

**“TRANSIT ONLY LANE”  
DEMONSTRATION PROJECT  
DECISION DOCUMENT**



**Interstate 805 & State Route 94 Transit Only Lane**

On I-805 between State Route 54 and SR 94, and on SR 94 WB between I-805 and I-5 in the  
Cities of San Diego and National City, in San Diego County, California

**RECOMMENDED FOR APPROVAL:**

  
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## **INTRODUCTION**

This document proposes a demonstration project (Pilot), over a three-year operation period, to allow bus on shoulder (BOS) operations on freeways for the Metropolitan Transit System (MTS) South Bay *Rapid*<sup>1</sup> by converting existing freeway shoulders into Transit-Only Lanes (TOL) and using state-of-the-art technology for driver assistance and ramp metering safety enhancements. During the Pilot period, the TOL will remain available for disabled vehicles, enforcement, emergency access, and other typical shoulder functions. This document refers to BOS operations solely for consistency with transit industry vocabulary; all references to shoulders where BOS operations are proposed will be converted to transit-only lanes.

The Pilot also includes a driver assistance technology package incorporating on-vehicle features and vehicle-to-infrastructure communications. On-vehicle features provide alerts to the bus driver to assist with facilitating safe merges and safe spacing between other vehicles and obstructions along the corridor. The ramp metering Transit Priority System (TPS) will utilize vehicle-to-infrastructure communications to improve safety at entrance ramp merge locations by holding vehicles at entrance ramp meters and allowing the approaching bus to travel through. These technologies will improve the safety of the ingress and egress maneuvers to and from the TOL.

The Pilot is proposed along Interstate (I-) 805 between State Route (SR) 54 (PM 8.9) and SR 94 (PM 13.5) and along SR 94 westbound into downtown San Diego between I-805 (PM 4.0) and the I-5 (PM 1.4). This will be on a seven-mile portion of the South Bay *Rapid* project—a 26-mile route from the Otay Mesa Port of Entry (POE) to downtown San Diego.

The Pilot will allow *Rapid* vehicles to operate in transit only lanes along segments of both I-805 and SR 94 during periods of congestion as a bypass to the lanes. Based on other demonstration projects in California and across the country, it is estimated that during congested periods, use of the transit only lanes could save South Bay *Rapid* passengers between 5 to 15 minutes per trip and increase peak hour trip reliability from 80 percent to more than 90 percent.

The Pilot is being conducted as a partnership among San Diego Association of Governments (SANDAG), the Metropolitan Transit System (MTS), the California Department of Transportation (Caltrans), California Highway Patrol (CHP), and the U.S. Department of Transportation (USDOT). Funding is provided in part by a grant from the Federal Transit Administration. Caltrans may terminate the pilot if operations are determined to be unsafe and immitigable.

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<sup>1</sup> *Rapid* is a transit service that features high-frequency, limited-stop service, upgraded vehicles and station amenities. Use of transit signal priority and dedicated lanes are implemented to provide improved travel times.

## **NEED AND PURPOSE**

The purpose of this project is to improve travel time reliability of *Rapid* operations along I-805 and SR 94.

The Pilot is needed to demonstrate the operational feasibility of converting existing shoulders for Transit Only Lane operations, as well as to investigate and identify:

- Utilization of vehicle-to-infrastructure technologies to support safe maneuvers along shoulders and adjacent to entrance ramps/gore areas
- Reliability improvement for transit customers
- Potential operational, enforcement, maintenance requirements for future deployments
- Operational Guidelines
- Recommended highway operational conditions for future deployments
- Highway improvements necessary to implement in other freeway corridors
- Performance measures /success criteria

## **BACKGROUND**

### **South Bay *Rapid* Background**

The South Bay *Rapid* project represents the southern spine of the *Rapid* network. It includes 12 stations in the South San Diego County and will provide connections to job centers in Downtown, Mid-City, Kearny Mesa, Mira Mesa, Poway, Rancho Bernardo and Escondido. The South Bay *Rapid* project represents a \$142 million regional investment and the culmination of 30 years of planning work at the City of Chula Vista, National City, SANDAG and MTS. The South Bay *Rapid* project is currently under construction, will be operated by MTS and is expected to begin operations in 2019.



**Figure 1: South Bay *Rapid* Route Map**

The South Bay *Rapid* will use the new I-805 / Palomar Street Direct Access Ramp (DAR) to access the I-805 HOV lanes. Until the ultimate direct connector ramp from the I-805 HOV lanes to the future SR 94 HOV lanes is constructed, the South Bay *Rapid* vehicles will have to exit the I-805 HOV lanes just north of SR 54 and transition into the main lanes to utilize the existing ramp connecting to SR 94.

The South Bay *Rapid* service is anticipated to serve approximately 5,500 passengers per day when it fully opens. After the service fully matures, it is estimated that daily ridership could exceed 20,000.

## **Regional Expectations**

The San Diego Forward: The Regional Plan (2015 Regional Plan) calls for a system of managed lanes along San Diego freeways with the goal of a well-integrated multimodal system. Additionally, the Federal Transit Administration (FTA) is interested in determining the effectiveness of innovative technology in a bus-on-shoulder application. Over a three-year operation period, the Pilot will provide documentation of how bus performance can be improved by allowing buses to drive on the freeway shoulder, during specific operating conditions, with Intelligent Transportation Systems (ITS) technologies. This proposed Pilot will assess the benefits and value of combining emerging ITS technologies through all phases of the project. The Pilot will also help the region reach the goals identified in the 2015 Regional Plan including:

- Provide transit service to address unmet travel demand by providing planned high-speed transit service between population and employment centers between the Otay Mesa POE, eastern Chula Vista and Downtown San Diego as defined in the 2015 Regional Plan and its Sustainable Communities, the City of Chula Vista General Plan update, and the final Otay Mesa-Mesa de Otay Binational Corridor Strategic Plan.
- Provide a high-speed, direct, reliable, pedestrian accessible, and convenient transit service to connect residential areas with employment and major activity centers utilizing the Bus Rapid Transit guideway network in eastern Chula Vista and transit infrastructure at the Otay Mesa POE and in Downtown San Diego.
- Provide a transit system consistent with adopted local and regional plans and policies and related environmental documents that support smart growth principles.

