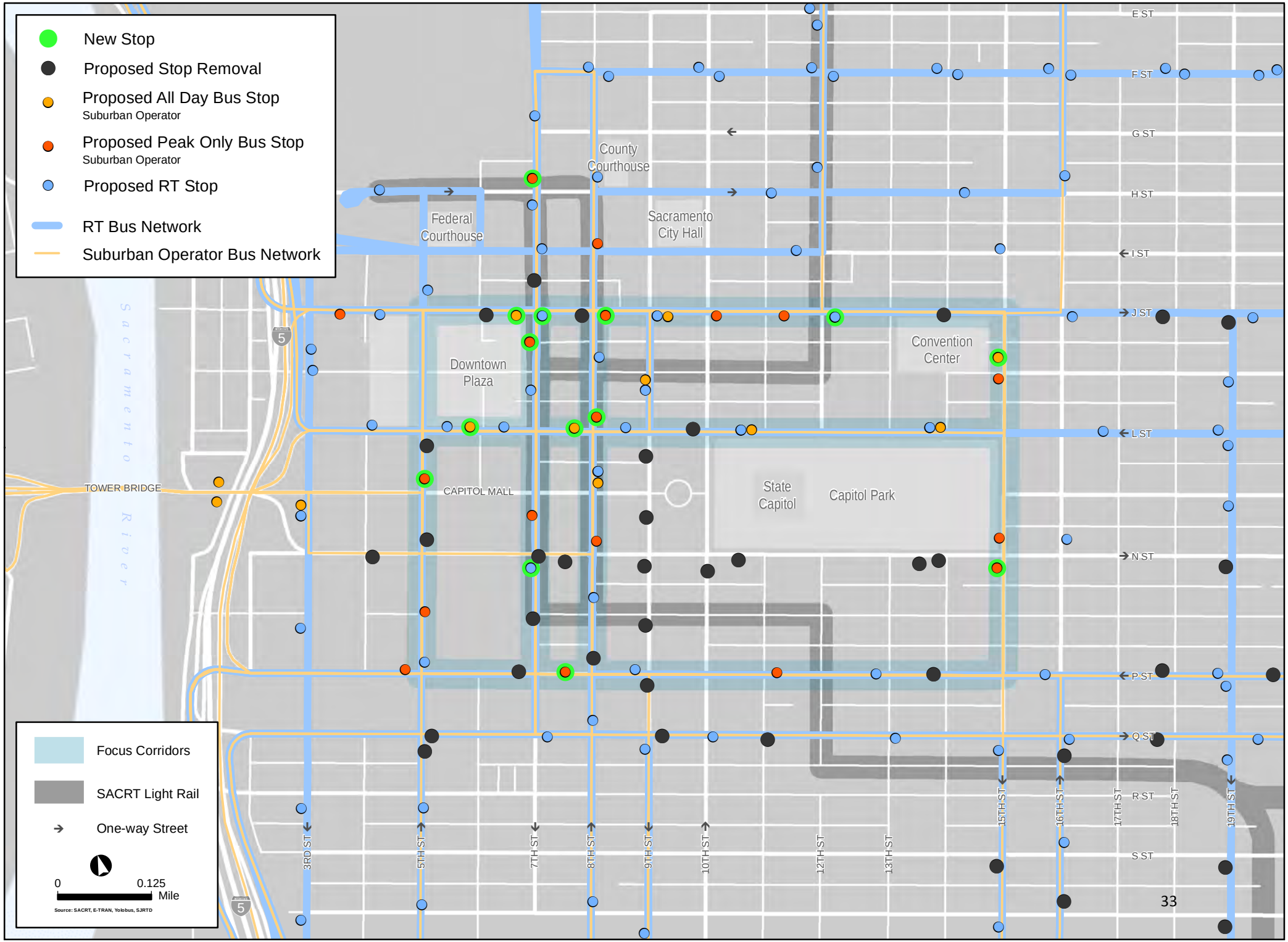
Creating coordinated, cohesive, direct transit service will simplify transit operations in downtown Sacramento, enhance the customer experience, and allow for more cost-effective service delivery. The preferred route alignment consolidation focuses express service on either the J Street, 15th Street, P Street, and 5th Street loop or on 7th Street and 8th Street. Utilizing two patterns for express service allows both consolidation and more even distribution of express trips in downtown. Local service alignments are slightly modified, most notably removal of service from 9th and 10th Streets. This change offers the opportunity to convert existing bus stops into other curb uses to balance potential conversion of curb space elsewhere in downtown. The preferred routing scenario recognizes J Street, L Street, 7th Street, and 8th Street as key local corridors for future investment.

In conjunction with the proposed routing scenario, the standard 3-block spacing between stops provides ¼ mile walk access to key existing and future markets in a majority of downtown as illustrated in the map *Walk Access for Proposed Corridors*. Transit users will walk further for faster, more frequent and reliable transit service, up to 0.6 miles in other cities. Currently bus stops are as close as every block in downtown Sacramento, contributing to slow operations. A walk shed of approximately ¼ mile (stops approximately every 3 blocks) will result in faster transit service while providing customers with access that encourages a walkable, livable downtown environment

Walk Access for Proposed Focus Corridors



Preferred Downtown Sacramento Transit Circulation Plan Concept



4.2 Preferred Infrastructure Improvements

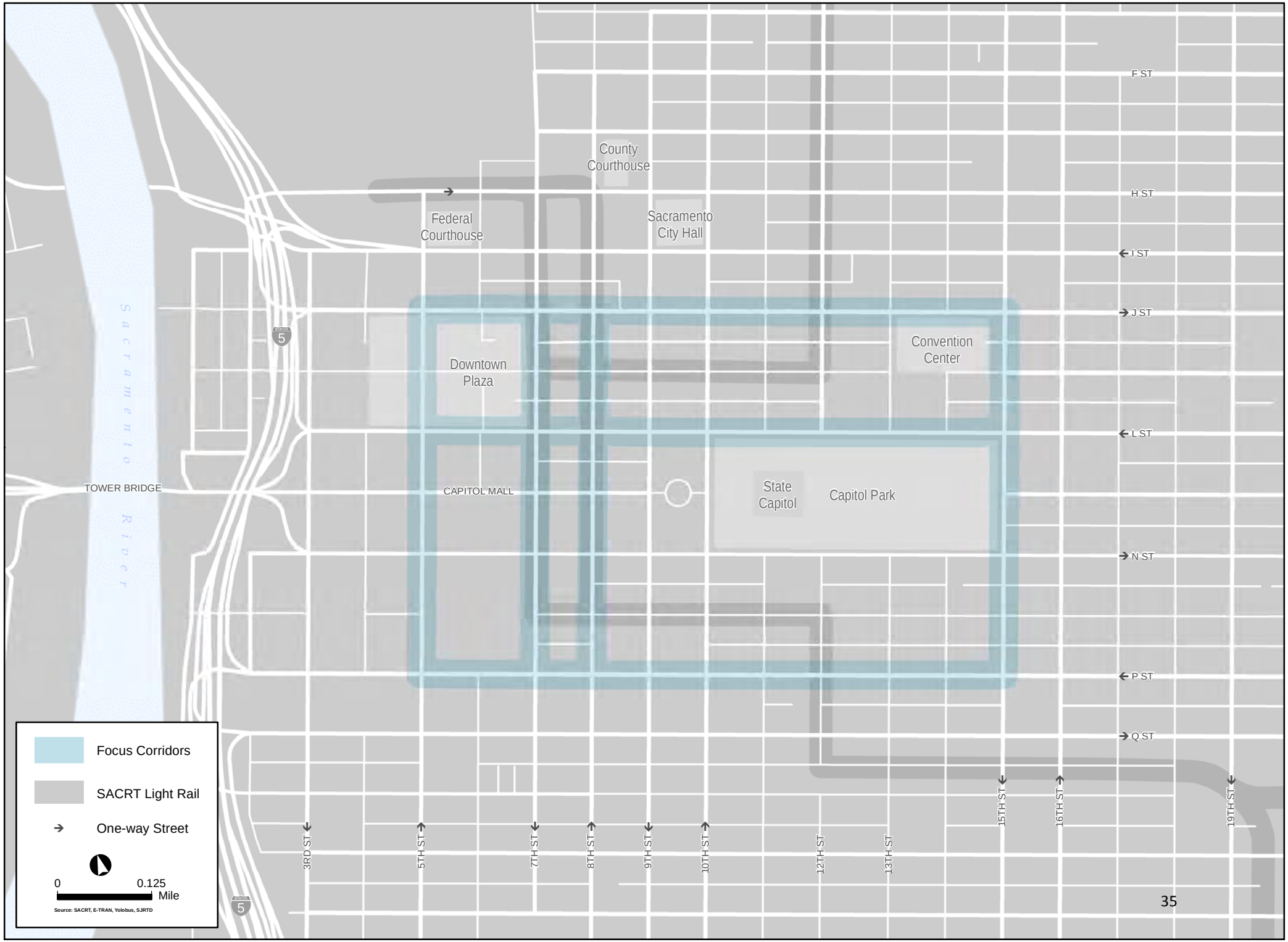
The preferred infrastructure improvements include those considered under Option 1: all-day bus lanes, bus bulbs (Local), and grouped curbside stops (Express). In addition, passenger wait facility improvements are also part of the preferred plan concept.

Bus Lanes

Bus lanes are proposed on the primary loop (J Street, 15th Street, P Street, 5th Street) and on 7th and 8th Streets. The addition of bus lanes will help minimize conflicts with other transportation modes and complement a sustainable environment in downtown Sacramento. The lanes will provide principal benefit to transit during peak demand hours when transit speeds are often below ten mph. They are recommended for full-time operation (all-day, all-week) in order to minimize roadway complexity and promote understanding as the general traffic volumes are low in the off-peak periods and do not warrant returning the lanes to mixed traffic use. The bus lane would be also used by vehicles accessing right curb parking and driveways and right turning traffic as well as emergency vehicles. Bus lane demarcation ranges from signage and "Bus Lane Only" notation to painted lanes to colored stamped concrete.

The City of Sacramento has indicated that it is moving forward with implementing a bike lane on J Street. Additional work regarding whether an integrated wider shared lane or separate bike and bus lanes will be the best option on J Street will need to be undertaken as part of the City's Downtown Transportation Plan development.

Preferred Bus Lanes Concept



Bus Bulbs and Stop Amenities

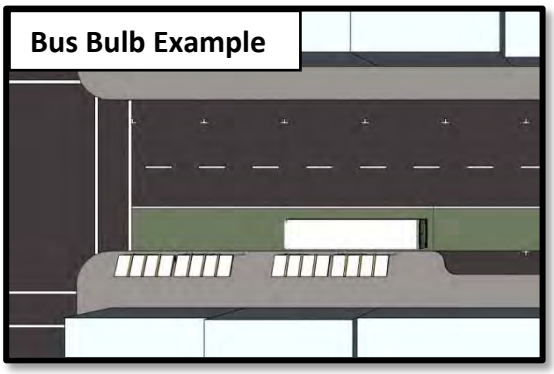
The bus bulbs use a curb extension or bump out to allow transit vehicles to stop directly in the bus lane. Delay from stop access and egress is reduced in addition to creating more predictability in bus spotting, further decreasing dwell time. The largest benefit of bus bulbs is that the extra space allows for the placement of the passenger wait facilities on the bulb, freeing the sidewalk for pedestrian traffic. In a number of cases, downtown Sacramento sidewalks are a less than optimal width, especially when encumbered with transit passenger shelters. Further, changes in bus stop locations and infrastructure will precipitate the need to address any outstanding ADA compliance issues relating to width and slope.

The proposed stop amenities focus on improving the transit customer wait experience, providing reduced dwell time, streamlining operations with passenger pre-queuing by entry doors, and making a positive contribution to the urban environment. The plan concept calls for the following amenities at the bus bulb and curb stop locations:

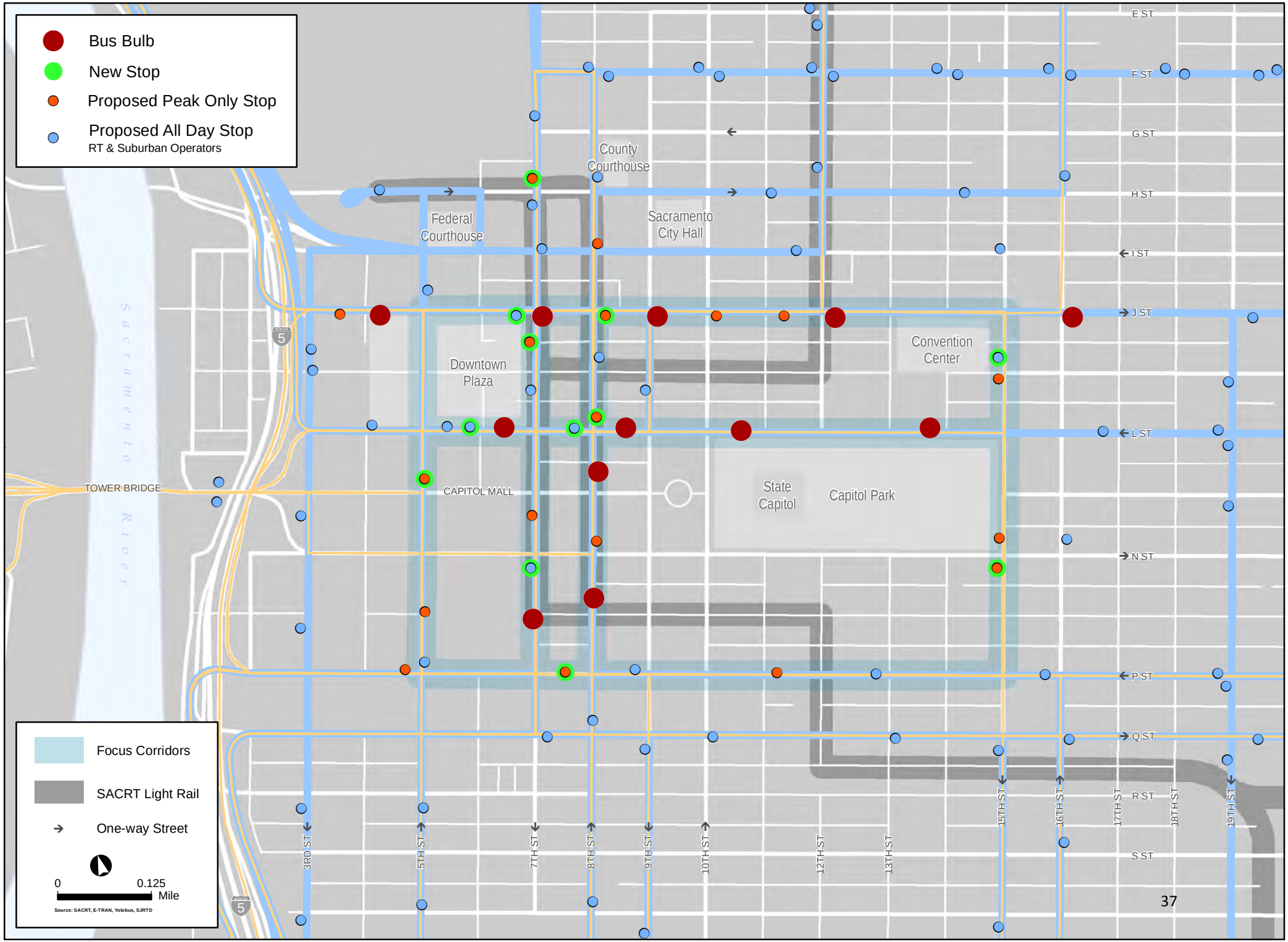
Amenity/Stop Type	Bus Bulb Stop	Sidewalk Bus Stop
Passenger Shelter	Yes	Yes
Information Display	Kiosk	Panel
Real Time Information Display	Yes	Not Initially
Seating	Yes	Yes
Lighting	Yes	Yes
Trash Receptacles	Yes	Yes

Shelter, seating, and lighting will be scaled to available space. Real time information is proposed for the bus bulbs; the sidewalk stops should be developed for future retrofit of displays as the vehicle location technology is implemented by other transit operators beyond RT.

Immediate term interim improvements are also part of the Plan Concept and focus on providing seating and improved information with the proposed route stop groups.



Preferred Bus Bulb Locations Concept



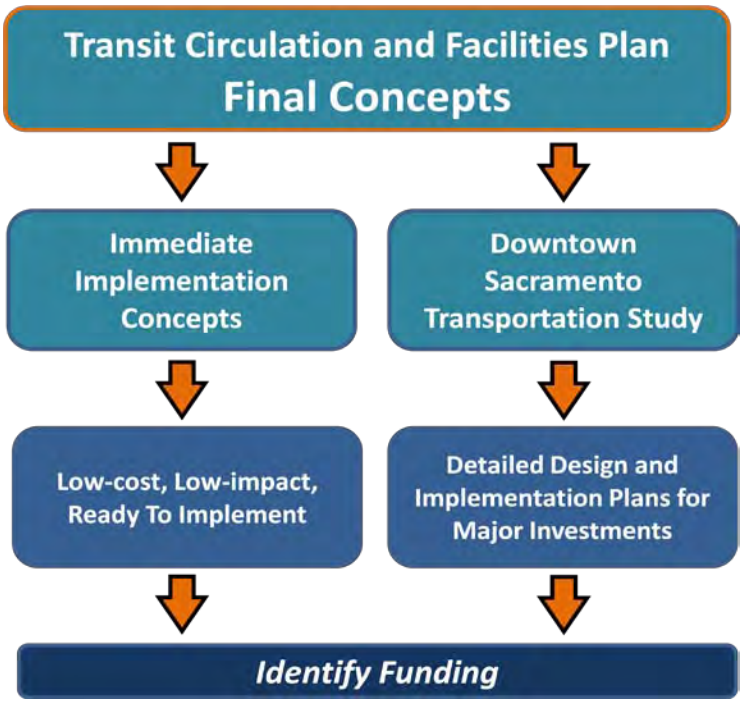
4.3 Plan Phasing

Immediate Term (1-3 Years)	Short Term (4-7 Years)	Long Term (Beyond 7 Years)
Route Realignments	Bus Lane	Bus Bulbs
Stop Spacing Adjustments		Passenger Amenity Improvements
Stop Grouping		
Interim Stop Improvements (information & seating)		

The phasing timeline is not rigid and can be adapted to opportunities as they arise, especially for lower cost elements. For instance, it may be possible to move forward more quickly with the bus lanes if no mitigation is needed.

A significant benefit comes from the route realignment and new stop strategy. In some cases, the proposed stop location will not be possible without addressing legacy issues, like ADA. In those cases, interim locations should be identified for use until the long term Plan Concept elements can be implemented. The second and third phases build on the groundwork established during the first phase, creating additional benefit and improvement.

The following figure provides a planning context for the Transit Circulation and Facilities Plan Concept phasing relative to the City of Sacramento's Downtown Transportation Study.



5 Transportation Assessment of Preferred Plan

5.1 Assessment Purpose

This assessment addresses the impacts of the recommended project phases on a range of transportation performance measures for key roadways within downtown Sacramento. It examines multiple roadways throughout downtown Sacramento, with a more focused analysis of J Street in particular. The supplemental analysis of conditions on J Street was conducted in recognition of the street's status as the backbone of the Central City's transportation system, the level of transit activity currently using the thoroughfare, and the level of vehicle congestion currently experienced along the corridor. Performance measures that are evaluated include roadway Level of Service (LOS) based on volume/capacity ratios for numerous road segments, total person throughput for vehicles traveling on the J Street at the approximate midpoint of the study corridor (i.e., between 9th Street and 10th Street), and a multimodal LOS analysis for five blocks of J Street using the new 2010 Highway Capacity Manual (HCM) method for transit, bicycle and pedestrian modes.

5.2 Purpose of This Summary Report

This report provides an assessment of the impact of the recommended project phases on a range of transportation performance measures for key roadways within Downtown Sacramento. This assessment examines multiple roadways throughout downtown Sacramento, with a more focused analysis of J Street in particular. The supplemental analysis of conditions on J Street was conducted in recognition of the street's status as the backbone of the Central City's transportation system, the level of transit activity currently using the thoroughfare, and the level of vehicle congestion currently experienced along the corridor. Performance measures that are evaluated include roadway level of service (LOS) based on volume/capacity ratios for numerous road segments, total person throughput for vehicles traveling on the J Street at the approximate midpoint of the study corridor (i.e., between 9th Street and 10th Street), and a multi-modal LOS analysis for five blocks of J Street using the new 2010 Highway Capacity Manual (HCM) method for transit, bicycle and pedestrian modes.

5.3 Approach

The assessment of the project alternative phases includes the development of travel forecasts for the roadway segments, an analysis of total person throughput for vehicles on J Street, and an analysis of roadway segment LOS. The analysis focused on roadway segments along and adjacent to the proposed bus loop formed by J Street, 15th Street, P Street, and 5th Street. Each of these assessments was completed for three scenarios:

- Existing Conditions
- Existing Plus Phase 1 Conditions
- Existing Plus Phase 2 Conditions

The City of Sacramento's Downtown On-Street Bikeway Project includes plans to add a Class II bicycle lane to J Street between 5th Street and 13th Street, which would cover the majority of the proposed Downtown bus loop. The J Street bicycle lanes are planned for implementation during the next repaving of J Street, which is currently scheduled for September 2012. Given that the multimodal LOS analysis conducted for this study focuses upon J Street, and is sensitive to variables that impact bicycle level of service (including the presence of dedicated bicycle facilities), three scenarios in addition to those listed above were analyzed using the multimodal LOS tool to evaluate the combined effects of both the downtown transit improvements as well as the Downtown On-Street Bikeway Project:

- Near-Term No Project
- Near-Term Plus Phase 1 Conditions
- Near-Term Plus Phase 2 Conditions

Description of Project Alternative

All assessments completed as part of this study evaluate the following two phases of the recommended project alternative:

- Phase 1:
    - Modifies routing of buses
    - Reconfigures bus stop locations
- Phase 2:
    - Phase 1 route/stop modifications
    - Adds bus lanes on multiple streets within Downtown

A subsequent third phase of the project has been identified, which will add bus bulbs at select bus stops. The addition of bus bulbs would not affect the planning level performance metrics used for this analysis. A more detailed operational analysis of the individual intersections, which is anticipated to be part of a future Downtown Circulation Study, would identify whether the proposed bus bulbs would result in queuing at the locations where they are recommended.

The proposed locations for bus lanes included as part of the Phase 2 assessment include the following streets:

- J Street – between 5th Street and 15th Street
- L Street – between 5th Street and 15th Street
- P Street – between 5th Street and 15th Street
- 5th Street – between J Street and P Street
- 7th Street – between J Street and P Street
- 8th Street – between J Street and P Street
- 15th Street – between J Street and P Street

The effects of each of the two project phases are layered upon existing conditions to create two "Existing Plus Project" scenarios. The effects of the project upon the transportation system were analyzed under Existing Plus Project conditions due to the fact that Phases 1 and 2 are both intended for near-term implementation. As previously discussed, the multimodal LOS analysis also includes two "Near-Term" scenarios that include the Class II bicycle lane on J Street planned as part of the City of Sacramento's Downtown On-Street Bikeway Project.

Data Collection

As the report for Task 3 (Existing Travel Conditions) was being prepared, it was recommended that additional data collection might be needed to evaluate the project alternative depending on the location of improvements and roadways affected. After reviewing the proposed improvements, it was determined that additional data and analysis was required for J Street, the roadway with the highest traffic volumes of any street on the proposed bus loop.

The data collection efforts for Task 3 also had limited counts for portions of 15th Street and P Street located on the proposed bus loop. Additional data was collected at the following locations:

- J Street – two additional daily roadway segment counts and six AM and PM peak period intersection turning movement counts
- 15th Street – one additional daily roadway segment count
- P Street – two additional daily roadway segment counts

Figure 1 shows the location of all study roadway segments, along with existing AM and PM peak hour traffic volumes.

Methodologies and Assumptions

All of the analysis conducted to evaluate the project was at the roadway segment level. It is anticipated that the upcoming Downtown Transportation Study will provide a more detailed evaluation of traffic operating conditions within Downtown, and will further evaluate the proposed improvements in this study in the context of alternatives for the overall transportation system. The level of analysis conducted for this study is consistent with the level of analysis performed for the *Sacramento 2030 General Plan* environmental impact report.

The *Sacramento 2030 General Plan* (2009) allows for flexible LOS standards with the aim of increasing transit ridership, bicycling, and walking within the City. The "core area" of the City bounded by C Street, the Sacramento River, 30th Street, and X Street, is exempt from LOS standards provided that projects provide improvements to other parts of the citywide transportation system within the project site vicinity (or within the area affected by the project's vehicular traffic impacts) to improve transportation-system-wide roadway capacity, to make intersection improvements, or to enhance non-auto travel modes in furtherance of the General Plan goals. Road widening or other improvements to road segments are not required. All roadway segments within the study area are included within the "core area" defined in the General Plan, and are therefore exempt from level of service standards.

As previously discussed, the evaluation of project alternatives included greater emphasis on J Street, as this street is most likely to be impacted by the proposed project. Two of the three metrics used in the evaluation of the project, as noted below, focus exclusively on J Street:

- Evaluation of Person Throughput (only for J Street)
- Roadway Volume/Capacity Analysis
- Multimodal Level of Service Analysis (only for J Street)

All of the above metrics account for the shifts in bus traffic within Downtown as a result of the proposed bus route and stop modifications included in Phase 1. These service adjustments would result in increases in bus traffic on some streets, and decreases on others. However, the magnitude of these changes in bus traffic is relatively small and would not result in significant changes to the overall volume of traffic on any given street. Therefore, the proposed modifications to bus routes and stops in Phase 1 are not expected to alter automobile travel patterns in the study area.

The implementation of bus lanes in Phase 2 is anticipated to divert existing automobile traffic to other traffic lanes on portions of the bus loop and to other streets in downtown. J Street is the most heavily congested street in Downtown Sacramento, and the addition of a bus lane would result in a modest diversion of auto traffic. Diversions in auto traffic are not expected on other streets on the bus loop as they are less congested and would experience smaller levels of added bus traffic, compared to J Street. Within the study area, the addition of a bus lane on J Street would further reduce capacity on a roadway currently operating between 9 and 25 percent of its capacity, depending upon segment in question. Therefore, some automobile traffic is anticipated to use alternate routes (i.e., H Street and Capitol Mall) with the implementation of Phase 2.

Figure 2 displays Phase 1 and Phase 2 peak hour traffic volumes for each of the study roadway segments alongside the existing traffic volumes. The Phase 2 forecasts account for the reduction in capacity on J Street as a result of the proposed bus lane. The level of diversion to other streets was forecast by calculating the increase in density on J Street (assuming a passenger car equivalent of 2.0 for buses), and examining the amount of automobile traffic likely to remain in the bus lane. This includes vehicles making right turns, accessing on-street parking, and accessing parking garages on the right side of the roadway.

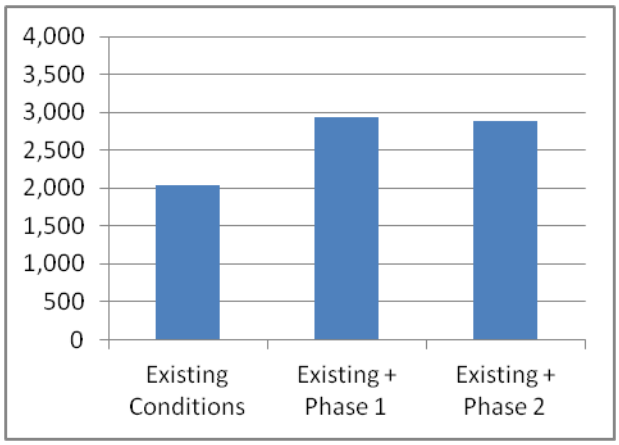
5.4 Project Evaluation

Person Throughput Analysis

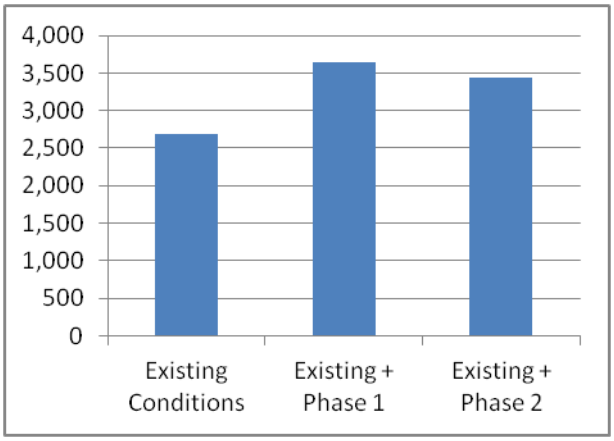
The person throughput analysis examined the total person throughput of the travel lanes on J Street between 9th Street and 10th Street, and includes all persons traveling either in buses or other motor vehicles. The analysis does not include existing bicyclists or pedestrians, as these are assumed to be constant throughout each of the scenarios. Bus occupancies used for the analysis were based upon data obtained by TMD from transit providers for local and express buses. On average, express buses have higher occupancy levels than local buses that operate on J Street. All automobiles/trucks were assumed

to have the regional commute trip average of 1.2 persons per vehicle. The two graphs below display the results of the peak hour person throughput analysis.

AM Peak Hour Person Throughput



PM Peak Hour Person Throughput



As shown in the above graphs, the implementation of either Phase 1 or Phase 2 of the project would result in a significant increase in person throughput on J Street. Phase 1 results in a 35 percent increase in person throughput during the AM peak hour, and a 44 percent increase in person throughput during the PM peak hour. The increase is not as high with the implementation of Phase 2, as some traffic is assumed to divert off of J Street with the addition of the bus lane included in this phase of the project.

Roadway Segment Volume/Capacity Analysis

Roadway segment volume/capacity (V/C) analysis is the traditional planning level analysis used by the City of Sacramento to evaluate roadway segments. This analysis applies daily roadway volume thresholds documented in the City's General Plan, and is based upon the functional classification and number of lanes for each roadway segment.

As shown in the table on the following page, all study roadway segments currently operate at LOS E or better, with the vast majority operating at LOS A or B. The study segment with the highest V/C ratio is J Street between 6th and 7th Streets, which currently has a V/C of 0.91.

The results of the daily roadway segment analysis are also displayed in Figures 3 and 4. As shown in the above table and Figure 4, the implementation of Phase 1 results in modest V/C changes to several of the study roadway segments as a result of changes in bus volumes. With the addition of Phase 2 improvements (bus lanes), the changes in V/C within the study area become more pronounced, particularly on J Street where existing volumes are closest to the roadway capacity. The segment of J Street between 6th and 7th, which currently has a V/C of 0.91, experiences an increase in the V/C ratio to 0.99 with Phase 2 of the project. This value is just under the capacity of the roadway.

Daily Roadway Segment Volume/Capacity Analysis						
Roadway Segment	**Existing Conditions**		**Existing Plus Route/Stop Modifications**		**Existing Plus Route/Stop Modifications & Bus Lane**	
	V/C	**LOS**	**V/C**	**LOS**	**V/C**	**LOS**
3rd Street - between J Street & K Street	0.39	A	0.40	A	0.40	A
3rd Street - between N Street & 0 Street	0.44	A	0.43	A	0.43	A
5th Street - between I Street & J Street	0.25	A	0.26	A	0.28	A
5th Street - between J Street & L Street	0.34	A	0.34	A	0.38	A
5th Street - between N Street & O Street	0.34	A	0.35	A	0.38	A
10th Street - between Capitol Mall & N Street	0.25	A	0.24	A	0.24	A
12th Street - between I Street & J Street	0.25	A	0.25	A	0.25	A
15th Street - between L Street & Capitol Mall	0.44	A	0.44	A	0.49	A
16th Street - between P Street & Q Street	0.63	B	0.63	B	0.63	B
Capitol Mall - between Neasham Circle & 3rd Street	0.56	A	0.56	A	0.56	A
I Street - between 5th Street & 6th Street	0.64	B	0.64	B	0.64	B
I Street - between 7th Street & 8th Street	0.74	C	0.74	C	0.74	C
J Street - between 4th Street & 5th Street	0.89	D	0.89	D	0.89	D
J Street - between 6th Street & 7th Street	0.91	E	0.91	E	0.99	E
J Street - between 9th Street & 10th Street	0.74	C	0.75	C	0.81	D
J Street - between 14th Street & 15th Street	0.80	D	0.81	D	0.87	D
L Street - between 14th Street & 15th Street	0.49	A	0.48	A	0.46	A
L Street - between 4th Street & 5th Street	0.50	A	0.50	A	0.50	A
P Street - between 8th Street & 9th Street	0.36	A	0.37	A	0.41	A
P Street - between 14th Street & 15th Street	0.35	A	0.36	A	0.40	A
P Street - between 2nd Street & 3rd Street	0.68	B	0.68	B	0.68	B
Q Street - between 12th Street & 13th Street	0.33	A	0.33	A	0.33	A
Q Street - between I-5 SB Off-ramp & 3rd Street	0.39	A	0.39	A	0.39	A
Source: City of Sacramento General Plan						

Multimodal Level of Service Analysis

The final performance metric, multimodal LOS, was applied to J Street between 5th Street and 10th Street. This methodology provides a separate LOS value for automobiles, pedestrians, bicycles, and transit on urban streets. The automobile LOS component of the analysis tool is consistent with the NCHRP Project 3-70 methodology, and the non-automobile components are consistent with the methodologies incorporated in the Highway Capacity Manual 2010. The table below presents the multimodal LOS analysis results for existing conditions on J Street between 5th Street and 10th Street.

J Street Multimodal Level of Service Analysis – Existing Conditions

AM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.58	2.55	B	969.20	0.97	A	3.25	C	1.50	A
6th Street to 7th Street	0.81	2.79	C	1900.06	3.07	C	2.70	B	2.65	B
7th Street to 8th Street	0.70	2.55	B	281.52	2.62	B	3.35	C	2.39	B
8th Street to 9th Street	0.70	2.55	B	141.51	2.14	B	3.87	D	1.70	A
9th Street to 10th Street	0.62	2.55	B	635.42	2.25	B	3.47	C	2.66	B

PM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.35	2.55	B	699.95	0.15	A	2.86	C	1.43	A
6th Street to 7th Street	0.45	2.79	C	1357.17	2.23	B	2.39	B	2.54	B
7th Street to 8th Street	0.47	2.55	B	683.95	1.86	A	3.04	C	2.25	B
8th Street to 9th Street	0.48	2.55	B	156.19	1.62	A	3.65	D	1.68	A
9th Street to 10th Street	0.44	2.55	B	635.42	1.81	A	3.27	C	2.58	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

Similar to the other analyses conducted for this study, the multimodal LOS tool examines roadway segments, and does not analyze LOS at intersections or consider roadway crossing difficulties for pedestrians. The methodologies applied in the multimodal LOS analysis consider a broad range of inputs beyond traditional intersection LOS analysis, including pedestrian environment and transit operating variables. For example, dwell times for local and express buses were accounted for at 25 seconds and 35 seconds, respectively, based on field observations conducted on J Street. Attachment A provides a detailed listing of all data inputs for multimodal LOS analysis.

As shown in the existing conditions results table, the bicycle mode currently performs worse than other modes on this section of J Street. During both the AM and PM peak hours, the bicycle mode has the highest LOS score on four out of the five blocks examined indicating poorer performance relative to the other modes.

The following table presents the results of the Existing Plus Phase 1 multimodal LOS analysis.

Street Multimodal Level of Service Analysis – Existing Plus Route/Stop Modifications (Phase 1)										
AM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.60	2.55	B	969.20	0.99	A	3.25	C	1.47	A
6th Street to 7th Street	0.82	2.79	C	1900.06	3.10	C	2.71	B	2.43	B
7th Street to 8th Street	0.71	2.55	B	281.52	2.65	B	3.36	C	1.73	A
8th Street to 9th Street	0.72	2.55	B	141.51	2.18	B	3.88	D	2.47	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.31	B	3.49	C	2.53	B
PM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.37	2.55	B	699.95	0.19	A	2.89	C	1.35	A
6th Street to 7th Street	0.48	2.79	C	1357.17	2.28	B	2.42	B	2.24	B
7th Street to 8th Street	0.48	2.55	B	683.95	1.91	A	3.07	C	1.61	A
8th Street to 9th Street	0.51	2.55	B	156.19	1.68	A	3.68	D	2.39	B
9th Street to 10th Street	0.48	2.55	B	635.42	1.86	A	3.30	C	2.46	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

As shown above, although the increases in bus volumes on J Street result in increases to the peak hour V/C ratios, these increases are not substantial enough to result in a change in the LOS score/value. The NCHRP Project 3-70 methodology used for this analysis calculates a V/C ratio based on volume, lanes, saturated flow rate, peak hour factor, and heavy vehicle percentage. This is used as a screen check to determine if a roadway segment is over its capacity; if it is, the LOS value defaults to F. If it is not, then the primary variable that affects the LOS score is the number of vehicle stops per segment.

Based on past modeling efforts conducted for this portion of J Street, current signal timing plans obtained from the City, and field observations, it was determined that the majority of vehicles do not

stop on any given segment/block of J Street within the area that we analyzed (approximately 80 percent of vehicles travel though any given block without stopping). This is due to the good progression achieved by the current traffic signal timing plans. The most delayed intersection on J Street Downtown is J Street/3rd Street, which also serves the off-ramps from Interstate 5. After receiving a green signal at this intersection, platoons of vehicles travel along J Street through several intersections before encountering a red light, due to the programmed signal timing offsets. These findings are consistent with previous studies that have examined intersection LOS on J Street, where relatively low levels of delay are found east of 3rd Street within Downtown. With the addition of either phase of the project, the study segments of J Street remain within their capacity during the peak hour, and vehicles continue to benefit from the good progression along the corridor. Therefore, using this methodology, the LOS scores/values do not change with the addition of either phase of the project.

The addition of the Phase 1 improvements results in improvements to the transit mode LOS. These improvements are primarily the result of increased transit service on J Street.

The following table presents the results of the Existing Plus Phase 2 multimodal LOS analysis.

J Street Multimodal Level of Service Analysis – Existing Plus Route/Stop Modifications & Bus Lane (Phase 2)

AM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.62	2.55	B	969.20	0.90	A	3.22	C	1.12	A
6th Street to 7th Street	0.84	2.79	C	1900.06	2.97	C	2.67	B	2.32	B
7th Street to 8th Street	0.72	2.55	B	281.52	2.52	B	3.32	C	1.37	A
8th Street to 9th Street	0.72	2.55	B	141.51	2.05	B	3.84	D	2.38	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.18	B	3.44	C	2.40	B

PM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.40	2.55	B	699.95	0.17	A	2.87	C	1.01	A
6th Street to 7th Street	0.52	2.79	C	1357.17	2.25	B	2.41	B	2.14	B
7th Street to 8th Street	0.51	2.55	B	683.95	1.88	A	3.06	C	1.27	A
8th Street to 9th Street	0.55	2.55	B	156.19	1.65	A	3.67	D	2.32	B
9th Street to 10th Street	0.49	2.55	B	635.42	1.83	A	3.29	C	2.34	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

Similar to Phase 1, the Phase 2 improvements increase the peak hour automobile V/C ratios on J Street, but do not result in a change to the LOS score/value. The implementation of Phase 2 results in further improvements to the transit mode score due to the benefits associated with the addition of a bus lane on J Street.

Figures 5 and 6 compare the multimodal LOS results for the Existing, Existing Plus Phase 1, and Existing Plus Phase 2 scenarios during the AM and PM peak hours, respectively. These figures also include graphs of the changes in bus volume for each block of J Street between 5th Street and 10th Street.

The Existing Plus Project results above isolate the effects of the proposed Downtown transit improvements on J Street to gauge the potential impacts to each mode as a result of this project. The following three tables present the Near-Term multimodal LOS analysis which includes the implementation of a Class II bicycle lane on J Street.

J Street Multimodal Level of Service Analysis – Near-Term No Project Conditions

AM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.58	2.55	B	969.20	0.97	A	0.00	A	1.56	A
6th Street to 7th Street	0.81	2.79	C	1900.06	3.07	C	0.81	A	2.63	B
7th Street to 8th Street	0.70	2.55	B	281.52	2.62	B	2.30	B	2.38	B
8th Street to 9th Street	0.70	2.55	B	141.51	2.14	B	3.29	C	1.69	A
9th Street to 10th Street	0.62	2.55	B	635.42	2.25	B	2.56	B	2.65	B

PM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.35	2.55	B	699.95	0.15	A	0.00	A	1.49	A
6th Street to 7th Street	0.45	2.79	C	1357.17	2.23	B	0.50	A	2.52	B
7th Street to 8th Street	0.47	2.55	B	683.95	1.86	A	1.99	A	2.23	B
8th Street to 9th Street	0.48	2.55	B	156.19	1.62	A	3.07	C	1.66	A
9th Street to 10th Street	0.44	2.55	B	635.42	1.81	A	2.36	B	2.57	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

As shown in the table above, under Near-Term No Project conditions the addition of a dedicated bicycle lane on J Street results in dramatic improvements to bicycle LOS on J Street during both the AM and PM

peak hours. Under existing conditions, none of the study segments on J Street operated at LOS A, and one of the five segments (8th Street to 9th Street) operated at LOS D during both the AM and PM peak hours. With the addition of the Downtown On-Street Bikeway Project, all segments operate at LOS C or better for the bicycle mode during both peak hours. Two segments operate at LOS A during the AM peak hour, and three segments operate at LOS A during the PM peak hour. The addition of the bicycle lane does not alter the performance of the auto or pedestrian modes, and results in slight changes to the transit mode as a result of the narrowing of traffic lanes on J Street.

The following table presents the results of the Near-Term Plus Phase 1 multimodal LOS analysis.

J Street Multimodal Level of Service Analysis – Near-Term Plus Route/Stop Modifications (Phase 1)

AM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.60	2.55	B	969.20	0.97	A	0.00	A	1.53	A
6th Street to 7th Street	0.82	2.79	C	1900.06	3.07	C	0.81	A	2.40	B
7th Street to 8th Street	0.71	2.55	B	281.52	2.62	B	2.31	B	1.71	A
8th Street to 9th Street	0.72	2.55	B	141.51	2.14	B	3.30	C	2.46	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.25	B	2.23	B	2.51	B

PM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.37	2.55	B	699.95	0.56	A	0.00	A	1.41	A
6th Street to 7th Street	0.48	2.79	C	1357.17	2.12	B	0.53	A	2.22	B
7th Street to 8th Street	0.48	2.55	B	683.95	1.82	A	2.02	B	1.60	A
8th Street to 9th Street	0.51	2.55	B	156.19	1.60	A	3.10	C	2.38	B
9th Street to 10th Street	0.48	2.55	B	635.42	1.77	A	2.39	B	2.45	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

Similar to the Existing Plus Project analysis results, the addition of Phase 1 of the project results in no changes to the auto mode LOS score, and slight changes to the pedestrian and bicycle mode scores. As expected, the most substantial change in LOS score occurs for the transit mode, which benefits from increased service levels as a result of the project.

The following table presents the results of the Near-Term Plus Phase 2 multimodal LOS analysis. As shown, the implementation of Phase 2 results in further improvements to the transit mode score due to the benefits associated with the addition of a bus lane on J Street.

J Street Multimodal Level of Service Analysis – Near-Term Plus Route/Stop Modifications & Bus Lane (Phase 2)										
AM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.62	2.55	B	969.20	1.26	A	0.00	A	1.18	A
6th Street to 7th Street	0.84	2.79	C	1900.06	2.80	C	0.78	A	2.30	B
7th Street to 8th Street	0.72	2.55	B	281.52	2.42	B	2.27	B	1.36	A
8th Street to 9th Street	0.72	2.55	B	141.51	1.97	A	3.25	C	2.37	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.09	B	2.53	B	2.38	B
PM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.40	2.55	B	699.95	0.53	A	0.00	A	1.07	A
6th Street to 7th Street	0.52	2.79	C	1357.17	2.09	B	0.51	A	2.12	B
7th Street to 8th Street	0.51	2.55	B	683.95	1.79	A	2.00	B	1.26	A
8th Street to 9th Street	0.55	2.55	B	156.19	1.57	A	3.09	C	2.31	B
9th Street to 10th Street	0.49	2.55	B	635.42	1.74	A	2.38	B	2.33	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

5.5 Conclusion

The recommended project alternative would result in improved transit service within downtown Sacramento, and if implemented, would increase person throughput on key corridors within the City. On J Street, calculations show that increased bus service could result in up to a 35 percent increase in person throughput during the AM peak hour and up to a 44 percent increase during the PM peak hour. The consolidation of bus routes and stops within downtown would result in more efficient transit operations, and faster travel times for buses. This could in turn lead to increased transit ridership, and potential savings in both capital and operating costs for transit providers in the region.

The proposed transit improvements would result in small increases to automobile volume to capacity ratios on J Street. The roadway segment volume/capacity analysis completed for key segments within the study area indicates that no roadway segment will degrade to LOS F as a result of the project.

The results of the multimodal LOS analysis, focused on the most heavily traveled street proposed for increased transit service, show no significant change in automobile LOS on J Street during the AM and PM peak hours. Any small increases in automobile congestion along the J Street portion of the transit loop could potentially be offset by traffic signal timing enhancements proposed as part of the project. The multimodal LOS analysis also reveals that the proposed changes to transit service along the corridor would result in measurable improvements to the transit LOS score. The combination of both the recommended transit improvements and the planned bicycle lane on J Street under would result in improvements for both bicyclists as well as transit riders on one of downtown Sacramento's primary thoroughfares.

5.4 On-Street Parking

Lastly, on-street parking adjustments were assessed within the Central Business District bounded by 3rd St, Q St, 16th St, and H St. Overall, on-street parking changes are neutral in the peak period. During the off-peak period additional on-street parking could be added as the result of conversion of bus stops to peak-only. The initial planning estimates of on-street parking changes are listed below.

On-Street Parking Change Estimates		
Street	**Peak Parking Change**	**All Day Parking Change**
10th	6	6
12th	0	0
15th	-7	-2
16th	0	0
3rd	0	0
5th	6	8
7th	-12	0
8th	-3	2
9th	17	17
H	0	0
I	0	0
J	-11	-5
L	2	2
N	9	9
P	-6	4
Q	5	5
Total	**6**	**46**

6th Street to 7th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.79	C	3.07	C	2.70	B	2.65	B
Existing + Phase 1	2.79	C	3.10	C	2.71	B	2.43	B
Existing + Phase 2	2.79	C	2.97	C	2.67	B	2.32	B

8th Street to 9th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	2.14	B	3.87	D	1.70	A
Existing + Phase 1	2.55	B	2.18	B	3.88	D	2.47	B
Existing + Phase 2	2.55	B	2.05	B	3.84	D	2.38	B

5th Street to 6th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	0.97	A	3.25	C	1.50	A
Existing + Phase 1	2.55	B	0.99	A	3.25	C	1.47	A
Existing + Phase 2	2.55	B	0.90	A	3.22	C	1.12	A

7th Street to 8th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	2.62	B	3.35	C	2.39	B
Existing + Phase 1	2.55	B	2.65	B	3.36	C	1.73	A
Existing + Phase 2	2.55	B	2.52	B	3.32	C	1.37	A

9th Street to 10th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	2.25	B	3.47	C	2.66	B
Existing + Phase 1	2.55	B	2.31	B	3.49	C	2.53	B
Existing + Phase 2	2.55	B	2.18	B	3.44	C	2.40	B

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J STREET MULTIMODAL LEVEL OF SERVICE - AM PEAK HOUR

FIGURE 5

6th Street to 7th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.79	C	2.23	B	2.39	B	2.54	B
Existing + Phase 1	2.79	C	2.28	B	2.42	B	2.24	B
Existing + Phase 2	2.79	C	2.25	B	2.41	B	2.14	B

8th Street to 9th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	1.62	A	3.65	D	1.68	A
Existing + Phase 1	2.55	B	1.68	A	3.68	D	2.39	B
Existing + Phase 2	2.55	B	1.65	A	3.67	D	2.32	B

5th Street to 6th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	0.15	A	2.86	C	1.43	A
Existing + Phase 1	2.55	B	0.19	A	2.89	C	1.35	A
Existing + Phase 2	2.55	B	0.17	A	2.87	C	1.01	A

7th Street to 8th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	1.86	A	3.04	C	2.25	B
Existing + Phase 1	2.55	B	1.91	A	3.07	C	1.61	A
Existing + Phase 2	2.55	B	1.88	A	3.06	C	1.27	A

9th Street to 10th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	1.81	A	3.27	C	2.58	B
Existing + Phase 1	2.55	B	1.86	A	3.30	C	2.46	B
Existing + Phase 2	2.55	B	1.83	A	3.29	C	2.34	B

FEHR PEERS

J STREET MULTIMODAL LEVEL OF SERVICE - PM PEAK HOUR

FIGURE 6

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6 Stakeholder Participation

6.1 Objective

The objective of the outreach effort was to identify and engage key stakeholders—downtown employers, businesses, property owners, residents, and transit, pedestrian and bicycle advocates—to provide input on potential solutions which will enhance the quality of transit service for customers and improve transit operation and facilities within the Downtown area.

6.2 Outreach Methods

Stakeholder Focus Group Workshops

Two rounds of stakeholder focus group workshops were held: a) initial input and b) respond to the draft initial Plan Concept recommendations. The detailed meeting summaries can be found in the Appendix.

Round One More than 30 stakeholder representatives attended one of two stakeholder workshops held in the morning and afternoon of January 20th. Representatives included downtown employers, state agencies, businesses, property owners, developers, and community-based organizations including neighborhood associations and environmental, transit, pedestrian, and bicycle advocates. The initial two stakeholder workshops included a discussion of the purpose and need of the study, stakeholders' input on transit opportunities and challenges within the downtown area, and a discussion to provide feedback on potential areas of improvement.

Round Two After initial proposed recommendations were developed, the project team held another Stakeholder Focus Group workshop on May 31st to receive feedback on the initial recommendations. Participants included members from the initial stakeholder focus group workshop and also business and property owners who may be impacted by the proposed recommendations. The proposed Plan Concept was presented and the stakeholders provided feedback.

One-on-One Stakeholder Interviews

In addition to the stakeholder focus group workshops, the project team met with Fran Halbakken, City of Sacramento, Downtown Railyards Program Manager. The Railyards is the largest downtown redevelopment and transit-oriented development project in the Sacramento region. Because of the size of the development and its potential impact to transit, the project team felt it was important to have a separate meeting to understand the current plans and status of development.

Business/Property Owners

After the initial draft of recommendations, the project team visited the 18 property owners whose properties would be potentially impacted by the recommendations to introduce the project; the property owners were also invited to attend the May 31st stakeholder workshop and provide input on specific site locations.

Project Update Newsletter

Two project update electronic newsletters were provided to the stakeholder groups. The newsletters provided links to reports about existing and future conditions, existing summary review, and draft recommendations. In addition, the newsletter served as a mechanism for distributing the project survey and as an invitation to the May 31st stakeholder focus group workshop.

Informational Brochure

An informational brochure was developed and distributed to the stakeholder groups to provide additional potential improvement considerations for the project.

Project Survey

More than 50 respondents provided additional feedback communicating their priorities and perceived effectiveness of the potential transit improvements. More than 97 percent of respondents stated that they worked in downtown Sacramento, and a majority of the respondents were either an employer or business association.

The results demonstrated that stakeholders felt the improvements that would make the largest difference were:

- **Bus stops and Train stations**
  - Real time transit information
  - Bus shelters
  - Off-vehicle fare payments
- **Right of way enhancements**
  - Stop location
  - Bus stop spacing
  - Bus bulbs/boarding islands
- **Intelligent transportation systems**
  - Real time information
  - Bus signal priority/automated vehicle location & radio location (tied)
- **Service design and operating practice**
  - Maximize service frequencies
  - Route alignment
  - Headway based schedules

6.3 Key Stakeholder Findings

The overall findings from the public outreach effort consisted were generally supportive of the proposed recommendations made by the project team. In particular they supported the transit consolidation, bus lanes, and bus bulbs. Some expressed concern at how the remaining traffic on J Street would be impacted by the addition of bus lanes and others expressed concern about bicycle safety if shared bus/bike lanes were implemented. The stakeholder expressed support for providing additional amenities to the bus stops and expressed a need for more seating and shelter at the stop locations. Concern was expressed regarding creating shelters for the transient population and stakeholders emphasized that a vigilant effort was needed to maintain all amenities. Lastly, the stakeholders made additional recommendations to include amenities in earlier phases of the project and to consider implementing a marketing campaign around improved transit as part of the effort.

7 Financial Analysis

7.1 Introduction

The financial analysis includes both capital and operating costs developed at a plan concept level. The capital costs were developed based on a survey of similar capital investments in representative California cities including San Francisco, Los Angeles, and Sacramento. The low, mid, and high capital costs were calculated around the representative capital costs in order to provide a range of potential cost. In the final analysis the mid-point unit cost figures were used to calculate the overall capital costs of the plan. The operation and maintenance costs were calculated based on a fixed percentage of the original capital expenditure, approximately eight percent annually.

7.2 Capital Costs

Projected capital costs were calculated following the plan phasing with capital improvements programmed for the immediate term, short term, and long term. Individual capital costs for each phase were assembled into overall packages to accommodate the proposed infrastructure investments. Additional capital unit cost detail can be found in the Capital Unit Cost Assumptions *Detail Appendix*.

- **Immediate Term (Interim Bus Stop Upgrade)**[1]
    - Interim bus stop amenities
        - Additional information
        - Seating
        - Rehab and cleaning
    - Repair and replacements
        - Major cleaning to support ongoing level-of-effort

[1] The capital costs include hard costs, but not soft costs like site-specific design or any legacy work required to meet minimum roadway or sidewalk standards (e.g., ADA).

- Relocation
  - Needed to implement route realignment proposals
  - Shift existing stops to proposed locations
- Wayfinding Improvements on City streets
  - Coordinated and clear communication of key directional information

- **Short Term (Bus Lane and Signal Enhancements)**
  - Several demarcation options available:
    - Basic restriping
    - Lane painting
    - Stamped concrete
  - Signal Enhancements on J Street for thirteen intersections

- **Long Term (Bus Stop Improvements)**[2]
  - Bus Bulb Stop
    - Bulb shelter
    - Information display (kiosk)
    - Real time display
    - Seating
    - Lighting
    - Trash, etc.
  - All Day Stop
    - Shelter
    - Information display
    - Seating
    - Lighting
    - Trash, etc.
  - Peak-Only Stop
    - Shelter
    - Information display
    - Seating
    - Lighting
    - Trash, etc.

[2] The capital costs include hard costs, but not soft costs like site-specific design or any legacy work required to meet minimum roadway or sidewalk standards (e.g., ADA).

Across the three plan phases the total units of infrastructure improvements needed to support the plan and the improvement unit costs were:

Proposed Capital Improvement	Amount	Capital Unit Cost Midpoint
Relocated Stop	13	$18,500
Stop Rehab and Cleaning	40	$4,500
Bus Lane Miles	4	$120,000
Bus Bulb Stop	13	$69,000
All Day Stop	26	$20,500
Peak-Only Stop	20	$20,500
Signal Enhancement	13	$34,000
Wayfinding Improvements	-	$200,000

The capital improvement unit costs were combined with the total number of proposed improvements in each phase to generate an overall total capital expenditure for each phase.

Planned Capital Investment	Total Capital Costs
Immediate Term (1-3 years)	$620,000
Short Term (4-7 years)	$950,000
Long Term (7 years and beyond)	$1,840,000

ADA Requirements

The cost for bringing the sidewalk space around new and relocated stops into complacence with ADA requirements has been included as a separate capital cost item with a unit cost of $75,000 for 14 stops.

ADA Requirements	Capital Costs
Immediate Term (1-3 years)	$1,050,000

7.3 Operating Costs

Maintenance of infrastructure is critical to ensuring an ongoing high quality transit product; therefore this plan includes an annual allowance for on-going operating costs to support a state of good repair for existing and new downtown facilities.

Planned Annual Operating Costs	
Immediate Term (1-3 years)	$50,000
Short Term (4-7 years)	$126,000
Long Term (7 years and beyond)	$273,000

The plan's anticipated impact on service operating costs is neutral. Existing service levels are not frequent enough to save vehicle resources given the projected level of time savings. Only a highly frequent transit service, for example a service with headways every five minutes, would see a reduction in operating costs. Overall revenue miles within the downtown study area remain neutral under the proposed alignment changes. Even though specific operating costs savings are not realized, the realignment and delay reduction will result in an improved level of service for transit in downtown and, based on industry experience, will attract more daily riders.

7.4 Potential Capital and Operating Revenues

While additional ridership and operating revenue is expected, none has been estimated at the Plan Concept level given the additional steps needed to refine and implement the recommendations. Typically, the elasticity for delay reduction is a 40 percent ridership increase per 100 percent improvement in operating speed. However, industry ridership estimation best practices for micro changes of much longer trips—such as reducing delay on just the downtown portion of an express trip—are still a work-in-progress. Factors such as new developments (e.g., Railyards, River District, Midtown) and State employment levels will also heavily influence ridership. In order to err conservatively, no new operating revenue is forecast for the Plan Concept.

Potential Project Funding

While the total capital cost for any phase and the new annual operating costs are not high, consideration should be given to potential project funding opportunities as the Plan Concept moves forward. Packaging just the transit projects around FTA and State funding is an option, as is seeking funding from multiple sources if a larger project was developed to encompass broader mobility elements, like active transportation or traffic signal upgrades, as part of the Downtown Transportation Plan.

- FTA's Section 5309 New Starts/Small Starts funding may be applicable if it is tied to the introduction of Streetcar or Rapid Bus/BRT service (Very Small Starts). Although RT's recent

TransitRenewal Plan does not include BRT, there will be opportunities for future lines that traverse the project corridors, like Lines 30/31 on J/L Streets and Line 51 on 7th/8th Streets.

- FTA's Section 5307 urbanized area formula funds are a potential source of revenue for either the capital or operating costs associated with the project. These funds are allocated on an annual basis by SACOG through the Transit Coordinating Committee. If the project's capital and/or operating expenses are determined to be a priority, funds could be allocated by the TCC for any or all of the components and/or phases of the project.

- For the last few years, FTA has made additional FTA 5309 funds available through an annual nationwide competitive process. The project's capital components may qualify under one or more of these programs should FTA continue to offer future Notices of Funding Ability.

- Federal programs like TIGER Grants focus on multimodal, multi-jurisdictional, and otherwise challenging-to-fund projects through existing programs. "These are innovative, 21st century projects that will change the U.S. transportation landscape by strengthening the economy and creating jobs, reducing gridlock and providing safe, affordable and environmentally sustainable transportation choices."--Ray LaHood, U.S. Secretary of Transportation.

- Other local discretionary funding is available from SACOG through its biennial regional funding round. This is a competitive grant program that provides an opportunity for a number of different projects eligible to use Congestion Mitigation and Air Quality (CMAQ), Regional Surface Transportation Program (RSTP) and State Transportation Improvement Program (STIP) funds. The next funding round is scheduled for the summer/fall of 2013. SACOG also manages the Proposition 1 B Public Transportation Modernization, Improvement, and Service Enhancement Account (PTMISEA) "regional" funds. The capital aspects of this project would all be eligible under this program. Although the majority of these funds have already been programmed, new, high priority projects are sometimes included in the project list.

8 Recommendations

8.1 Preferred Plan Concept

The preferred plan concept recommends several key transit delay reduction strategies to improve transit circulation in downtown Sacramento. The following key elements of the preferred plan concept are recommended for implementation or for further detailed assessment:

- **Grouped bus stop patterns**: Under existing downtown transit operations, all buses stop at all stops. This leads to both long bus queues competing for limited stop curb space and exacerbates conflicts in the amount of dwell between express and local buses at the common stops. Creation of an "A" "B" "C" set of stop groups will speed transit travel and improve the passenger wait experience.

- **Balanced stop spacing:** Well-spaced stops (1/4 – 1/2 mile) balance operational efficiencies while maintaining customer access. Stops placed too close together greatly increase transit travel times and significantly increase customer perception of slow travel.
- **Simplified and consolidated route alignments**: Fewer overall turns and a preference for right turns would have a positive impact on transit and other traffic, as bus turning movements create queues and delay.
- **Bus lanes**: Bus lanes provide dedicated right-of-way for bus-only operations and reduce conflict between buses and through traffic. Peak-only bus lanes minimize all day traffic impacts while the lower non-peak traffic often allows for full-time bus lanes with little additional impact.
- **Bus bulbs**: Bus bulbs allow for transit vehicles to remain in the travel lane, avoiding the delay from entering/re-entering traffic. This physical form of transit stop provides an opportunity to reduce delay and provide better service, while also creating room for additional stop amenities.
- **Stop Amenities**: The proposed stop amenities focus on improving the transit customer wait experience, providing reduced dwell time, streamlining operations with passenger pre-queuing by entry doors, and making a positive contribution to the urban environment.

8.2 Next Steps

Bolstering the profile of transit in downtown is consistent with goals of increasing transit ridership in the city's General Plan. By creating a more appealing and faster travel experience transit's role in downtown mobility can increase. Investing in upgraded transit facilities and service quality in the near term will better position Downtown Sacramento to accommodate and promote future economic development while increasing downtown livability.

Based on the results of the impact assessment and stakeholder and TAC support of the plan concepts, it is recommended that the preferred plan concept move forward in two stages: immediately implementable concepts and concepts which inform subsequent downtown planning efforts, specifically the City of Sacramento's Downtown Transportation Study.

All immediate term concepts—route realignments, stop adjustments, and interim stop improvements—could move forward independently of the subsequent Downtown Transportation Study. Additionally, the first phase can operate independently from the remaining phases, although with reduced delay reduction. Moving forward with immediate term concepts is dependent on the availability of funding and additional detailed vetting of stop locations. Specifically, for each stop location the unique capital requirements, including legacy remedial improvements, will need to be identified. If a low cost action is possible following this analysis, it may be included in the immediate term implementation. Otherwise, alternative locations which adhere to the overall strategy should be considered.

The remaining concepts in phases two and three should serve as recommended input to the City of Sacramento's Downtown Transportation Study, which should carefully consider transit's role in downtown Sacramento.

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Routing Scenario C
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Preferred Bus Bulb Locations Concept
Preferred Downtown Sacramento Transit Circulation Plan Concept
Preferred Stop Modifications Concept
El Dorado Downtown Sacramento Stops & Alignment Concept
e-tran Downtown Sacramento Stops & Alignment Concept
North Natomas Downtown Sacramento Stops & Alignment Concept
Placer Downtown Sacramento Stops & Alignment Concept
SJRTD Downtown Sacramento Stops & Alignment Concept
SCT/Link Downtown Sacramento Stops & Alignment Concept
Roseville Downtown Sacramento Stops & Alignment Concept
Yolobus Downtown Sacramento Stops & Alignment Concept
Yuba-Sutter Downtown Sacramento Stops & Alignment Concept
SACRT Downtown Sacramento Stops & Alignment Concept

Capital Unit Cost Assumptions

Evaluation of Project Alternatives Report
Attachment A

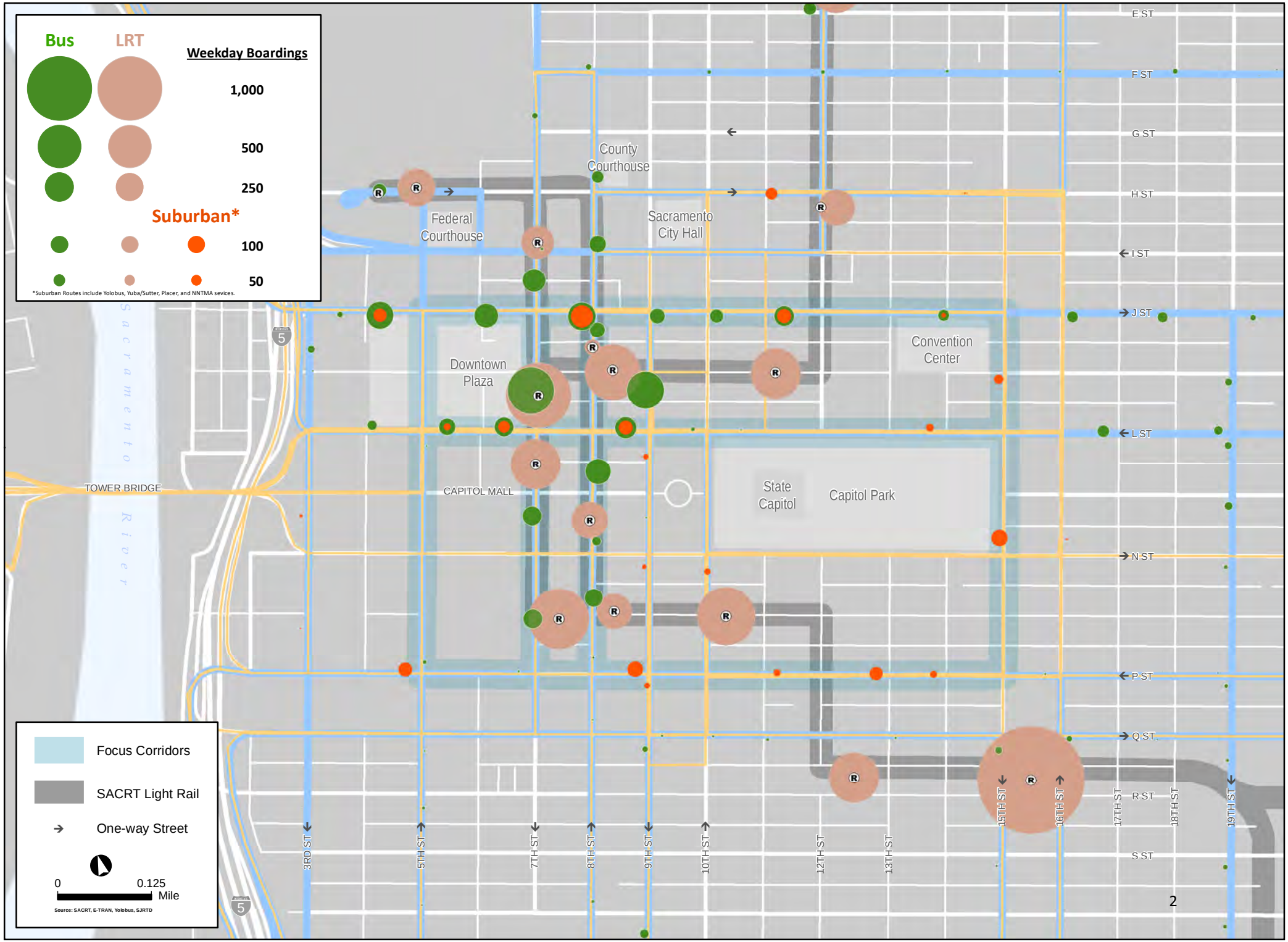
LOS Technical Analysis
Anlaysis tables and spreadsheets
Volume/Capacity Ratios

Task 2 Existing Studies Review Document

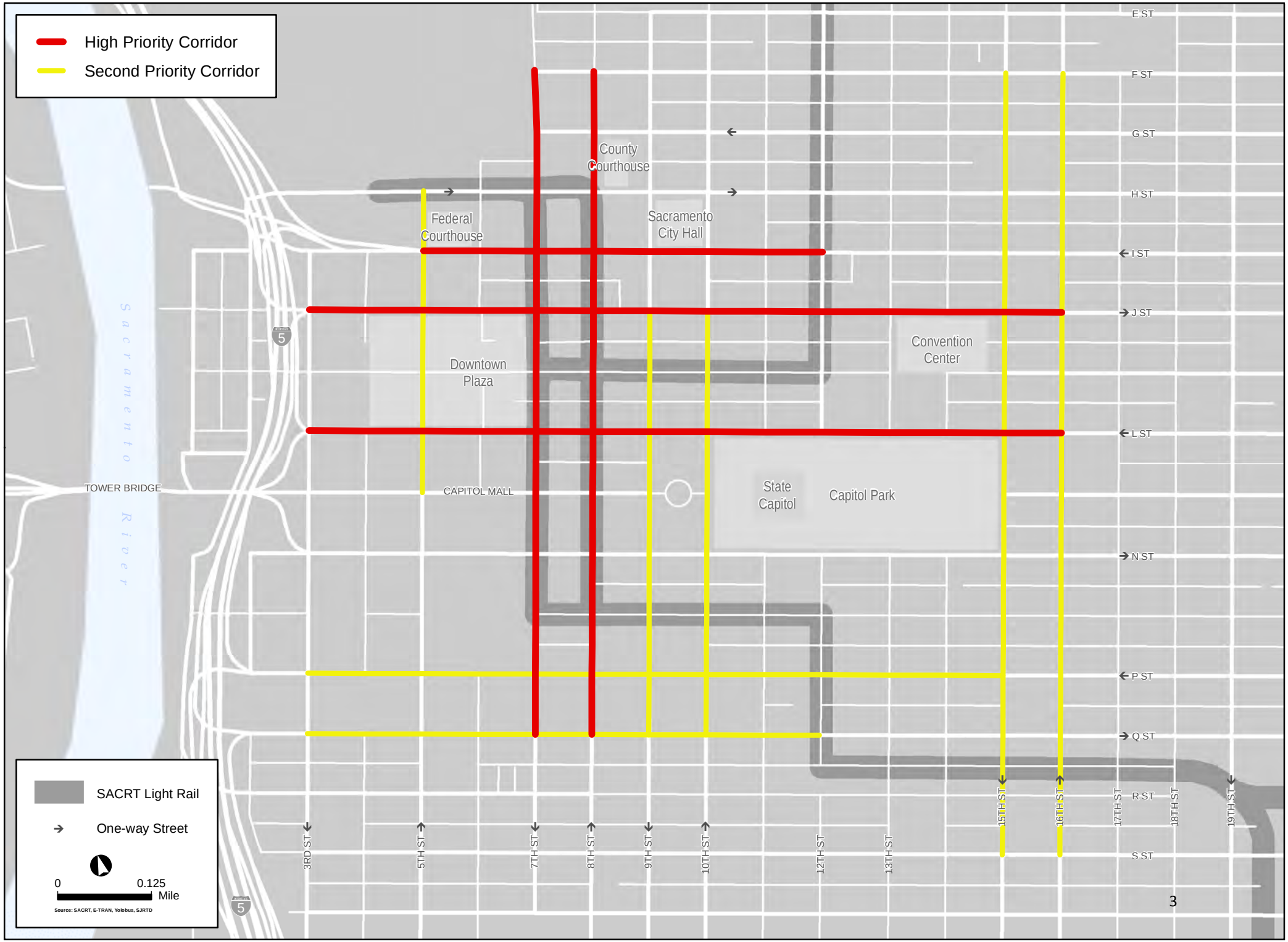
Outreach Activities Summary
Stakeholder Focus Group Meeting January 20, 2012
Stakeholder One-on-One Meeting: Fran Halbakken
Stakeholder Focus Group Meeting May 31, 2012
Online Survey Comments Received