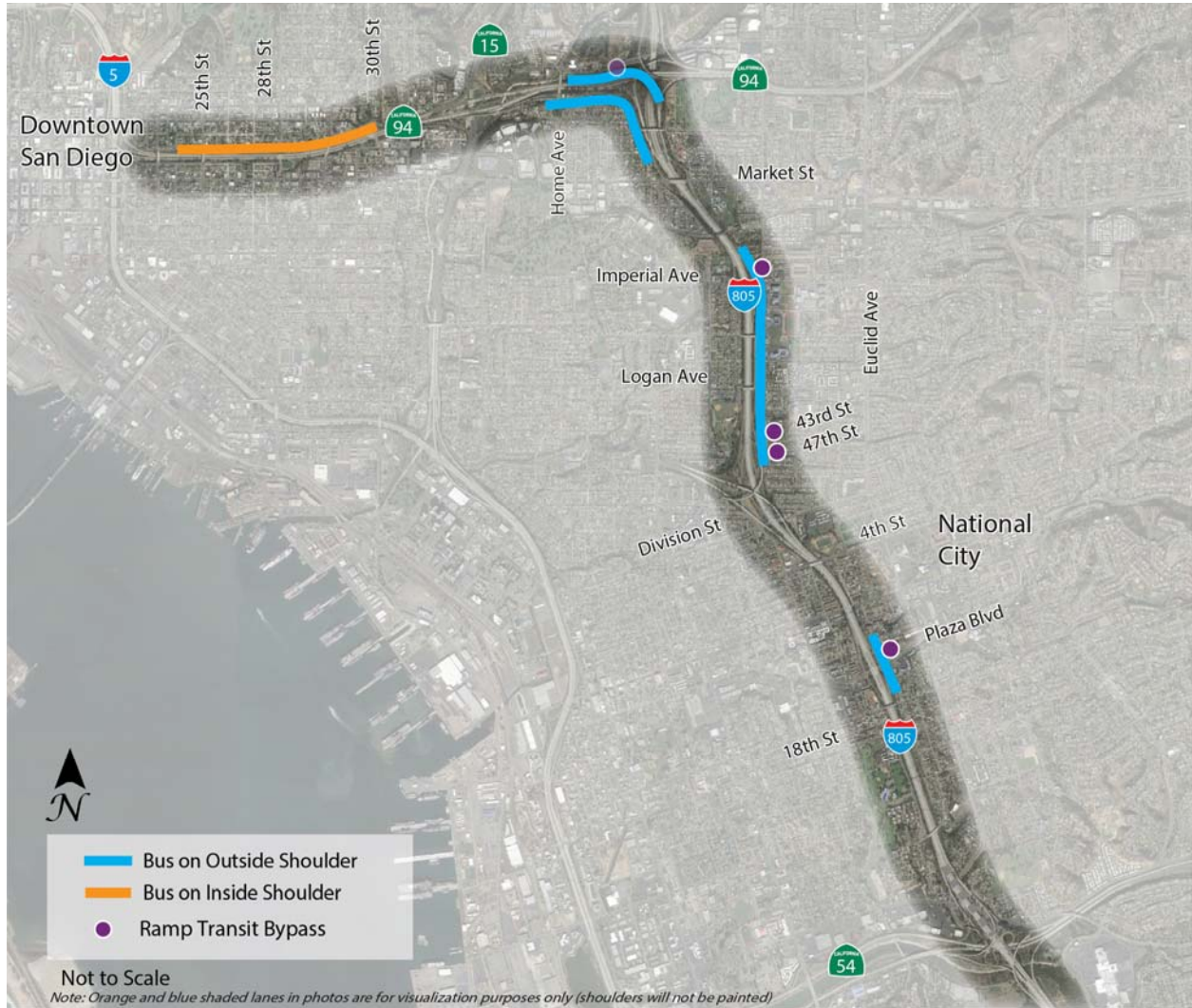
As observed in peer metropolitan areas, shoulder use during congested periods provide reduced travel times and, more importantly improved travel reliability. For this project, shoulder use is anticipated to improve South Bay *Rapid* passenger experience in both reduced travel time and improved travel reliability. For example, during the peak period improving travel time by 5 minutes means a passenger can save over 40 hours of travel time per year by not being stuck in consistently congested conditions. Over the Pilot period, passengers regularly commuting on the South Bay *Rapid* service could save thousands of hours of cumulative travel time. Higher travel time reliability of transit service is expected to drive higher ridership for the *Rapid* service, specifically in the corridor and throughout the region.



## PROJECT PROPOSAL

The Pilot is proposed on I-805 and SR 94 along a seven mile stretch of the South Bay *Rapid* route. The duration of the demonstration is 3 years, with evaluation and reporting to FTA in the last 12 months. The Pilot will be deployed in two phases. Both phases of the project are described in detail below.

Figure 2 shows the Project map and includes areas of: HOV lanes, auxiliary lanes, and shoulder to TOL conversions.