Comments Received
Regional Transit Letter to SACOG

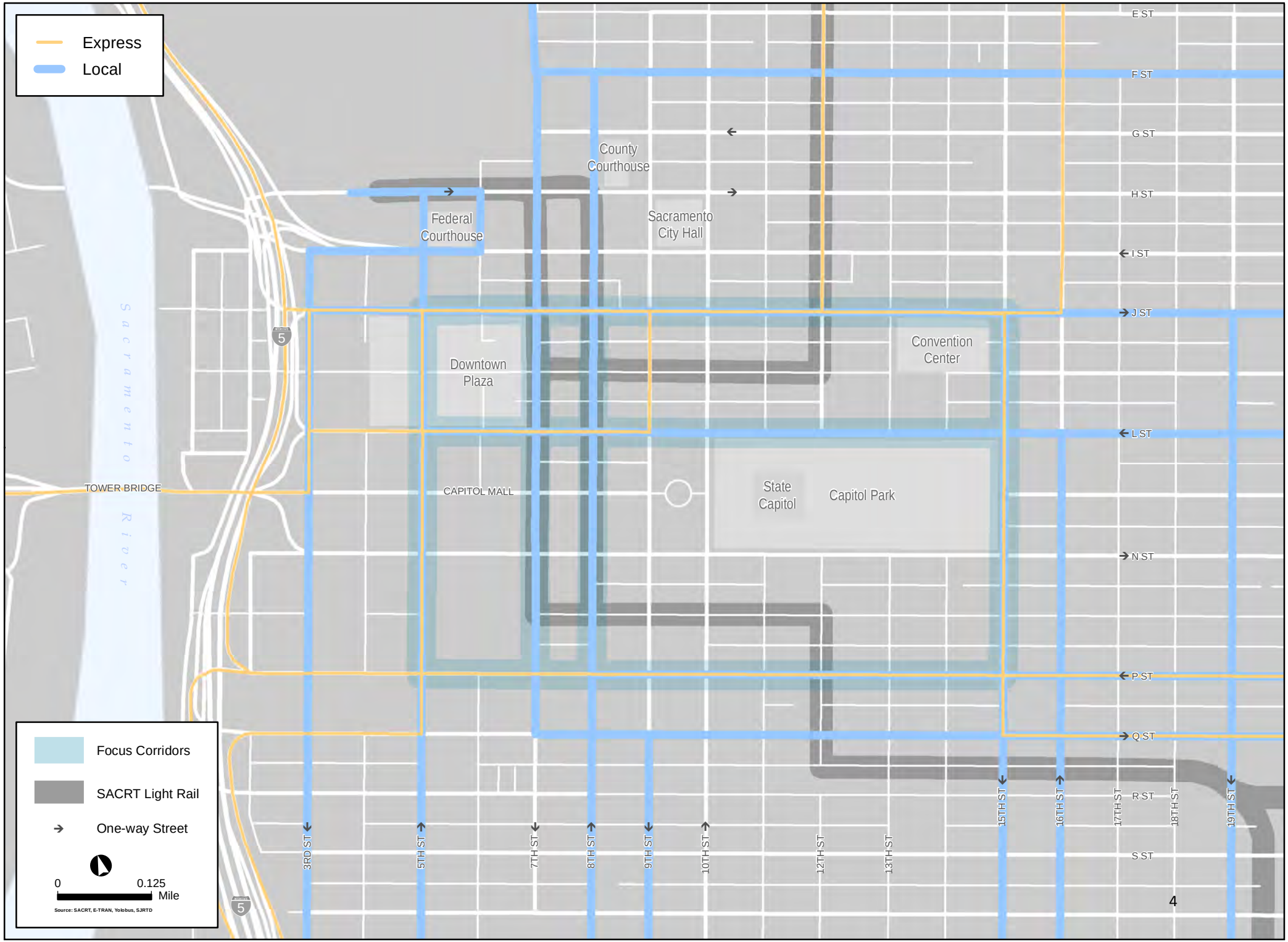
Downtown Sacramento Boardings - Weekday



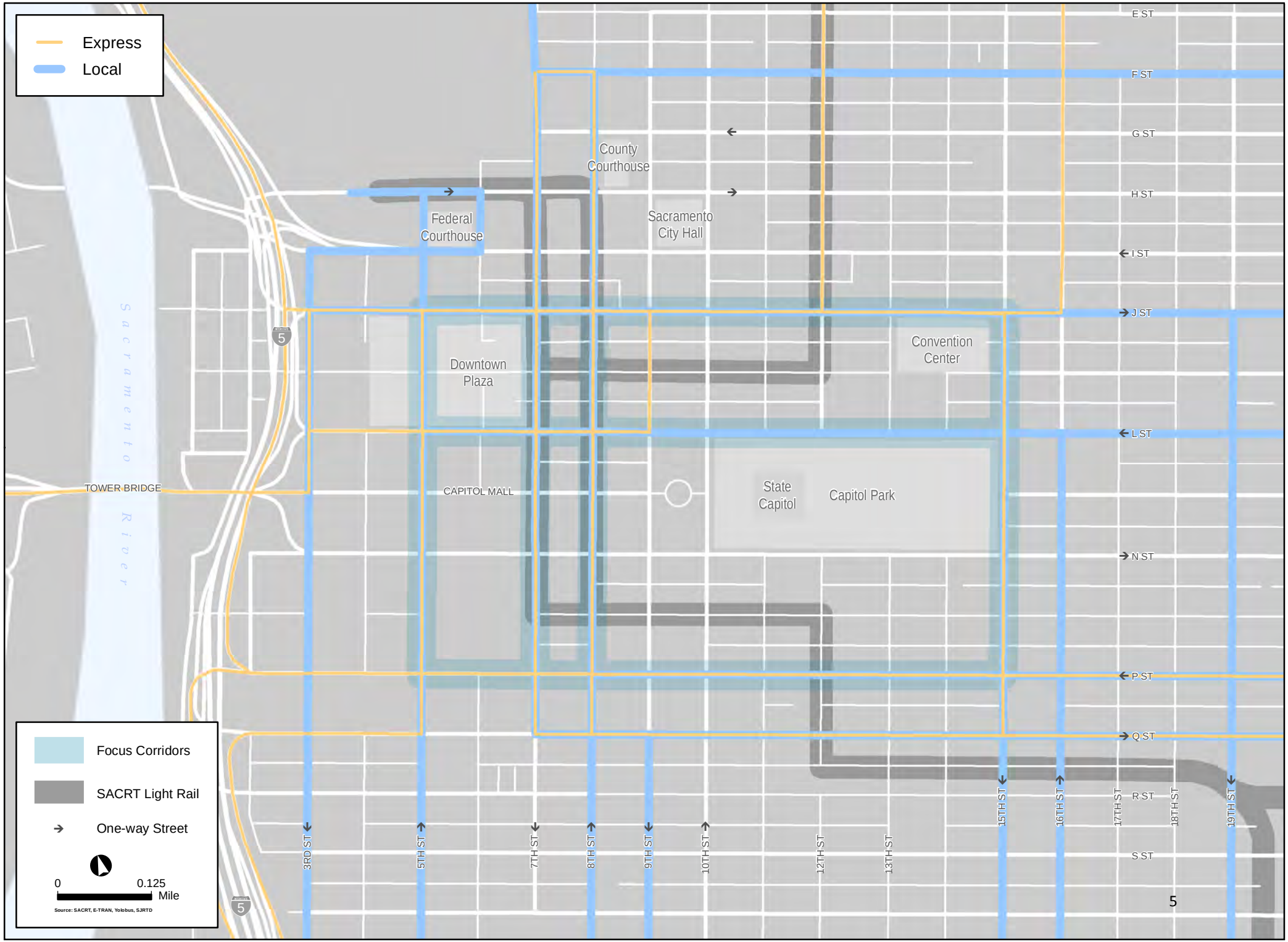
Key Study Corridors



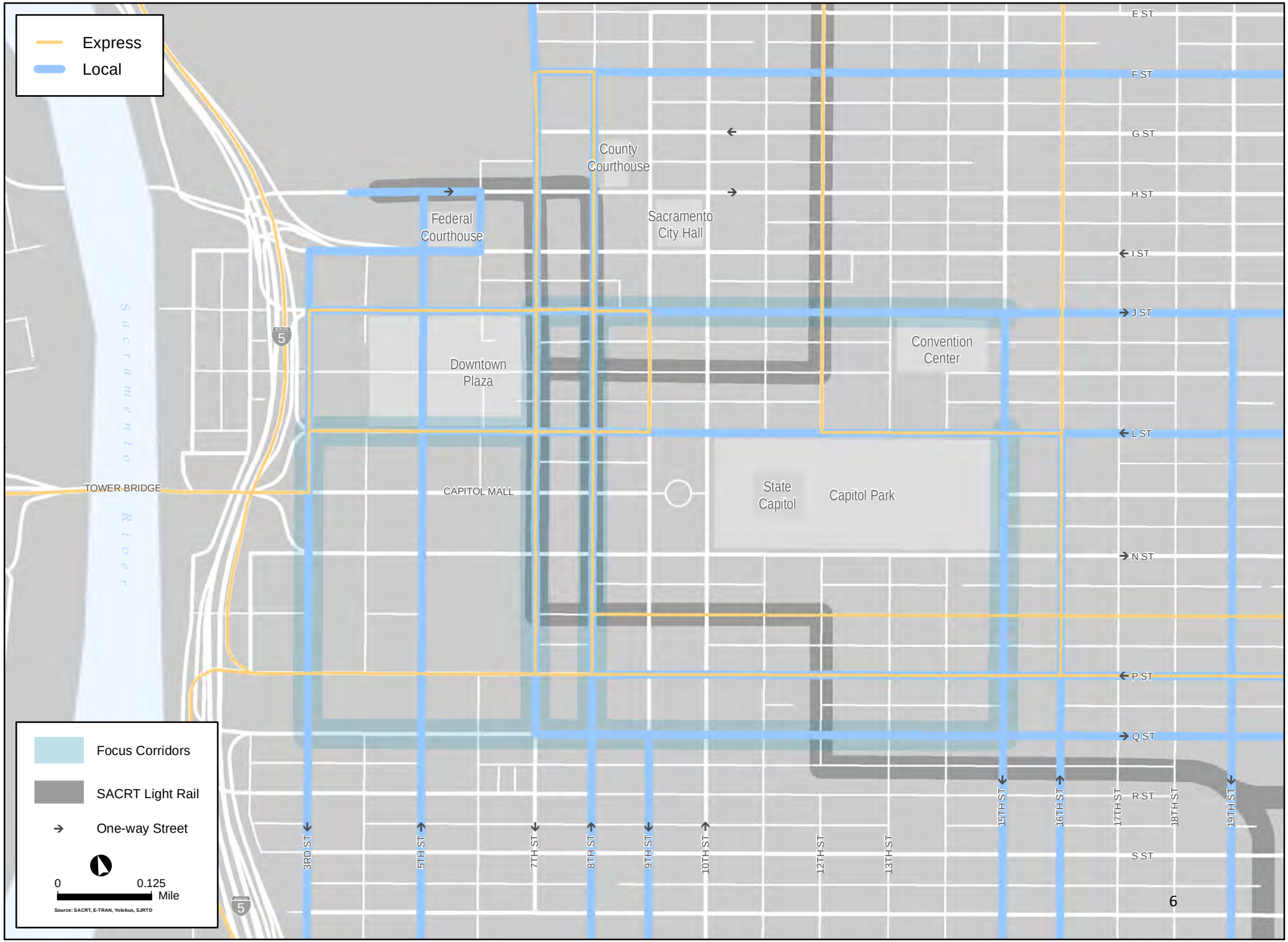
Routing Scenario A



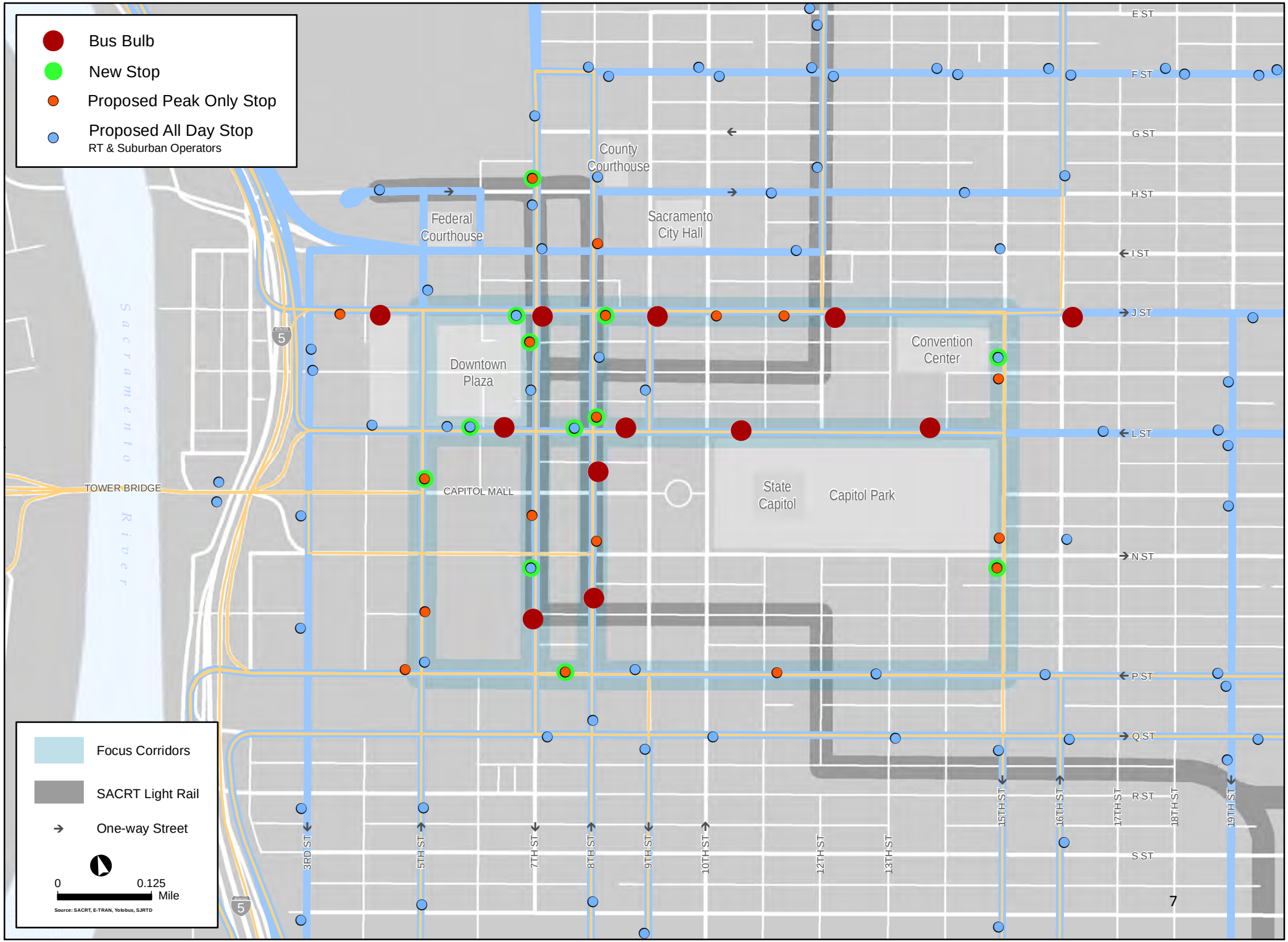
Routing Scenario B



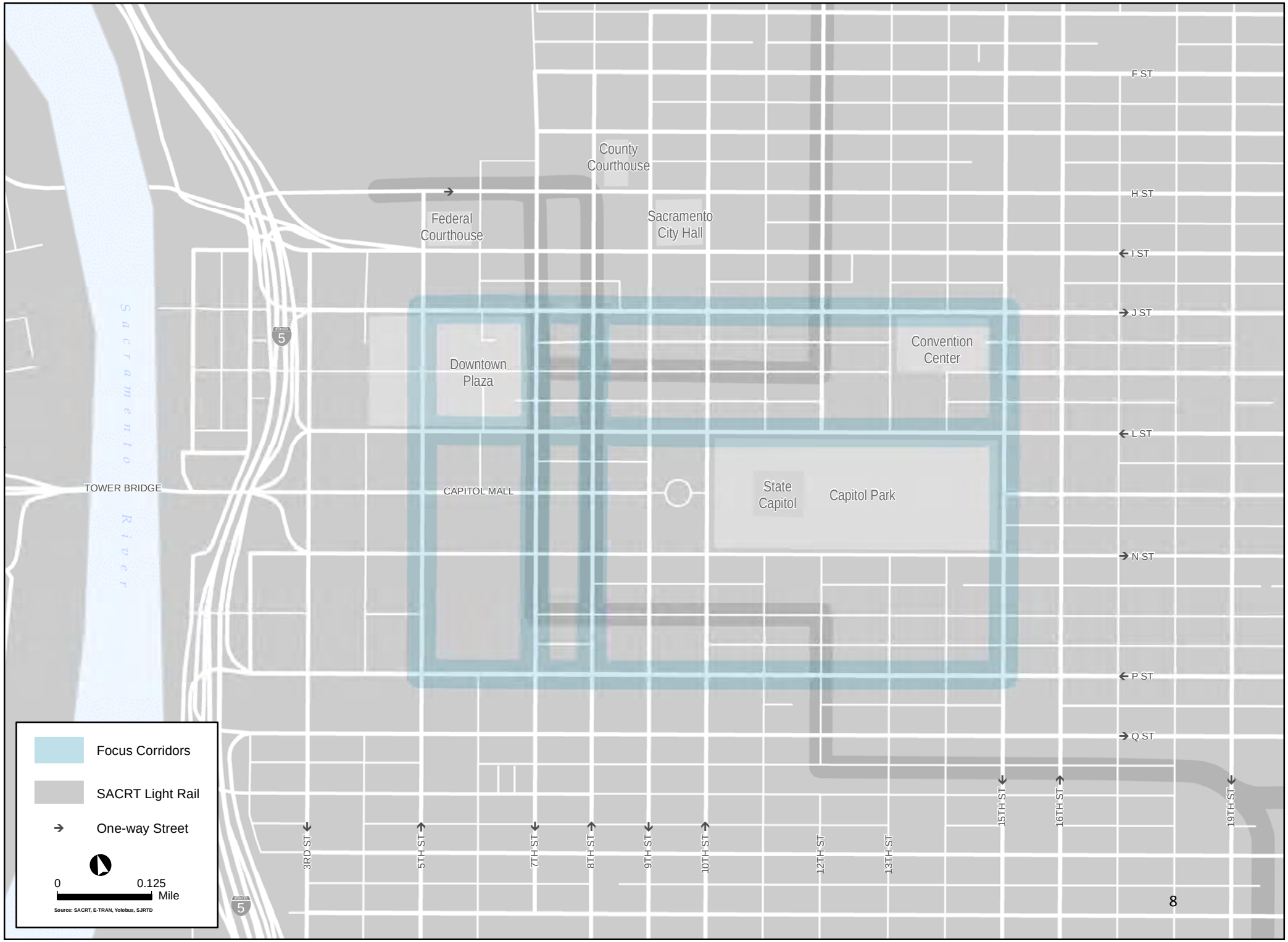
Routing Scenario C



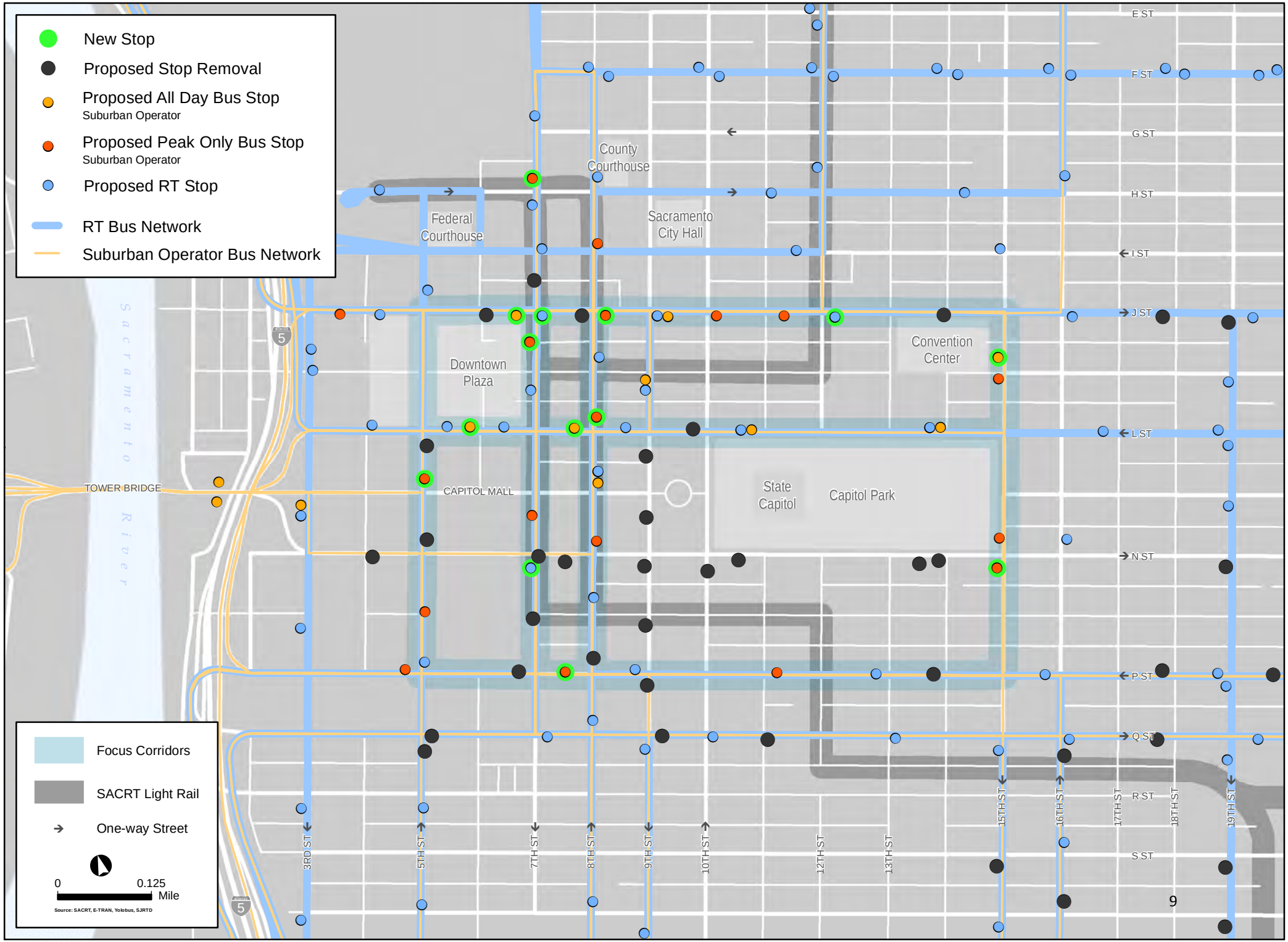
Preferred Bus Bulb Locations Concept



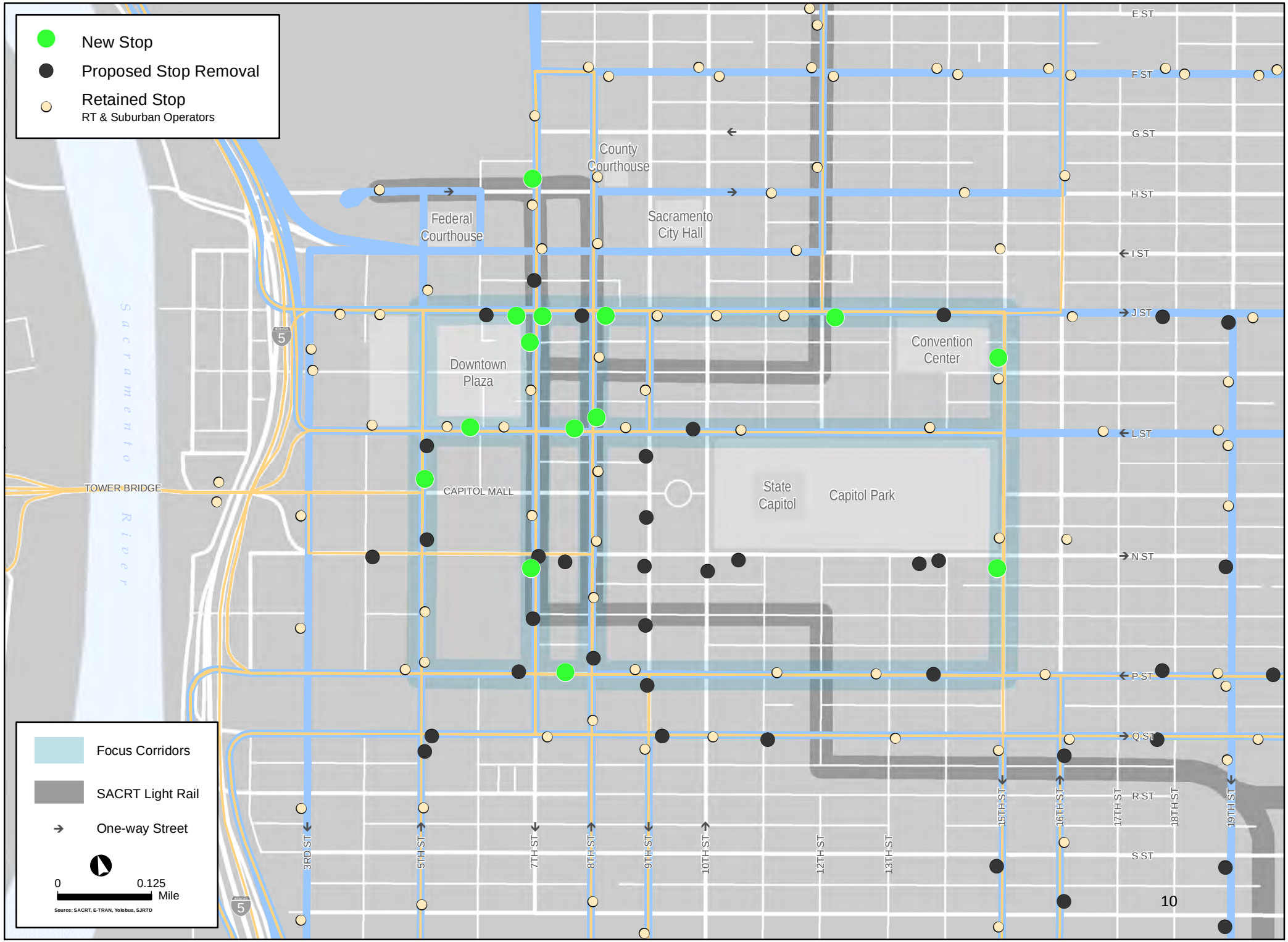
Preferred Bus Lanes Concept



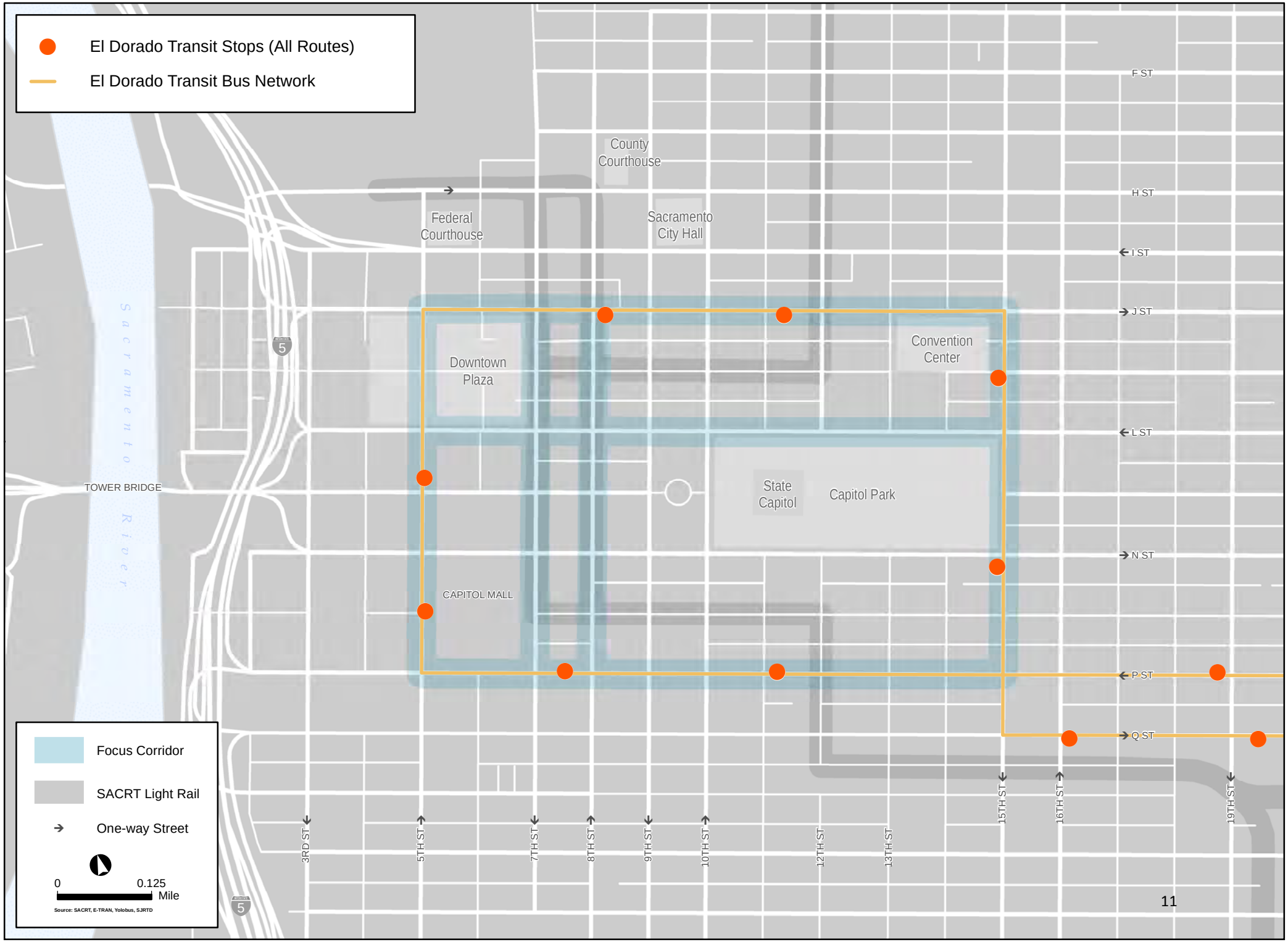
Preferred Downtown Sacramento Transit Circulation Plan Concept



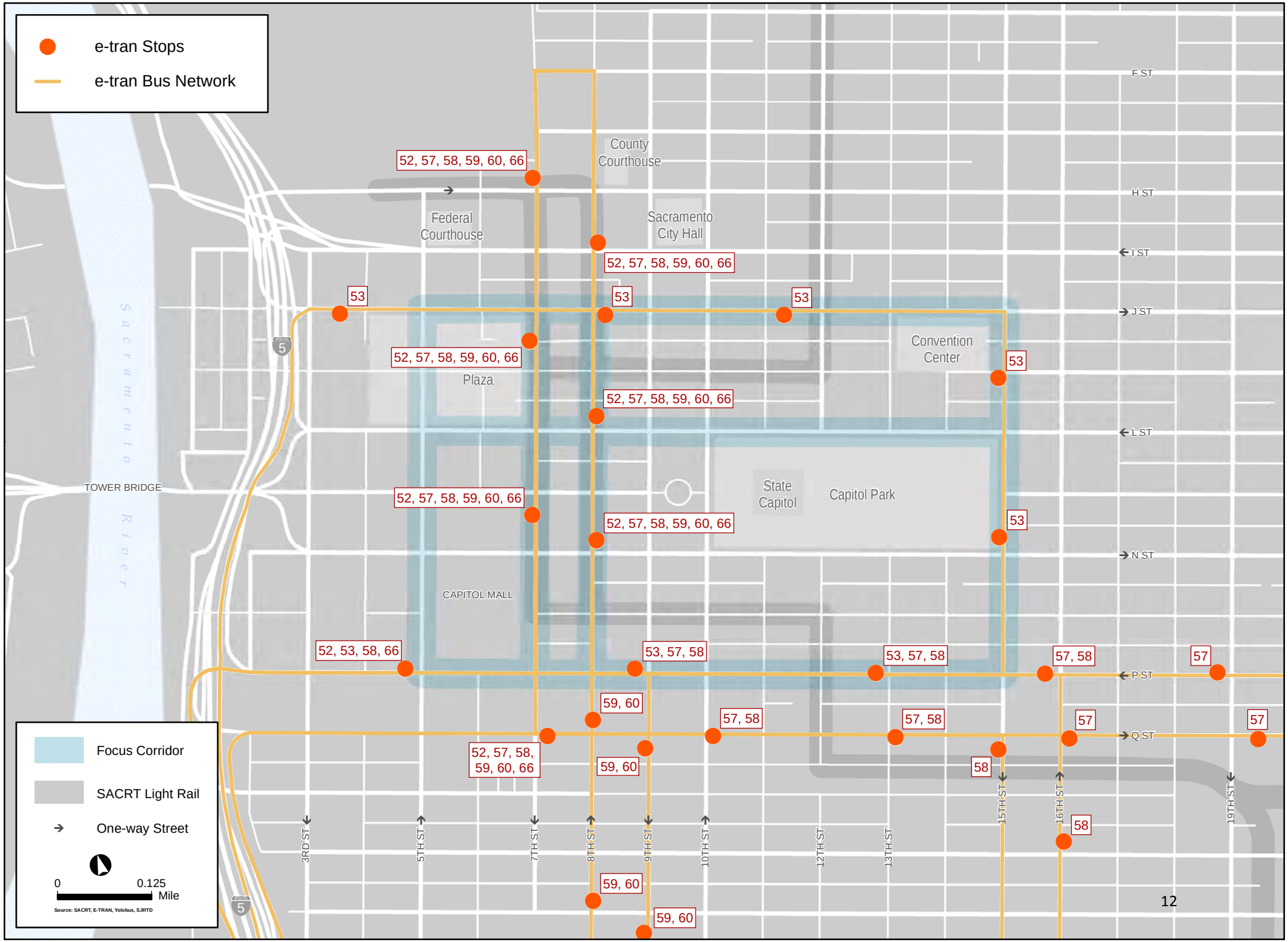
Preferred Stop Modifications Concept



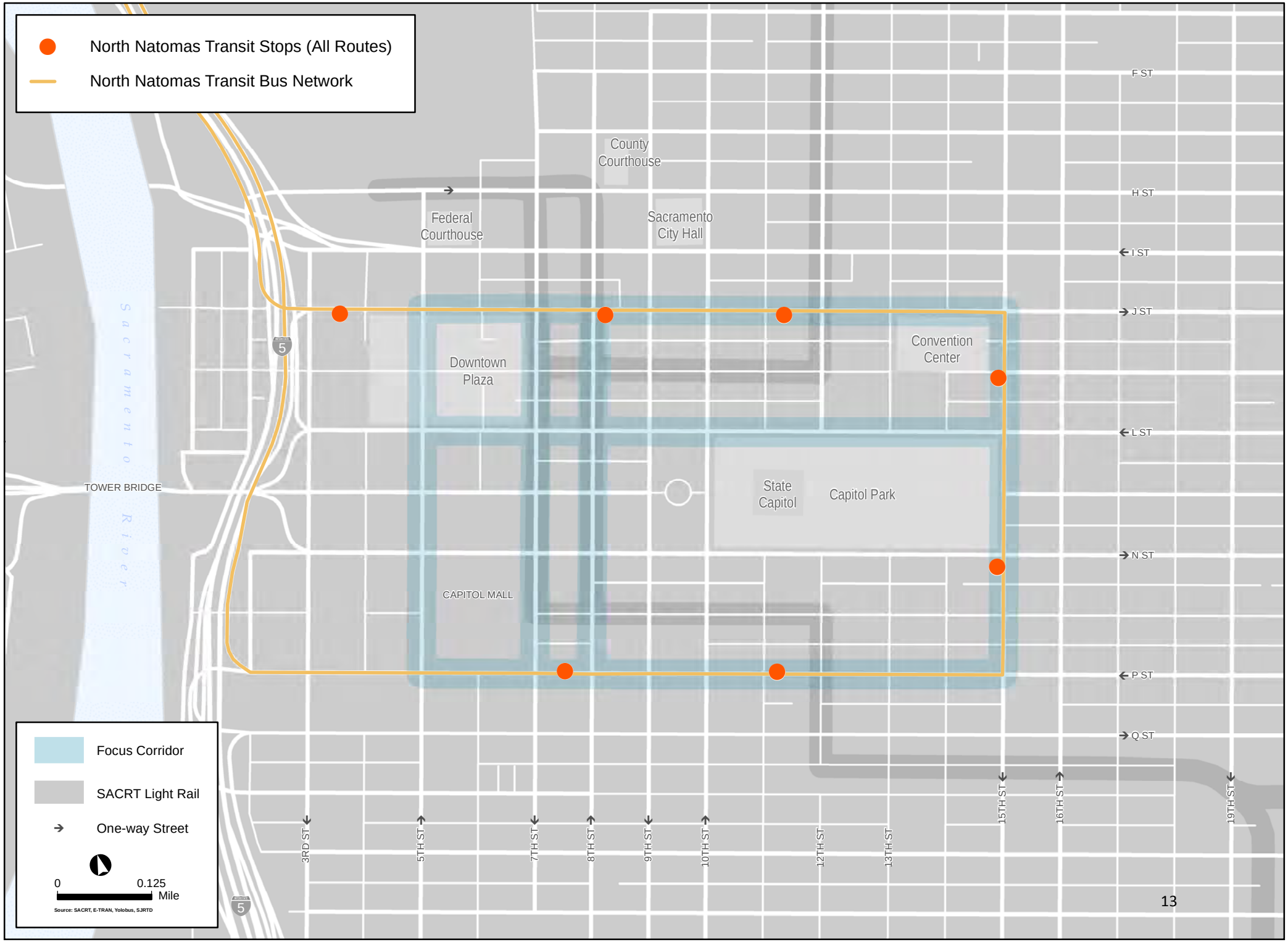
El Dorado Downtown Sacramento Stops & Alignment Concept



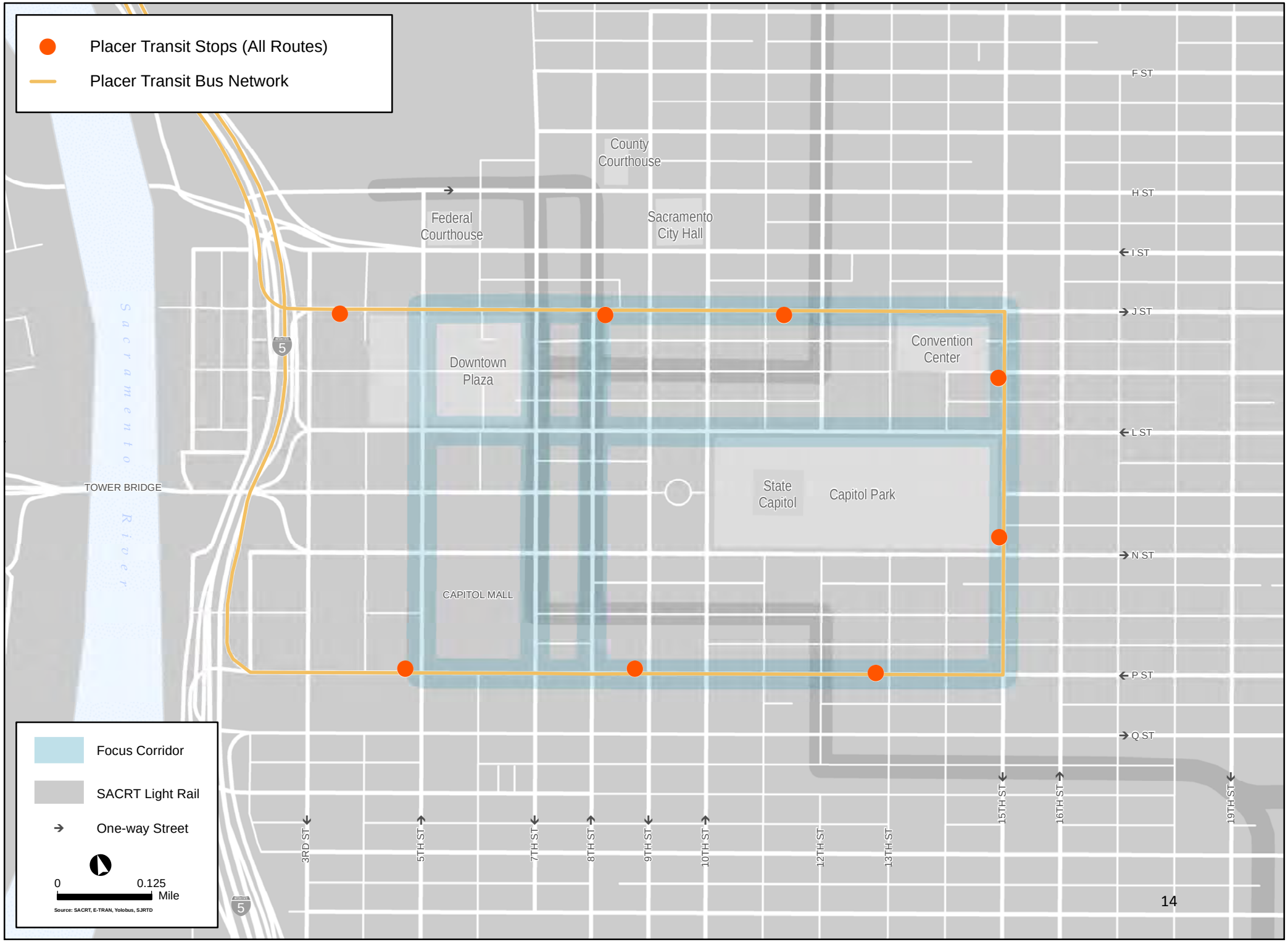
e-tran Downtown Sacramento Stops & Alignment Concept



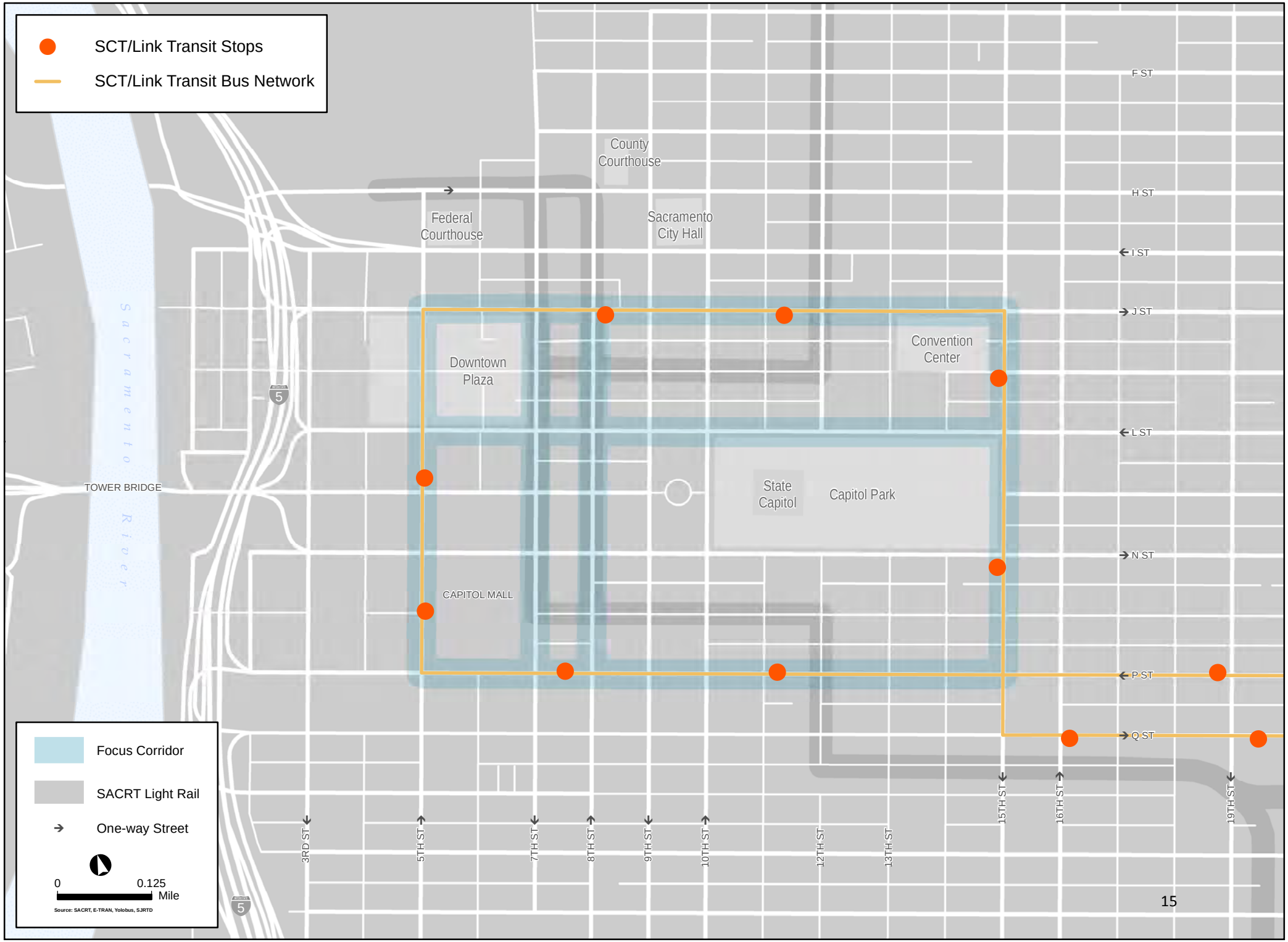
North Natomas Downtown Sacramento Stops & Alignment Concept



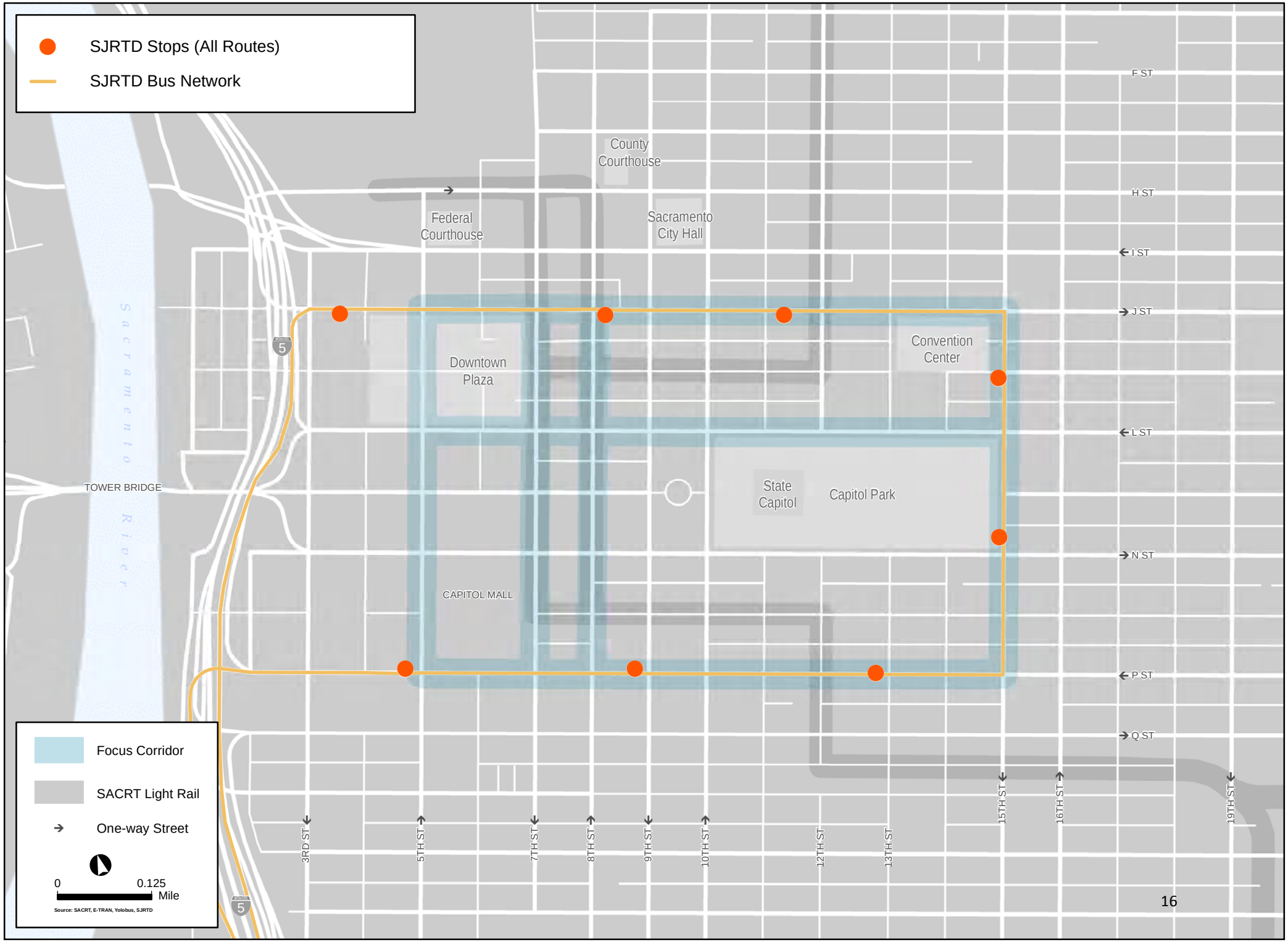
Placer Downtown Sacramento Stops & Alignment Concept



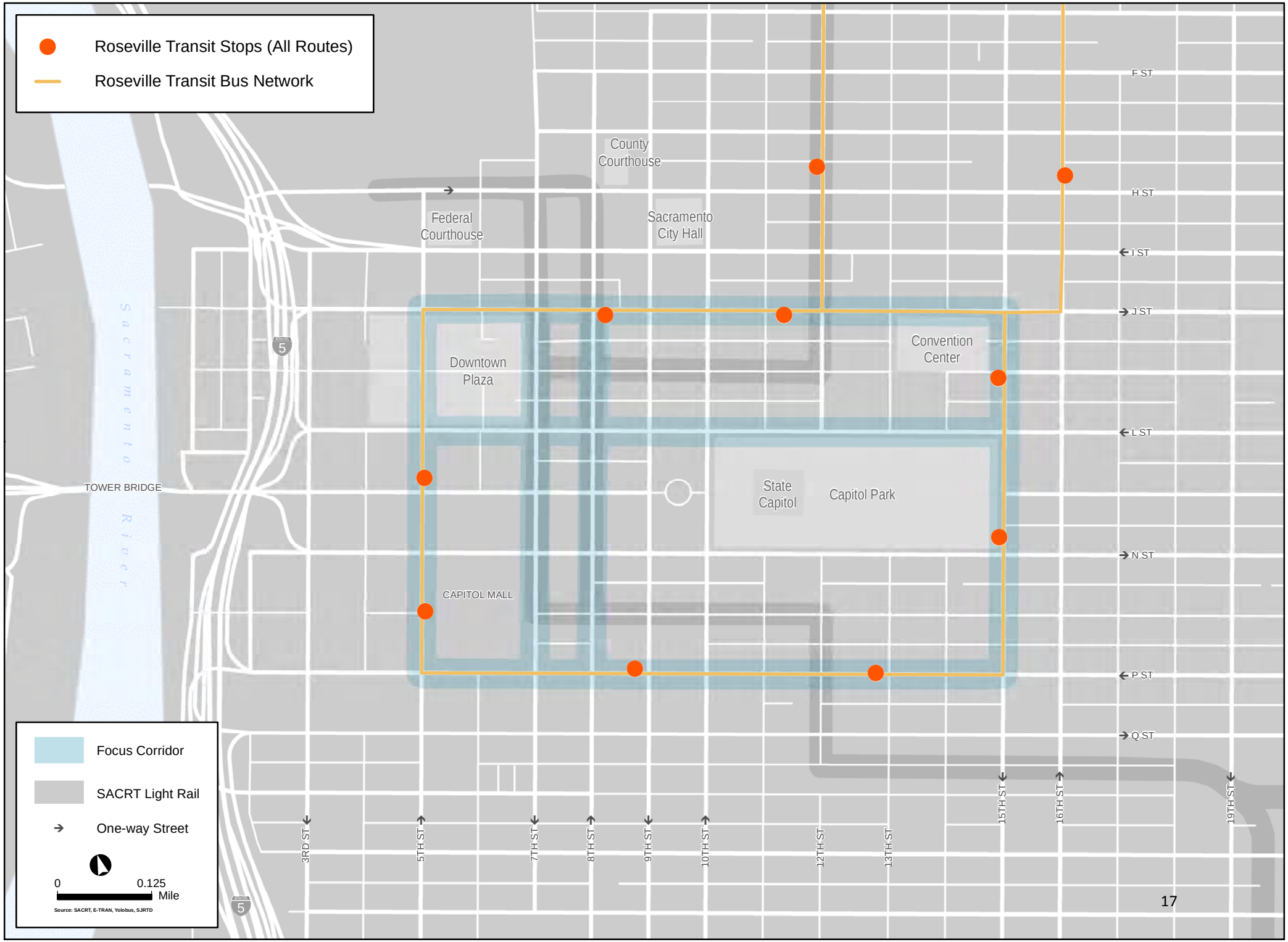
SCT/Link Downtown Sacramento Stops & Alignment Concept



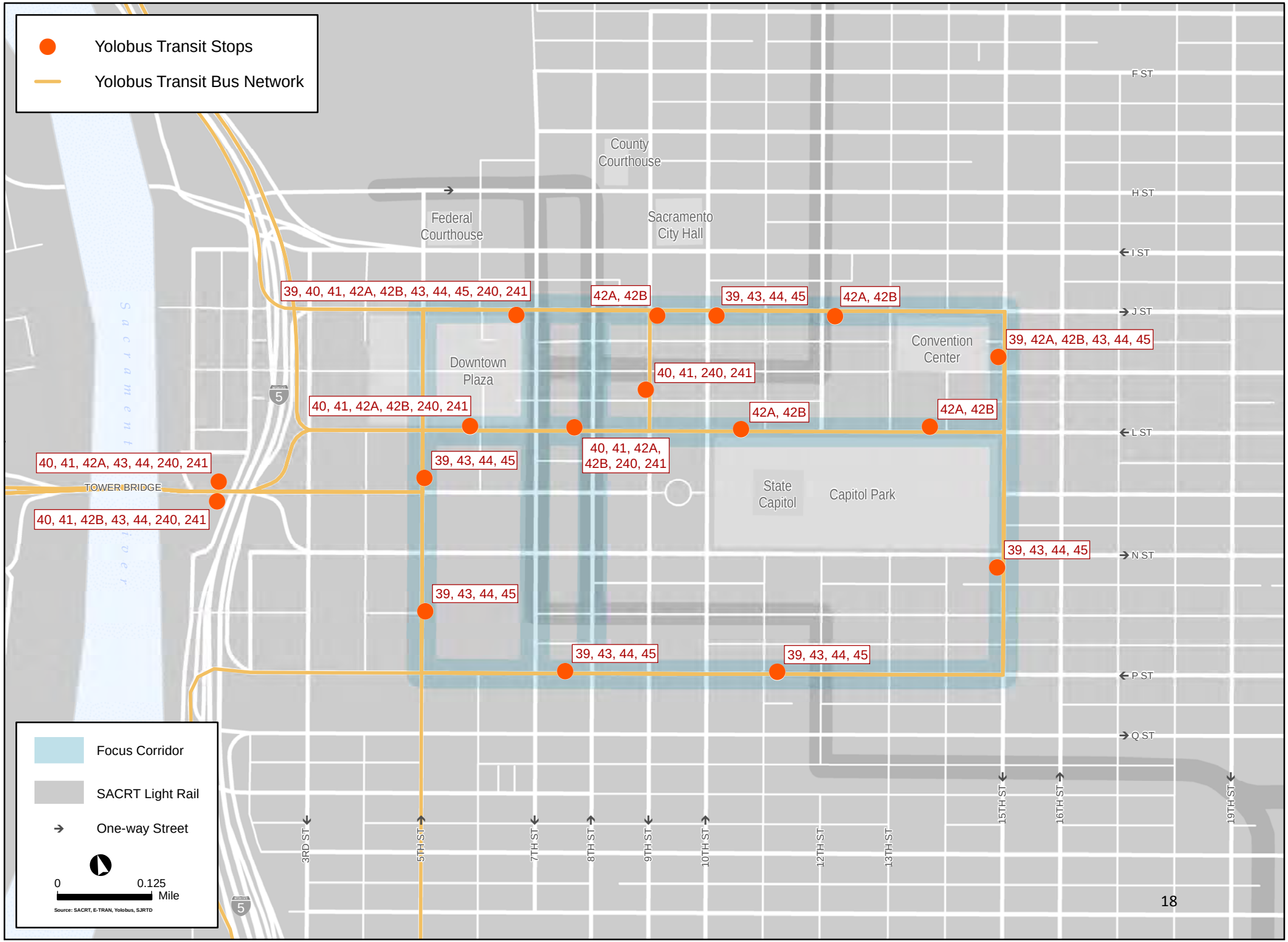
SJRTD Downtown Sacramento Stops & Alignment Concept



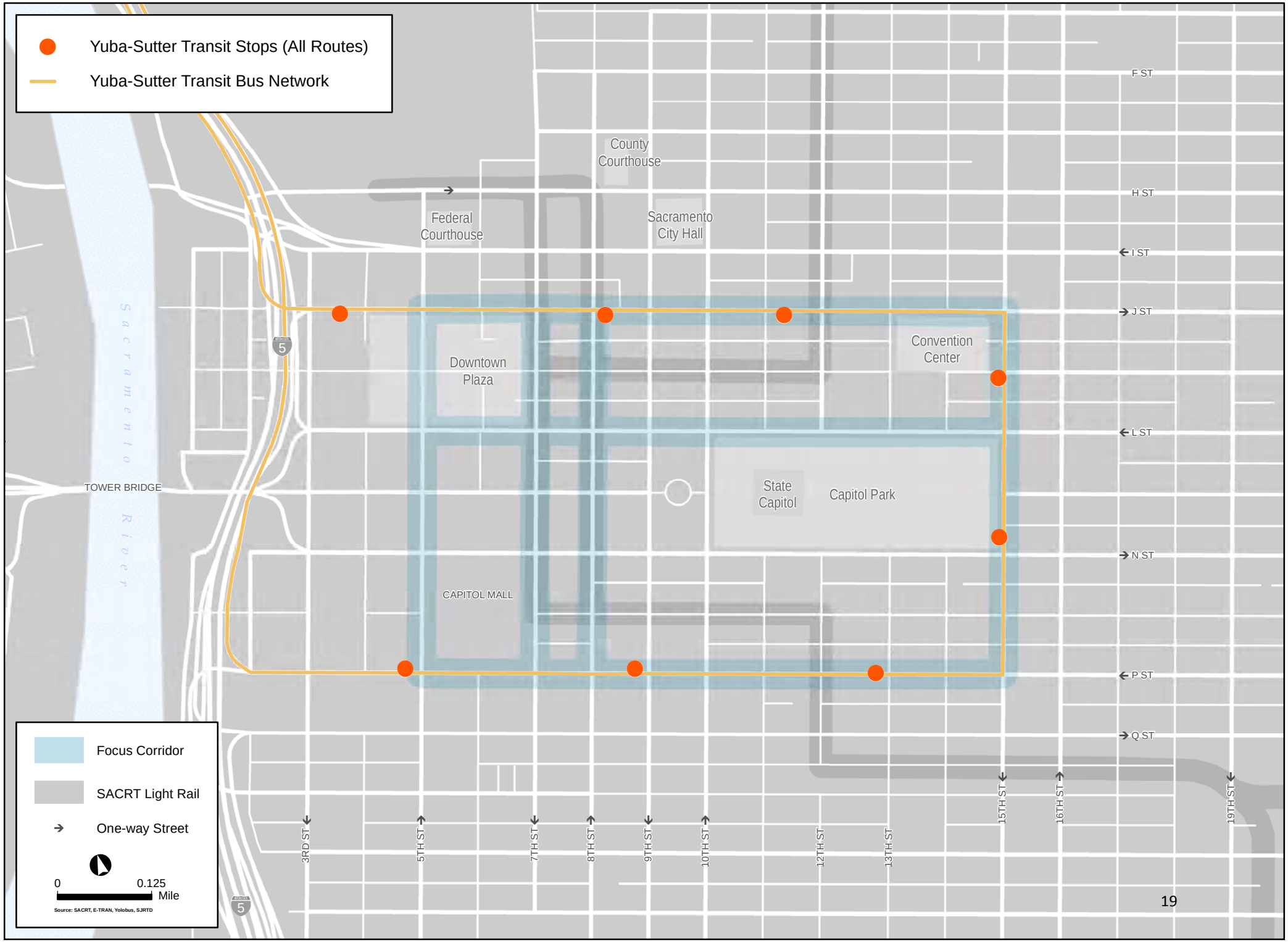
Roseville Downtown Sacramento Stops & Alignment Concept



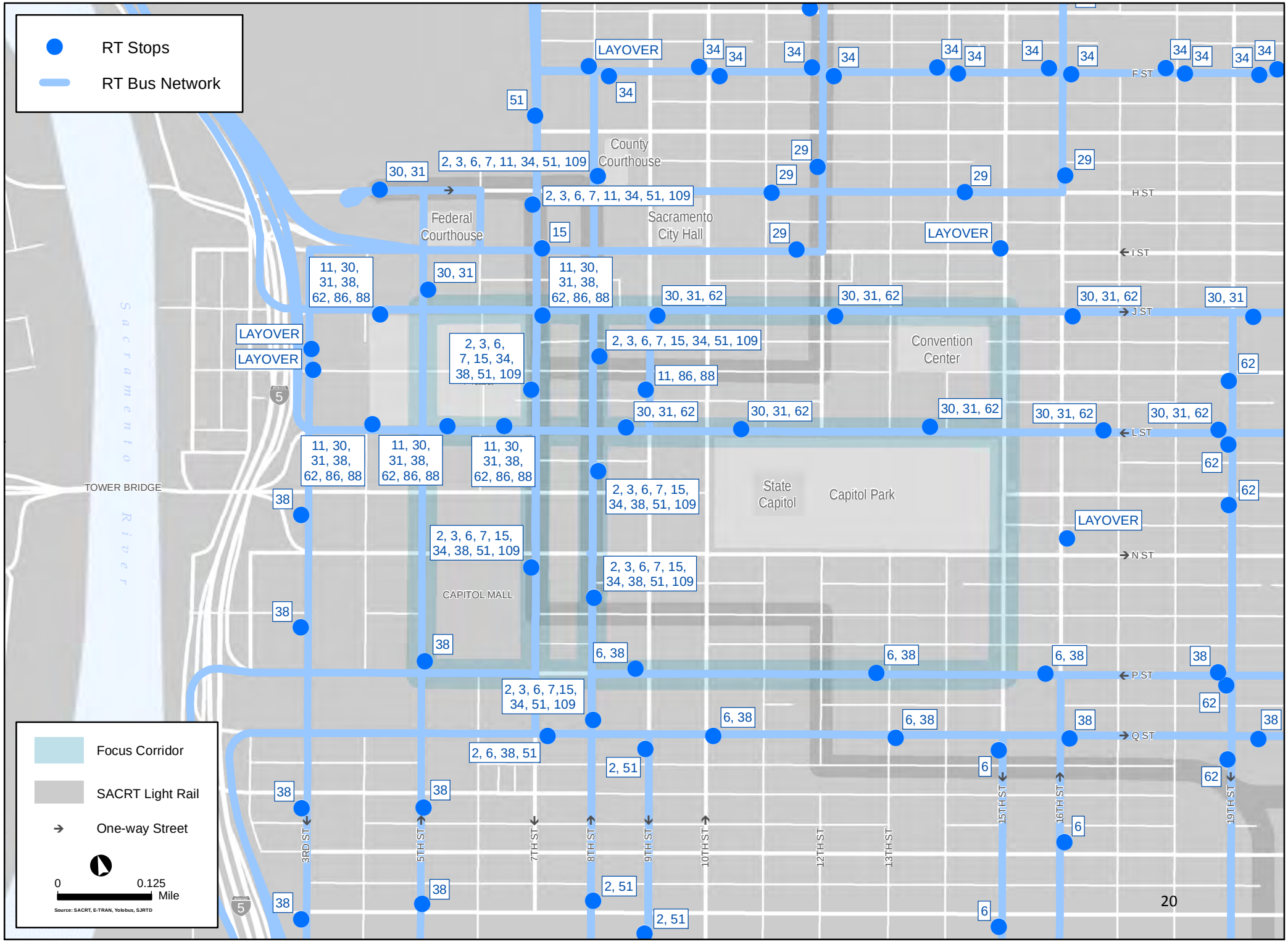
Yolobus Downtown Sacramento Stops & Alignment Concept



Yuba-Sutter Downtown Sacramento Stops & Alignment Concept



Sacramento Regional Transit Downtown Stops & Alignment Concept



Capital Unit Cost Assumptions Detail

The following table shows the detailed cost assumptions which were included in each capital unit cost item. The mid-point unit cost figures were used to calculate the overall capital costs of the plan. This detail is provided in order to receive feedback from the TAC on the unit cost assumptions.

The operation and maintenance costs were calculated based on a fixed percentage of the original capital expenditure, approximately 8 percent. The capital costs were developed based on a survey of similar capital investments in representative cities including San Francisco, Los Angeles, and Sacramento. The low, mid, and high capital costs were calculated around the representative capital costs in order to provide a range of potential cost. Any specific costs from local experience that the TAC members share will be used to refine the unit cost estimates.

Capital Item	Capital Unit Cost Low	Capital Unit Cost Mid	Capital Unit Cost High
Bus Lane			
(striping/low/mid to stamped concrete/high)	$50,000	$120,000	$300,000
Bus Bulb Stop			
Bulb	$15,000	$25,000	$35,000
Shelter (standard for all like stops)	$5,000	$15,000	$25,000
Information Display (Kiosk)	$2,500	$5,000	$7,500
Real Time Display	$7,500	$13,000	$20,000
Seating	$2,500	$5,000	$7,500
Lighting	$1,000	$5,000	$10,000
Trash, etc.	$500	$1,000	$1,500
Total	**$34,000**	**$69,000**	**$106,500**
All Day Stop			
Bulb			
Shelter (standard for all like stops)	$5,000	$15,000	$25,000
Information Display	$500	$1,000	$1,500
Seating	$1,500	$2,500	$5,000
Lighting	$500	$1,000	$5,000
Trash, etc.	$500	$1,000	$1,500
Total	**$8,000**	**$20,500**	**$38,000**
Peak Only Stop			
Shelter (standard for all like stops)	$5,000	$15,000	$25,000
Information Display	$500	$1,000	$1,500
Seating	$1,500	$2,500	$5,000
Lighting	$500	$1,000	$5,000
Trash, etc.	$500	$1,000	$1,500
Total	**$8,000**	**$20,500**	**$38,000**
Interim Stop Upgrade			
Rehab (repair, replace, clean)	$1,500	$2,500	$5,000
Information Display	$500	$1,000	$1,500
Seating	$500	$1,000	$2,500
Total	**$2,500**	**$4,500**	**$9,000**
Stop Relocation (prior to improvements)			
Bus Pad	$10,000	$15,000	$20,000
Shelter/amenities relocation	$1,000	$2,500	$5,000
Information Display (Kiosk)	$500	$1,000	$1,500
Total	**$11,500**	**$18,500**	**$26,500**

Tasks 4/5

Evaluation of Project Alternatives

Downtown Sacramento Transit Circulation and Facilities Plan

INTRODUCTION

Study Purpose

The Downtown Sacramento Transit Circulation and Facilities Plan is intended to improve transit travel times and the desirability of transit services to customers by using a variety of strategies, including enhanced transit facilities. Expediting the movement of buses and other transit service into, through, and out of downtown will reduce travel time for transit customers and decrease conflicts with automobile traffic. Improving transit speeds has a two-fold positive impact: a) it improves the travel experience for customers, increasing ridership and revenue; and b) allows for better utilization of vehicles, reducing both operating and vehicle capital costs.

Study Area

At the outset of the study, the study area was identified as the downtown Central City area bounded by the American River to the north, the Sacramento River to the west, Alhambra Boulevard to the east, and Broadway to the south. As the study progressed, a greater emphasis was placed on downtown Sacramento and the Central Business District. The analysis of existing conditions confirmed that mobility issues are most prevalent in this area, and transit improvements in this area will likely yield the greatest benefits. Therefore, proposed improvements associated with this project and the analyses contained in this report focus upon downtown Sacramento.

Purpose of This Summary Report

This report provides an assessment of the impact of the recommended project phases on a range of transportation performance measures for key roadways within Downtown Sacramento. This assessment examines multiple roadways throughout downtown Sacramento, with a more focused analysis of J Street in particular. The supplemental analysis of conditions on J Street was conducted in recognition of the street's status as the backbone of the Central City's transportation system, the level of transit activity currently using the thoroughfare, and the level of vehicle congestion currently experienced along the corridor. Performance measures that are evaluated include roadway level of service (LOS) based on volume/capacity ratios for numerous road segments, total person throughput for vehicles traveling on the J Street at the approximate midpoint of the study corridor (i.e., between 9th Street and 10th Street), and a multi-modal LOS analysis for five blocks of J Street using the new 2010 Highway Capacity (HCM) method for transit, bicycle and pedestrian modes.

APPROACH

The assessment of the project alternative phases includes the development of travel forecasts for the roadway segments, an analysis of total person throughput for vehicles on J Street, and an analysis of roadway segment LOS. The analysis focused on roadway segments along and adjacent to the proposed bus loop formed by J Street, 15th Street, P Street, and 5th Street. Each of these assessments was completed for three scenarios:

- Existing Conditions
- Existing Plus Phase 1 Conditions

- Existing Plus Phase 2 Conditions

The City of Sacramento's Downtown On-Street Bikeway Project includes plans to add a Class II bicycle lane to J Street between 5th Street and 13th Street, which would cover the majority of the proposed Downtown bus loop. The J Street bicycle lanes are planned for implementation during the next repaving of J Street, which is currently scheduled for September 2012. Given that the multi-modal LOS analysis conducted for this study focuses upon J Street, and is sensitive to variables that impact bicycle level of service (including the presence of dedicated bicycle facilities), three scenarios in addition to those listed above were analyzed using the multi-modal LOS tool to evaluate the combined effects of both the downtown transit improvements as well as the Downtown On-Street Bikeway Project:

- Near-Term No Project
- Near-Term Plus Phase 1 Conditions
- Near-Term Plus Phase 2 Conditions

Description of Project Alternative

All assessments completed as part of this study evaluate the following two phases of the recommended project alternative:

- Phase 1:
    - Modifies routing of buses
    - Reconfiguration of bus stop locations
- Phase 2:
    - Phase 1 route/stop modifications
    - Plus bus lanes on multiple streets within Downtown

A subsequent third phase of the project has been identified, which will add bus bulbs at select bus stops. The addition of bus bulbs would not affect the planning level performance metrics used for this analysis. A more detailed operational analysis of the individual intersections, which is anticipated to be part of a future Downtown Circulation Study, would identify whether the proposed bus bulbs would result in queuing at the locations where they are recommended.

The proposed locations for bus lanes included as part of the Phase 2 assessment include the following streets:

- J Street – between 5th Street and 15th Street
- L Street – between 5th Street and 15th Street
- P Street – between 5th Street and 15th Street
- 5th Street – between J Street and P Street
- 7th Street – between J Street and P Street
- 8th Street – between J Street and P Street
- 15th Street – between J Street and P Street

The effects of each of the two project phases are layered upon existing conditions to create two "Existing Plus Project" scenarios. The effects of the project upon the transportation system were analyzed under Existing Plus Project conditions due to the fact that Phases 1 and 2 are both intended for near-term implementation. As previously discussed, the multi-modal LOS analysis also includes two "Near-Term" scenarios that include the Class II bicycle lane on J Street planned as part of the City of Sacramento's Downtown On-Street Bikeway Project.

Data Collection

As the report for Task 3 (Existing Travel Conditions) was being prepared, it was recommended that additional data collection might be needed to evaluate the project alternative depending on the location of improvements and roadways affected. After reviewing the proposed improvements, it was determined that additional data and analysis was required for J Street, the roadway with the highest traffic volumes of any street on the proposed bus loop.

The data collection efforts for Task 3 also had limited counts for portions of 15th Street and P Street located on the proposed bus loop. Additional data was collected at the following locations:

- J Street – two additional daily roadway segment counts and six AM and PM peak period intersection turning movement counts
- 15th Street – one additional daily roadway segment count
- P Street – two additional daily roadway segment counts

Figure 1 shows the location of all study roadway segments, along with existing AM and PM peak hour traffic volumes.

Methodologies and Assumptions

All of the analysis conducted to evaluate the project was at the roadway segment level. It is anticipated that the upcoming Downtown Transportation Study will provide a more detailed evaluation of traffic operating conditions within Downtown, and will further evaluate the proposed improvements in this study in the context of alternatives for the overall transportation system. The level of analysis conducted for this study is consistent with the level of analysis performed for the *Sacramento 2030 General Plan* environmental impact report.

The *Sacramento 2030 General Plan* (2009) allows for flexible LOS standards with the aim of increasing transit ridership, bicycling, and walking within the City. The "core area" of the City bounded by C Street, the Sacramento River, 30th Street, and X Street, is exempt from LOS standards provided that projects provide improvements to other parts of the citywide transportation system within the project site vicinity (or within the area affected by the project's vehicular traffic impacts) to improve transportation-system-wide roadway capacity, to make intersection improvements, or to enhance non-auto travel modes in furtherance of the General Plan goals. Road widening or other improvements to road segments are not required. All roadway segments within the study area are included within the "core area" defined in the General Plan, and are therefore exempt from level of service standards.

As previously discussed, the evaluation of project alternatives included greater emphasis on J Street, as this street is most likely to be impacted by the proposed project. Two of the three metrics used in the evaluation of the project, as noted below, focus exclusively on J Street:

- Evaluation of Person Throughput (only for J Street)
- Roadway Volume/Capacity Analysis
- Multimodal Level of Service Analysis (only for J Street)

All of the above metrics account for the shifts in bus traffic within Downtown as a result of the proposed bus route and stop modifications included in Phase 1. These service adjustments would result in increases in bus traffic on some streets, and decreases on others. However, the magnitude of these changes in bus traffic is relatively small and would not result in significant changes to the overall volume of traffic on any given street. Therefore, the proposed modifications to bus routes and stops in Phase 1 are not expected to result in the alteration of automobile travel patterns in the study area.

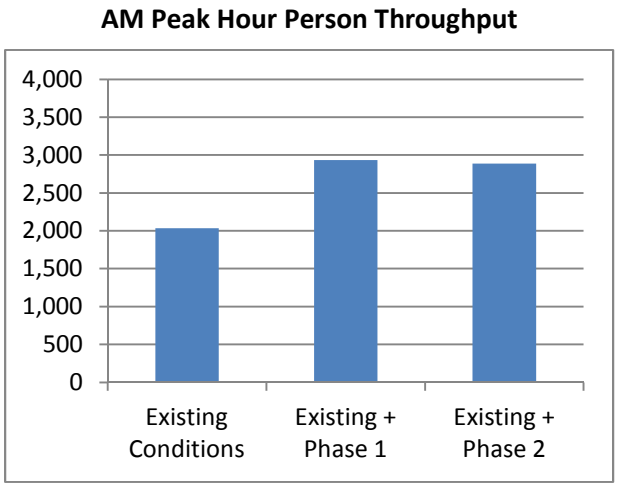
The implementation of bus lanes, in Phase 2 of the project, is anticipated to result in a diversion of existing automobile traffic to other streets and among traffic lanes on portions of the bus loop. J Street is the most heavily congested street in Downtown Sacramento, and the addition of a bus lane would result in a modest diversion of auto traffic. Diversions in auto traffic are not expected on other streets on the bus loop as they are less congested and would experience smaller levels of added bus traffic, compared to J Street. Because the addition of a bus lane on J Street would further reduce capacity on a roadway currently operating within 9 to 25 percent of its capacity (depending upon segment) within the study area, some automobile traffic is anticipated to use alternate routes (i.e., H Street and Capitol Mall) with the implementation of Phase 2.

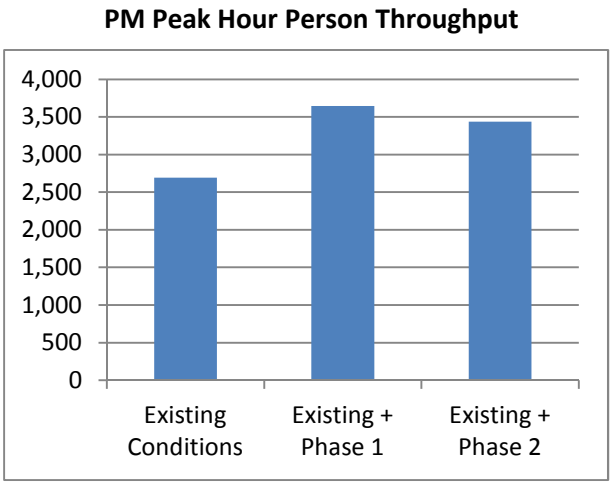
Figure 2 displays Phase 1 and Phase 2 peak hour traffic volumes for each of the study roadway segments alongside the existing traffic volumes. The Phase 2 forecasts account for the reduction in capacity on J Street as a result of the proposed bus lane. The level of diversion to other streets was forecasted by calculating the increase in density on J Street (assuming a passenger car equivalent of 2.0 for buses), and examining the level of automobile traffic likely to remain in the bus lane. This includes vehicles making right turns, accessing on-street parking, and accessing parking garages on the right side of the roadway.

PROJECT EVALUATION

Person Throughput Analysis

The person throughput analysis examined the total person throughput of the travel lanes on J Street between 9th Street and 10th Street, and includes all persons traveling either in buses or other motor vehicles. The analysis does not include existing bicyclists or pedestrians, as these are assumed to be constant throughout each of the scenarios. Bus occupancies used for the analysis were based upon data obtained by TMD from transit providers for local and express buses. On average, express buses have higher occupancy levels than local buses that operate on J Street. All automobiles/trucks were assumed to have the regional commute trip average of 1.2 persons per vehicle. The two graphs below display the results of the peak hour person throughput analysis.





As shown in the above graphs, the implementation of either Phase 1 or Phase 2 of the project would result in a significant increase in person throughput on J Street. Phase 1 results in a 35 percent increase in person throughput during the AM peak hour, and a 44 percent increase in person throughput during the PM peak hour. The increase is not as high with the implementation of Phase 2, as some traffic is assumed to divert off of J Street with the addition of the bus lane included in this phase of the project.

Roadway Segment Volume/Capacity Analysis

Roadway segment volume/capacity (V/C) analysis is the traditional planning level analysis used by the City of Sacramento to evaluate roadway segments. This analysis applies daily roadway volume thresholds documented in the City's General Plan, and is based upon the functional classification and number of lanes for each roadway segment.

As shown in the table on the following page, all study roadway segments currently operate at LOS E or better, with the vast majority operating at LOS A or B. The study segment with the highest V/C ratio is J Street between 6th and 7th Streets, which currently has a V/C of 0.91.

The results of the daily roadway segment analysis are also displayed in Figures 3 and 4. As shown in the above table and Figure 4, the implementation of Phase 1 results in modest V/C changes to several of the study roadway segments as a result of changes in bus volumes. With the addition of Phase 2 improvements (bus lanes), the changes in V/C within the study area become more pronounced, particularly on J Street where existing volumes are closest to the roadway capacity. The segment of J Street between 6th and 7th, which currently has a V/C of 0.91, experiences an increase in the V/C ratio to 0.99 with Phase 2 of the project. This value is just under the capacity of the roadway.

Daily Roadway Segment Volume/Capacity Analysis						
Roadway Segment	Existing Conditions		Existing Plus Route/Stop Modifications		Existing Plus Route/Stop Modifications & Bus Lane	
	V/C	LOS	V/C	LOS	V/C	LOS
3rd Street - between J Street & K Street	0.39	A	0.40	A	0.40	A
3rd Street - between N Street & 0 Street	0.44	A	0.43	A	0.43	A
5th Street - between I Street & J Street	0.25	A	0.26	A	0.28	A
5th Street - between J Street & L Street	0.34	A	0.34	A	0.38	A
5th Street - between N Street & O Street	0.34	A	0.35	A	0.38	A
10th Street - between Capitol Mall & N Street	0.25	A	0.24	A	0.24	A
12th Street - between I Street & J Street	0.25	A	0.25	A	0.25	A
15th Street - between L Street & Capitol Mall	0.44	A	0.44	A	0.49	A
16th Street - between P Street & Q Street	0.63	B	0.63	B	0.63	B
Capitol Mall - between Neasham Circle & 3rd Street	0.56	A	0.56	A	0.56	A
I Street - between 5th Street & 6th Street	0.64	B	0.64	B	0.64	B
I Street - between 7th Street & 8th Street	0.74	C	0.74	C	0.74	C
J Street - between 4th Street & 5th Street	0.89	D	0.89	D	0.89	D
J Street - between 6th Street & 7th Street	0.91	E	0.91	E	0.99	E
J Street - between 9th Street & 10th Street	0.74	C	0.75	C	0.81	D
J Street - between 14th Street & 15th Street	0.80	D	0.81	D	0.87	D
L Street - between 14th Street & 15th Street	0.49	A	0.48	A	0.46	A
L Street - between 4th Street & 5th Street	0.50	A	0.50	A	0.50	A
P Street - between 8th Street & 9th Street	0.36	A	0.37	A	0.41	A
P Street - between 14th Street & 15th Street	0.35	A	0.36	A	0.40	A
P Street - between 2nd Street & 3rd Street	0.68	B	0.68	B	0.68	B
Q Street - between 12th Street & 13th Street	0.33	A	0.33	A	0.33	A
Q Street - between I-5 SB Off-ramp & 3rd Street	0.39	A	0.39	A	0.39	A
Source: City of Sacramento General Plan						

Multimodal Level of Service Analysis

The final performance metric, multimodal LOS, was applied to J Street between 5th Street and 10th Street. This methodology provides a separate LOS value for automobiles, pedestrians, bicycles, and transit on urban streets. The automobile LOS component of the analysis tool is consistent with the NCHRP Project 3-70 methodology, and the non-automobile components are consistent with the methodologies incorporated in the Highway Capacity Manual 2010. The table below presents the multimodal LOS analysis results for existing conditions on J Street between 5th Street and 10th Street.

J Street Multimodal Level of Service Analysis – Existing Conditions

AM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.58	2.55	B	969.20	0.97	A	3.25	C	1.50	A
6th Street to 7th Street	0.81	2.79	C	1900.06	3.07	C	2.70	B	2.65	B
7th Street to 8th Street	0.70	2.55	B	281.52	2.62	B	3.35	C	2.39	B
8th Street to 9th Street	0.70	2.55	B	141.51	2.14	B	3.87	D	1.70	A
9th Street to 10th Street	0.62	2.55	B	635.42	2.25	B	3.47	C	2.66	B

PM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.35	2.55	B	699.95	0.15	A	2.86	C	1.43	A
6th Street to 7th Street	0.45	2.79	C	1357.17	2.23	B	2.39	B	2.54	B
7th Street to 8th Street	0.47	2.55	B	683.95	1.86	A	3.04	C	2.25	B
8th Street to 9th Street	0.48	2.55	B	156.19	1.62	A	3.65	D	1.68	A
9th Street to 10th Street	0.44	2.55	B	635.42	1.81	A	3.27	C	2.58	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)

Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

Similar to the other analyses conducted for this study, the multimodal LOS tool examines roadway segments, and does not analyze LOS at intersections or consider roadway crossing difficulties for pedestrians. The methodologies applied in the multimodal LOS analysis consider a broad range of inputs beyond traditional intersection LOS analysis, including pedestrian environment and transit operating variables. For example, dwell times for local and express buses were accounted for at 25 seconds and 35 seconds, respectively, based on field observations conducted on J Street. Attachment A provides a detailed listing of all data inputs for multimodal LOS analysis.

As shown in the existing conditions results table, the bicycle mode currently performs worse than other modes on this section of J Street. During both the AM and PM peak hours, the bicycle mode has the highest LOS score on four out of the five blocks examined indicating poorer performance relative to the other modes.

The following table presents the results of the Existing Plus Phase 1 multimodal LOS analysis.

Street Multimodal Level of Service Analysis – Existing Plus Route/Stop Modifications (Phase 1)										
AM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.60	2.55	B	969.20	0.99	A	3.25	C	1.47	A
6th Street to 7th Street	0.82	2.79	C	1900.06	3.10	C	2.71	B	2.43	B
7th Street to 8th Street	0.71	2.55	B	281.52	2.65	B	3.36	C	1.73	A
8th Street to 9th Street	0.72	2.55	B	141.51	2.18	B	3.88	D	2.47	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.31	B	3.49	C	2.53	B
PM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.37	2.55	B	699.95	0.19	A	2.89	C	1.35	A
6th Street to 7th Street	0.48	2.79	C	1357.17	2.28	B	2.42	B	2.24	B
7th Street to 8th Street	0.48	2.55	B	683.95	1.91	A	3.07	C	1.61	A
8th Street to 9th Street	0.51	2.55	B	156.19	1.68	A	3.68	D	2.39	B
9th Street to 10th Street	0.48	2.55	B	635.42	1.86	A	3.30	C	2.46	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

As shown above, although the increases in bus volumes on J Street result in increases to the peak hour V/C ratios, these increases are not substantial enough to result in a change in the LOS score/value. The NCHRP Project 3-70 methodology used for this analysis calculates a V/C ratio based on volume, lanes, saturated flow rate, peak hour factor, and heavy vehicle percentage. This is used as a screen check to determine if a roadway segment is over its capacity; if it is, the LOS value defaults to F. If it is not, then the primary variable that affects the LOS score is the number of vehicle stops per segment.

Based on past modeling efforts conducted for this portion of J Street, current signal timing plans obtained from the City, and field observations, it was determined that the majority of vehicles do not stop on any given segment/block of J Street within the area that we analyzed (approximately 80 percent

of vehicles travel though any given block without stopping). This is due to the good progression achieved by the current traffic signal timing plans. The most delayed intersection on J Street Downtown is J Street/3rd Street, which also serves the off-ramps from Interstate 5. After receiving a green signal at this intersection, platoons of vehicles travel along J Street through several intersections before encountering a red light, due to the programmed signal timing offsets. These findings are consistent with previous studies that have examined intersection LOS on J Street, where relatively low levels of delay are found east of 3rd Street within Downtown. With the addition of either phase of the project, the study segments of J Street remain within their capacity during the peak hour, and vehicles continue to benefit from the good progression along the corridor. Therefore, using this methodology, the LOS scores/values do not change with the addition of either phase of the project.

The addition of the Phase 1 improvements results in improvements to the transit mode LOS. These improvements are primarily the result of increased transit service on J Street.

The following table presents the results of the Existing Plus Phase 2 multimodal LOS analysis.

J Street Multimodal Level of Service Analysis – Existing Plus Route/Stop Modifications & Bus Lane (Phase 2)										
AM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.62	2.55	B	969.20	0.90	A	3.22	C	1.12	A
6th Street to 7th Street	0.84	2.79	C	1900.06	2.97	C	2.67	B	2.32	B
7th Street to 8th Street	0.72	2.55	B	281.52	2.52	B	3.32	C	1.37	A
8th Street to 9th Street	0.72	2.55	B	141.51	2.05	B	3.84	D	2.38	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.18	B	3.44	C	2.40	B
PM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.40	2.55	B	699.95	0.17	A	2.87	C	1.01	A
6th Street to 7th Street	0.52	2.79	C	1357.17	2.25	B	2.41	B	2.14	B
7th Street to 8th Street	0.51	2.55	B	683.95	1.88	A	3.06	C	1.27	A
8th Street to 9th Street	0.55	2.55	B	156.19	1.65	A	3.67	D	2.32	B
9th Street to 10th Street	0.49	2.55	B	635.42	1.83	A	3.29	C	2.34	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

Similar to Phase 1, the Phase 2 improvements increase the peak hour automobile V/C ratios on J Street, but do not result in a change to the LOS score/value. The implementation of Phase 2 results in further improvements to the transit mode score due to the benefits associated with the addition of a bus lane on J Street.

Figures 5 and 6 compare the multimodal LOS results for the Existing, Existing Plus Phase 1, and Existing Plus Phase 2 scenarios during the AM and PM peak hours, respectively. These figures also include graphs of the changes in bus volume for each block of J Street between 5th Street and 10th Street.

The Existing Plus Project results above isolate the effects of the proposed Downtown transit improvements on J Street to gauge the potential impacts to each mode as a result of this project. The following three tables present the Near-Term multi-modal LOS analysis which includes the implementation of a Class II bicycle lane on J Street.

J Street Multimodal Level of Service Analysis – Near-Term No Project Conditions

AM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.58	2.55	B	969.20	0.97	A	0.00	A	1.56	A
6th Street to 7th Street	0.81	2.79	C	1900.06	3.07	C	0.81	A	2.63	B
7th Street to 8th Street	0.70	2.55	B	281.52	2.62	B	2.30	B	2.38	B
8th Street to 9th Street	0.70	2.55	B	141.51	2.14	B	3.29	C	1.69	A
9th Street to 10th Street	0.62	2.55	B	635.42	2.25	B	2.56	B	2.65	B

PM Peak Hour

Block	Auto Mode			Pedestrian Mode			Bicycle Mode		Transit Mode	
	V/C Ratio	LOS Score	LOS	Ped Space[1]	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
5th Street to 6th Street	0.35	2.55	B	699.95	0.15	A	0.00	A	1.49	A
6th Street to 7th Street	0.45	2.79	C	1357.17	2.23	B	0.50	A	2.52	B
7th Street to 8th Street	0.47	2.55	B	683.95	1.86	A	1.99	A	2.23	B
8th Street to 9th Street	0.48	2.55	B	156.19	1.62	A	3.07	C	1.66	A
9th Street to 10th Street	0.44	2.55	B	635.42	1.81	A	2.36	B	2.57	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

As shown in the table above, under Near-Term No Project conditions the addition of a dedicated bicycle lane on J Street results in dramatic improvements to bicycle LOS on J Street during both the AM and PM peak hours. Under existing conditions, none of the study segments on J Street operated at LOS A, and

one of the five segments (8th Street to 9th Street) operated at LOS D during both the AM and PM peak hours. With the addition of the Downtown On-Street Bikeway Project, all segments operate at LOS C or better for the bicycle mode during both peak hours. Two segments operate at LOS A during the AM peak hour, and three segments operate at LOS A during the PM peak hour. The addition of the bicycle lane does not alter the performance of the auto or pedestrian modes, and results in slight changes to the transit mode as a result of the narrowing of traffic lanes on J Street.

The following table presents the results of the Near-Term Plus Phase 1 multimodal LOS analysis.

J Street Multimodal Level of Service Analysis – Near-Term Plus Route/Stop Modifications (Phase 1)										
AM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.60	2.55	B	969.20	0.97	A	0.00	A	1.53	A
6th Street to 7th Street	0.82	2.79	C	1900.06	3.07	C	0.81	A	2.40	B
7th Street to 8th Street	0.71	2.55	B	281.52	2.62	B	2.31	B	1.71	A
8th Street to 9th Street	0.72	2.55	B	141.51	2.14	B	3.30	C	2.46	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.25	B	2.23	B	2.51	B
PM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.37	2.55	B	699.95	0.56	A	0.00	A	1.41	A
6th Street to 7th Street	0.48	2.79	C	1357.17	2.12	B	0.53	A	2.22	B
7th Street to 8th Street	0.48	2.55	B	683.95	1.82	A	2.02	B	1.60	A
8th Street to 9th Street	0.51	2.55	B	156.19	1.60	A	3.10	C	2.38	B
9th Street to 10th Street	0.48	2.55	B	635.42	1.77	A	2.39	B	2.45	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

Similar to the Existing Plus Project analysis results, the addition of Phase 1 of the project results in no changes to the auto mode LOS score, and slight changes to the pedestrian and bicycle mode scores. As expected, the most substantial change in LOS score occurs for the transit mode, which benefits from increased service levels as a result of the project.

The following table presents the results of the Near-Term Plus Phase 2 multimodal LOS analysis. As shown, the implementation of Phase 2 results in further improvements to the transit mode score due to the benefits associated with the addition of a bus lane on J Street.

J Street Multimodal Level of Service Analysis – Near-Term Plus Route/Stop Modifications & Bus Lane (Phase 2)										
AM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.62	2.55	B	969.20	1.26	A	0.00	A	1.18	A
6th Street to 7th Street	0.84	2.79	C	1900.06	2.80	C	0.78	A	2.30	B
7th Street to 8th Street	0.72	2.55	B	281.52	2.42	B	2.27	B	1.36	A
8th Street to 9th Street	0.72	2.55	B	141.51	1.97	A	3.25	C	2.37	B
9th Street to 10th Street	0.65	2.55	B	635.42	2.09	B	2.53	B	2.38	B
PM Peak Hour										
Block	**Auto Mode**			**Pedestrian Mode**			**Bicycle Mode**		**Transit Mode**	
	V/C Ratio	**LOS Score**	**LOS**	**Ped Space[1]**	**LOS Score**	**LOS**	**LOS Score**	**LOS**	**LOS Score**	**LOS**
5th Street to 6th Street	0.40	2.55	B	699.95	0.53	A	0.00	A	1.07	A
6th Street to 7th Street	0.52	2.79	C	1357.17	2.09	B	0.51	A	2.12	B
7th Street to 8th Street	0.51	2.55	B	683.95	1.79	A	2.00	B	1.26	A
8th Street to 9th Street	0.55	2.55	B	156.19	1.57	A	3.09	C	2.31	B
9th Street to 10th Street	0.49	2.55	B	635.42	1.74	A	2.38	B	2.33	B

Note:
1. Pedestrian space is reported in square feet per pedestrian (ft^2/ped)
Source: NCHRP Project 3-70 Multimodal Level of Service For Urban Streets and Highway Capacity Manual 2010, Chapter 17.