**Figure 2. I-805 and SR 94 TOL Project Map**

## Operational Parameters

The Pilot is based on the previously piloted TOL conversion on SR-52 and industry implemented BOS operating parameters across the United States. These parameters define the allowable BOS operations during periods of traffic congestion at slow operating speeds.

South Bay *Rapid* vehicles may utilize TOL's, when the following conditions are met:

- Shoulder is signed for "MTS" Bus Lane
- Operating only during peak hours of 5 a.m. to 9 a.m. and 3 p.m. to 7 p.m.
- Freeway speeds are below 35mph
- *Rapid* vehicles being operated by MTS, or its contracted operators
- *Rapid* vehicles will not exceed 35 mph while operating in the TOL
- When operating in the TOL, *Rapid* vehicles are restricted to 15 mph faster than the adjacent general-purpose lane. For example, if general traffic is traveling at 5mph, *Rapid* vehicles would operate no faster than 20mph

South Bay *Rapid* vehicles will not be permitted to utilize TOL's, during:

- Non-peak hours
- During periods of rain or when any visible wetness on the roadway is present

South Bay *Rapid* vehicles operating in the TOL must yield to:

- Emergency response vehicles
- Enforcement and maintenance vehicles
- Disabled vehicles
- Large debris

Up to four buses per peak hour are anticipated to operate in the TOL during periods of operation.

Freeway Service Patrol (FSP) will respond to disabled vehicles and remove large debris in the TOL, and Caltrans Maintenance will sweep the TOL on an as needed basis.

Training for the bus drivers will address the Pilot requirements as well as how to handle obstructions such as stalled vehicles and vehicle enforcement. Classroom training for the bus drivers is anticipated in 2018 along with system testing, field training, and potential early *Rapid* deployment. South Bay *Rapid* operations is scheduled to take place in early 2019.



## **Phasing**

### **Phase 1**

Phase 1 will install the technology infrastructure; driver assistance technology and vehicle-to-infrastructure, within the entire limits of the Pilot. This phase will also complete structural section changes, barrier modifications, and provide signage and pavement markings and delineation along northbound I-805 and the freeway-to-freeway connectors for the operation of *Rapid* buses in the TOL.

Along northbound I-805, the TOL will begin at the gore with the Imperial Avenue off-ramp and continue to the Imperial Avenue on-ramp. It is anticipated that the *Rapid* buses will operate either in the TOL or an auxiliary lane, with the ability to cross gore areas, between the Ocean View Boulevard overcrossing and the connector ramp to westbound SR 94.

On the connector, *Rapid* buses will use a TOL to merge onto SR 94, bypassing any ramp meter queues. Once on SR-94 *Rapid* buses will use the general-purpose lanes to proceed into Downtown.

Along eastbound SR 94, the TOL will begin just west of Home Avenue, and continue onto the connector to southbound I-805. The TOL will continue southbound on I-805 to the Market Street on-ramp.

### **Phase 2**

Phase 2 will expand the operation of the Pilot to include additional TOL's on I-805 and westbound SR-94. Within 90 days from the start of the Pilot, an assessment will be made to initiate the second phase of the project. This phase will be implemented in a timeframe that is mutually agreed to by MTS, SANDAG, Caltrans and CHP.

This phase will add or modify signage and pavement markings and delineation needed for BOS operations within the remainder of the project limits.

Along northbound I-805, the TOL will begin at the gore with the Plaza Boulevard off-ramp and continue to the gore with the Plaza Boulevard on-ramp. An additional TOL will be located from the gore with the 47<sup>th</sup> Street off-ramp to just south of the Ocean View Boulevard overcrossing. It is anticipated that the *Rapid* buses will operate either in the TOL or an auxiliary lane, with the ability to cross gore areas, between the Plaza Boulevard off-ramp and SR 94.

On westbound SR 94, the TOL will begin in the median just west of the SR 94/SR 15 interchange and continue to the SR 94 termination in Downtown San Diego.

Phase 2 will continue through the remainder of the 3 year Pilot demonstration.