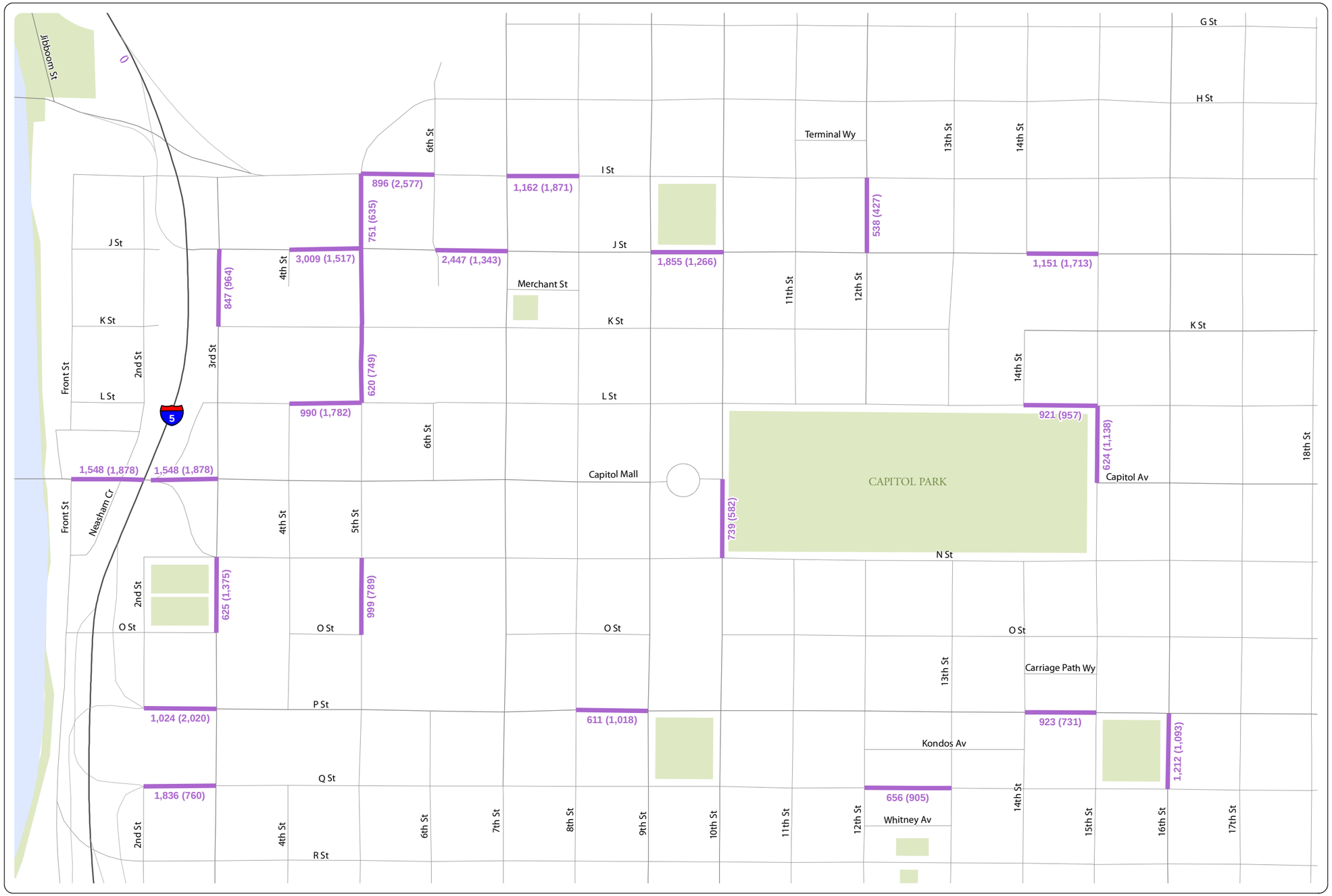
CONCLUSION

The recommended project alternative would result in improved transit service within downtown Sacramento, and if implemented, would increase person throughput on key corridors within the City. On J Street, calculations show that increased bus service could result in up to a 35 percent increase in person throughput during the AM peak hour and up to a 44 percent increase during the PM peak hour. The consolidation of bus routes and stops within downtown would result in more efficient transit operations, and faster travel times for buses. This could in turn lead to increased transit ridership, and potential savings in both capital and operating costs for transit providers in the region.

The proposed transit improvements would result in small increases to automobile volume to capacity ratios on J Street. The roadway segment volume/capacity analysis completed for key segments within the study area indicates that no roadway segment will degrade to LOS F as a result of the project.

The results of the multi-modal LOS analysis, focused on the most heavily traveled street proposed for increased transit service, show no significant change in automobile LOS on J Street during the AM and

PM peak hours. Any small increases in automobile congestion along the J Street portion of the transit loop could potentially be offset by traffic signal timing enhancements proposed as part of the project. The multi-modal LOS analysis also reveals that the proposed changes to transit service along the corridor would result in measurable improvements to the transit LOS score. The combination of both the recommended transit improvements and the planned bicycle lane on J Street under would result in improvements for both bicyclists as well as transit riders on one of downtown Sacramento's primary thoroughfares.



LEGEND

- Study Segment
- AM (PM) Peak Hour Traffic Volume
- Park

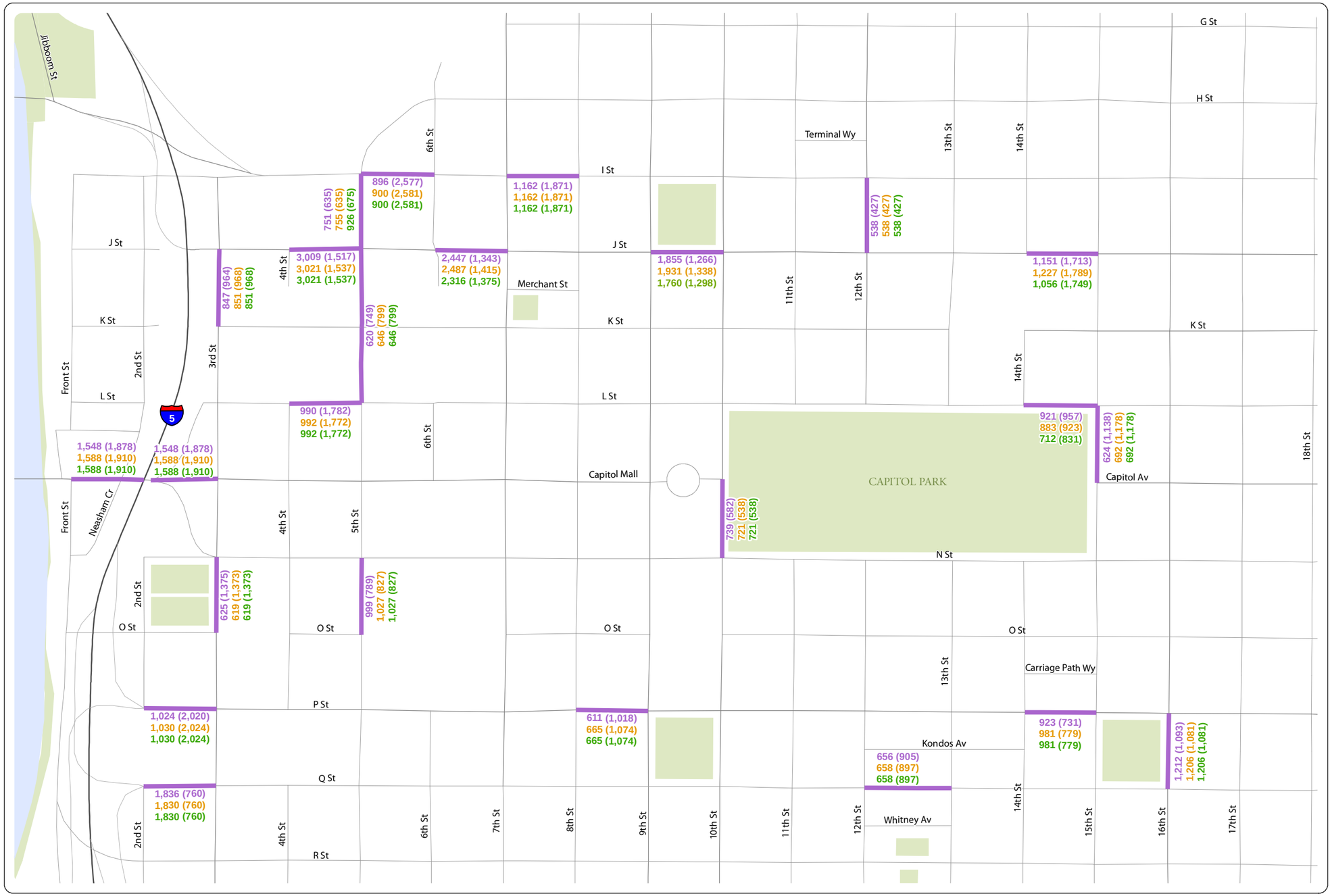
Not to Scale

FEHR PEERS

Path: N:\2011Projects\2932_DowntownSacramentoTransit\Graphics\GIS\MXD\June2012\fig01_TrafficVolumes_ex.mxd

DOWNTOWN PEAK HOUR ROADWAY SEGMENT VOLUMES - EXISTING CONDITIONS

FIGURE 1



LEGEND

Study Segment

Peak Hour Traffic Volume

AM (PM) Existing

AM (PM) Phase 1: Existing with Route Stop/ Modifications

AM (PM) Phase 2: Existing with Route/Stop Modifications & Bus Lane

Park

N

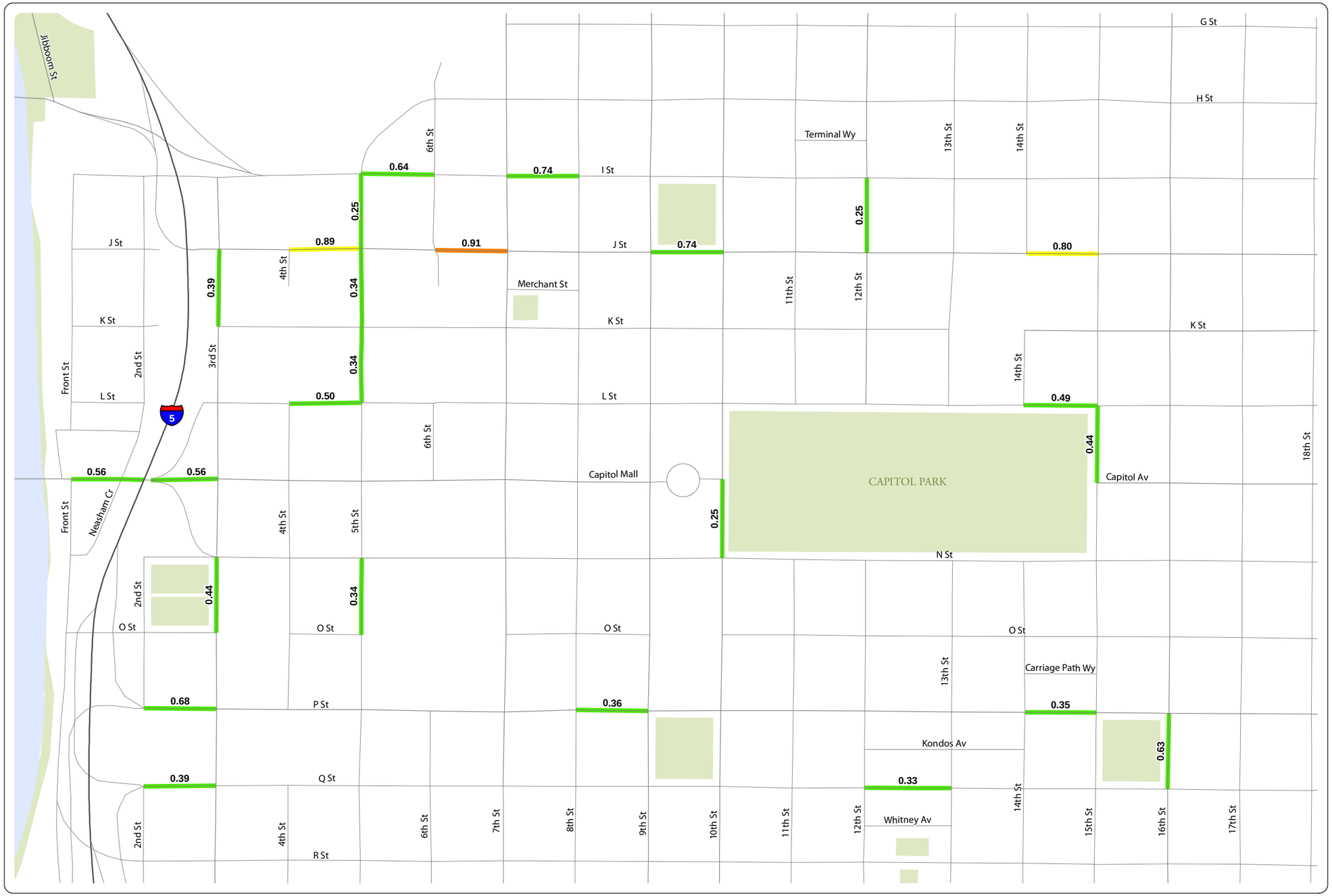
Not to Scale

FEHR PEERS

Path: N:\2011Projects\2932_DowntownSacramentoTransit\Graphics\GIS\MXD\June2012\fig02_TrafficVolumes_EPP.mxd

DOWNTOWN PEAK HOUR ROADWAY SEGMENT VOLUMES - EXISTING PLUS PROJECT CONDITIONS

FIGURE 2



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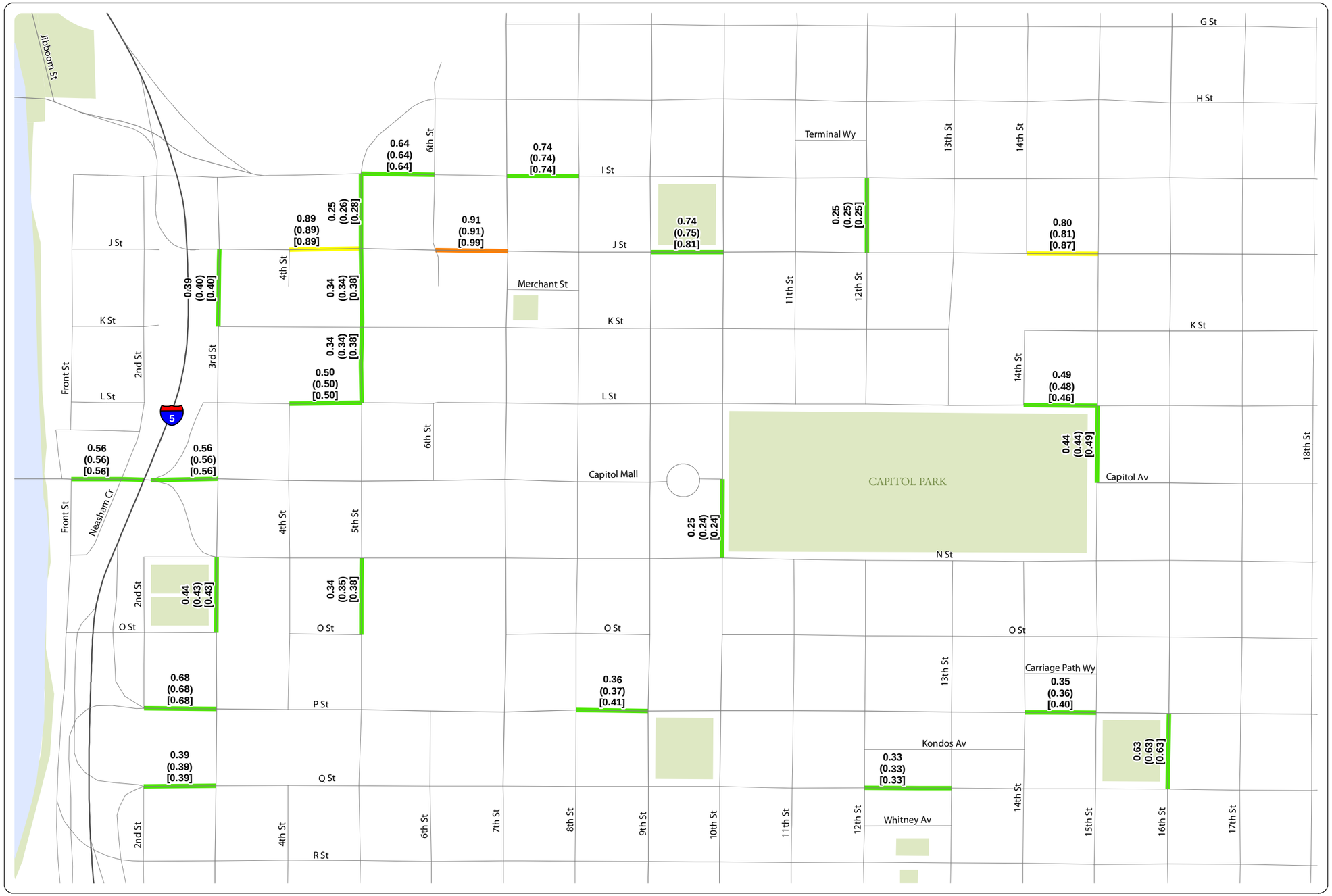
DOWNTOWN ROADWAY VOLUME/CAPACITY RATIOS - EXISTING CONDITIONS

FIGURE 3



LEGEND

0.39	Existing Ratio
(0.39)	Phase 1: Existing Ratio with Route Stop/Modifications
[0.39]	Phase 2: Existing Ratio with Route/ Stop Modifications & Bus Lane
	< 0.8
	0.8 - 0.9
	0.9 - 1.0
	> 1.0
	Park

N

Not to Scale

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DOWNTOWN ROADWAY VOLUME/CAPACITY RATIOS - EXISTING PLUS PROJECT CONDITIONS

FIGURE 4

6th Street to 7th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.79	C	3.07	C	2.70	B	2.65	B
Existing + Phase 1	2.79	C	3.10	C	2.71	B	2.43	B
Existing + Phase 2	2.79	C	2.97	C	2.67	B	2.32	B

8th Street to 9th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	2.14	B	3.87	D	1.70	A
Existing + Phase 1	2.55	B	2.18	B	3.88	D	2.47	B
Existing + Phase 2	2.55	B	2.05	B	3.84	D	2.38	B

5th Street to 6th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	0.97	A	3.25	C	1.50	A
Existing + Phase 1	2.55	B	0.99	A	3.25	C	1.47	A
Existing + Phase 2	2.55	B	0.90	A	3.22	C	1.12	A

7th Street to 8th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	2.62	B	3.35	C	2.39	B
Existing + Phase 1	2.55	B	2.65	B	3.36	C	1.73	A
Existing + Phase 2	2.55	B	2.52	B	3.32	C	1.37	A

9th Street to 10th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	2.25	B	3.47	C	2.66	B
Existing + Phase 1	2.55	B	2.31	B	3.49	C	2.53	B
Existing + Phase 2	2.55	B	2.18	B	3.44	C	2.40	B

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J STREET MULTIMODAL LEVEL OF SERVICE - AM PEAK HOUR

FIGURE 5

6th Street to 7th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.79	C	2.23	B	2.39	B	2.54	B
Existing + Phase 1	2.79	C	2.28	B	2.42	B	2.24	B
Existing + Phase 2	2.79	C	2.25	B	2.41	B	2.14	B

8th Street to 9th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	1.62	A	3.65	D	1.68	A
Existing + Phase 1	2.55	B	1.68	A	3.68	D	2.39	B
Existing + Phase 2	2.55	B	1.65	A	3.67	D	2.32	B

5th Street to 6th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	0.15	A	2.86	C	1.43	A
Existing + Phase 1	2.55	B	0.19	A	2.89	C	1.35	A
Existing + Phase 2	2.55	B	0.17	A	2.87	C	1.01	A

7th Street to 8th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	1.86	A	3.04	C	2.25	B
Existing + Phase 1	2.55	B	1.91	A	3.07	C	1.61	A
Existing + Phase 2	2.55	B	1.88	A	3.06	C	1.27	A

9th Street to 10th Street

	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS	LOS Score	LOS
Existing	2.55	B	1.81	A	3.27	C	2.58	B
Existing + Phase 1	2.55	B	1.86	A	3.30	C	2.46	B
Existing + Phase 2	2.55	B	1.83	A	3.29	C	2.34	B

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J STREET MULTIMODAL LEVEL OF SERVICE - PM PEAK HOUR

FIGURE 6

Document Path: N:\2011Projects\2932_DowntownSacramentoTransit\Graphics\GIS\MXD\June2012\fig06_JStreet_Multimodal_LOS_PM.mxd

ATTACHMENT A: MULTIMODAL LEVEL OF SERVICE DATA INPUTS

General Roadway Segment Data

- Segment length (ft) measured from upstream boundary intersection stop bar to downstream boundary intersection stop bar
- Speed limit (mph)
- Vehicle flow rate (vph)
- Pedestrian flow rate (ped/hr)
- Peak-hour factor
- Heavy vehicle %
- Intersection control type
- If downstream intersection is signalized, the % of green time for the analysis direction in relation to overall cycle length
- Adjusted saturation flow rate (vphgl)
- Does the downstream boundary intersection approach provide separated left-turn lane(s)?
- Average travel time (s)
- Average stops per vehicle
- Average pedestrian free-flow speed (ft/s)

Roadway Cross-Section Data

- Sidewalk width (ft)
- Fixed object width (ft)
- Buffer width (ft)
- Shoulder parking width (ft)
- Bike lane width (ft)
- Vehicle travel lane width (ft)
- Median width (ft)
- Median type
- Pavement condition
- Parking occupancy (%)
- Proportion of sidewalk length adjacent to window display, building face, fence or low wall
- Is curb present?
- Is parking striped?
- Does buffer contain continuous barrier at least 3 ft high and average spacing of 20 ft or less?

Transit Data

- Number of bus stops
- % of bus stops with shelters and/or benches
- Whether or not the bus stop is located in a Central Business District (CBD)
- If downstream boundary intersection is signalized, estimate running time loss (min/mi)

- Are bus stops on near side of intersection?
- Number of bus routes on segment
- Frequency of each route (bus/hr)
- Load factor of each route (pass/seat)
- On-time performance (%)
- Average bus dwell time (s)
- Re-entry delay (s)
- Average passenger trip length (miles)

A. Compute Auto LOS

Street: **J Street - AM Peak Hour (Existing)**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	2711	0.96	90%	2542	Input_SegData
2	2447	0.94	88%	2291	Input_SegData
3	2220	0.97	86%	1968	Input_SegData
4	1967	0.90	91%	1989	Input_SegData
5	1855	0.91	86%	1753	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,450	4	0.75	4350	0.58	OK	Input_SegData, Input_XSection
2	1,450	3	0.65	2828	0.81	OK	Input_SegData, Input_XSection
3	1,450	3	0.65	2828	0.70	OK	Input_SegData, Input_XSection
4	1,450	3	0.65	2828	0.70	OK	Input_SegData, Input_XSection
5	1,450	3	0.65	2828	0.62	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **J Street - AM Peak Hour (Existing)**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	44.0	1.5	34.0	3.50	34.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	65	0.22	3.50	969.20	Input_SegData, Input_XSection
2	3.5	25	0.11	3.50	1900.06	Input_SegData, Input_XSection
3	3.5	255	0.75	3.50	281.52	Input_SegData, Input_XSection
4	3.5	160	1.48	3.49	141.51	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	12.0	12.0	0	0.00	5.37	10.0	3.0	-6.6465	Input_XSection
2	11.0	11.0	8.5	0.15	1.00	9.5	3.2	-4.8664	Input_XSection
3	12.0	12.0	7.5	0.40	1.00	9.5	3.2	-5.1372	Input_XSection
4	12.5	12.5	6.5	0.75	1.00	10.0	3.0	-5.4283	Input_XSection
5	12.0	12.0	7.5	0.50	1.00	10.0	3.0	-5.2285	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	1.5419	0.0298	0.9720	Input_SegData, Input_XSection
2	1.8556	0.0291	3.0651	Input_SegData, Input_XSection
3	1.6835	0.0298	2.6229	Input_SegData, Input_XSection
4	1.4916	0.0298	2.1400	Input_SegData, Input_XSection
5	1.4067	0.0291	2.2540	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	C
3	B
4	B
5	B

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **J Street - AM Peak Hour (Existing)**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	53	75%	0%	0%	0.80	Yes	Input_Transit
2	53	75%	0%	100%	0.80	Yes	Input_Transit
3	51	75%	0%	0%	0.80	Yes	Input_Transit
4	46	75%	0%	0%	0.80	Yes	Input_Transit
5	23	75%	0%	0%	0.80	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	1	7.8	Input_Transit
4	405	8.6	0	8.6	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.75	2	0	0.75	0	0	2	32	Input_Transit
2	1	3	31.60377358	1.00	31.60377358	0	34	71	Input_Transit
3	0.65	2	31.8627451	0.65	20.71078431	0	23	58	Input_Transit
4	0.65	2	0	0.65	0	0	2	32	Input_Transit
5	1	3	31.52173913	1.00	31.52173913	0	34	71	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.2	Input_Transit
3	Yes	3.0	14	3.8	Input_Transit
4	Yes	3.0	14	6.0	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.89	Input_Transit
2	1.00	0.05	1.56	0.42	19.33	6.00	-0.40	0.65	3.89	Input_Transit
3	1.00	0.00	1.56	0.42	16.48	6.00	-0.40	0.69	3.89	Input_Transit
4	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.88	Input_Transit
5	1.00	0.00	1.56	0.42	19.37	6.00	-0.40	0.65	3.76	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.09	0.97	1.50	A
2	2.54	3.07	2.65	B
3	2.67	2.62	2.39	B
4	3.08	2.14	1.70	A
5	2.45	2.25	2.66	B
Average			2.18	B

D. Compute Bicycle LOS

Street: **J Street - AM Peak Hour (Existing)**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	0.0	4	UD	0	0	Input_XSection
2	11.0	10.0	3	UD	10	0	Input_XSection
3	12.0	9.0	3	UD	9	0	Input_XSection
4	12.5	8.0	3	UD	8	0	Input_XSection
5	12.0	9.0	3	UD	9	0	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	12.0	2.0%	0.0	0.00	12.0	-0.72	Input_SegData, Input_XSection
2	11.0	2.0%	8.5	0.15	16.5	-1.36	Input_SegData, Input_XSection
3	12.0	2.0%	7.5	0.40	11.5	-0.66	Input_SegData, Input_XSection
4	12.5	2.0%	6.5	0.75	4.0	-0.08	Input_SegData, Input_XSection
5	12.0	2.0%	7.5	0.50	9.5	-0.45	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	2711	2711	8.6	2.0%	21.0	4.0	2.60	0.16	0.44	Input_SegData, Inp
2	2447	2447	8.5	2.0%	21.0	4.0	2.70	0.16	0.44	Input_SegData, Inp
3	2220	2220	8.6	2.0%	21.0	4.0	2.65	0.16	0.44	Input_SegData, Inp
4	1967	1967	8.6	2.0%	21.0	4.0	2.59	0.16	0.44	Input_SegData, Inp
5	1855	1855	8.5	2.0%	21.0	4.0	2.56	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	3.25	C
2	2.70	B
3	3.35	C
4	3.87	D
5	3.47	C

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **J Street - PM Peak Hour (Existing)**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	1265	0.97	95%	1239	Input_SegData
2	1343	0.94	84%	1200	Input_SegData
3	1218	0.92	94%	1244	Input_SegData
4	1286	0.92	91%	1272	Input_SegData
5	1266	0.96	89%	1174	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,600	4	0.55	3520	0.35	OK	Input_SegData, Input_XSection
2	1,600	3	0.55	2640	0.45	OK	Input_SegData, Input_XSection
3	1,600	3	0.55	2640	0.47	OK	Input_SegData, Input_XSection
4	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection
5	1,600	3	0.55	2640	0.44	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **J Street - PM Peak Hour (Existing)**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	44.0	1.5	34.0	3.50	34.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	90	0.30	3.50	699.95	Input_SegData, Input_XSection
2	3.5	35	0.15	3.50	1357.17	Input_SegData, Input_XSection
3	3.5	105	0.31	3.50	683.95	Input_SegData, Input_XSection
4	3.5	145	1.34	3.50	156.19	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	12.0	12.0	0	0.00	5.37	10.0	3.0	-6.6465	Input_XSection
2	11.0	11.0	8.5	0.15	1.00	9.5	3.2	-4.8664	Input_XSection
3	12.0	12.0	7.5	0.40	1.00	9.5	3.2	-5.1372	Input_XSection
4	12.5	12.5	6.5	0.75	1.00	10.0	3.0	-5.4283	Input_XSection
5	12.0	12.0	7.5	0.50	1.00	10.0	3.0	-5.2285	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	0.7195	0.0298	0.1495	Input_SegData, Input_XSection
2	1.0184	0.0291	2.2279	Input_SegData, Input_XSection
3	0.9237	0.0298	1.8631	Input_SegData, Input_XSection
4	0.9752	0.0298	1.6235	Input_SegData, Input_XSection
5	0.9601	0.0291	1.8074	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	B
3	A
4	A
5	A

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **J Street - PM Peak Hour (Existing)**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	38	75%	0%	0%	0.40	Yes	Input_Transit
2	38	75%	0%	100%	0.40	Yes	Input_Transit
3	36	75%	0%	0%	0.40	Yes	Input_Transit
4	33	75%	0%	0%	0.40	Yes	Input_Transit
5	25	75%	0%	0%	0.40	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	1	7.8	Input_Transit
4	405	8.6	0	8.6	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.55	2	0	0.55	0	0	2	32	Input_Transit
2	1	3	30	1.00	30	0	33	69	Input_Transit
3	0.55	2	30.27777778	0.55	16.65277778	0	18	54	Input_Transit
4	0.55	2	0	0.55	0	0	2	32	Input_Transit
5	1	3	31.8	1.00	31.8	0	35	71	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.3	Input_Transit
3	Yes	3.0	14	4.1	Input_Transit
4	Yes	3.0	14	6.0	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.85	Input_Transit
2	1.00	0.05	1.56	0.42	18.98	6.00	-0.40	0.66	3.85	Input_Transit
3	1.00	0.00	1.56	0.42	15.54	6.00	-0.40	0.70	3.84	Input_Transit
4	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.83	Input_Transit
5	1.00	0.00	1.56	0.42	19.43	6.00	-0.40	0.65	3.78	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.06	0.15	1.43	A
2	2.53	2.23	2.54	B
3	2.69	1.86	2.25	B
4	3.04	1.62	1.68	A
5	2.46	1.81	2.58	B
Average			2.09	B

D. Compute Bicycle LOS

Street: **J Street - PM Peak Hour (Existing)**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	0.0	4	UD	0	0	Input_XSection
2	11.0	10.0	3	UD	10	0	Input_XSection
3	12.0	9.0	3	UD	9	0	Input_XSection
4	12.5	8.0	3	UD	8	0	Input_XSection
5	12.0	9.0	3	UD	9	0	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	12.0	2.0%	0.0	0.00	12.0	-0.72	Input_SegData, Input_XSection
2	11.0	2.0%	8.5	0.15	16.5	-1.36	Input_SegData, Input_XSection
3	12.0	2.0%	7.5	0.40	11.5	-0.66	Input_SegData, Input_XSection
4	12.5	2.0%	6.5	0.75	4.0	-0.08	Input_SegData, Input_XSection
5	12.0	2.0%	7.5	0.50	9.5	-0.45	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	1265	1265	8.6	2.0%	21.0	4.0	2.22	0.16	0.44	Input_SegData, Inp
2	1343	1343	8.5	2.0%	21.0	4.0	2.39	0.16	0.44	Input_SegData, Inp
3	1218	1218	8.6	2.0%	21.0	4.0	2.34	0.16	0.44	Input_SegData, Inp
4	1286	1286	8.6	2.0%	21.0	4.0	2.37	0.16	0.44	Input_SegData, Inp
5	1266	1266	8.5	2.0%	21.0	4.0	2.36	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	2.86	C
2	2.39	B
3	3.04	C
4	3.65	D
5	3.27	C

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **Street - AM Peak Hour (Route Modification**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	2751	0.96	91%	2608	Input_SegData
2	2487	0.94	88%	2328	Input_SegData
3	2256	0.97	86%	2000	Input_SegData
4	2015	0.90	91%	2037	Input_SegData
5	1931	0.91	86%	1825	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,450	4	0.75	4350	0.60	OK	Input_SegData, Input_XSection
2	1,450	3	0.65	2828	0.82	OK	Input_SegData, Input_XSection
3	1,450	3	0.65	2828	0.71	OK	Input_SegData, Input_XSection
4	1,450	3	0.65	2828	0.72	OK	Input_SegData, Input_XSection
5	1,450	3	0.65	2828	0.65	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **Street - AM Peak Hour (Route Modification**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	44.0	1.5	34.0	3.50	34.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	65	0.22	3.50	969.20	Input_SegData, Input_XSection
2	3.5	25	0.11	3.50	1900.06	Input_SegData, Input_XSection
3	3.5	255	0.75	3.50	281.52	Input_SegData, Input_XSection
4	3.5	160	1.48	3.49	141.51	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	12.0	12.0	0	0.00	5.37	10.0	3.0	-6.6465	Input_XSection
2	11.0	11.0	8.5	0.15	1.00	9.5	3.2	-4.8664	Input_XSection
3	12.0	12.0	7.5	0.40	1.00	9.5	3.2	-5.1372	Input_XSection
4	12.5	12.5	6.5	0.75	1.00	10.0	3.0	-5.4283	Input_XSection
5	12.0	12.0	7.5	0.50	1.00	10.0	3.0	-5.2285	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	1.5646	0.0298	0.9947	Input_SegData, Input_XSection
2	1.8860	0.0291	3.0955	Input_SegData, Input_XSection
3	1.7108	0.0298	2.6502	Input_SegData, Input_XSection
4	1.5280	0.0298	2.1764	Input_SegData, Input_XSection
5	1.4643	0.0291	2.3117	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	C
3	B
4	B
5	B

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **Street - AM Peak Hour (Route Modification**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	73	75%	0%	0%	0.80	Yes	Input_Transit
2	73	75%	100%	100%	0.80	Yes	Input_Transit
3	69	75%	0%	0%	0.80	Yes	Input_Transit
4	70	75%	100%	100%	0.80	Yes	Input_Transit
5	61	75%	100%	100%	0.80	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.75	2	0	0.75	0	0	2	32	Input_Transit
2	0.65	2	32.39726027	0.65	21.05821918	0	23	59	Input_Transit
3	0.65	2	0	0.65	0	0	2	32	Input_Transit
4	1	3	32.85714286	1.00	32.85714286	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.7	Input_Transit
3	Yes	3.0	14	6.0	Input_Transit
4	Yes	3.0	14	3.2	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	16.45	6.00	-0.40	0.69	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	18.93	6.00	-0.40	0.66	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	19.44	6.00	-0.40	0.65	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.12	0.99	1.47	A
2	2.69	3.10	2.43	B
3	3.11	2.65	1.73	A
4	2.57	2.18	2.47	B
5	2.54	2.31	2.53	B
Average			2.12	B

D. Compute Bicycle LOS

Street: **Street - AM Peak Hour (Route Modification**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	0.0	4	UD	0	0	Input_XSection
2	11.0	10.0	3	UD	10	0	Input_XSection
3	12.0	9.0	3	UD	9	0	Input_XSection
4	12.5	8.0	3	UD	8	0	Input_XSection
5	12.0	9.0	3	UD	9	0	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	12.0	2.0%	0.0	0.00	12.0	-0.72	Input_SegData, Input_XSection
2	11.0	2.0%	8.5	0.15	16.5	-1.36	Input_SegData, Input_XSection
3	12.0	2.0%	7.5	0.40	11.5	-0.66	Input_SegData, Input_XSection
4	12.5	2.0%	6.5	0.75	4.0	-0.08	Input_SegData, Input_XSection
5	12.0	2.0%	7.5	0.50	9.5	-0.45	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	2751	2751	8.6	2.0%	21.0	4.0	2.61	0.16	0.44	Input_SegData, Inp
2	2487	2487	8.5	2.0%	21.0	4.0	2.70	0.16	0.44	Input_SegData, Inp
3	2256	2256	8.6	2.0%	21.0	4.0	2.65	0.16	0.44	Input_SegData, Inp
4	2015	2015	8.6	2.0%	21.0	4.0	2.60	0.16	0.44	Input_SegData, Inp
5	1931	1931	8.5	2.0%	21.0	4.0	2.58	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	3.25	C
2	2.71	B
3	3.36	C
4	3.88	D
5	3.49	C

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **Street - PM Peak Hour (Route Modification**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	1337	0.97	95%	1309	Input_SegData
2	1415	0.94	84%	1264	Input_SegData
3	1286	0.92	91%	1272	Input_SegData
4	1362	0.92	91%	1347	Input_SegData
5	1338	0.96	90%	1254	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,600	4	0.55	3520	0.37	OK	Input_SegData, Input_XSection
2	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection
3	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection
4	1,600	3	0.55	2640	0.51	OK	Input_SegData, Input_XSection
5	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **Street - PM Peak Hour (Route Modification**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	44.0	1.5	34.0	3.50	34.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	90	0.30	3.50	699.95	Input_SegData, Input_XSection
2	3.5	35	0.15	3.50	1357.17	Input_SegData, Input_XSection
3	3.5	105	0.31	3.50	683.95	Input_SegData, Input_XSection
4	3.5	145	1.34	3.50	156.19	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	12.0	12.0	0	0.00	5.37	10.0	3.0	-6.6465	Input_XSection
2	11.0	11.0	8.5	0.15	1.00	9.5	3.2	-4.8664	Input_XSection
3	12.0	12.0	7.5	0.40	1.00	9.5	3.2	-5.1372	Input_XSection
4	12.5	12.5	6.5	0.75	1.00	10.0	3.0	-5.4283	Input_XSection
5	12.0	12.0	7.5	0.50	1.00	10.0	3.0	-5.2285	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	0.7604	0.0298	0.1905	Input_SegData, Input_XSection
2	1.0730	0.0291	2.2825	Input_SegData, Input_XSection
3	0.9752	0.0298	1.9146	Input_SegData, Input_XSection
4	1.0329	0.0298	1.6812	Input_SegData, Input_XSection
5	1.0147	0.0291	1.8620	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	B
3	A
4	A
5	A

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **Street - PM Peak Hour (Route Modification**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	74	75%	0%	0%	0.40	Yes	Input_Transit
2	74	75%	100%	100%	0.40	Yes	Input_Transit
3	70	75%	0%	0%	0.40	Yes	Input_Transit
4	71	75%	100%	100%	0.40	Yes	Input_Transit
5	61	75%	100%	100%	0.40	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.55	2	0	0.55	0	0	2	32	Input_Transit
2	0.55	2	32.2972973	0.55	17.76351351	0	19	56	Input_Transit
3	0.55	2	0	0.55	0	0	2	32	Input_Transit
4	1	3	32.74647887	1.00	32.74647887	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.9	Input_Transit
3	Yes	3.0	14	6.0	Input_Transit
4	Yes	3.0	14	3.2	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	15.66	6.00	-0.40	0.70	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	18.91	6.00	-0.40	0.66	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	19.44	6.00	-0.40	0.65	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.12	0.19	1.35	A
2	2.74	2.28	2.24	B
3	3.12	1.91	1.61	A
4	2.57	1.68	2.39	B
5	2.54	1.86	2.46	B
Average			2.01	B

D. Compute Bicycle LOS

Street: **Street - PM Peak Hour (Route Modification**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	0.0	4	UD	0	0	Input_XSection
2	11.0	10.0	3	UD	10	0	Input_XSection
3	12.0	9.0	3	UD	9	0	Input_XSection
4	12.5	8.0	3	UD	8	0	Input_XSection
5	12.0	9.0	3	UD	9	0	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	12.0	2.0%	0.0	0.00	12.0	-0.72	Input_SegData, Input_XSection
2	11.0	2.0%	8.5	0.15	16.5	-1.36	Input_SegData, Input_XSection
3	12.0	2.0%	7.5	0.40	11.5	-0.66	Input_SegData, Input_XSection
4	12.5	2.0%	6.5	0.75	4.0	-0.08	Input_SegData, Input_XSection
5	12.0	2.0%	7.5	0.50	9.5	-0.45	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	1337	1337	8.6	2.0%	21.0	4.0	2.24	0.16	0.44	Input_SegData, Inp
2	1415	1415	8.5	2.0%	21.0	4.0	2.42	0.16	0.44	Input_SegData, Inp
3	1286	1286	8.6	2.0%	21.0	4.0	2.37	0.16	0.44	Input_SegData, Inp
4	1362	1362	8.6	2.0%	21.0	4.0	2.40	0.16	0.44	Input_SegData, Inp
5	1338	1338	8.5	2.0%	21.0	4.0	2.39	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	2.89	C
2	2.42	B
3	3.07	C
4	3.68	D
5	3.30	C