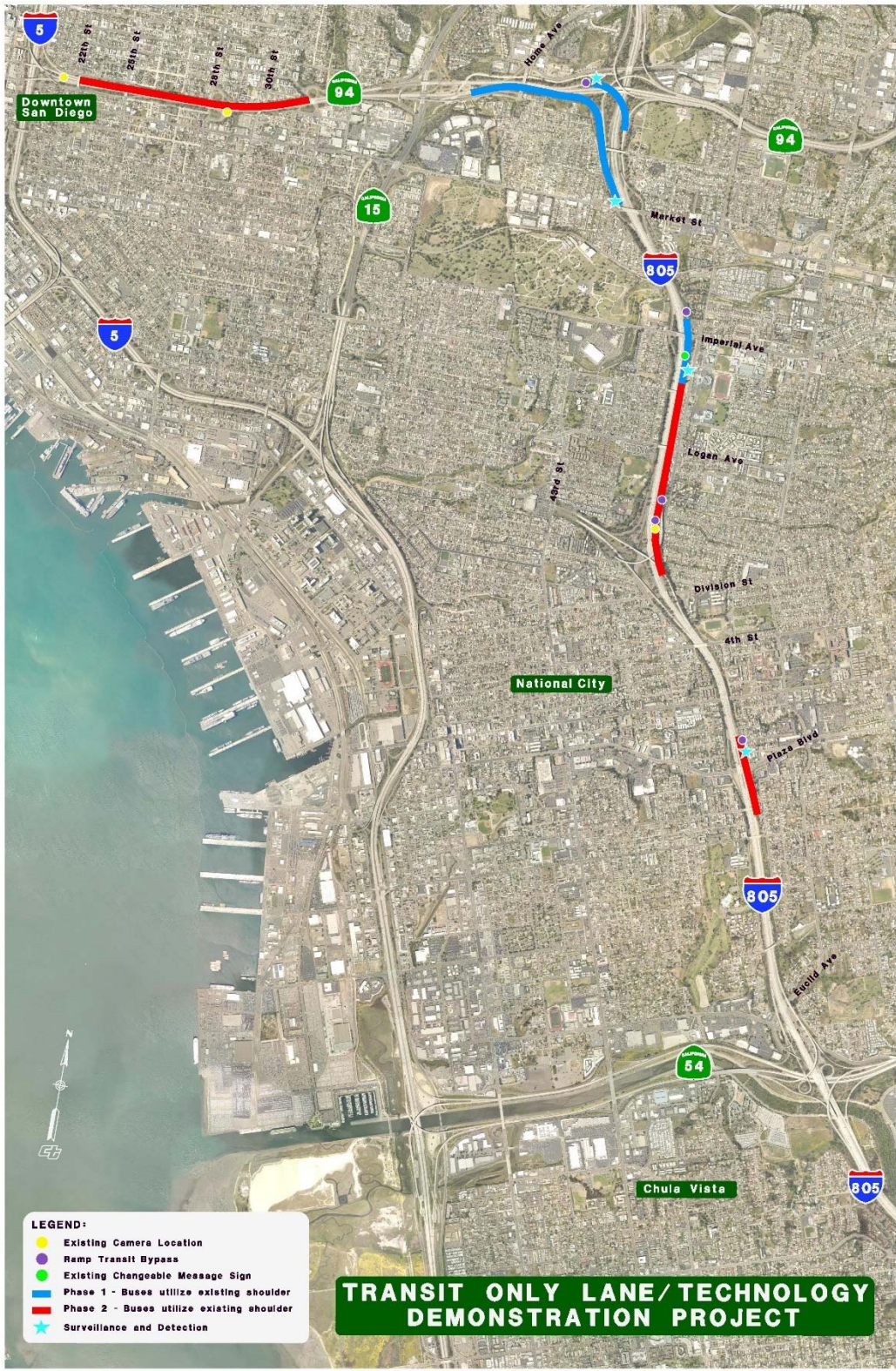


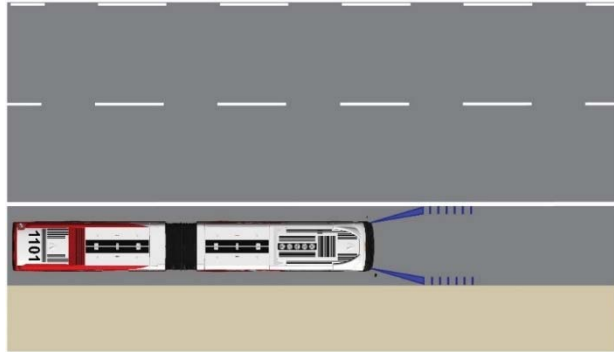
Figure 3: I-805 and SR 94 Project Phase Map

## Driver-assist Technology Features

The Pilot is expected to utilize driver-assist technology to enhance safety for South Bay *Rapid* users. The application of assistive technology for the bus drivers will improve the safety of the ingress and egress maneuvers from the TOL to the general-purpose lanes. These systems will provide audio, visual, and/or haptic feedback to the bus driver to improve safety by mitigating conflicts between buses, other vehicles, and obstructions along the corridor. Bus drivers will not have to turn-on, turn-off, or modify the system during operation. Driver-assist technologies proposed as part of this demonstration include:

### Lane Departure Warning (LDW):

The LDW system will alert (audio, visual, and/or haptic) bus drivers that they are drifting into an adjacent lane.



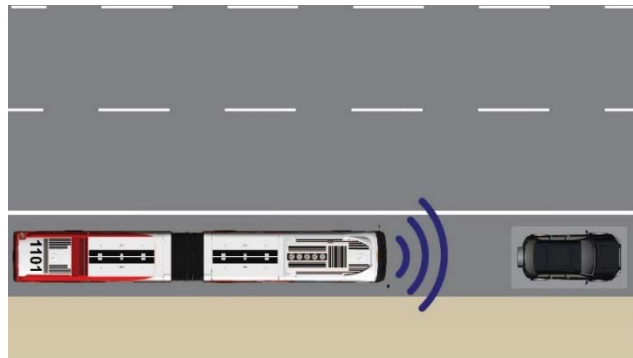
### Blind Spot Warning (BSW):

The BSW system will alert bus drivers of vehicles in the blind spots of the bus.



### Forward Collision Warning (FCW):

The FCW warning system will alert bus drivers of forward obstructions.



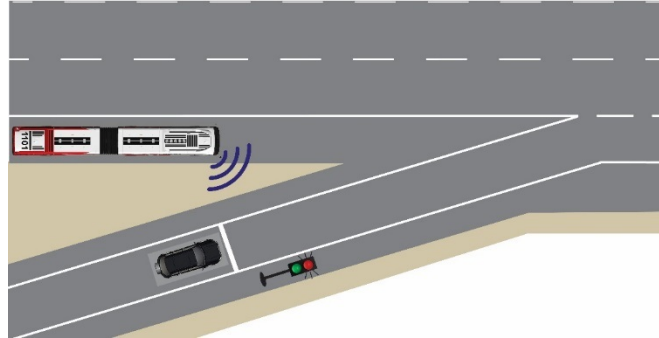


## Vehicle-to-Infrastructure Technology Features

The Pilot is also expected to utilize vehicle-to-infrastructure technology to enhance safe operation of the *Rapid* vehicles to navigate around entrance ramps, including:

### Ramp Metering Transit Priority System (TPS):

The TPS will hold vehicles at each entrance ramp meters along the corridor allowing an approaching bus to travel through potential conflict points.