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **et - AM Peak Hour (Route Mods + Bus Only**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	2580	0.96	90%	2419	Input_SegData
2	2316	0.94	87%	2144	Input_SegData
3	2085	0.97	85%	1827	Input_SegData
4	1844	0.90	90%	1844	Input_SegData
5	1760	0.91	85%	1644	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,305	4	0.75	3915	0.62	OK	Input_SegData, Input_XSection
2	1,305	3	0.65	2545	0.84	OK	Input_SegData, Input_XSection
3	1,305	3	0.65	2545	0.72	OK	Input_SegData, Input_XSection
4	1,305	3	0.65	2545	0.72	OK	Input_SegData, Input_XSection
5	1,305	3	0.65	2545	0.65	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: ɜt - AM Peak Hour (Route Mods + Bus Only

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	44.0	1.5	34.0	3.50	34.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	65	0.22	3.50	969.20	Input_SegData, Input_XSection
2	3.5	25	0.11	3.50	1900.06	Input_SegData, Input_XSection
3	3.5	255	0.75	3.50	281.52	Input_SegData, Input_XSection
4	3.5	160	1.48	3.49	141.51	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	12.0	12.0	0	0.00	5.37	10.0	3.0	-6.6465	Input_XSection
2	11.0	11.0	8.5	0.15	1.00	9.5	3.2	-4.8664	Input_XSection
3	12.0	12.0	7.5	0.40	1.00	9.5	3.2	-5.1372	Input_XSection
4	12.5	12.5	6.5	0.75	1.00	10.0	3.0	-5.4283	Input_XSection
5	12.0	12.0	7.5	0.50	1.00	10.0	3.0	-5.2285	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	1.4674	0.0298	0.8974	Input_SegData, Input_XSection
2	1.7563	0.0291	2.9658	Input_SegData, Input_XSection
3	1.5811	0.0298	2.5206	Input_SegData, Input_XSection
4	1.3984	0.0298	2.0467	Input_SegData, Input_XSection
5	1.3347	0.0291	2.1820	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	C
3	B
4	B
5	B

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: ɜt - AM Peak Hour (Route Mods + Bus Only

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	73	75%	0%	0%	0.80	Yes	Input_Transit
2	73	75%	100%	100%	0.80	Yes	Input_Transit
3	69	75%	0%	0%	0.80	Yes	Input_Transit
4	70	75%	100%	100%	0.80	Yes	Input_Transit
5	61	75%	100%	100%	0.80	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.75	2	0	0.75	0	0	2	32	Input_Transit
2	0.65	2	32.39726027	0.65	21.05821918	0	23	59	Input_Transit
3	0.65	2	0	0.65	0	0	2	32	Input_Transit
4	1	3	32.85714286	1.00	32.85714286	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	1.2	6	7.4	Input_Transit
2	Yes	2.0	9	4.0	Input_Transit
3	Yes	1.2	6	7.4	Input_Transit
4	Yes	2.0	9	3.4	Input_Transit
5	Yes	1.2	5	3.5	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	15.45	6.00	-0.40	0.70	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	17.93	6.00	-0.40	0.67	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	17.64	6.00	-0.40	0.67	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.34	0.90	1.12	A
2	2.75	2.97	2.32	B
3	3.34	2.52	1.37	A
4	2.62	2.05	2.38	B
5	2.62	2.18	2.40	B
Average			1.92	A

D. Compute Bicycle LOS

Street: ɜt - AM Peak Hour (Route Mods + Bus Only

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	0.0	4	UD	0	0	Input_XSection
2	11.0	10.0	3	UD	10	0	Input_XSection
3	12.0	9.0	3	UD	9	0	Input_XSection
4	12.5	8.0	3	UD	8	0	Input_XSection
5	12.0	9.0	3	UD	9	0	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	12.0	2.0%	0.0	0.00	12.0	-0.72	Input_SegData, Input_XSection
2	11.0	2.0%	8.5	0.15	16.5	-1.36	Input_SegData, Input_XSection
3	12.0	2.0%	7.5	0.40	11.5	-0.66	Input_SegData, Input_XSection
4	12.5	2.0%	6.5	0.75	4.0	-0.08	Input_SegData, Input_XSection
5	12.0	2.0%	7.5	0.50	9.5	-0.45	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	2580	2580	8.6	2.0%	21.0	4.0	2.58	0.16	0.44	Input_SegData, Inp
2	2316	2316	8.5	2.0%	21.0	4.0	2.67	0.16	0.44	Input_SegData, Inp
3	2085	2085	8.6	2.0%	21.0	4.0	2.61	0.16	0.44	Input_SegData, Inp
4	1844	1844	8.6	2.0%	21.0	4.0	2.55	0.16	0.44	Input_SegData, Inp
5	1760	1760	8.5	2.0%	21.0	4.0	2.53	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	3.22	C
2	2.67	B
3	3.32	C
4	3.84	D
5	3.44	C

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **et - PM Peak Hour (Route Mods + Bus Only**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	1297	0.97	95%	1270	Input_SegData
2	1375	0.94	84%	1229	Input_SegData
3	1246	0.92	90%	1219	Input_SegData
4	1322	0.92	91%	1308	Input_SegData
5	1298	0.96	86%	1163	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,440	4	0.55	3168	0.40	OK	Input_SegData, Input_XSection
2	1,440	3	0.55	2376	0.52	OK	Input_SegData, Input_XSection
3	1,440	3	0.55	2376	0.51	OK	Input_SegData, Input_XSection
4	1,440	3	0.55	2376	0.55	OK	Input_SegData, Input_XSection
5	1,440	3	0.55	2376	0.49	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: ɜt - PM Peak Hour (Route Mods + Bus Only

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	44.0	1.5	34.0	3.50	34.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	90	0.30	3.50	699.95	Input_SegData, Input_XSection
2	3.5	35	0.15	3.50	1357.17	Input_SegData, Input_XSection
3	3.5	105	0.31	3.50	683.95	Input_SegData, Input_XSection
4	3.5	145	1.34	3.50	156.19	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	12.0	12.0	0	0.00	5.37	10.0	3.0	-6.6465	Input_XSection
2	11.0	11.0	8.5	0.15	1.00	9.5	3.2	-4.8664	Input_XSection
3	12.0	12.0	7.5	0.40	1.00	9.5	3.2	-5.1372	Input_XSection
4	12.5	12.5	6.5	0.75	1.00	10.0	3.0	-5.4283	Input_XSection
5	12.0	12.0	7.5	0.50	1.00	10.0	3.0	-5.2285	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	0.7377	0.0298	0.1677	Input_SegData, Input_XSection
2	1.0427	0.0291	2.2522	Input_SegData, Input_XSection
3	0.9449	0.0298	1.8843	Input_SegData, Input_XSection
4	1.0025	0.0298	1.6508	Input_SegData, Input_XSection
5	0.9843	0.0291	1.8316	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	B
3	A
4	A
5	A

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: ɜt - PM Peak Hour (Route Mods + Bus Only

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	74	75%	0%	0%	0.40	Yes	Input_Transit
2	74	75%	100%	100%	0.40	Yes	Input_Transit
3	70	75%	0%	0%	0.40	Yes	Input_Transit
4	71	75%	100%	100%	0.40	Yes	Input_Transit
5	61	75%	100%	100%	0.40	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.55	2	0	0.55	0	0	2	32	Input_Transit
2	0.55	2	32.2972973	0.55	17.76351351	0	19	56	Input_Transit
3	0.55	2	0	0.55	0	0	2	32	Input_Transit
4	1	3	32.74647887	1.00	32.74647887	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	1.2	6	7.4	Input_Transit
2	Yes	2.0	9	4.2	Input_Transit
3	Yes	1.2	6	7.4	Input_Transit
4	Yes	2.0	9	3.4	Input_Transit
5	Yes	1.2	5	3.5	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	14.66	6.00	-0.40	0.71	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	17.91	6.00	-0.40	0.67	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	17.64	6.00	-0.40	0.67	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.34	0.17	1.01	A
2	2.80	2.25	2.14	B
3	3.34	1.88	1.27	A
4	2.62	1.65	2.32	B
5	2.62	1.83	2.34	B
Average			1.82	A

D. Compute Bicycle LOS

Street: ɜt - PM Peak Hour (Route Mods + Bus Only

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	0.0	4	UD	0	0	Input_XSection
2	11.0	10.0	3	UD	10	0	Input_XSection
3	12.0	9.0	3	UD	9	0	Input_XSection
4	12.5	8.0	3	UD	8	0	Input_XSection
5	12.0	9.0	3	UD	9	0	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	12.0	2.0%	0.0	0.00	12.0	-0.72	Input_SegData, Input_XSection
2	11.0	2.0%	8.5	0.15	16.5	-1.36	Input_SegData, Input_XSection
3	12.0	2.0%	7.5	0.40	11.5	-0.66	Input_SegData, Input_XSection
4	12.5	2.0%	6.5	0.75	4.0	-0.08	Input_SegData, Input_XSection
5	12.0	2.0%	7.5	0.50	9.5	-0.45	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	1297	1297	8.6	2.0%	21.0	4.0	2.23	0.16	0.44	Input_SegData, Inp
2	1375	1375	8.5	2.0%	21.0	4.0	2.40	0.16	0.44	Input_SegData, Inp
3	1246	1246	8.6	2.0%	21.0	4.0	2.35	0.16	0.44	Input_SegData, Inp
4	1322	1322	8.6	2.0%	21.0	4.0	2.38	0.16	0.44	Input_SegData, Inp
5	1298	1298	8.5	2.0%	21.0	4.0	2.37	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	2.87	C
2	2.41	B
3	3.06	C
4	3.67	D
5	3.29	C

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **J Street - AM Peak Hour (Existing)**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	2711	0.96	90%	2542	Input_SegData
2	2447	0.94	88%	2291	Input_SegData
3	2220	0.97	86%	1968	Input_SegData
4	1967	0.90	91%	1989	Input_SegData
5	1855	0.91	86%	1753	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,450	4	0.75	4350	0.58	OK	Input_SegData, Input_XSection
2	1,450	3	0.65	2828	0.81	OK	Input_SegData, Input_XSection
3	1,450	3	0.65	2828	0.70	OK	Input_SegData, Input_XSection
4	1,450	3	0.65	2828	0.70	OK	Input_SegData, Input_XSection
5	1,450	3	0.65	2828	0.62	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **J Street - AM Peak Hour (Existing)**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	29.0	1.5	19.0	3.50	19.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	65	0.22	3.50	969.20	Input_SegData, Input_XSection
2	3.5	25	0.11	3.50	1900.06	Input_SegData, Input_XSection
3	3.5	255	0.75	3.50	281.52	Input_SegData, Input_XSection
4	3.5	160	1.48	3.49	141.51	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	27.0	27.0	15	0.00	5.37	10.0	3.0	-6.2794	Input_XSection
2	17.0	17.0	11.51	0.15	1.00	9.5	3.2	-5.0299	Input_XSection
3	16.0	16.0	10.51	0.40	1.00	9.5	3.2	-5.2360	Input_XSection
4	16.0	16.0	10.51	0.75	1.00	10.0	3.0	-5.5069	Input_XSection
5	16.0	16.0	10.51	0.50	1.00	10.0	3.0	-5.3205	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	1.5419	0.0298	1.3391	Input_SegData, Input_XSection
2	1.8556	0.0291	2.9016	Input_SegData, Input_XSection
3	1.6835	0.0298	2.5241	Input_SegData, Input_XSection
4	1.4916	0.0298	2.0614	Input_SegData, Input_XSection
5	1.4067	0.0291	2.1620	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	C
3	B
4	B
5	B

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **J Street - AM Peak Hour (Existing)**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	53	75%	0%	0%	0.80	Yes	Input_Transit
2	53	75%	0%	100%	0.80	Yes	Input_Transit
3	51	75%	0%	0%	0.80	Yes	Input_Transit
4	46	75%	0%	0%	0.80	Yes	Input_Transit
5	23	75%	0%	0%	0.80	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	1	7.8	Input_Transit
4	405	8.6	0	8.6	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.75	2	0	0.75	0	0	2	32	Input_Transit
2	1	3	31.60377358	1.00	31.60377358	0	34	71	Input_Transit
3	0.65	2	31.8627451	0.65	20.71078431	0	23	58	Input_Transit
4	0.65	2	0	0.65	0	0	2	32	Input_Transit
5	1	3	31.52173913	1.00	31.52173913	0	34	71	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.2	Input_Transit
3	Yes	3.0	14	3.8	Input_Transit
4	Yes	3.0	14	6.0	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.89	Input_Transit
2	1.00	0.05	1.56	0.42	19.33	6.00	-0.40	0.65	3.89	Input_Transit
3	1.00	0.00	1.56	0.42	16.48	6.00	-0.40	0.69	3.89	Input_Transit
4	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.88	Input_Transit
5	1.00	0.00	1.56	0.42	19.37	6.00	-0.40	0.65	3.76	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.09	1.34	1.56	A
2	2.54	2.90	2.63	B
3	2.67	2.52	2.38	B
4	3.08	2.06	1.69	A
5	2.45	2.16	2.65	B
Average			2.18	B

D. Compute Bicycle LOS

Street: **J Street - AM Peak Hour (Existing)**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	15.0	4	UD	0	15	Input_XSection
2	11.0	13.0	3	UD	7	6	Input_XSection
3	11.0	12.0	3	UD	7	5	Input_XSection
4	11.0	12.0	3	UD	7	5	Input_XSection
5	11.0	12.0	3	UD	7	5	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	27.0	2.0%	0.0	0.00	42.0	-8.82	Input_SegData, Input_XSection
2	17.0	2.0%	5.5	0.15	25.5	-3.25	Input_SegData, Input_XSection
3	16.0	2.0%	5.5	0.40	18.5	-1.71	Input_SegData, Input_XSection
4	16.0	2.0%	5.5	0.75	11.5	-0.66	Input_SegData, Input_XSection
5	16.0	2.0%	5.5	0.50	16.5	-1.36	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	2711	2711	8.6	2.0%	21.0	4.0	2.60	0.16	0.44	Input_SegData, Inp
2	2447	2447	8.5	2.0%	21.0	4.0	2.70	0.16	0.44	Input_SegData, Inp
3	2220	2220	8.6	2.0%	21.0	4.0	2.65	0.16	0.44	Input_SegData, Inp
4	1967	1967	8.6	2.0%	21.0	4.0	2.59	0.16	0.44	Input_SegData, Inp
5	1855	1855	8.5	2.0%	21.0	4.0	2.56	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	0.00	A
2	0.81	A
3	2.30	B
4	3.29	C
5	2.56	B

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **J Street - PM Peak Hour (Existing)**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	1265	0.97	95%	1239	Input_SegData
2	1343	0.94	84%	1200	Input_SegData
3	1218	0.92	94%	1244	Input_SegData
4	1286	0.92	91%	1272	Input_SegData
5	1266	0.96	89%	1174	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,600	4	0.55	3520	0.35	OK	Input_SegData, Input_XSection
2	1,600	3	0.55	2640	0.45	OK	Input_SegData, Input_XSection
3	1,600	3	0.55	2640	0.47	OK	Input_SegData, Input_XSection
4	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection
5	1,600	3	0.55	2640	0.44	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **J Street - PM Peak Hour (Existing)**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	29.0	1.5	19.0	3.50	19.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	90	0.30	3.50	699.95	Input_SegData, Input_XSection
2	3.5	35	0.15	3.50	1357.17	Input_SegData, Input_XSection
3	3.5	105	0.31	3.50	683.95	Input_SegData, Input_XSection
4	3.5	145	1.34	3.50	156.19	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	25.5	25.5	13.5	0.00	5.37	10.0	3.0	-6.2627	Input_XSection
2	17.0	17.0	11.51	0.15	1.00	9.5	3.2	-5.0299	Input_XSection
3	16.0	16.0	10.51	0.40	1.00	9.5	3.2	-5.2360	Input_XSection
4	16.0	16.0	10.51	0.75	1.00	10.0	3.0	-5.5069	Input_XSection
5	16.0	16.0	10.51	0.50	1.00	10.0	3.0	-5.3205	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	0.7195	0.0298	0.5334	Input_SegData, Input_XSection
2	1.0184	0.0291	2.0644	Input_SegData, Input_XSection
3	0.9237	0.0298	1.7643	Input_SegData, Input_XSection
4	0.9752	0.0298	1.5449	Input_SegData, Input_XSection
5	0.9601	0.0291	1.7154	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	B
3	A
4	A
5	A

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **J Street - PM Peak Hour (Existing)**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	38	75%	0%	0%	0.40	Yes	Input_Transit
2	38	75%	0%	100%	0.40	Yes	Input_Transit
3	36	75%	0%	0%	0.40	Yes	Input_Transit
4	33	75%	0%	0%	0.40	Yes	Input_Transit
5	25	75%	0%	0%	0.40	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	1	7.8	Input_Transit
4	405	8.6	0	8.6	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.55	2	0	0.55	0	0	2	32	Input_Transit
2	1	3	30	1.00	30	0	33	69	Input_Transit
3	0.55	2	30.27777778	0.55	16.65277778	0	18	54	Input_Transit
4	0.55	2	0	0.55	0	0	2	32	Input_Transit
5	1	3	31.8	1.00	31.8	0	35	71	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.3	Input_Transit
3	Yes	3.0	14	4.1	Input_Transit
4	Yes	3.0	14	6.0	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.85	Input_Transit
2	1.00	0.05	1.56	0.42	18.98	6.00	-0.40	0.66	3.85	Input_Transit
3	1.00	0.00	1.56	0.42	15.54	6.00	-0.40	0.70	3.84	Input_Transit
4	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.83	Input_Transit
5	1.00	0.00	1.56	0.42	19.43	6.00	-0.40	0.65	3.78	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.06	0.53	1.49	A
2	2.53	2.06	2.52	B
3	2.69	1.76	2.23	B
4	3.04	1.54	1.66	A
5	2.46	1.72	2.57	B
Average			2.09	B

D. Compute Bicycle LOS

Street: **J Street - PM Peak Hour (Existing)**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	15.0	4	UD	15	0	Input_XSection
2	11.0	13.0	3	UD	7	6	Input_XSection
3	11.0	12.0	3	UD	7	5	Input_XSection
4	11.0	12.0	3	UD	7	5	Input_XSection
5	11.0	12.0	3	UD	7	5	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	25.5	2.0%	13.5	0.00	39.0	-7.61	Input_SegData, Input_XSection
2	17.0	2.0%	5.5	0.15	25.5	-3.25	Input_SegData, Input_XSection
3	16.0	2.0%	5.5	0.40	18.5	-1.71	Input_SegData, Input_XSection
4	16.0	2.0%	5.5	0.75	11.5	-0.66	Input_SegData, Input_XSection
5	16.0	2.0%	5.5	0.50	16.5	-1.36	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	1265	1265	8.6	2.0%	21.0	4.0	2.22	0.16	0.44	Input_SegData, Inp
2	1343	1343	8.5	2.0%	21.0	4.0	2.39	0.16	0.44	Input_SegData, Inp
3	1218	1218	8.6	2.0%	21.0	4.0	2.34	0.16	0.44	Input_SegData, Inp
4	1286	1286	8.6	2.0%	21.0	4.0	2.37	0.16	0.44	Input_SegData, Inp
5	1266	1266	8.5	2.0%	21.0	4.0	2.36	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	0.00	A
2	0.50	A
3	1.99	A
4	3.07	C
5	2.36	B

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **Street - AM Peak Hour (Route Modification**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	2751	0.96	91%	2608	Input_SegData
2	2487	0.94	88%	2328	Input_SegData
3	2256	0.97	86%	2000	Input_SegData
4	2015	0.90	91%	2037	Input_SegData
5	1931	0.91	86%	1825	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,450	4	0.75	4350	0.60	OK	Input_SegData, Input_XSection
2	1,450	3	0.65	2828	0.82	OK	Input_SegData, Input_XSection
3	1,450	3	0.65	2828	0.71	OK	Input_SegData, Input_XSection
4	1,450	3	0.65	2828	0.72	OK	Input_SegData, Input_XSection
5	1,450	3	0.65	2828	0.65	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **Street - AM Peak Hour (Route Modification**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	29.0	1.5	19.0	3.50	19.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	65	0.22	3.50	969.20	Input_SegData, Input_XSection
2	3.5	25	0.11	3.50	1900.06	Input_SegData, Input_XSection
3	3.5	255	0.75	3.50	281.52	Input_SegData, Input_XSection
4	3.5	160	1.48	3.49	141.51	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	27.0	27.0	15	0.00	5.37	10.0	3.0	-6.2794	Input_XSection
2	17.0	17.0	11.51	0.15	1.00	9.5	3.2	-5.0299	Input_XSection
3	16.0	16.0	10.51	0.40	1.00	9.5	3.2	-5.2360	Input_XSection
4	16.0	16.0	10.51	0.75	1.00	10.0	3.0	-5.5069	Input_XSection
5	17.0	17.0	11.51	0.50	1.00	10.0	3.0	-5.3444	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	1.5646	0.0298	1.3618	Input_SegData, Input_XSection
2	1.8860	0.0291	2.9319	Input_SegData, Input_XSection
3	1.7108	0.0298	2.5514	Input_SegData, Input_XSection
4	1.5280	0.0298	2.0978	Input_SegData, Input_XSection
5	1.4643	0.0291	2.1958	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	C
3	B
4	B
5	B

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **Street - AM Peak Hour (Route Modification**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	73	75%	0%	0%	0.80	Yes	Input_Transit
2	73	75%	100%	100%	0.80	Yes	Input_Transit
3	69	75%	0%	0%	0.80	Yes	Input_Transit
4	70	75%	100%	100%	0.80	Yes	Input_Transit
5	61	75%	100%	100%	0.80	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.75	2	0	0.75	0	0	2	32	Input_Transit
2	0.65	2	32.39726027	0.65	21.05821918	0	23	59	Input_Transit
3	0.65	2	0	0.65	0	0	2	32	Input_Transit
4	1	3	32.85714286	1.00	32.85714286	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.7	Input_Transit
3	Yes	3.0	14	6.0	Input_Transit
4	Yes	3.0	14	3.2	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	16.45	6.00	-0.40	0.69	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	18.93	6.00	-0.40	0.66	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	19.44	6.00	-0.40	0.65	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.12	1.36	1.53	A
2	2.69	2.93	2.40	B
3	3.11	2.55	1.71	A
4	2.57	2.10	2.46	B
5	2.54	2.20	2.51	B
Average			2.12	B

D. Compute Bicycle LOS

Street: **Street - AM Peak Hour (Route Modification**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	15.0	4	UD	0	15	Input_XSection
2	11.0	13.0	3	UD	7	6	Input_XSection
3	11.0	12.0	3	UD	7	5	Input_XSection
4	11.0	12.0	3	UD	7	5	Input_XSection
5	11.0	13.0	3	UD	7	6	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	27.0	2.0%	0.0	0.00	42.0	-8.82	Input_SegData, Input_XSection
2	17.0	2.0%	5.5	0.15	25.5	-3.25	Input_SegData, Input_XSection
3	16.0	2.0%	5.5	0.40	18.5	-1.71	Input_SegData, Input_XSection
4	16.0	2.0%	5.5	0.75	11.5	-0.66	Input_SegData, Input_XSection
5	17.0	2.0%	5.5	0.50	18.5	-1.71	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	2751	2751	8.6	2.0%	21.0	4.0	2.61	0.16	0.44	Input_SegData, Inp
2	2487	2487	8.5	2.0%	21.0	4.0	2.70	0.16	0.44	Input_SegData, Inp
3	2256	2256	8.6	2.0%	21.0	4.0	2.65	0.16	0.44	Input_SegData, Inp
4	2015	2015	8.6	2.0%	21.0	4.0	2.60	0.16	0.44	Input_SegData, Inp
5	1931	1931	8.5	2.0%	21.0	4.0	2.58	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	0.00	A
2	0.81	A
3	2.31	B
4	3.30	C
5	2.23	B

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **Street - PM Peak Hour (Route Modification**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	1337	0.97	95%	1309	Input_SegData
2	1415	0.94	84%	1264	Input_SegData
3	1286	0.92	91%	1272	Input_SegData
4	1362	0.92	91%	1347	Input_SegData
5	1338	0.96	90%	1254	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,600	4	0.55	3520	0.37	OK	Input_SegData, Input_XSection
2	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection
3	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection
4	1,600	3	0.55	2640	0.51	OK	Input_SegData, Input_XSection
5	1,600	3	0.55	2640	0.48	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: **Street - PM Peak Hour (Route Modification**

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	29.0	1.5	19.0	3.50	19.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	90	0.30	3.50	699.95	Input_SegData, Input_XSection
2	3.5	35	0.15	3.50	1357.17	Input_SegData, Input_XSection
3	3.5	105	0.31	3.50	683.95	Input_SegData, Input_XSection
4	3.5	145	1.34	3.50	156.19	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	27.0	27.0	15	0.00	5.37	10.0	3.0	-6.2794	Input_XSection
2	17.0	17.0	11.51	0.15	1.00	9.5	3.2	-5.0299	Input_XSection
3	16.0	16.0	10.51	0.40	1.00	9.5	3.2	-5.2360	Input_XSection
4	16.0	16.0	10.51	0.75	1.00	10.0	3.0	-5.5069	Input_XSection
5	16.0	16.0	10.51	0.50	1.00	10.0	3.0	-5.3205	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	0.7604	0.0298	0.5576	Input_SegData, Input_XSection
2	1.0730	0.0291	2.1190	Input_SegData, Input_XSection
3	0.9752	0.0298	1.8158	Input_SegData, Input_XSection
4	1.0329	0.0298	1.6026	Input_SegData, Input_XSection
5	1.0147	0.0291	1.7700	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	B
3	A
4	A
5	A

	LOS by Average Pedestrian Space (ft^2/p)					
LOS Score	60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: **Street - PM Peak Hour (Route Modification**

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	74	75%	0%	0%	0.40	Yes	Input_Transit
2	74	75%	100%	100%	0.40	Yes	Input_Transit
3	70	75%	0%	0%	0.40	Yes	Input_Transit
4	71	75%	100%	100%	0.40	Yes	Input_Transit
5	61	75%	100%	100%	0.40	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.55	2	0	0.55	0	0	2	32	Input_Transit
2	0.55	2	32.2972973	0.55	17.76351351	0	19	56	Input_Transit
3	0.55	2	0	0.55	0	0	2	32	Input_Transit
4	1	3	32.74647887	1.00	32.74647887	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	3.0	14	6.0	Input_Transit
2	Yes	3.0	14	3.9	Input_Transit
3	Yes	3.0	14	6.0	Input_Transit
4	Yes	3.0	14	3.2	Input_Transit
5	Yes	3.0	14	3.2	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	15.66	6.00	-0.40	0.70	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	10.80	6.00	-0.40	0.79	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	18.91	6.00	-0.40	0.66	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	19.44	6.00	-0.40	0.65	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.12	0.56	1.41	A
2	2.74	2.12	2.22	B
3	3.12	1.82	1.60	A
4	2.57	1.60	2.38	B
5	2.54	1.77	2.45	B
Average			2.01	B

D. Compute Bicycle LOS

Street: **Street - PM Peak Hour (Route Modification**

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	15.0	4	UD	0	15	Input_XSection
2	11.0	13.0	3	UD	7	6	Input_XSection
3	11.0	12.0	3	UD	7	5	Input_XSection
4	11.0	12.0	3	UD	7	5	Input_XSection
5	11.0	12.0	3	UD	7	5	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	27.0	2.0%	0.0	0.00	42.0	-8.82	Input_SegData, Input_XSection
2	17.0	2.0%	5.5	0.15	25.5	-3.25	Input_SegData, Input_XSection
3	16.0	2.0%	5.5	0.40	18.5	-1.71	Input_SegData, Input_XSection
4	16.0	2.0%	5.5	0.75	11.5	-0.66	Input_SegData, Input_XSection
5	16.0	2.0%	5.5	0.50	16.5	-1.36	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	1337	1337	8.6	2.0%	21.0	4.0	2.24	0.16	0.44	Input_SegData, Inp
2	1415	1415	8.5	2.0%	21.0	4.0	2.42	0.16	0.44	Input_SegData, Inp
3	1286	1286	8.6	2.0%	21.0	4.0	2.37	0.16	0.44	Input_SegData, Inp
4	1362	1362	8.6	2.0%	21.0	4.0	2.40	0.16	0.44	Input_SegData, Inp
5	1338	1338	8.5	2.0%	21.0	4.0	2.39	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	0.00	A
2	0.53	A
3	2.02	B
4	3.10	C
5	2.39	B

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **et - AM Peak Hour (Route Mods + Bus Only**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	2580	0.96	90%	2419	Input_SegData
2	2316	0.94	87%	2144	Input_SegData
3	2085	0.97	85%	1827	Input_SegData
4	1844	0.90	90%	1844	Input_SegData
5	1760	0.91	85%	1644	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,305	4	0.75	3915	0.62	OK	Input_SegData, Input_XSection
2	1,305	3	0.65	2545	0.84	OK	Input_SegData, Input_XSection
3	1,305	3	0.65	2545	0.72	OK	Input_SegData, Input_XSection
4	1,305	3	0.65	2545	0.72	OK	Input_SegData, Input_XSection
5	1,305	3	0.65	2545	0.65	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: [redacted]et - AM Peak Hour (Route Mods + Bus Only

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	29.0	1.5	19.0	3.50	19.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	65	0.22	3.50	969.20	Input_SegData, Input_XSection
2	3.5	25	0.11	3.50	1900.06	Input_SegData, Input_XSection
3	3.5	255	0.75	3.50	281.52	Input_SegData, Input_XSection
4	3.5	160	1.48	3.49	141.51	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	27.0	27.0	15	0.00	5.37	10.0	3.0	-6.2794	Input_XSection
2	17.0	17.0	11.51	0.15	1.00	9.5	3.2	-5.0299	Input_XSection
3	16.0	16.0	10.51	0.40	1.00	9.5	3.2	-5.2360	Input_XSection
4	16.0	16.0	10.51	0.75	1.00	10.0	3.0	-5.5069	Input_XSection
5	16.0	16.0	10.51	0.50	1.00	10.0	3.0	-5.3205	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	1.4674	0.0298	1.2646	Input_SegData, Input_XSection
2	1.7563	0.0291	2.8023	Input_SegData, Input_XSection
3	1.5811	0.0298	2.4217	Input_SegData, Input_XSection
4	1.3984	0.0298	1.9681	Input_SegData, Input_XSection
5	1.3347	0.0291	2.0900	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	C
3	B
4	A
5	B

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: ɜt - AM Peak Hour (Route Mods + Bus Only

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	73	75%	0%	0%	0.80	Yes	Input_Transit
2	73	75%	100%	100%	0.80	Yes	Input_Transit
3	69	75%	0%	0%	0.80	Yes	Input_Transit
4	70	75%	100%	100%	0.80	Yes	Input_Transit
5	61	75%	100%	100%	0.80	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.75	2	0	0.75	0	0	2	32	Input_Transit
2	0.65	2	32.39726027	0.65	21.05821918	0	23	59	Input_Transit
3	0.65	2	0	0.65	0	0	2	32	Input_Transit
4	1	3	32.85714286	1.00	32.85714286	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	1.2	6	7.4	Input_Transit
2	Yes	2.0	9	4.0	Input_Transit
3	Yes	1.2	6	7.4	Input_Transit
4	Yes	2.0	9	3.4	Input_Transit
5	Yes	1.2	5	3.5	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	15.45	6.00	-0.40	0.70	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	17.93	6.00	-0.40	0.67	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	17.64	6.00	-0.40	0.67	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.34	1.26	1.18	A
2	2.75	2.80	2.30	B
3	3.34	2.42	1.36	A
4	2.62	1.97	2.37	B
5	2.62	2.09	2.38	B
Average			1.92	A

D. Compute Bicycle LOS

Street: ɜt - AM Peak Hour (Route Mods + Bus Only

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	15.0	4	UD	0	15	Input_XSection
2	11.0	13.0	3	UD	7	6	Input_XSection
3	11.0	12.0	3	UD	7	5	Input_XSection
4	11.0	12.0	3	UD	7	5	Input_XSection
5	11.0	12.0	3	UD	7	5	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	27.0	2.0%	0.0	0.00	42.0	-8.82	Input_SegData, Input_XSection
2	17.0	2.0%	5.5	0.15	25.5	-3.25	Input_SegData, Input_XSection
3	16.0	2.0%	5.5	0.40	18.5	-1.71	Input_SegData, Input_XSection
4	16.0	2.0%	5.5	0.75	11.5	-0.66	Input_SegData, Input_XSection
5	16.0	2.0%	5.5	0.50	16.5	-1.36	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	2580	2580	8.6	2.0%	21.0	4.0	2.58	0.16	0.44	Input_SegData, Inp
2	2316	2316	8.5	2.0%	21.0	4.0	2.67	0.16	0.44	Input_SegData, Inp
3	2085	2085	8.6	2.0%	21.0	4.0	2.61	0.16	0.44	Input_SegData, Inp
4	1844	1844	8.6	2.0%	21.0	4.0	2.55	0.16	0.44	Input_SegData, Inp
5	1760	1760	8.5	2.0%	21.0	4.0	2.53	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	0.00	A
2	0.78	A
3	2.27	B
4	3.25	C
5	2.53	B

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

A. Compute Auto LOS

Street: **et - PM Peak Hour (Route Mods + Bus Only**

Direction= **EB**

1. Compute Directional Hourly Demand (v)

Segment & Downstream Signal	Unadjusted Volume (vph)	PHF (#)	Thru Traffic (%)	Ajdusted Demand Volume (vph)	from:
1	1297	0.97	95%	1270	Input_SegData
2	1375	0.94	84%	1229	Input_SegData
3	1246	0.92	90%	1219	Input_SegData
4	1322	0.92	91%	1308	Input_SegData
5	1298	0.96	86%	1163	Input_SegData

2. Compute Directional Hourly Capacity and V/C

Segment & Downstream Signal	Adjusted Saturation (vphgl)	Thru Lanes One-Dir. (#)	Thru (g/C) (#)	Capacity (vph)	v/c	v/c Check	from:
1	1,440	4	0.55	3168	0.40	OK	Input_SegData, Input_XSection
2	1,440	3	0.55	2376	0.52	OK	Input_SegData, Input_XSection
3	1,440	3	0.55	2376	0.51	OK	Input_SegData, Input_XSection
4	1,440	3	0.55	2376	0.55	OK	Input_SegData, Input_XSection
5	1,440	3	0.55	2376	0.49	OK	Input_SegData, Input_XSection

3. Mean Through Speed (including delay at downstream signal)

Segment & Downstream Signal	Free Speed (mph)	Segment Length (ft)	Average Speed (mph)	from:
1	30	405	8.6	Input_SegData
2	30	400	8.5	Input_SegData
3	30	405	8.6	Input_SegData
4	30	405	8.6	Input_SegData
5	30	400	8.5	Input_SegData
Total/Ave.	30.0	2015	8.6	

4. Compute Stops

Segment & Downstream Signal	Stops Per Veh	Stops Per Mile (stps/mi)	Left Trn Ln (YES/NO)	Median Type	from:
1	0.2	2.61	YES	0	Input_SegData
2	0.2	2.64	NO	0	Input_SegData
3	0.2	2.61	YES	0	Input_SegData
4	0.2	2.61	YES	0	Input_SegData
5	0.2	2.64	YES	0	Input_SegData
Total/Ave		2.62	0.80	0.00	

Median Types
0 = none
1 = one-way st
2= TWLTL
3 = Raised

5. Compute Auto LOS

Segment & Signal	LOS A (%)	LOS B (%)	LOS C (%)	LOS D (%)	LOS E (%)	LOS F (%)	Weighted Average	Auto LOS
1	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
2	13.8%	35.1%	25.6%	14.0%	7.4%	4.2%	2.79	C
3	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
4	18.6%	39.0%	23.0%	11.0%	5.4%	3.0%	2.55	B
5	18.5%	39.0%	23.0%	11.1%	5.5%	3.0%	2.55	B
Average	17.5%	38.3%	23.6%	11.6%	5.8%	3.2%	2.59	B

LOS:	A	B	C	D	E	F
weights:	1	2	3	4	5	6

B. Compute Pedestrian LOS

Street: ɜt - PM Peak Hour (Route Mods + Bus Only

1. Compute Effective Sidewalk Width

Segment	Total Walkway Width (ft)	Shy Dist. Outside S/W (ft)	Shy Dist. Inside S/W (ft)	Effective Fixed Object Width (ft)	Buffer Width (ft)	Effective Sidewalk Width (ft)	from
1	29.0	1.5	19.0	3.50	19.00	5.00	Input_XSection
2	9.5	1.7	1.5	2.50	0.00	3.77	Input_XSection
3	9.5	1.3	1.5	1.00	0.00	5.70	Input_XSection
4	10.0	2.7	1.5	4.00	0.00	1.80	Input_XSection
5	12.0	2.7	1.5	2.00	0.00	5.80	Input_XSection

2. Compute Average Pedestrian Space

Segment	Avg. Free-Flow Ped. Walking Speed (ft/s)	Pedestrian Demand (ped/hr)	Ped. Flow Rate Per Unit Width (ped/ft/min)	Average Ped. Walking Speed (ft/s)	Average Pedestrian Space (ft^2/ped)	from
1	3.5	90	0.30	3.50	699.95	Input_SegData, Input_XSection
2	3.5	35	0.15	3.50	1357.17	Input_SegData, Input_XSection
3	3.5	105	0.31	3.50	683.95	Input_SegData, Input_XSection
4	3.5	145	1.34	3.50	156.19	Input_SegData, Input_XSection
5	3.5	115	0.33	3.50	635.42	Input_SegData, Input_XSection

3. Cross-Section Adjustment Factor

Segment	Total Width W_T (ft)	Effective Width W_V (ft)	Effective Width W_1 (ft)	On-Street Parking Occ (decimal)	Buffer Area Coefficient	Adj. Available Sidewalk Width (ft)	Sidewalk Width Coefficient	Cross-Section Adjustment Factor	from
1	27.0	27.0	15	0.00	5.37	10.0	3.0	-6.2794	Input_XSection
2	17.0	17.0	11.51	0.15	1.00	9.5	3.2	-5.0299	Input_XSection
3	16.0	16.0	10.51	0.40	1.00	9.5	3.2	-5.2360	Input_XSection
4	16.0	16.0	10.51	0.75	1.00	10.0	3.0	-5.5069	Input_XSection
5	16.0	16.0	10.51	0.50	1.00	10.0	3.0	-5.3205	Input_XSection

4. Motorized Vehicle Volume and Speed Adjustment Factors, Pedestrian LOS Score for Link

Segment	Vehicle Volume Adjustment Factor	Vehicle Speed Adjustment Factor	Ped. Link LOS Score	from
1	0.7377	0.0298	0.5349	Input_SegData, Input_XSection
2	1.0427	0.0291	2.0887	Input_SegData, Input_XSection
3	0.9449	0.0298	1.7855	Input_SegData, Input_XSection
4	1.0025	0.0298	1.5722	Input_SegData, Input_XSection
5	0.9843	0.0291	1.7397	Input_SegData, Input_XSection

5. Determine Pedestrian LOS for Link

Seg.	Ped. Link LOS #
1	A
2	B
3	A
4	A
5	A

LOS Score	LOS by Average Pedestrian Space (ft^2/p) 60	40	24	15	8	0
-100	A	B	C	D	E	F
2.00001	B	B	C	D	E	F
2.75001	C	C	C	D	E	F
3.50001	D	D	D	D	E	F
4.25001	E	E	E	E	E	F
5.00001	F	F	F	F	F	F

C. Compute Transit LOS

Street: ɜt - PM Peak Hour (Route Mods + Bus Only

1. Input Data

Segment	Transit Frequency (bus/h)	On-Time Performance (%)	Stops with Shelter (%)	Stops with Bench (%)	Pk Load Factor (p/seat)	Central Busi. District (Yes/No)	from
1	74	75%	0%	0%	0.40	Yes	Input_Transit
2	74	75%	100%	100%	0.40	Yes	Input_Transit
3	70	75%	0%	0%	0.40	Yes	Input_Transit
4	71	75%	100%	100%	0.40	Yes	Input_Transit
5	61	75%	100%	100%	0.40	Yes	Input_Transit

2. Compute Mean Bus Speed

Segment	Length (ft)	Auto Spd (mph)	Bus Stops (#)	Ave Bus Speed (mph)	from
1	405	8.6	0	8.6	Input_Transit
2	400	8.5	1	7.5	Input_Transit
3	405	8.6	0	8.6	Input_Transit
4	405	8.6	1	7.8	Input_Transit
5	400	8.5	1	7.5	Input_Transit
Total/Ave	2015	8.6		8.0	

3. Compute Transit Vehicle Running Time

Segment	Prop. Of Stop AccelDecl Delay not due to t.c.	Accel-Decel Stop Delay (s)	Dwell Time (s)	Prop. Of Dwell Time Occuring During Eff. Grn.	Transit Delay Due to Serving Passengers (s)	Ave Reentry Delay (s)	Delay due to Stop (s)	Ave Segment Transit Running Time (s)	from
1	0.55	2	0	0.55	0	0	2	32	Input_Transit
2	0.55	2	32.2972973	0.55	17.76351351	0	19	56	Input_Transit
3	0.55	2	0	0.55	0	0	2	32	Input_Transit
4	1	3	32.74647887	1.00	32.74647887	0	36	71	Input_Transit
5	1	3	33.68852459	1.00	33.68852459	0	36	73	Input_Transit

4. Compute Intersection Delay and Average Transit Travel Speed

Segment	Intersection Signalized?	Transit Time Loss (min/mi)	Intersection Delay (s/veh)	Ave Bus Speed (mph)	from
1	Yes	1.2	6	7.4	Input_Transit
2	Yes	2.0	9	4.2	Input_Transit
3	Yes	1.2	6	7.4	Input_Transit
4	Yes	2.0	9	3.4	Input_Transit
5	Yes	1.2	5	3.5	Input_Transit

5. Compute Transit Perceived Travel Time and Headway Factors

Segment	PLWF factor	ATR min/mi	t-ex (min)	T-ex (min/mi)	PTTR (min/mi)	BTTR (min/mi)	Ridership Elasticity	Fptt	Fh	from
1	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
2	1.00	0.41	1.56	0.42	14.66	6.00	-0.40	0.71	3.92	Input_Transit
3	1.00	0.00	1.56	0.42	9.00	6.00	-0.40	0.85	3.92	Input_Transit
4	1.00	0.41	1.56	0.42	17.91	6.00	-0.40	0.67	3.92	Input_Transit
5	1.00	0.41	1.56	0.42	17.64	6.00	-0.40	0.67	3.91	Input_Transit

PLWF = Passenger Load Weighting Factor
ATR = Amenity Time Rate
PTTR = Perceived Travel Time Rate
Fptt = Perceived Travel Time Factor
Fh = Headway Factor
t-ex = Excess Wait Time due to Late Arrivals
T-ex = Excess Wait Time rate due to Late Arrivals
BTTR = Base Travel Time Rate

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

6. Compute Transit LOS

Segment	Wait/Ride Score	Ped LOS	LOS Score	Transit LOS
1	3.34	0.53	1.07	A
2	2.80	2.09	2.12	B
3	3.34	1.79	1.26	A
4	2.62	1.57	2.31	B
5	2.62	1.74	2.33	B
Average			1.81	A

D. Compute Bicycle LOS

Street: ɜt - PM Peak Hour (Route Mods + Bus Only

1. Geometric Input Data

Segment	Outside Lane Width (ft)	Bike/Shldr Lane Width (ft)	Through Lanes (lanes)	Divided/ Undivided (D/UD)	Shoulder Width (ft)	Bike Lane Width (ft)	from
1	12.0	15.0	4	UD	0	15	Input_XSection
2	11.0	13.0	3	UD	7	6	Input_XSection
3	11.0	12.0	3	UD	7	5	Input_XSection
4	11.0	12.0	3	UD	7	5	Input_XSection
5	11.0	12.0	3	UD	7	5	Input_XSection

2. Compute Cross-Section Adjustment Factor

Segment	Effective Width W_v (ft)	Heavy Vehicle (%)	Adj. Width of Paved Outside Shoulder, W_{OS}^* ft	On-Street Parking Occ (decimal)	Effective Width of Outside Thru Lane (ft)	Cross-Section Adjustment Factor	from
1	27.0	2.0%	0.0	0.00	42.0	-8.82	Input_SegData, Input_XSection
2	17.0	2.0%	5.5	0.15	25.5	-3.25	Input_SegData, Input_XSection
3	16.0	2.0%	5.5	0.40	18.5	-1.71	Input_SegData, Input_XSection
4	16.0	2.0%	5.5	0.75	11.5	-0.66	Input_SegData, Input_XSection
5	16.0	2.0%	5.5	0.50	16.5	-1.36	Input_SegData, Input_XSection

3. Compute Vehicle Volume and Speed Adjustment Factors, and Pavement Condition Adjustment Factor

Segment	Vehicle Demand Flow Rate (veh/h)	Adj. Veh. Demand Flow Rate (veh/h)	Avg. Vehicle Running Spped (mph)	Adj. Heavy Vehicle (%)	Adjusted Ave. Vehicle Running Speed (mph)	Pavement Condition Rating	Veh. Volume Adjustment Factor	Veh. Speed Adjustment Factor	Pavement Cond. Adjustment Factor	from
1	1297	1297	8.6	2.0%	21.0	4.0	2.23	0.16	0.44	Input_SegData, Inp
2	1375	1375	8.5	2.0%	21.0	4.0	2.40	0.16	0.44	Input_SegData, Inp
3	1246	1246	8.6	2.0%	21.0	4.0	2.35	0.16	0.44	Input_SegData, Inp
4	1322	1322	8.6	2.0%	21.0	4.0	2.38	0.16	0.44	Input_SegData, Inp
5	1298	1298	8.5	2.0%	21.0	4.0	2.37	0.16	0.44	Input_SegData, Inp

4. Determine Bicycle LOS for Link

Segment	Bicycle LOS Score	Bicycle LOS
1	0.00	A
2	0.51	A
3	2.00	B
4	3.09	C
5	2.38	B

Score	LOS
-100	A
0	A
2.00001	B
2.75001	C
3.50001	D
4.25001	E
5.00001	F

Existing Plus Project Volume/Capacity Ratios - With Stop/Route Modifications

ID	Roadway Segment	ADT	Number of Lanes	Roadway Class	A	B	C	D	E	V/C	LOS
1	10th Street - between Capitol Mall & N	5,509	3	3L	13,500	15,750	18,000	20,250	22,500	0.24	A
3	12th Street - between I & J	5,730	3	3L	13,500	15,750	18,000	20,250	22,500	0.25	A
54	15th Street - between L & Capitol	10,006	3	3L	13,500	15,750	18,000	20,250	22,500	0.44	A
4	16th Street - between P & Q	14,153	3	3L	13,500	15,750	18,000	20,250	22,500	0.63	B
17	3rd Street - between J & K	8,927	3	3L	13,500	15,750	18,000	20,250	22,500	0.40	A
18	3rd Street - between N & 0	9,750	3	3L	13,500	15,750	18,000	20,250	22,500	0.43	A
21	5th Street - between I & J	7,687	4	4L	18,000	21,000	24,000	27,000	30,000	0.26	A
22	5th Street - between J & L	7,674	3	3L	13,500	15,750	18,000	20,250	22,500	0.34	A
23	5th Street - between N & O	7,776	3	3L	13,500	15,750	18,000	20,250	22,500	0.35	A
31	Capitol Mall - between Neasham & 3rd	16,833	4	4L	18,000	21,000	24,000	27,000	30,000	0.56	A
35	I Street - between 5th & 6th	19,198	4	4L	18,000	21,000	24,000	27,000	30,000	0.64	B
36	I Street - between 7th & 8th	16,717	3	3L	13,500	15,750	18,000	20,250	22,500	0.74	C
39	J Street - between 4th & 5th	26,712	4	4L	18,000	21,000	24,000	27,000	30,000	0.89	D
40	J Street - between 6th & 7th	20,585	3	3L	13,500	15,750	18,000	20,250	22,500	0.91	E
52	J Street - between 9th & 10th	16,941	3	3L	13,500	15,750	18,000	20,250	22,500	0.75	C
53	J Street - between 14th & 15th	18,256	3	3L	13,500	15,750	18,000	20,250	22,500	0.81	D
41	L Street - between 14th & 15th	10,850	3	3L	13,500	15,750	18,000	20,250	22,500	0.48	A
43	L Street - between 4th & 5th	14,889	4	4L	18,000	21,000	24,000	27,000	30,000	0.50	A
55	P Street - between 8th & 9th	8,387	3	3L	13,500	15,750	18,000	20,250	22,500	0.37	A
56	P Street - between 14th & 15th	8,039	3	3L	13,500	15,750	18,000	20,250	22,500	0.36	A
45	P Street - between 2nd & 3rd	15,353	3	3L	13,500	15,750	18,000	20,250	22,500	0.68	B
46	Q Street - between 12th & 13th	7,447	3	3L	13,500	15,750	18,000	20,250	22,500	0.33	A
49	Q Street - between I-5 SB Off & 3rd	11,578	4	4L	18,000	21,000	24,000	27,000	30,000	0.39	A

Existing Plus Project Volume/Capacity Ratios - With Stop/Route Modifications & Bus Lane

ID	Roadway Segment	ADT	Number of Lanes	Roadway Class	A	B	C	D	E	V/C	LOS
1	10th Street - between Capitol Mall & N	5,509	3	3L	13,500	15,750	18,000	20,250	22,500	0.24	A
3	12th Street - between I & J	5,730	3	3L	13,500	15,750	18,000	20,250	22,500	0.25	A
54	15th Street - between L & Capitol	10,006	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.49	A
4	16th Street - between P & Q	14,153	3	3L	13,500	15,750	18,000	20,250	22,500	0.63	B
17	3rd Street - between J & K	8,927	3	3L	13,500	15,750	18,000	20,250	22,500	0.40	A
18	3rd Street - between N & 0	9,750	3	3L	13,500	15,750	18,000	20,250	22,500	0.43	A
21	5th Street - between I & J	8,298	4	4L	18,000	21,000	24,000	27,000	30,000	0.28	A
22	5th Street - between J & L	7,674	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.38	A
23	5th Street - between N & O	7,776	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.38	A
31	Capitol Mall - between Neasham & 3rd	16,833	4	4L	18,000	21,000	24,000	27,000	30,000	0.56	A
35	I Street - between 5th & 6th	19,198	4	4L	18,000	21,000	24,000	27,000	30,000	0.64	B
36	I Street - between 7th & 8th	16,717	3	3L	13,500	15,750	18,000	20,250	22,500	0.74	C
39	J Street - between 4th & 5th	26,712	4	4L	18,000	21,000	24,000	27,000	30,000	0.89	D
40	J Street - between 6th & 7th	19,974	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.99	E
52	J Street - between 9th & 10th	16,330	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.81	D
53	J Street - between 14th & 15th	17,645	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.87	D
41	L Street - between 14th & 15th	10,239	3	3L	13,500	15,750	18,000	20,250	22,500	0.46	A
43	L Street - between 4th & 5th	14,889	4	4L	18,000	21,000	24,000	27,000	30,000	0.50	A
55	P Street - between 8th & 9th	8,387	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.41	A
56	P Street - between 14th & 15th	8,039	2	2.7L	12,150	14,175	16,200	18,225	20,250	0.40	A
45	P Street - between 2nd & 3rd	15,353	3	3L	13,500	15,750	18,000	20,250	22,500	0.68	B
46	Q Street - between 12th & 13th	7,447	3	3L	13,500	15,750	18,000	20,250	22,500	0.33	A
49	Q Street - between I-5 SB Off & 3rd	11,578	4	4L	18,000	21,000	24,000	27,000	30,000	0.39	A

Existing Conditions Volume/Capacity Ratios

ID	Roadway Segment	ADT	Number of Lanes	Roadway Class	**A**	**B**	**C**	**D**	**E**	V/C	LOS
1	10th Street - between Capitol Mall & N	5,633	3	3L	13,500	15,750	18,000	20,250	22,500	0.25	A
2	12th Street - between C & D	15,523	4	4L	18,000	21,000	24,000	27,000	30,000	0.52	A
3	12th Street - between I & J	5,730	3	3L	13,500	15,750	18,000	20,250	22,500	0.25	A
54	15th Street - between L & Capitol	9,846	3	3L	13,500	15,750	18,000	20,250	22,500	0.44	A
4	16th Street - between P & Q	14,175	3	3L	13,500	15,750	18,000	20,250	22,500	0.63	B
5	19th Street - between J & K	5,670	2	2L	9,000	10,500	12,000	13,500	15,000	0.38	A
6	19th Street - between V & W	10,952	2	2L	9,000	10,500	12,000	13,500	15,000	0.73	C
7	21st Street - between K & L	10,291	2	2L	9,000	10,500	12,000	13,500	15,000	0.69	B
8	21st Street - between X & Broadway	9,158	3	3L	13,500	15,750	18,000	20,250	22,500	0.41	A
9	21st Street - between V & W	10,556	2	2L	9,000	10,500	12,000	13,500	15,000	0.70	C
10	29th Street - between E & F	6,926	3	3L	13,500	15,750	18,000	20,250	22,500	0.31	A
11	29th Street - between G & H	8,996	3	3L	13,500	15,750	18,000	20,250	22,500	0.40	A
12	29th Street - between I & J	3,985	3	3L	13,500	15,750	18,000	20,250	22,500	0.18	A
13	29th Street - between R & S	8,239	3	3L	13,500	15,750	18,000	20,250	22,500	0.37	A
14	30th Street - between E & F	6,695	3	3L	13,500	15,750	18,000	20,250	22,500	0.30	A
15	30th Street - between G & H	7,252	3	3L	13,500	15,750	18,000	20,250	22,500	0.32	A
16	30th Street - between R & S	5,150	3	3L	13,500	15,750	18,000	20,250	22,500	0.23	A
17	3rd Street - between J & K	8,863	3	3L	13,500	15,750	18,000	20,250	22,500	0.39	A
18	3rd Street - between N & 0	9,788	3	3L	13,500	15,750	18,000	20,250	22,500	0.44	A
19	3rd Street - between U & V	2,714	3	3L	13,500	15,750	18,000	20,250	22,500	0.12	A
20	3rd Street - between X & Broadway	2,272	3	3L	13,500	15,750	18,000	20,250	22,500	0.10	A
21	5th Street - between I & J	7,639	4	4L	18,000	21,000	24,000	27,000	30,000	0.25	A
22	5th Street - between J & L	7,546	3	3L	13,500	15,750	18,000	20,250	22,500	0.34	A
23	5th Street - between N & O	7,722	3	3L	13,500	15,750	18,000	20,250	22,500	0.34	A
24	5th Street - between U & V	3,075	3	3L	13,500	15,750	18,000	20,250	22,500	0.14	A
25	5th Street - between X & Broadway	5,102	4	4L	18,000	21,000	24,000	27,000	30,000	0.17	A
26	8th - between V & W	2,463	2	2LO	3,000	3,500	4,000	4,500	5,000	0.49	A
27	9th - between W & X	5,560	3	3L	13,500	15,750	18,000	20,250	22,500	0.25	A
28	Broadway - between 10th & Riverside	10,062	3	3L	13,500	15,750	18,000	20,250	22,500	0.45	A
29	Broadway - between 20th & 21st	17,461	4	4L	18,000	21,000	24,000	27,000	30,000	0.58	A
30	Broadway - between 3rd & 5th	5,519	2	2L	9,000	10,500	12,000	13,500	15,000	0.37	A
31	Capitol Mall - between Neasham & 3rd	16,767	4	4L	18,000	21,000	24,000	27,000	30,000	0.56	A
32	F Street - between 11th & 12th*	2,933	2	2LO	3,000	3,500	4,000	4,500	5,000	0.59	A
33	F Street - between 28th & 29th*	3,932	2	2LO	3,000	3,500	4,000	4,500	5,000	0.79	C
34	F Street - between 19th & 20th*	2,189	2	2LO	3,000	3,500	4,000	4,500	5,000	0.44	A
35	I Street - between 5th & 6th	19,142	4	4L	18,000	21,000	24,000	27,000	30,000	0.64	B
36	I Street - between 7th & 8th	16,717	3	3L	13,500	15,750	18,000	20,250	22,500	0.74	C
37	J Street - between 19th & 20th	6,422	3	3L	13,500	15,750	18,000	20,250	22,500	0.29	A
38	J Street - between 28th & 29th	15,576	3	3L	13,500	15,750	18,000	20,250	22,500	0.69	B
39	J Street - between 4th & 5th	26,582	4	4L	18,000	21,000	24,000	27,000	30,000	0.89	D
40	J Street - between 6th & 7th	20,371	3	3L	13,500	15,750	18,000	20,250	22,500	0.91	E
52	J Street - between 9th & 10th	16,695	3	3L	13,500	15,750	18,000	20,250	22,500	0.74	C
53	J Street - between 14th & 15th	18,006	3	3L	13,500	15,750	18,000	20,250	22,500	0.80	D
41	L Street - between 14th & 15th	10,928	3	3L	13,500	15,750	18,000	20,250	22,500	0.49	A
42	L Street - between 19th & 20th	4,354	2	2C	5,250	6,125	7,000	7,875	8,750	0.50	A
43	L Street - between 4th & 5th	14,881	4	4L	18,000	21,000	24,000	27,000	30,000	0.50	A
55	P Street - between 8th & 9th	8,193	3	3L	13,500	15,750	18,000	20,250	22,500	0.36	A
56	P Street - between 14th & 15th	7,853	3	3L	13,500	15,750	18,000	20,250	22,500	0.35	A
44	P Street - between 19th & 20th	4,265	2	2L	9,000	10,500	12,000	13,500	15,000	0.28	A
45	P Street - between 2nd & 3rd	15,343	3	3L	13,500	15,750	18,000	20,250	22,500	0.68	B
46	Q Street - between 12th & 13th	7,439	3	3L	13,500	15,750	18,000	20,250	22,500	0.33	A
47	Q Street - between 19th & 20th	5,478	2	2L	9,000	10,500	12,000	13,500	15,000	0.37	A
48	Q Street - between 28th & 29th	5,829	2	2L	9,000	10,500	12,000	13,500	15,000	0.39	A
49	Q Street - between I-5 SB Off & 3rd	11,584	4	4L	18,000	21,000	24,000	27,000	30,000	0.39	A
50	Richards Blvd - between 12th & Sunbeam	15,410	4	4L	18,000	21,000	24,000	27,000	30,000	0.51	A

51	Richards Blvd - between Bercut & I-5 NB On	29,110	4	4L	18,000	21,000	24,000	27,000	30,000	0.97	E

Task 2

Existing Studies Review

Downtown Sacramento Transit Circulation and Facilities Plan

Introduction

The Downtown Sacramento Transit Circulation and Facilities Plan is intended to improve travel times and the desirability of transit services to customers including enhanced transit facilities. Expediting the movement of buses and other transit service into, through, and out of downtown will reduce travel time for transit customers and decrease conflicts with automobile traffic. Improving transit speeds has a two-fold positive impact: a) it improves the travel experience for customers, increasing ridership and revenue; and b) allows for better utilization of vehicles, reducing both operating and vehicle capital costs.

The center of regional activity, Sacramento has a true downtown with substantial employment and retail elements. The central business district (CBD) is characterized by high peak hour activity concentrations surrounded by lower density established residential and mixed-use areas, which have a unique charm and a potential for growing appeal in terms of retail and entertainment. The grid street pattern is readily navigable and easily walkable.

Currently, most transit service is concentrated on a few key corridors rather than spread throughout the downtown area as is usual in cities of similar size to Sacramento. This effective form of service design creates a higher frequency of corridor service and allows customers quick access to multiple routes. It also, however, can create bottlenecks with multiple vehicles jockeying for position with variable stop dwell times. Industry best practice cost-effective transit priority options and operating practices can successfully reduce delay on these important corridors. Often, treatments which move transit vehicles more smoothly along their alignment also have positive impacts on automobile, pedestrian, and bicycle flows, making implementation a win-win situation if designed and implemented to best advantage.

The following review of previous and on-going planning efforts related to downtown Sacramento mobility provides a context for a comprehensive planning effort. Key findings and recommendations from the relevant studies specific to downtown mobility will guide the refinement of the final project study area and ensure an inclusive, consistent approach to the Downtown Sacramento Transit Circulation and Facilities Plan.

Study Area

The study area has been identified as the downtown Central City area bounded by the American River to the north, the Sacramento River to the west, Alhambra Boulevard to the east, and Broadway to the south. As the study moves forward, emphasis will likely be placed on the CBD west of 16th Street, where downtown mobility issues are most prevalent.

Existing Study Review

The consulting team reviewed previous and existing studies relevant to transit and development in downtown Sacramento, including:

- City of Sacramento General Plan Update 2009
- SACOG Metropolitan Transportation Plan (MTP) 2008
- Downtown/Riverfront Streetcar Study 2007
- Sacramento Streetcar System Plan 2011-2012
- Sacramento Regional Transit Comprehensive Operational Analysis (Transit Renewal) 2011-2012
- Sacramento Regional Transit Short Range Transit Plan 2011
- Sacramento Regional Transit Master Plan (The TransitAction Plan) 2009
- SRTPs of Other Downtown Sacramento Transit Operators
- Western El Dorado County 2008 SRTP
- Fairfield/Suisun Transit SRTP FY2006-FY2015
- Yuba-Sutter Transit SRTP 2008
- Sacramento Council of Governments Folsom Stage Line Long Range Transit Plan FY2009/10 to FY 2018/19
- Placer County Transit SRTP 2005
- Roseville Transit Short Range Transit Plan Update 2005
- Sacramento Council of Governments South County Transit/LINK LRTP FY2009/10 to FY2018/19
- San Joaquin Regional Transit District Short Range Transit Plan FY2009-2013
- Yolo County Transit District LRTP FY2009-10 to FY2018-19
- North Natomas Transportation Management Association Five Year Transit Plan 2010
- Central City Two-Way Conversion Study 2006
- Reintroduction of Vehicles on K Street 2010-2011
- City of Sacramento Docks Area Concept Plan 2008
- Old Sacramento State Historic Park General Plan 2012
- I-5 Riverfront Reconnection Project 2000-2011
- Merged Downtown Sacramento Redevelopment Project Area Implementation Plan 2005-2009
- R Street Corridor 1996/2007
- Sacramento Intermodal Facility Technical Reports 2003-2009
- Sacramento Region State Office Planning Study 2008
- Capitol Area Plan Progress Report 2011
- State Your Mode 2009 State Employee Commute Survey Final Results
- City of Sacramento Climate Action Plan 2010-2011
- Sacramento River Crossing Alternatives Study 2011
- River District Specific Plan 2010-2011
- The Central City Bike Access Study Phase I Analysis 2008

Summaries from these reports are presented on the following pages.

City of Sacramento General Plan Update 2009

Specific to downtown mobility, the City of Sacramento General Plan Update promotes an integrated, balanced multi-modal transportation system inclusive of walking, cycling, transit, and driving. The City supports a well-designed transit system with a variety of types of transit, including support for the development of streetcar lines and emerging technologies. The General Plan outlines policies for enhancement of transit service within the Central City area through amenities such as increased frequency and scheduling reliability, traffic signal priority, signal pre-emption, queue jumps, and exclusive transit lanes to improve transit operations. The City will direct increased investment for transit, bikeway, and pedestrian way improvements along designated multimodal corridors.

Additional circulation policies of note for downtown include:

- Development of new street networks will follow grid-patterns.
- Establish peak-period parking restrictions to aid circulation and reduce delay.
- Support for Transit Oriented Development along R Street in addition to a possible R Street shuttle and creation of a pedestrian corridor.
- City shall seek to maintain level of service (LOS) A-E within the CBD and multi-modal districts. However, LOS F conditions in the Central City are acceptable during peak hours provided that improvements to other components of the transportation system to improve roadway capacity or enhance non-auto travel modes are made.
- Route traffic to activity areas without directing such traffic through residential neighborhoods.

SACOG Metropolitan Transportation Plan (MTP) 2008

The SACOG MTP presents a new transportation vision for Sacramento with priority given to transit expansion. The mobility element of the MTP supports significant transit service expansion, coordination among all forms of existing and expanded transit service, and a priority for transit investments that result in an effective transit system. SACOG aims to pursue transit improvements on high-capacity corridors including signal preemption, next-bus notifications signs, pedestrian access upgrades, and shelters/stations. Improvements and expansion of roads will focus on supporting infill development and mitigating midday congestion.

Downtown/Riverfront Streetcar Study 2007

The initial streetcar feasibility study evaluated a proposed streetcar line between downtown Sacramento and the Washington/Triangle/Civic Center areas of West Sacramento that would act as an urban circulator and a pedestrian accelerator. Development of a streetcar is citied as a way to support the expansion of a truly urban environment through redevelopment and accommodation or both commute and all day demand trip purposes. The preferred alignment follows a direct route from Downtown West Sacramento, across the Tower Bridge, down Capitol Mall, up to K Street, and around the convention center. A short initial alignment would allow for frequent service. Streetcar stops would include simple shelters located curb side or in the center median. At the time of the study the streetcar was found to be technically, politically, and financially feasible. The next steps include the need for preliminary engineering and design, environmental analysis, and financing and management.

Sacramento Streetcar System Plan 2011-12

As a follow-up to the Downtown/Riverfront Streetcar Study conducted jointly by the cities of Sacramento and West Sacramento, the City of Sacramento is completing a citywide effort to evaluate streetcar alignments and determine how to prioritize their implementation. A Draft System Plan has been released that identifies a 3.3 mile Starter Line route through the Central City. The alignment of the Starter Line within West Sacramento would be along West Capitol Avenue and Tower Bridge Gateway. After crossing the Tower Bridge and entering the City of Sacramento, the route turns north on 3rd Street to a stop at the Sacramento Valley Station (site of the planned Intermodal Transportation Facility) before connecting to existing light rail tracks (on H Street, the 7th Street/8th Street couplet, and K Street), then continuing east to the Sacramento Convention Center, and extending to 19th Street in Midtown via the J Street/L Street couplet. The recommendations of the Sacramento Streetcar System Plan will be reviewed and incorporated into the Downtown Sacramento Circulation Plan.

Sacramento Regional Transit Comprehensive Operational Analysis (*Transit Renewal*) 2011-2012

The Sacramento Regional Transit *Transit Renewal* study (currently underway) will be reviewed and incorporated into the Downtown Sacramento Circulation Plan when completed. The final recommended service plan is expected to be completed in early 2012.

Sacramento Regional Transit Short Range Transit Plan 2011

The SRTP follows the guidance of the *Transit Action Plan* and SACOG's regional Blueprint and MTP2035 in developing a 10-year outlook for Regional Transit operations. The in-progress Comprehensive Operational Analysis, *Transit Renewal*, will provide the detailed work necessary to restore and expand transit service levels, with recommendations being incorporated into a future SRTP. The document outlines service and performance standards for RT services. The SRTP outlines a goal to return service hours to pre-June 2010 service levels by 2017, followed by additional service expansion. The SRTP stresses the dynamic nature of the funding and operations perspective. Implications for Downtown Sacramento include potential route realignments and service level changes. The SRTP is scheduled to be updated in Spring 2012 following the completion of the COA. Changes in local, state, and federal funding streams will also have a direct impact on the SRTP update.

Sacramento Regional Transit Master Plan (The TransitAction Plan) 2009

A philosophy of delivering high speed, high frequency, and high capacity transit along key corridors was proposed as a key element of the TransitAction Plan. Public outreach during the project indicated that a high frequency and fast transit network was desired by the public. While these objectives were applied on a regional scale, they are also applicable to downtown services. Two downtown European street trams were proposed, one linking West Sacramento to Downtown to CSUS to Cal Expo and Arden and the other on the south side of Downtown along Broadway. Recommendations for a "Hi-Bus" (high frequency, high capacity, and high quality) network would likely influence downtown circulation with additional service and needs for expedited downtown travel. Additional rail service volumes would increase transit capacity connecting to downtown.

The proposed scenarios are not financially constrained and funding sources were not identified as part of the visioning process.

- Expanded and New Service Types:
    - Regional Rail: Increase frequency of Capitol Corridor service to four trips per peak hour. Introduce new commuter service from the south of the county and beyond.
    - Light Rail: Extension of the Blue Line south to Elk Grove, and north to Citrus Heights and Roseville; extension of the Gold Line toward El Dorado County; and construction of a new Green Line between Downtown and Sacramento International Airport.
    - Streetcar: Includes four new streetcar/tram systems, two loops in downtown, a Citrus Heights-Rancho Cordova Street Tram, and a Rancho Cordova Streetcar.
    - Bus Rapid Transit (BRT): Where possible upgrade enhanced corridors.
    - Hi-Bus Network: Establishes over 260 miles of high frequency, high speed, and high quality bus service.
    - Local Bus: Serve community circulation and link passengers to the high capacity transit network.

Construction of the Green Line light rail project between downtown and the River District is currently underway, with service on this segment anticipated to begin in early 2012. Upon opening, the Green Line will operate between the existing 13th Street light rail station downtown and a new 7th & Richards/Township 9 station. This 1.1 mile extension of the region's light rail system is the first phase of the Green Line, which is envisioned to eventually extend 12.8 miles through the River District and Natomas to the Sacramento International Airport.

SRTPs of Other Downtown Sacramento Transit Operators

The following table summarizes SRTPs and LRTPs of operators with current or planned service to downtown Sacramento, with particular focus on policies and recommendations directly related to services in downtown Sacramento. A majority of the operators run commute based express service into downtown and selected operators have plans to increase service levels in the future.

Other Downtown Sacramento Transit Operators	Current Trips Per Peak	Additional Planned Trips	Future Service Plans
Western El Dorado County 2008 SRTP	11 (2 Reverse)	-	Maintain existing level of service, no proposal for expansion.
Fairfield/Suisun Transit SRTP FY2006-FY2015	3	-	No proposed changes.
Yuba-Sutter Transit SRTP 2008	9	4 Peak 1 Off-Peak	Expansion of express trips proposed based on demand
Folsom Stage Line Long Range Transit Plan FY2009/10 to FY 2018/19	RT Gold Line Service	-	The LRTP lists a potential improvement, subject to further funding availability, of extending frequency and/or duration of Gold Line service with the possibility of limited-stop Gold Line service.
Placer County Transit SRTP 2005	4	-	-
Roseville Transit Short Range Transit Plan Update 2005	8	-	-
South County Transit/LINK LRTP FY2009/10 to FY2018/19	-	2	The LRTP proposes a one year trial express service from Lodi to downtown Sacramento with two trips starting in FY10-FY11.
2012 Amendment to the South County Transit Link SRTP Update 2008/09 through 2012/13	-	3	The draft SRTP amendment proposes a three year trial express service from Galt to downtown Sacramento with three daily trips: one trip during the AM peak, one midday trip, and one trip during the PM peak.
San Joaquin Regional Transit District Short Range Transit Plan FY2009-2013	2	-	The SRTP does not specify any proposed expansions to service.
Yolo County Transit District LRTP FY2009-10 to FY2018-19	**Express** 6 Peak	-	The 10-year transit plan recommends additional commute trips connecting to downtown Sacramento and the implementation of additional routes serving developing areas in West Sacramento.
	Local 85 All Day	-	
North Natomas Transportation Management Association Five Year Transit Plan 2010	9	5	The SRTP outlines options for additional trips or larger vehicles to accommodate demand within acceptable loading conditions. A new park and ride based service is proposed with four daily trips to downtown from Arco Arena. A new reverse commute service from Elk Grove and the Highway 99 corridor with six daily roundtrips is also outlined.

Central City Two-Way Conversion Study 2006

The study evaluated the potential conversion of one-way streets into two-way streets to increase neighborhood livability and enhance local access to neighborhoods while balancing adverse impacts. The one-way street segments listed below were considered as part of the study. As noted below, some of the considered segments underwent the conversion process following the study, and others were ultimately selected for "road diets" to reduce the number of travel lanes from three to two and add on-street bicycle lanes:

- 3rd Street from I Street to J Street for Two-Way Conversion (completed)
- J Street from 29th Street to Alhambra Blvd. for Two-way Conversion (completed between 30th Street and Alhambra Blvd.)
- L Street from 16th Street to 29th Street for Two-way Conversion (road diet completed between 15th Street and 29th Street)
- N Street from 16th Street to 28th Street for Two-way Conversion (completed between 21st Street and 29th Street)
- P Street from 16th Street to Alhambra Boulevard for Two-way Conversion (road diet completed between 15th Street and 29th Street)
- Q Street from 16th Street to 29th Street for Two-way Conversion (road diet completed between 15th Street and 29th Street)
- 19th and 21st Streets from H/I Street to W Street for Reduction of lanes from 3 to 2 (road diets completed, 21st Street converted between W Street and Broadway)
- 9th and 10th Streets from E Street to G Street for Two-way Conversion (9th Street converted between E and H Streets, 10th Street converted between E and I Streets)

Circulation impacts identified by the study include an increase in travel time and reduced peak level of service at certain intersections. Transit represents one of the areas of impact reviewed for the study. A significant impact on transit service is defined as an increase of more than 10-percent in the route's travel time. As proposed, the project would increase transit travel times on most street segments proposed for conversion up to 2 minutes during peak periods. This impact is less than the 10-percent significant impact threshold.

Reintroduction of Vehicles on K Street 2010-2011

In order to increase access and visibility to businesses, promote safety, stimulate additional economic activity, and improve circulation the Sacramento City Council approved reintroducing vehicles on K Street. An initial pilot project opened four blocks to traffic in November 2011 (between 8th Street and 12th Street), allowing for measurement of the impact on light rail operations and pedestrian movement. In the event significant delays develop, peak period vehicle restrictions on K Street are proposed. The study forecasted traffic volumes between 1,000 and 3,000 vehicles per day.

City of Sacramento Docks Area Concept Plan 2008

The plan aims to create a riverfront mixed-use neighborhood of 1,155 dwelling units, retail, and commercial office space on a compact, pedestrian oriented scale. The triangular project area is bounded

by the Sacramento River to the west, I-5 to the east, and Highway 50 to the south. The plan anticipates increased bus service to the Docks Area as development occurs.

Old Sacramento State Historic Park General Plan 2012

California State Parks is in the process of developing a General Plan for the Old Sacramento State Historic Park. This plan will provide a long-term vision of the future of the park, and will include numerous enhancements to existing components of the park, as well as new facilities including construction of the Railroad Technology Museum located in the Railyards. Other components of the Preferred Alternative Plan include pedestrian/bicycle circulation improvements, expanded excursion train operations, and a horse-drawn streetcar serving Old Sacramento via a loop route along 2nd Street, I Street, Front Street, and L Street.

I-5 Riverfront Reconnection Project 2000-2011

This project, formerly known as "Bridging I-5," would realign Front Street between O Street and L Street, construct a new overcrossing of I-5 at N Street, and construct a new at-grade intersection at Capitol Mall/Front Street. Additionally, the project would reconfigure Capitol Mall to include Class II on-street bicycle lanes alongside two travel lanes in each direction between Neasham Circle and 3rd Street, and construct bicycle/pedestrian improvements on the existing O Street overcrossing. Construction of the project would improve access to the riverfront and Old Sacramento for all modes of travel, and relieve traffic at the Capitol Mall/Neasham Circle intersection by providing an additional gateway to Old Sacramento from Capitol Mall. After completion of the environmental review process and final design, construction of the project could begin as early as 2014.

Merged Downtown Sacramento Redevelopment Project Area Implementation Plan 2005-2009

The Redevelopment Agency works to improve neighborhoods and the economic base of Downtown Sacramento through transformation of blighted areas within downtown. The plan presents a process and framework to present specific development plans, set priorities for specific projects, and propose solutions. The 2020 build out scenario contains growth in residential dwellings, retail, office, and commercial square footage. Projections estimate a net increase of 2.4 million square feet of non-residential development and 1,185 dwelling units. Planned growth would lead to an increase in travel demand and a corresponding increase in congestion.

R Street Corridor Plan 1996/2007

The R Street Corridor Special Planning District encompasses 54 blocks bounded by Q Street on the north, S Street on the south, the I-5 Freeway on the west, and 29th Street on the east. The R Street Corridor Plan envisions the long-term transformation of the corridor from current heavy commercial, warehouse, and office character to a mixed-use district containing a variety of residential, office, and support commercial uses. The corridor is currently served by light rail, offering opportunities for transit supportive development. Additional future enhancements to bus or shuttle service are proposed. Additionally, pedestrian friendly crossing and other infrastructure is recognized as important to maximizing transit ridership. The plan establishes policies to create a pedestrian scale street.

Construction of Phase 1 streetscape improvements on R Street between 10th and 13th Streets is currently underway, with a second Phase planned between 16th and 18th Streets. Both projects include the construction of new sidewalks and installation of pedestrian amenities to improve walkability along the corridor.

Sacramento Intermodal Facility Technical Reports 2003-2009

The Sacramento Intermodal Facility (SITF) will serve as a regional hub and transfer point by bringing together passenger rail, light rail, bus service, bicyclists, pedestrians, taxicabs, and automobiles. Circulation for transit services would improve to meet the distinct operational requirements of operators. The *Final Conceptual Transit and Joint Development Programs* anticipates 12 local RT bus routes serving the SITF, with rerouted downtown alignments. Although few of the regional service providers indicated plans to shift operations to SITF at this time, realignments are anticipated and accommodated in the plan. Implementation of SITF will create multiple circulation access points to the facility.

Ongoing planning efforts surrounding the possibility of locating a new sports and entertainment arena on the site of the proposed intermodal facility may have significant impacts of the site's design and function. As plans for a potential arena become more finalized the impact on downtown circulation can be better evaluated.

Sacramento Region State Office Planning Study 2008

The study identifies opportunity areas for expanding state office space in the next ten years throughout the Sacramento region, of particular note are the sites considered in downtown. In the near term a total potential of 10 million net square feet of state office space is identified. The proposed downtown sites are located along either existing or planned light rail service, consistent with the study's approach of locating State facilities adjacent to public transportation. Development of the additional office space could represent opportunities for expanded transit ridership into and within downtown.

Capitol Area Plan Progress Report 2011

The Capitol Area Plan guides the smart growth development of the Capitol Area blending State office functions with retail and residential elements in a sustainable, transit-oriented manner. The State currently has 33 office buildings totaling over 7 million net square feet of office space. The progress report covers the accomplishments of 2010 within the plan area, including progress on future office development plans, planning and land sales for new housing developments, and streetscape and light rail station improvements.

State Your Mode 2009 State Employee Commute Survey Final Results 2009

A 2009 transportation survey of State employees in the Sacramento region collected information on commute choices and patterns. Within the core Sacramento area 36 percent of workers reported using public transit to commute and 34 percent drove alone, compared with 27 percent using transit and 45 percent driving alone region-wide. The top three reasons to increase transit use would be telework, more frequent transit service, and monthly cash subsidy for alternative commute mode.

City of Sacramento Climate Action Plan 2010-2011

Currently under development, the Climate Action Plan (CAP) will identify how the City and community can reduce greenhouse gas emissions while adapting to the effects of climate change. An overview of the CAP lists sustainable land use and mobility as a proposed category of action. Example action measures in the sustainable land use and mobility category include reducing vehicle miles travelled, lower parking requirements, parking pricing, increasing pedestrian/bike/transit use, and infill/mixed use neighborhoods. The CAP represents a policy level impact on Downtown Sacramento circulation with potential additional transit intensity as a result of the CAP's proposed actions.

Sacramento River Crossing Alternatives Study 2011

This study explored the need for new crossings of the Sacramento River, as well as modifications to existing crossings, in an effort to improve connectivity between Sacramento and West Sacramento. Future crossings will serve a mix of motor vehicles, transit, bicycles, and pedestrians. The study, adopted by both the Sacramento and West Sacramento City Councils, recommends the development of two new crossings including one in the "north market" area north of Tower Bridge and one in the "south market" area. New crossings would enhance connectivity across the river to shorten trip lengths, reduce delays, and enable multimodal options including pedestrian/bike, transit, and vehicles. Selecting specific bridge location alternatives would involve preliminary engineering and additional study and review.

River District Specific Plan 2010-2011

The plan envisions the development of a mixed-use community combining existing light industrial uses with a mixture of residential and retail/commercial infill. Specific to circulation, the plan establishes goals of extending the grid to connect to surrounding neighborhoods and providing a pedestrian and bicycle friendly environment inclusive of ongoing projects. Goals include maximizing public transit connections within the River District, including facilitating transfers between bus and light rail. As the area redevelops and demand increases, an increased level of transit service is proposed to accommodate travel demand and connect to the Sacramento Intermodal Transportation Facility. The circulation element includes provisions for inclusion of pedestrian and bicycle paths, lanes, and routes.

The Central City Bike Access Study Phase I Analysis 2008

The Central City Bike Access Study Phase I Analysis evaluated the level of service (LOS) impact of converting existing three lane one-way streets into two lanes with a dedicated on-street bike lane. Proposed street segments were grouped into three categories: conversion would not impact the City's LOS C standard (previous standard in place at the time this plan was developed), conversion could potentially occur if City adopts LOS E standard, and conversion would create LOS F conditions and should not be converted. The corridors recommended for further study include:

- 5th Street between H Street and Broadway
- 9th Street between I Street and Broadway
- G Street between 7th Street and 16th Street
- H Street between 9th Street and 16th Street
- I Street between 16th Street and 21st Street
- N Street between 3rd Street and 15th Street
- P Street between 5th Street and 15th Street
- Q Street between 5th Street and 15th Street

Key Issues

Several key issues were identified based on the study review and discussions with the project Technical Advisory Committee (TAC). The following key issues represent areas of emphasis that the Downtown Sacramento Transit Circulation and Facilities Plan will address.

Integration with concurrent planning efforts

A number of major planning projects are currently underway in the downtown Sacramento area, each carrying the potential to significantly impact future transit operations and downtown traffic. A key element of the Downtown Sacramento Transit Circulation and Facilities Plan is to ensure that the plan is responsive to other planning efforts within the study area, including:

- The reintroduction of vehicular traffic on K Street and the associated impact on light rail and streetcar operations
- The creation of a downtown streetcar network and the associated impact on light rail operations and downtown traffic
- Future development of the Railyards and associated activity centers (e.g. intermodal facility, potential downtown Sports and Entertainment Complex)
- Incorporation of recommendations from the Sacramento Regional Transit Comprehensive Operational Analysis (*Transit Renewal*) and Sacramento Streetcar Planning study
- Promotion of increased multi-modal coordination

Stop locations

Securing preferred downtown bus stop locations poses a number of issues for downtown transit operators and stakeholders:

- Utilizing curb space for bus stops instead of revenue-generating street parking leads to a contentious situation
- Business owners may be adverse to having a bus stop near their storefronts due to visibility issues or opposition to having transit patrons waiting on the sidewalk
- Far-side bus stops, while considered safer for pedestrians and more efficient operationally, have the potential to clog intersections and limit bus stops to a single vehicle at a time

The plan will strive to recommend bus stop locations that meet the customer and operational needs for transit operators while minimizing the impact on other downtown stakeholders.