Transit signal priority at the entrance ramps will improve safety by reducing conflicts between the bus in the TOL and vehicles entering the freeway. The roadside processor at each ramp meter will be responsible for processing the bus location and speed information and providing transit priority at the appropriate time given the current speed of the bus and distance from the conflict area.

## Highway Modifications

Improvements to the shoulder infrastructure for the TOL are intended to mitigate the reduction in service life of the pavement resulting from the equivalent single axle loads (ESALs) of *Rapid* vehicles on it. Pavement mitigation treatments were identified with the assistance of Caltrans pavement design staff.

### Existing Highway Conditions

I-805: Original construction of I-805 occurred between 1971 and 1975. Within the Pilot limits, the lane configuration varies from four to five lanes in each direction, with up to two auxiliary lanes. The general-purpose lanes, auxiliary lanes, and ramps were built of concrete. In 2014, the inside shoulder of the freeway was converted to an HOV lane. The existing outside shoulders, typically ten feet wide but as narrow as eight feet in some locations, are built of asphalt pavement over a variable depth aggregate base (see Exhibit A for existing cross sections).

A field visit with Caltrans pavement engineering staff was conducted to assess the structural adequacy of the gore and shoulder areas within the Pilot limits on the I-805. It was determined that all shoulders and ramp gore areas were structurally adequate for this pilot project, with the exception of the northbound Plaza Boulevard off-ramp and southbound Imperial Avenue on-ramp. It was recommended that these gore areas be resurfaced to bear the loads that will be exerted upon it during the Pilot.

SR 94: Original construction of SR 94 occurred between 1955 and 1958. Within the project limits, the lane configuration varies from four to five lanes in each direction, with up to one auxiliary lane. As is the case for I-805, the general-purpose lanes, auxiliary lanes, and ramps were built of

concrete. The existing inside shoulders are 9.85 feet wide, of asphalt pavement over aggregate base (see Exhibit A for existing cross sections). A field visit with Caltrans pavement engineering staff was conducted to assess the structural adequacy of the inside shoulder areas within the Pilot limits on the SR-94. It was determined that all shoulders and ramp gore areas were structurally adequate for this pilot project. Buses will not drive on the outside shoulders of SR 94 west of Home Avenue.

Both the I-805 and SR-94 corridors have heavy peak volumes and congestion. Rear end, sideswipe, hit object and even over turn type accidents on freeway segments are typically indicative of congested related collisions. Traffic collision data has been collected and will be used as a baseline in comparison with data collected during the Pilot.

### **Proposed Highway Improvements**

The following locations were identified for improvements:

- Resurfacing
  - The resurfacing of the existing shoulders around inlets on I-805 will result in a pavement edge drop. Although the inlets are designed to bear traffic loading, MTS determined the edge drop at these inlet locations would be noticeable to passengers riding the *Rapid* and a variable depth cold-plane is proposed to slope the pavement down to the inlet grate surface to present a smoother riding experience. Three inlets in the southbound direction and six inlets in the northbound direction are proposed to receive this treatment.
  - One gore area; at the northbound I-805 Plaza Blvd off-ramp, will be resurfaced.
  - The existing inside shoulder pavement along westbound SR 94 will be cold-planed and overlaid between 22<sup>nd</sup> Street and 30<sup>th</sup> Street.
  - The existing outside shoulder, between the northbound I-805 to westbound SR 94 connector and the Home Avenue bridge, will be cold-planed and overlaid.
- Pavement delineation modifications
  - Pavement marking modifications on I-805 to increase the existing shoulder width from to a minimum of 11 feet for the proposed TOL. As needed, this added width is to be taken from a general-purpose lane, which would be restriped to a minimum of 11 feet.
  - Pavement marking modifications will be made to the northbound I-805 to westbound SR 94 connector ramp to increase the existing shoulder width from 10 feet to the proposed 11 feet TOL width. This width is proposed to be taken from the adjacent HOV lane, which would be restriped from 12 feet to 11 feet each.
  - Pavement marking modifications on SR 94 to increase the existing inside shoulder width from 9.85 feet to 11 feet for the proposed TOL. This added width is to be taken from the two left-most general-purpose lanes, which would be restriped from 12 feet to 11 feet.
  - The raised pavement markers on the existing outside shoulder pavement west of the northbound I-805 to westbound SR 94 connector will be removed and replaced with pavement marking.

- Modifications to the ramp meter signal at the connector ramp from northbound I-805 to westbound SR 94 to provide a transit-only bypass.
- TOL signage improvements will be made at each interchange ramp on northbound I-805 along the BOS corridor, with special care taken at ramps with potential conflict zones with *Rapid* vehicles on shoulders.
  - The signing improvements include static signs alerting drivers to the presence of *Rapid* operation in the TOL, and warn drivers that a bus may merge into the ramp or auxiliary lane from the TOL.
  - Blank-out signs will be placed at the ramp meter signals showing a graphic bus icon with “MERGING” or “CROSSING” or reading “BUS MERGING” or “BUS CROSSING”.
  - Signing improvements will be made along the main lanes of I-805 and SR 94 indicating when TOL for BOS operations begins and ends.
- Several call box relocations were identified.
- Roadside tree trimming will be required in spot locations to provide adequate sight distance for *Rapid* operations.
- Modify the concrete barrier around overhead sign structures in the median of SR 94. The concrete flares will be removed and replaced with a steel plate to protect the base and provide the designated TOL width.