Downtown bus routing

Selecting downtown bus routings that minimize travel times through downtown while also penetrating the downtown transit market provides a two-fold benefit for transit operators: increased operational savings and improved quality of service for the customer. The plan will identify downtown corridors where bus service is most appropriate (for both local and commuter bus services) to allow downtown transit operators to realize these benefits. Elements that may affect the selection of downtown bus routings include proximity to major downtown activity centers, coordination with rail services (both light rail and future streetcar), and the potential to implement transit enhancements on select corridors.

Implementing and leveraging policy commitment to operational improvements, transit technology improvements, on/in street improvements, streetside improvements, and facility improvements

Focused transit service design is capable of delivering an adequate transit product within the existing downtown Sacramento transit environment. However, in order to maximize the benefit of downtown transit services, downtown stakeholders must commit to facilitating the development of a transit-first environment. A policy-driven, coordinated effort by downtown transit operators and stakeholders will ensure the development of a robust downtown transit system free of detriment to stakeholder interests. The stakeholder outreach portion of the plan aims to build consensus among stakeholders to foster stakeholder ownership of the study and its recommendations and allow for continual coordination.

Next Steps

The information compiled in this study review will provide background context throughout the Downtown Sacramento Transit Circulation and Facilities Plan. The plan will build upon previous transit and development plans and work concurrently with ongoing planning efforts. Together with the existing and future conditions review, the study review will serve as support for the development of project alternatives for transit enhancements in downtown Sacramento. The major issues identified will be addressed by specific recommendations produced in the plan.

Stakeholder Focus Group Meeting

January 20, 2012

10:00 – 12:00 p.m. and 1:00 – 3:00 p.m.
SACOG Offices, 1415 L Street, Sacramento

ORGANIZATIONS REPRESENTED
David S. Taylor Interests
Domus Development
Fulcrum Property
Old Sacramento Business Association
Downtown Sacramento Partnership
River District
City of Sacramento, Economic Development
Westfield Downtown Plaza
Department of General Services
CA State Parks
Sacramento Metropolitan Air Quality Management District (SMAQMD)
Alkali Flats Neighborhood Association
WALK Sacramento
Sacramento Area Bicycle Advocates (SABA)

PROJECT TEAM
Jim Brown, SACOG
Victoria Cacciatore, SACOG
Russ Chisholm, TMD
Greg Behrens, TMD
Michael Couvrette, TMD
Gladys Cornell, AIM Consulting
Ciara Zanze, AIM Consulting

MEETING OBJECTIVES

- Shared understanding of the purpose and process of the study
- Shared understanding of existing and future conditions
- Identify potential solutions to enhance the quality of transit service for customers and improve transit operations
- Improve transit facilities within the Downtown area

PROJECT OVERVIEW

- Review of study goals and objectives, schedule, and project study area.

STAKEHOLDER DISCUSSION

Perceived key mobility issues:

Stakeholders were asked to identify the perceived mobility issues in the project area. There was general discussion of inadequate service for short intra-city trips and the need for an 'urban circulator' in the core downtown area. Stakeholders noted that local transit caters to commuters to downtown. There is also a perceived stigma associated with taking public transit, which may be resolved with better branding and targeting to younger generations. It was also noted that current stops and routes do not facilitate walking and biking to and from transit stops.

Stakeholder feedback:

What are some of the key mobility issues faced in downtown Sacramento?

- Transit needs to be more accessible for visitors to the Sacramento region. It doesn't seem to go to many of Sacramento tourist sites, e.g., museums, etc. Visitors need to easily identify transit stops. Also, currently there is no way-finding signage to destinations. Business Improvement Districts and RT should collaborate on marketing efforts for tourists.
- We have a lot of accessible and inexpensive parking in the downtown and midtown areas. This makes it more challenging for a transit option. If RT wants to capture more riders then they should consider how to make the short downtown/midtown trips less expensive then longer commuter trips and create higher frequencies. Nobody wants to wait 15/30 minute intervals for the next ride.
- Transit routes are not going to key office locations – i.e. State offices in Natomas
- Downtown bus stops are an outdated design. They should have "real-time" rider information, better visibility and amenities (including benches and shade structures).
- Bus stops don't fit within the city fabric.
- RT is not convenient. We need an urban circulator for short trips.
- Bus stops slow traffic down
- Transit suffers from a negative perception/stigma. Many potential users don't feel it is safe. Need to create and project a safer environment both on the light rail/buses and at the stops.
- We are concerned that the River District will become the low cost parking option for commuters. How can we build on transit oriented development in the River District and discourage the use of the new RT light rail station from becoming a park and ride for commuters in South and North Natomas?
- Walkability around transit is not very good. Light rail stops often create physical barriers for pedestrians.
- Transit caters to those who lack another transportation/commute option

Suggested Potential Transit Improvements: Looking to the future, how to resolve issues

Stakeholders were asked to suggest potential transit improvements that might resolve the perceived mobility issues. There was a general discussion about the need for increased marketing of existing service as well as creating a brand to attract new riders, make transit more attractive, and help potential customers understand the benefits of taking transit.

Stakeholders also noted that existing routes are not well connected and are difficult to follow. It would be beneficial to create a simplified transit system that would be friendly to local riders as well as tourists. Some suggestions and comments on proposed toolbox improvements were also noted.

Stakeholder feedback:

How would you like to see transit issues resolved?

- Getting to transit in a safe way – one way streets create high speed environment. We need to find ways to reduce the speed of vehicle traffic around transit stops. Lack of continuous bike routes makes it difficult for the "last mile"; the last segment from transit to destination.
- The City of Sacramento is currently updating their pedestrian plan. Now would be a good time to find ways to consider how best to incorporate transit into a walkable environment.
- Branding and marketing is very important, especially to the younger population. Branding transit and communicating to the public does not happen in Sacramento. Look at the Portland model. The transit provider puts their logos on everything. Change the perception of transit, i.e., transit is not just for those who have no other option. Make transit cool. Utilize more opportunity to sell ads and generate revenue.
- Need to find ways to increase visibility of transit for tourists. Improve links from routes to locations – make it easy for people to follow, bread crumb trail
    - Education, show walking distance
    - How to make the transition from transit to walking – show "convenient to…"
    - Have transit be your guide around the city, bus stops as a transition to walking
    - Way-finding is an issue, make the systems cohesive, do it on a broad basis so everything has an identity but flows together
    - Build on way-finding in the core central city
    - Privatize – Downtown partnership – info kiosks for tourists
- Encourage more RT engagement with the private sector. State employees could drive a transit initiative – get majority on transit, since a significant state workforce is employed downtown. Transit providers need to work with employers to find creative ways to encourage transit use, such as increase subsidies for transit passes
- Think about a comprehensive transportation system.
    - Promote connectivity of the Central City and also West Sacramento.
    - Like the idea of queue jumps; it would facilitate transit movement with signal priority.

    - RT cuts off at the Sacramento River. This is a barrier to new development.
    - Need a transit loop system for Broadway
    - Consider creating a transit center/hub for all operators and use RT to disperse to local destinations.
    - Property near the Sacramento river slated for redevelopment
    - Get transit to serve the short trips
    - Need to better align transit and building policy
    - Consider the land use consequences
    - Hope solution doesn't focus on immediate short term fiscal savings
- Have more amenities: comfort, seats, lighting, shade, make them well maintained and walkable
    - Want to know when the bus is coming, real time information
    - We need to better integrate bus stops into the urban fabric
    - Queue jumps facilitate transit movement
    - Downtown has the space to add bus lanes
    - A bike/bus shared lane would be a win/win and easy to do
    - Low floor stations are better

Feedback on Existing Conditions:

Stakeholders were asked to provide feedback on existing service and conditions. Discussion focused on adjusting bus stop spacing to create faster service and promote walking and cycling. It was also noted that current signage is not easy to follow, and transit stops should be coordinated with key city destinations that are highlighted on existing way-finding signage in the downtown area. There was also a discussion about a lack of targeted marketing and the need to address current perception that transit is not always safe for riders.

Stakeholder feedback:

Which corridors do you experience the greatest delays? Which corridors do you see as having the greatest number of conflicts? Which bus stops are the most problematic?

Bus Stops and Spacing

- Spacing stops three blocks or more apart may be problematic during the afternoon summer heat
- From environmental standpoint, the farther apart the bus stops the better, could be 4-5 blocks
- How do you deal with other buses stopping at the same time? Avoid queuing.
- Incorporate ITS with smart phone app for transit users to receive real time transit information.
- RT needs to market existing applications that are available for transit users.
- Bus stops can become barriers to pedestrian access to commercial activities.
- Parking issues/directional signage issues for tourists – people don't know transit is available
    - Not educated on transit

    - Frequency of transit it not friendly to tourists

Land Use

- Developers have a hard time working with RT "shifting sands"
    - There is a lot of shared interest
    - It could be a deterrent to other potential developers
- Need more connections between West Sac and downtown – convenience, easier to drive
- Need timely connections between Sac and West Sac
- LRT on K Street – LRT stations are adjacent to chronic vacant locations
- Broadway is an example of how and why transit does not work – 37 RT stops along Broadway; perhaps a loop system would work better.
- Way-finding was not coordinated with transit points, have transit serve the highlighted locations on the way-finding signage located around town.

Pedestrian/Bike integration

- More riders would take light rail and then bike if it was easier to get bikes on light rail
    - No continuous routes for cyclists
    - J Street to 15th Street is a "nightmare" for cyclists
    - No bike lanes on 15th and 16th

Transit User Experience

- Driving is faster i.e. 8 minutes to drive time vs. 50+ minutes bus time
- Used to commute from East Sac to downtown for work but the time and cost was greater than driving
- Bus stops too often and runs behind schedule
- Relationship between driver and rider – no regulation (i.e. bus driver will not ask a rider to turn down loud music etc.) bad experiences on bus makes you not want to ride again
- We don't really have 'regional transit' we have 12 separate operators. Better coordination between transit providers would make a better experience for users.
- Bring the State into the conversation, State employees – get them on transit
- SAC TMA offer incentives?

Public Perception/Marketing

- Marketing – bad info flows out when there is no info
- Safety is a huge neighborhood concern when considering transit. Connectivity is not as big of an issue as safety. It is not perception as much as reality for some areas (i.e. La Valentina Station)
- Safety concerns decrease transit usage among the middle class
    - Part of the problem is no fare collection/regulation on light rail
    - Perception of people who ride light rail
    - Fear of theft/assault

- Advertising is negative, makes people think they will get robbed i.e. signs that say watch your wallet – builds perception

Does your organization have any mobility initiatives? What are they?

- DGS – transit subsidy, State initiative to locate offices within ½ mile to transit

NEXT STEPS

- Stakeholders requested electronic copies of the presentation
- Next meeting will likely be in April

SACOG Downtown Transit Circulation and Facilities Study

Stakeholder One-on-One Meeting

Fran Halbakken, Railyards Program Manager

March 7, 2012

Fran serves as the City's infrastructure program manager for the Railyards project. Fran highlighted the most recent infrastructure work completed or in progress at the project.

The City is responsible for the intermodal terminal but the entire project including the private development is a TOD project. The overall development plan currently has the west end dedicated to retail and the east end residential with one station. She thought that the plan would need to be changed because it has too much retail.

The plan calls for ½ hour headways for light rail. No final plan on the location of the intermodal station. At the moment the Sports and Entertainment facility architect is recommending placing the intermodal station in the far west corner nearest the freeway and the S&E facility in the eastern corner of the site. The city recognizes this is not the best solution for making the intermodal terminal a user friendly facility. However, they are also very sensitive to the S&E team's concern regarding the lack of space for loading docks, if the S&E facility is located in the west side of the site. The loading docks are a very critical component to the facility. The city is also aware that the current proposed site plan does not correspond to the ULI Daniel Rose Fellowship recommendations based upon a Technical Assistance Plan completed by a team of national experts. Fran stated the City plans to re-engage members of the ULI national team to brainstorm a potential solution. Everything is still very much in flux. Location will be sorted out through the environmental process. AECOM is the prime consultant for the environmental process.

Currently RT is considering having light rail loop around the facility and RT wants to store cars on the loop around the S&E facility. The team expressed concern about the location of the light rail alignment as this could create a pedestrian barrier. Also, there is still a question about how the proposed streetcar will be integrated into the site. Fran expressed a need to implement a fully operational simulation for the streetcar.

Another issue is the NBA requirement for a 1,000 space premium parking garage and hotel near the site. These requirements are also further constraining an already constrained site. Fran mentioned that the parking facility may have a joint use with the proposed County courthouse.

Current schedule is for the S&E facility is:

Design start – April 2012

Construction starts – April 2013

S&E facility opens – September 2015

Status of other development projects:

1. Depot: The transportation terminal is dependent on funding. The city is applying for a TIGER grant for the depot.
2. Courts: Original schedule was 2015. Could be pushed back 2 to 3 years. State took some of the money for the project.
3. Affordable housing: had redevelopment funding, but now that is questionable.

Stakeholder Focus Group Meeting

May 31, 2012

9:00 – 11:00 p.m. and 1:00 – 3:00 p.m.
SACOG Offices, 1415 L Street, Sacramento

ORGANIZATIONS REPRESENTED
Department of General Services
California State Parks
Westfield Downtown Plaza
The River District
City of Sacramento, Department of Economic Development
WALK Sacramento
Downtown Sacramento Partnership
Caltrans, District 3
Sacramento Convention Center

PROJECT TEAM
Jim Brown, SACOG
Victoria Cacciatore, SACOG
Russ Chisholm, TMD
Michael Couvrette, TMD
Gladys Cornell, AIM Consulting
Ciara Zanze, AIM Consulting

MEETING OBJECTIVES

- Review the purpose and process of the study
- Overview of existing and future conditions / study area
- Review stakeholder feedback received to date / survey results
- Present draft recommendations
- Receive feedback on draft recommendations

PROJECT OVERVIEW

- Review of study goals, objectives, and implementation process
- Review of stakeholder feedback

Stakeholder Feedback:

Draft Plan:
Stakeholders were asked to comment on specific elements of the draft recommendations. There was general agreement that the grouping of transit stops and the addition of dedicated bus lanes would improve transit circulation in downtown. Many stakeholders had questions about how and where bus lanes and amenities would be implemented. Stakeholders raised concerns about the addition of more stop amenities when it was noted that existing stop amenities are not maintained and add to the negative perception of transit.

Questions and comments:

- Are there impacts to the movement of traffic with the addition of bus lanes? Do they create a slow down if one lane of traffic is removed?
    - The addition of bus lanes can generally streamline traffic; minor signal timing changes will occur along with the implementation of the bus lanes.
- The area around the Citizen Hotel and the Sheraton already have congestion with valet parking and vehicles pulling out into traffic, what effect will bus lanes have on this area?
    - The bus lanes would allow for queuing space which should reduce congestion.
- How was the potential ESC at the Railyards considered in relation to the final plan?
    - Putting transit on J will put people about a block away or a walkable distance, walking creates an opportunity for people to linger, visit businesses.
- The plan recommends adding three bus bulbs near the Westfield Downtown Plaza, concerned that this will bring more transients into the area. One potential bulb is located in front of an office building; this may discourage leasing the office. The additions of bus bulbs or stop amenities are good in theory, but the reality is they are not kept clean or maintained.
    - Maintenance is considered in cost analysis and new stops are designed to discourage sleeping on seats.
- Amenities that are not maintained are not amenities.
- Important to focus on maintenance, non-maintained amenities add to negative perception.
- Like the idea of grouping stops, hate waiting on the bus while it stops at every stop.
- Safety concern for shared bus/bike lanes, especially for a casual cyclist.
- What would the width of the lanes be on J Street?
    - Current plan is two traffic lanes, with one bus lane.
- If J Street only has two lanes for traffic, will local streets have increased traffic?
    - Still looking at traffic patterns.
- Caltrans has a concern for J Street if the addition of bus lanes results in queuing and backing up near freeway onramp.
    - Spent a lot of focus on J and 3rd, the queuing should improve with the new plan.
- How would bus lanes be imposed? What about parking?

    - 2 lanes + bus still have parking. Bulbs can result in additional parking; don't need as much space to pull into traffic.
- Create a shelter that works for both sun and rain; people waiting won't back up against the building for cover.
- Seating at stops is important, it is nice to be able to sit down and wait at every stop, especially for those who use transit to commute to/from work.
- Ease, information and timeliness is most important for visitors form out of town. Real time information would entice visitors to use transit if they knew the next bus would be coming in 10 mins.

Phasing and schedule:
Stakeholders raised questions regarding the phasing and implementation schedule for the recommendations, including when recommendations would be implemented and what would be included in the final report. In general, stakeholders felt very strongly that a strong marketing campaign should be included with every proposed phase of implementation. In addition, stakeholders noted that including certain recommendations in the final report could be used as a tool to move the recommendations forward to implementation more quickly.

<u>Questions and comments:</u>
- When does the immediate 1-3 years phase start?
    - Phase one of implementation could begin at the conclusion of this study if the plan is accepted.
- What feedback have you received from RT regarding the plan?
    - RT has been receptive of the plan; overall they liked grouping stops, spacing distance between stops and walking distances.
- How will the public be informed of the changes when implementation begins?
    - When implementation of stop grouping occurs, area maps and stop information will be available at stop locations.
- Maps and information kiosks will be important when changes are introduced.
- Is light rail included in the route map?
    - Yes, tried to get the buses to move with the trains, signal priority would also help accomplish this. The plan is also taking into account future transit plans, and incorporating possible shared stops, for example a shared streetcar and bus stop.
- Does the plan address changing the location of light rail stations? In the downtown area some stops are too close together. For example, 7th street has two stations within a block of each other.
    - The plan does not make many light rail recommendations because of the future changes that are underway with the addition of the green line extension and eventually streetcar.

- Will the report make recommendations regarding the current light rail platform stations? Having the recommendation in the report could be a catalyst for change and a way to move the change forward more quickly.
    - The report will address having a more consistent amenities and stop look. Will follow up with RT regarding the light rail stop recommendation, it could be included in the long term phasing plan.
- Marketing is important early on in the implementation plan; should consider including it in earlier phases to attract more riders in anticipation of better amenities.
- Ridership experience is important; people have a negative perception of transit and it is important to address that along with the recommended plan.
- Currently transit has an image problem; "special transit" would be a draw (i.e. streetcar)
- Concerned about the public perception of transit, how and where is marketing included in the phasing plan?
    - Initially thought to include marketing in the last phase of implementing high level amenities, however it is clear after this discussion that it should be included throughout the phases.
- Important to have a positive marketing campaign, compared to the current "negative" campaign.
- How can transit providers market the entire experience and promote mobility? Make it attractive.
- Large part of marketing is price; currently RT is expensive, it is $5 for a round trip pass and for $6 you can drive and park downtown. Can parking prices be raised to make transit look more affordable?
- Suggest that RT bring back the central city fare and/or the DASH program.
- Way finding within the central city should be coordinated to have a cohesive look and feel. Inconsistent way finding signs can be misleading

1. BUS STOPS AND TRAIN STATIONS Which bus stop and train station improvements would make the biggest difference? (Please choose by level of importance, 5 being HIGH importance, 1 being LOW importance.)

	1	2	3	4	5	Response Count
Level Boarding Platforms	11.9% (5)	11.9% (5)	**26.2% (11)**	**26.2% (11)**	23.8% (10)	42
Passenger Pre-Queuing	17.9% (7)	20.5% (8)	**33.3% (13)**	20.5% (8)	7.7% (3)	39
Real Time Transit Information	4.7% (2)	2.3% (1)	0.0% (0)	30.2% (13)	**62.8% (27)**	43
Off-Vehicle Fare Payment	7.3% (3)	9.8% (4)	19.5% (8)	**31.7% (13)**	**31.7% (13)**	41
Bus Shelters	2.2% (1)	13.3% (6)	22.2% (10)	26.7% (12)	**35.6% (16)**	45
					answered question	**46**
					skipped question	**1**

2. RIGHT OF WAY ENHANCEMENTS Which right of way enhancements would make the biggest difference? (Please choose by level of importance, 5 being HIGH importance, 1 being LOW importance.)

	1	2	3	4	5	Response Count
Bus Bulbs / Boarding Islands	12.2% (5)	9.8% (4)	22.0% (9)	**39.0% (16)**	17.1% (7)	41
Bus Stop Length	7.5% (3)	25.0% (10)	25.0% (10)	**27.5% (11)**	15.0% (6)	40
Bus Stop Spacing	11.6% (5)	14.0% (6)	16.3% (7)	**41.9% (18)**	16.3% (7)	43
Stop Location	7.0% (3)	4.7% (2)	4.7% (2)	**44.2% (19)**	39.5% (17)	43
					answered question	**45**
					skipped question	**2**

3. INTELLIGENT TRANSPORTATION SYSTEMS Which Intelligent Transportation System improvement would make the biggest difference? (Please choose by level of importance, 5 being HIGH importance, 1 being LOW importance.)

	1	2	3	4	5	Response Count
Bus Signal Priority	2.3% (1)	4.5% (2)	18.2% (8)	**47.7% (21)**	27.3% (12)	44
Real Time information	4.7% (2)	0.0% (0)	7.0% (3)	23.3% (10)	**65.1% (28)**	43
Automated Vehicle Location / Radio Location	2.4% (1)	7.1% (3)	16.7% (7)	**47.6% (20)**	26.2% (11)	42
					answered question	**45**
					skipped question	**2**

4. SERVICE DESIGN AND OPERATING PRACTICE Which service design and operating practice would make the biggest difference? (Please choose by level of importance, 5 being HIGH importance, 1 being LOW importance.)

	1	2	3	4	5	Response Count
Route Alignment	0.0% (0)	9.1% (4)	18.2% (8)	**40.9% (18)**	31.8% (14)	44
Maximize Service Frequencies	4.8% (2)	2.4% (1)	14.3% (6)	23.8% (10)	**54.8% (23)**	42
Headway-Based Schedules	2.6% (1)	10.5% (4)	28.9% (11)	**34.2% (13)**	23.7% (9)	38
Policing of Transit Priority	2.4% (1)	14.6% (6)	22.0% (9)	**34.1% (14)**	26.8% (11)	41
					answered question	**44**
					skipped question	**3**

5. Check if you: (pick all that apply)

		Response Percent	Response Count
Live in Downtown Sacramento		9.3%	4
Work in Downtown Sacramento		**97.7%**	**42**
		answered question	**43**
		skipped question	**4**

6. Is the organization you represent a: (check only one answer)

	Response Percent	Response Count
Major Employer / Business Association	**60.5%**	**26**
Property Owner	2.3%	1
Developer	4.7%	2
Neighborhood Association	11.6%	5
Transit Advocate	4.7%	2
Cycling Advocate	4.7%	2
Pedestrian Advocate	11.6%	5
	answered question	**43**
	skipped question	**4**

Regional Transit

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June 14, 2012

Jim Brown
Supervising Senior Planner
Sacramento Area Council of Governments
1415 L Street, Suite 300
Sacramento, California 95814

Dear Mr. Brown:

This letter is to document RT's support for the Downtown Circulation Study that SACOG will soon be completing, as well as to identify areas that are of concern. My staff and I appreciate the opportunity to participate as members of the Technical Advisory Committee and we look forward to continuing the constructive relationship as follow-up work progresses with the City of Sacramento's upcoming Downtown Transportation Study.

RT supports the project goals of simpler bus routing, reduced delay, and improved passenger waiting areas. The study has also done a good job identifying a number of opportunities for improvement and demonstrating some promising design options. At this point however, RT remians skeptical as to whether or not the project recommendations, as of the final TAC meeting on Thursday, June 14, 2012, would yield an overall benefit. The attached memorandum has been prepared to specify RT's concerns, as well as identify a number of specific areas where the plan may be improved.

In light of RT's contractual arrangement with the City of Sacramento, whereby the cost and administrative burden of constructing, removing, and maintaining bus stops for all regional carriers is shared by RT and the City, RT requires that the current procedure for approval of bus stop changes, whereby the City delegates final authority to RT, remain unaltered. The practical implication of this condition is that all changes to bus stops recommended in the Downtown Circulation Study should be considered an initial recommendation and a demonstration of a concept, but not an approved plan of action.

Finally, in regards to the larger context in which the Downtown Circulation Study has been pursued, specifically, a proposal by the City to reduce J Street from three lanes to two lanes, RT has concerns that such a proposal could be detrimental both to transit operations and to overall mobility. While the final decision on the lane reduction is outside the scope of SACOG's study, and while it is premature to draw any

conclusions about the overall impacts of such a lane reduction, I want to be forthright and candid in expressing RT's concern, so it can be taken into consideration, along with the remainder of the study findings, as the broader plan progresses. A more detailed discussion on this topic can be found in the attached memorandum.

Thank you again for your dedicated work on this project and for the opportunity to contribute.

Sincerely Yours,

James A. Drake for
Tom Quigley
Director of Planning

c: Mike Wiley, General Manager/CEO
Mike Mattos, Chief of Facilities and Business Support Services
Mark Lonergan, Chief of Operations
RoseMary Covington, AGM of Planning and Transit System Development
Fedolia "Sparky" Harris, City of Sacramento

REGIONAL TRANSIT MEMO

DATE: June 14, 2012

TO: Tom Quigley, Director of Planning

FROM: James Drake, Service Planner JD

SUBJ: SACOG Downtown Circulation Study

The subject of this memorandum is SACOG's Downtown Circulation Study, which has been under way for most of the past year and is set to conclude at the end of the month. The study findings are expected to be inputs into a broader Downtown Transportation Study by the City of Sacramento. RT has been an active member of the study's Technical Advisory Committee for the duration of the TAC. This memorandum attempts to capture the consensus concerns, which have been expressed in working sessions over the duration of the project, and to formalize them into writing. The scope of this memorandum includes concerns with both the general thrust as well as specific elements of the project.

Project Context

The context of this project is that the City of Sacramento is considering a lane reduction for J Street from 3 to 2 auto lanes, along with installation of a bicycle lane. The Downtown Circulation Study assumes this is the base case. The study proposes that one of the existing three lanes be retained and designated for buses only, which all TAC participants agree would be preferable to a straight reduction to two lanes.

While the overall impact of a lane reduction is beyond the scope of the current study, RT participants in the TAC share concern about this proposal. The impacts of a 3-to-2 lane reduction on J Street were documented in the project's traffic study. Not surprisingly, it found that congestion would worsen on J Street, resulting in deflection of cars onto H Street. J Street currently carries about 2,000 vehicles per hour at peak on three arterial lanes, each of which, as a rule of thumb, can handle about 600 vehicles per hour, i.e., it is already near or over capacity at peak. To install bicycle lanes on J Street, which is the main outlet for Interstate 5, seems certain to negatively impact congestion, mobility, and air quality. Moreover, if a lane is taken, traffic congestion could become so bad that when RT adds trains downtown (from the Green Line, the Downtown Streetcar, and possibly limited stop service), it could result in a major gridlock problem. The problems are not as severe for RT as for general motorists; however, even with a bus lane, buses will still be affected by congestion in auto lanes whenever they leave the bus lane to pass or make left turns, or if intersections become gridlocked.

There is probably no question that buses are better off with their own lane than sharing two lanes with automobiles. However, it is premature to conclude that a bus lane would speed up buses and bicycles, and that only autos will be slowed down. Although this is

plausible, it was not a finding of the traffic study. What the study found was an increase in transit level of service; however, as Fehr and Peers confirmed, transit LOS is primarily an indication of the number of buses per hour on the street. Since relocation of bus routes to J Street is an assumption of the project, to state that the transit LOS will increase is merely a restatement of the assumptions. Although they were firm in their assertions that bus speeds would be improved, the consultants were not able to quantify these assertions by delay category or in aggregate. They have acknowledged that such an analysis is outside the scope of the project, to presumably be conducted during the City of Sacramento's follow-up study.

The bus lane should reduce delay from merging and congestion; however, there are still a number of troubling unknowns. Buses will have to leave the bus lanes for passing and for left turns; automobiles will enter the bus lanes for parking, for right turns, for driveway access, and in violation of the lane restriction; cars will periodically park in the peak-only bus stops; and buses stopped at bus bulbs may increase queuing. The interaction with the rail system is particularly concerning, but was not within the scope of the traffic study. Until a full simulation is carried out, it is therefore premature to conclude that a lane reduction would improve transit speeds overall, even if a bus lane is retained.

Route Realignments

Assuming the lane reduction to be a certainty, and acknowledging that a bus lane is obviously better than no lane, another question still remains: Should non-RT expresses be relocated from their current scattered routes to a new standardized J/15th/P Street loop? Even with a bus lane, the benefits of the proposed reorganization remain questionable. They certainly have not been quantified. It's plausible that the plan would actually be worse for both RT and non-RT riders.

The proposed relocation of Yolobus expresses from 9th/10th Street and L Street to the new J/15th/P Street loop, along with the corresponding removal of most stops on 9th/10th Street is of questionable benefit. Currently, 9th Street has some of the best stops downtown, with large, flat, shaded concrete areas with shelters, many of which are minimally used. 10th Street, though it has only one major stop at N Street, is probably the single most popular stop for Yolobus expresses in the afternoon, and it is largely by choice. Yolobus riders who arrive via another bus or light rail often choose to wait at that stop for its combination of visibility, capacity, and shade. The minor addition of benches would make it a great stop. Moreover, the fact that 9th/10th Street is not being recommended for *increased* use constitutes a missed opportunity. Apart from RT Route 38, which runs only hourly, these stops are unused other than by Yolobus expresses, which means that 9th Street is used only for morning drop-off, and 10th Street is used only for afternoon pickup. Why not simply relocate some routes from 7th/8th to 9th/10th Streets? A couple obvious choices would be Routes 2, 3, 6, and 7. The e-Tran routes would be an even better fit, as they use the stops in the morning that Yolobus uses in the afternoon. This would reduce crowding at stops for RT or e-Tran buses remaining on 7th/8th Street, perhaps as much or more than the

consultants' stop separation and capitol improvement proposal for 7th/8th Street, with negligible work, and with less passenger confusion. These stops are in good shape, and ready to use right now. In terms of passenger confusion, if the study assumes the relocation of many routes to a J/15th/P Street loop, certainly a relocation from 7th/8th to 9th/10th Street would have the same or less impact.

The situation is much the same when you consider the relocation of Yolobus expresses from L Street to P Street. L Street west of 7th Street has wide, flat sidewalks, ample waiting areas, and long, easy approaches for buses. P Street, on the other hand, specifically west of 7th Street, where new service is proposed, is usually crowded with parked cars, has narrow, separated sidewalks without waiting areas, is cluttered with parking meters, trees, and other obstructions, and has small bus stops close to the corner of the intersection. To relocate buses from L Street to P Street would seem to create an operational problem where there is none today. Perhaps more importantly, L Street is right next to the Downtown Plaza mall. The ability to get off work, purchase an item at the mall or a snack at a convenience store, before catching one's bus home, is exactly the experience we should be striving to deliver for transit users, not to mention valuable business for mall tenants. P Street in comparison has no significant retail or convenience stores. This is of course why there are few passenger waiting areas on P Street; it is not a commercial area. Not to be overlooked, the relocation of Yolobus expresses from L Street to P Street would separate them from Yolobus Routes 42A and 42B, creating an additional inconvenience for Yolobus riders where there is none today.

Stop Separation

Another area of concern is the proposal to introduce stop separation or skip-stops, i.e., having buses skip certain stops along the route. The basic idea proposed by the consultants is to separate local buses (primarily RT buses) from expresses (primarily non-RT buses), with expresses stopping in turnouts, due to their longer dwell times. Even separated by agency, schemes like this are difficult to understand for the average customer. For customers with mental disabilities or visual impairments, the problem is much worse. A stated goal of the project has been to simplify downtown circulation, which is supported by everyone. Stop separation, however, is not going to make any aspect of catching a bus simpler or easier to understand, and RT will likely be asked to account for the benefits, particularly by the disabled community. In many areas, I question why local and express stops need to be located on entirely different blocks. Why not just enlarge the existing stop and designate one area for locals and one for expresses? On southbound 7th Street, far side of Capitol, the existing bus stop can be very crowded with buses during the afternoon peak; however, there is very little automobile traffic, and plenty of available curb space. Why install a new stop near-side of this intersection when the existing far-side stop could simply be enlarged? The additional area could be subject to peak-only parking restrictions, just like the consultant proposed at the alternate location. By keeping all buses in one basic location, it would not be as confusing for passengers. This same principle could be applied at several other locations.

These are the general concerns voiced by RT TAC members. Based on discussions at the TAC meetings, I suspect many of the non-RT participants are more optimistic about the overall benefits of the plan. Considering that a great deal of the cost and administrative difficulty of implementation will fall to RT, however, we need to be cautious before embarking upon a complicated program of improvements, especially if a simpler program could achieve the same or better results.

Stop-by-Stop Issues

Putting aside the general concerns discussed above and focusing strictly on improving the plan as it is today, the following are suggestions concerning specific areas. Many of these suggestions have been made by RT already, but evidently have not been incorporated into the plan at this point.

- On 7th/8th, Routes 2, 3, 6, and 7 make up a family of routes; that is, they all serve the same general area. For the sake of passenger convenience, they must therefore share stops. Since all four have ridership patterns akin to expresses, with lots of boardings concentrated at one time, the logic used in the study would suggest they continue to use turnouts. On northern sections of 8th Street, this may be necessary so as not to obstruct J and I Streets. However, on many sections of 7th Street, both north of I Street and south of Capitol Avenue, bus bulbs would be helpful for these routes, to provide more passenger waiting space and because the stops are difficult to pull into. Traffic on these parts of 7th Street is not so bad that a bus bulb would cause queuing problems.

- J/3rd (f/s) is identified as a peak-only stop. It needs to be a local stop, as we use it for layover. J/4th (f/s) can be a peak-only stop instead.

- J/6th (f/s) has been eliminated. We need this stop for Route 11, which returned to its normal alignment on Monday 6/11 and which will continue to use this stop until the Green Line is built to Natomas.

- J/8th (n/s) has been relocated to J/7th (f/s) where it is supposed to be a bus bulb. Considering that the far-side J/7th area is used for delivery trucks, an easier solution might be to simply enlarge the existing stop at J/8th (n/s) by adding red curb west of the parking garage driveway, in front of the luggage store. This new area could be a peak-only stop and would merely formalize and better organize how buses are already using this area in the morning. In addition to the concerns about delivery trucks, the proposed site far-side of J/7th could also be a problem, especially as a bus bulb, as proposed, because buses and cars might queue into the intersection, obstructing trains southbound on 7th Street.

- J/8th (f/s) is proposed for express-only, which would be a turnout; however, parking is at a premium here, and might be construed as a significant concession

by the City, which would be more useful elsewhere, especially considering that there appear to be simpler solutions at this intersection, described above.

- J/12th (f/s) is proposed as a new local stop with a bus bulb, far side of light rail tracks, which is a problem because buses and/or autos might queue onto the tracks at 12th Street. ADA grade restrictions are also a concern for a new stop at this location. It would be easier to retain J/11th (f/s) as a local stop. J/10th (f/s) could still become an express stop.

- J/14th at the Convention Center is needed for adequate stop spacing.

- Overall, I dislike adding buses to J Street. Currently, Downtown Sacramento does not have many congested areas. J Street is unfortunately one of them. Why relocate a route to J Street if it doesn't need to be there? This would seem to worsen crowding at J Street bus stops for RT and others that currently use them. I will concede, however, that with a bus lane, this may be acceptable.

- L/14th seems potentially problematic as a bus bulb because it is a layover location for Yolobus. Perhaps Yolobus should be designated to use the turnout in front of the hotel, and the on-street stop should be designated RT-only, to reduce confusion among Yolobus riders, and to keep the stop open for RT buses.

- L/9th (f/s) if turned into a bus bulb as proposed seems like it would create a difficult right turn for Routes 11, 86, 88 etc. coming from southbound 9th Street.

- L/8th (f/s) - Why do we need a new stop here, especially for expresses? What expresses will use this stop if Yolobus expresses are rerouted to J/15th/P Streets? Is this considering Yolobus 42A/B as an express? If so, it seems overkill to create and maintain new stops for one route that comes twice an hour. The existing stops on L Street from 9th to 3rd Street are all above average in terms of wide sidewalks, easy approach, and high visibility. The main need in this area is for additional shelter, mostly from the sun, preferably without walls, as this area can be like an oven. However, if Yolobus expresses are removed from L Street as proposed by the consultants, the payoff from improving amenities here is reduced. In fact, the P Street corridor, where Yolobus is to be relocated, has narrower sidewalks, fewer waiting areas, the stops are smaller and more difficult to enter, and they have less capacity when multiple buses arrive at the same time.

- 9th/10th Street is shown with stops removed between L and P Streets, which is a problem because those stops are needed by Route 38. My earlier suggestions about the use of 9th/10th Street aside, these stops are needed for Route 38 regardless of any other changes. Route 38 has been considered for relocation to 15th/16th Streets; however, due to concerns about traffic on 15th/16th Streets, relocation was not adopted in TransitRenewal.

- 7th/H Street (n/s) is a new near-side stop. Why create a new stop in this location when there is an existing stop far-side of 7th/H that is lightly used? And why remove a well-used stop one block farther south at 7th/I (f/s)? Why not keep the two existing stops (7th/H and 7th/I) and designate one for e-Tran, one for RT, or something akin to that?

- 7th/Capitol (n/s) is a proposed new stop, to be a near-side bus bulb. There is also a new stop at 7th/J (f/s) for express only. Why install these two new stops? Why not just add space at 7th/K and 7th/Capitol?

- 7th/N and 7th/O both appear to be designated as local-only stops. Both of these stops are used by a lot of commuters. At least one, probably 7th/O, should include expresses. This could possibly be overlooked if P/7th wasn't removed, although P/7th is inferior in terms of visibility, waiting environment, etc.

- 8th/O is designated as a bus bulb, which is a problem for two reasons. First, it is a layover location. Second, it is far-side of light rail tracks. This change would move the bus stop and layover area into the path of trains turning onto 8th Street.

- 8th/I cannot become a peak-only stop as proposed; it is the busiest stop for Route 11. Due to its turning movements, people have to catch it there or at J/6th. Making Capitol workers walk to H Street is unacceptable. This is also a good example of why we need to be cautious in general about stop removal. Sometimes, for particular reasons, we cannot avoid having an oddly aligned route, in which case, it becomes very helpful to have a lot of available stops. This is of course also helpful when we have detours for construction or special events as well, which are frequent occurrences downtown.

- P/13th needs to be an express bus stop--they are practically the only patrons who use it. Unfortunately, it is currently one of the worst stops in the afternoon for express buses. It is a popular stop due to nearby offices as well as light rail. But the space only accommodates one bus at a time. Express buses routinely queue near-side of 13th Street, which creates an unusual situation, as the intersection is uncontrolled, with no crosswalk, and pedestrians have to cross three lanes of traffic going about 35 mph at times. Queued buses worsen visibility for cars going straight on westbound P Street as well as for autos turning right from southbound 13th Street. Autos turning left from northbound 13th Street compound the problems. Overall, it a very unsafe intersection with frequent near-misses. This bus stop needs more space as-is right now, just to help reduce the bus queuing. If additional buses are routed to this stop, it will need even more. Elimination of P/14th, which is justified, should "buy" us some space at P/13th.

- P/11th needs to remain a stop for all buses. Otherwise the walk distance is too far for Route 38. Route 38 runs only once an hour and rarely uses this stop, so it doesn't contribute much to congestion. Nor will existing Route 38 riders mind the bus stopping here. At this point in the route, patrons getting on or off are likely to be the only ones on the bus.

- Q/9th and Q/11th have been removed, with Q/10th retained, so as to make three blocks between stops. We previously requested that Q/9th and Q/11th be retained, and that Q/10th could be removed, so as to keep spacing at every other block in this area, which is more suitable for the density, with dense condos and office buildings in the area. East of 15th/16th, the loads on board are higher and the density is lower, at which point three block spacing is appropriate.

- If the plan calls for bus lanes, and further proposes to make optimal use of the bus lanes by relocating routes to the bus lanes, more attention needs to be paid to expanding and improving layover locations. RT already has to deadhead several Route 30 buses from the Amtrak station to 3rd & J for some layovers.

Although there are some problems with the project, there are a number of useful outputs, especially demonstrating the usefulness of bus bulbs in a number of locations for reducing re-entry delay, improving the waiting environment, and conserving parking space. While the 3-to-2 lane reduction may be of questionable overall merit, if the City of Sacramento approves this change, we should certainly support and be grateful for the chance to retain a lane for buses only. Recognizing that the current study is simply a first step in a long process, and that the City of Sacramento will be following up with a more detailed study, I would suggest that RT continue to participate in these discussions in an active, constructive manner, but also continue to be forthright about areas of concern.

c: Mike Mattos, Chief of Facilities & Business Support Services
Lynn Cain, Director of Facilities
Robert Hendrix, Facilities Supervisor
Mark Lonergan, Chief of Operations
John Darragh, Director of Transportation
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