All physical improvements to support the Pilot will be constructed during Phase 1, except for signing and pavement delineation, which will be installed by phase. After completion of the pilot, SANDAG commits all project related signing and pavement delineation will be restored to pre-demonstration conditions along the corridor.

Note: All improvements are anticipated to be removed along the corridor after the completion of the demonstration pilot except for the concrete median barrier. SANDAG commits to working with Caltrans to return the freeway to the pre-demonstration condition.

## Non-standard Design Features

There are four design standard features that will be impacted by this Pilot. Two will impact mainline lane traffic and three will impact the TOL.

- Shoulder Width - Existing shoulders within the Pilot (both in Phase 1 and Phase 2) will be converted into a transit-only lane. These shoulder locations are proposed at:

Direction	Route	Existing Shoulder	Approximate Location
Northbound	I-805	Outside	E. 16 <sup>th</sup> Street to the E. Plaza Blvd onramp
Northbound	I-805	Outside	Division Street to Imperial Ave.
Northbound/Westbound	I-805/SR 94	Outside	Freeway-to-freeway Connector
Westbound	SR 94	Inside	Broadway to 22 <sup>nd</sup>
Eastbound/Southbound	SR 94/I-805	Outside	Home Ave. to Market Street

Consequently, disabled, emergency or enforcement vehicles would utilize the transit only lane as a shoulder and have preferential access over a bus.

This pilot does not propose to modify any existing shoulders not being converted to a TOL. Currently, there are existing shoulder locations, that are not proposed to operate as a TOL, and do not meet the minimum 10' shoulder design width standard (HDM Index 302.1 Shoulder Width) in either the inside (converted to HOV along I-805, TOL along SR 94) or outside shoulders (converted to TOL along I-805 and only 2' to 6' wide along SR 94).

- Traveled Way Width - The existing shoulders would be converted into 11-foot transit-only lanes, creating a nonstandard lane width for the buses (HDM Index 301.1 Traveled Way Width).

In addition, the northbound I-805 main lanes within the project limits will be restriped to accommodate the width for the TOL. The two left-most lanes on westbound SR 94 are proposed to be restriped to 11 feet from an existing 12 feet, to achieve an 11-foot TOL width (HDM Index 301.1 Travel Way Width).

- Clear Recovery Zone - There would be little or no clear recovery zone for the buses along I-805 and SR 94 operating in the TOL (HDM Index 309.1(2) Clear Recovery Zone).
- Horizontal Clearance - There would be little to no horizontal clearance to fixed objects for the buses operating in the TOL (HDM Index 309.1(3)(a) Minimum Clearances).



## Performance Measures

As a commitment to FTA, SANDAG will prepare an assessment report to monitor the effects of the Pilot. Performance measures will be used to determine the Pilot’s performance and establish or modify guidelines, propose additional capital improvements, as well as address additional maintenance and enforcement costs and responsibilities for future TOL and BOS deployments. The key measures monitored will include:

Performance Measure	Agency Responsible for Collecting Data
<b>Safety</b>	
TOL incidents and misuse	SANDAG/MTS/CHP
Collision incidents along the corridor	Caltrans/CHP
Incidents involving <i>Rapid</i> buses in the TOL (attributable / not attributable to <i>Rapid</i> )	SANDAG/MTS/CHP
<b>Freeway Operations</b>	
MTS shoulder use conflicts (debris, cars, enforcement, etc.)	SANDAG/MTS
Traffic data on freeway conditions during the evaluation period (during times of TOL operations and non-BOS operations)	SANDAG
<b>Transit Operations including Technology Metrics</b>	
GPS traces on <i>Rapid</i> buses in the I-805 & SR 94 corridors	SANDAG
<i>Rapid</i> Bus Travel Time Reliability (On Time Performance)	MTS
TPS requests and activations at ramp meters	SANDAG
Activations of Forward Collision, Blind Spot, and Lane Departure warnings	SANDAG
<i>Rapid</i> ridership	SANDAG
<b>Observations</b>	
Number of times that MTS is contacted by Caltrans/CHP requesting the TOL be vacated	MTS/CHP/Caltrans
Qualitative feedback from project participants	Caltrans/SANDAG/MTS/CHP

To determine the success of the Pilot, the performance measures described above will determine if the benefits of the project in terms of travel time reliability, safety, changes in freeway service and driver/passengers’ perception is a benefit to the region. The performance metrics are further discussed in the Project Concept of Operations.

Operational context will also be researched, incorporating the following:

- Freeway Operations
- Lane Closures
- Alert Logs for Transit Service Outage
- FSP Removal of Large Debris
- Freeway Maintenance Logs
- Transit Analytics Logs
- CHP Officer Interviews

The Pilot assessment will evaluate all the factors above and calculate a cost vs. benefit analysis that will determine if the benefits of the project in terms of travel time reliability, safety, changes in freeway service and driver/passenger perception is a benefit to the region compared to the amount of capital costs associated with the project. If deemed feasible by the criteria and performance measures discussed throughout this report, then the next objective would be to establish parameters for future deployments. Additionally, CHP would perform an independent formal review of the project.

## **ENVIRONMENTAL STATUS**

The Pilot, including restoration of signing and striping to pre-project conditions after the completion of the project, has been determined to be classified as a Categorical Exemption under the National Environmental Protection Agency and a Categorical Exclusion under the California Environmental Quality Act.

The environmental documentation for this pilot include a Community Impact Assessment, a Visual Impact Assessment, and a Natural Environment Study Assessment. Also, the project may achieve a projected reduction of 155,006 MTCO<sub>2</sub> in GHG emissions.

### **Community Impact Assessment Summary**

Potential community impacts analyzed included operational noise. The Pilot has been determined to be exempt from Federal Highway Administration requirements pertaining to noise analysis and mitigation for highway projects.

Other potential community impacts analyzed include impacts related to construction, traffic and/or parking, air quality, visual/aesthetic, land use plan consistency, Section 4(f) and 6(f) impacts, coastal zone program consistency, Environmental Justice communities, community character, community cohesion, and right-of-way (R/W) acquisition. In general, the effects of the proposed improvements and operations on the surrounding communities were determined to be negligible, minimal or temporary, or positive.

### **Visual Impact Assessment Summary**

The Pilot would introduce surface improvements (i.e., re-striping and pavement rehabilitation) and the addition of some small-scale infrastructure (transit bypass signal pole and mast, signage, transit technology utilities, and possibly a two-foot-high retaining wall) into an existing transportation corridor that already contains these transportation-related infrastructural elements. Additionally, it would shift a relatively small number of buses (four per hour during morning and evening peak periods) operating in the corridor from the HOV/general-purpose lanes to the freeway shoulders. These project elements would not substantially change the existing visual environment of the project corridor. The visual character of the proposed project would be compatible with the existing visual character of the corridor, and the visual quality of the existing corridor would not be altered by the proposed project. Viewer exposure to the project elements and the viewer sensitivity to changes are both expected to be low. Based on the low degree of resource change and the anticipated low viewer response to these changes, impacts of the project are assessed as low and no avoidance and minimization measures are identified.

### **Natural Environment Study Summary**

Federal and state listed species are not likely to be present and are currently presumed to be absent from the Biological Study Area. Further, USFWS-designated critical habitat does not occur within the BSA. Therefore, consultation with the USFWS or the CDFW is not required for this project, as the project is expected to have no effect on federally listed species and critical habitat.

## **OTHER CONSIDERATIONS**

### **Concept of Operations and System Requirements**

The purpose of the Concept of Operations (ConOps) is to describe the characteristics of the TOL operations and supporting technology from the perspectives of the various stakeholders and identify the major systems, technologies, and infrastructure changes needed for implementation.

The three primary project partners, responsible for project planning, design, and implementation are the San Diego Association of Governments (SANDAG), Caltrans (District 11 and Headquarters), and the San Diego Metropolitan Transit System (MTS). The U.S. Department of Transportation (USDOT) and Federal Transit Administration (FTA) will provide grant oversight.

TOL use, operations, and data collection will be shared responsibility by SANDAG, MTS and CHP. SANDAG will be responsible for performing the initial analysis.

### **Operating Scenarios Assessed**

Each scenario describes a sequence of events, activities carried out by the user, the system, and the environment. It specifies what triggers the sequence, who or what performs each step, when communications occur and to whom, and what information is being communicated.

The Scenarios Include:

- **Normal Operations**

In the normal operations scenario, responsibility for operations falls mainly on the MTS Bus Operator and associated dispatching support services. Caltrans maintains normal operations by regularly sweeping the TOL to keep it clear of debris. CHP and FSP have no added role in normal operations except as mutually agreed.

- **Incidents**

Bus drivers are trained to recognize that obstacles in the TOL pose a challenge to the effectiveness of *Rapid* operations. The operator is trained to safely leave the TOL in the event of an obstacle; the decision to re-enter the TOL is left to the judgment of the operator. MTS dispatchers monitor freeway conditions and incident reports from CHP, and communicate information to the bus operator. CHP and FSP are trained on the requirements for the TOL, so that they can better assess the safety of their own operations as well as the safety of all freeway users. In the event of an incident or enforcement action, CHP will perform their duties in accordance with CHP policies, procedures, and safe practices. CHP will try to expedite the clearance of the TOL whenever possible. FSP will notify MTS dispatch when they will be operating in the TOL and potentially in conflict with the shoulder operations. Caltrans maintenance personnel will, as available, respond to reports of debris on the TOL and clear the TOL as soon as possible.

- **Planned Construction**

With planned construction notices, MTS operations staff will provide a Route Bulletin to South Bay *Rapid* operators informing them of the planned construction project and the associated impacts to route operations. The drivers will have advanced notice and will operate the route according to the bulletin provided. MTS dispatch staff will also be briefed on the construction and route modifications to be able to answer any questions from

operators in the field. CHP, FSP, and Caltrans maintenance will know, from TOL/BOS training, that BOS operations will not occur within the construction zone, but will remain aware of the potential for buses operating on the TOL on the remaining stretch of the freeway.

- **Training**

Bus operators will be trained in both the classroom and in driving the route to ensure a full understanding of shoulder operating procedures. Operators will learn about the technology that will allow for safe operation of the bus, as well as ramp priority measures. Operators will be trained on how to react to obstacles on the shoulder, particularly disabled vehicles and law enforcement activities. MTS dispatchers will attend a classroom training session on operational policies and safety practices and procedures. Dispatchers will observe the training and driving operations to better understand the challenges that operators will face while operating in the shoulder. MTS operations supervisors will attend both operator and dispatcher trainings, as well as bus simulator and behind the wheel training, to experience the operations first hand. CHP, FSP, and Caltrans maintenance staff will attend classroom training sessions informing them of standard operations policies and practices. CHP will provide an officer to assist in the driver training of MTS employees.

- **Maintenance**

Operators are responsible for identifying any potential anomalies or malfunctions in the safety technology to the operations supervisor and any mechanical or operational issues to the MTS dispatcher. The MTS dispatcher records any maintenance issues and dispatches maintenance to repair the bus, as well as an additional bus to take the passengers from the failed bus to their destination.

Caltrans will be responsible for the repair of technical equipment not on the buses such as ramp metering equipment and changeable message signs and blank out signs, maintenance of the roadway surface and striping, as well as regular sweeping of the TOL.

SANDAG and Caltrans will enter into a maintenance agreement for the implementation of this pilot project.

### **Summary of System Requirements**

The system requirements document codifies the Concept of Operations into a matrix of “shall” statements that are mapped to a list of User needs. This structured list of requirements identifies the functional and nonfunctional characteristics of the technology. The mapping of system requirements to user needs ensures traceability of a requirement to a general feature of the project. The requirements are given unique numbers and are intended to be testable and verifiable. The TOL system requirements were categorized in the following structure:

FR1	Traffic Monitoring, Traffic Management
FR2	Performance Reporting
FR3	Alert Management
FR4	Training
FR5	Field Systems, On-bus technology
FR6	Data Management, Data Sharing
FR7	System Interface and Configuration Management
FR8	System Maintenance

The system requirements will also be used during the execution phase of the project to develop an acceptance test plan (ATP). The ATP, developed by vendors/system integrators, will include detailed procedures that demonstrate to SANDAG and the project partners that the procured off the shelf and newly developed systems meet the requirements of the Pilot. This is a necessary and important component of a technology procurement of this type.

## **PUBLIC AWARENESS**

SANDAG will develop and pay for a public awareness campaign to help educate the public about the demonstration, assure them of its safety, and make them more aware of the benefits of taking transit, especially during congested commute times. The public awareness campaign will aim to reach the following target audiences:

- Drivers on I-805 and SR 94
- Transit riders
- Communities adjacent to the demonstration area
- Community leaders and key influencers
- Elected and agency officials
- Transit and mobility advocates
- General public
- Media
- Social Media

It is important to ensure that information from this public awareness campaign is provided in English, Spanish and other languages, as needed, through a variety of communication tools, via multiple formats, to ensure that the message reaches the diverse cultures in the project area.

A message platform communicating key information regarding the TOL and how TOL operations would be deployed, would be the foundation for all informational materials about the project. A unique branding identity would also be developed to enhance recognition of the campaign. These messages and graphic identity would be incorporated into a suite of materials that would support communications efforts:

- Fact sheet and/or brochure
- FAQ
- Website
- Multi-media presentation
- Videos
- Infographics
- Radio spots
- E-newsletter content
- Social media content
- Billboards
- Media kit
- Other materials, as needed

Materials should be graphically driven with easy-to-understand messages. A video demonstrating the program in action would be especially effective, so the public can “see” the buses operate on the TOL safely and effectively.

The following methods would be employed to ensure that the messages are successfully communicated to the public:



### **Advertising**

- Drive time radio spots and billboards targeting drivers within corridors where the project is being implemented. All ads would push viewers/listeners to the website for more information.
- Video public service announcements and community newspaper display ads. All ads would push viewers to the website for more information.
- Digital marketing campaign to promote social media content including infographics, videos, articles. All digital marketing efforts would push viewers to the website for more information.

### **Outreach**

- E-newsletter campaign
- Presentations to community, business, and advocacy organizations
- Leverage relationships with community groups, business organizations, schools, and other partner agencies to share information with their respective constituencies
- Briefings for elected and agency officials and key community leaders/influencers

### **Media**

- Briefings for area media.
- Press releases to announce key achievements and milestones
- Press tour of TOL operations at the commencement of service and use of TOL

## **SCHEDULE AND COST**

The demonstration is anticipated to be in place for three years starting in the Summer of 2019. The following is the proposed project timeline:

- Winter 2017 – Technology Package Procurement
- Spring 2018 – Bus Procurement and Technology Package System Integration
- Fall 2018 - Construction of freeway improvements – conversion of shoulders to TOL
- Winter 2018 – System Testing
- Summer 2019
  - *Rapid* service BOS Operations Begin
  - Data collection and evaluation period begins
- Fall 2019 – 3-month assessment
- Winter 2019 – 6-month assessment
- Winter 2020– 12-month assessment
- Summer 2021
  - 24-month assessment
  - Technical report development begins
- Summer 2022 – TOL Pilot End
- Winter 2022 – Restoration of highway improvements to pre-demonstration conditions

Total project costs, excluding the bus procurement is anticipated at \$8-10 million and broken down as follows:

- Highway Improvements (~\$4.7 million)
- Technology Package and System Integration (~\$2.5 million)
- Implementation Support (~\$150,000)
- Caltrans Operations and Maintenance (~\$750,000)

Highway improvements in Caltrans right-of-way are estimated at approximately \$3.5 million. Additional operations & maintenance funding for Caltrans shoulder sweeping and debris removal is anticipated as part of the Pilot.

## **STAKEHOLDER REVIEW**

The following stakeholders have reviewed this proposal.

Federal Highway Administration – Lismary Gavillan

California Highway Patrol – Captain Jim Nellis

Caltrans Headquarters Division of Design, Design Coordinator, District 8 & 11 – Luis Betancourt

Caltrans Headquarters Division of Traffic Operations – Joseph Rouse

## GLOSSARY

Auxiliary lane	A lane on a freeway that allows simultaneous merging off of the freeway to an off-ramp and merging on to the freeway from an on-ramp
Community Cohesion	The degree to which residents have a “sense of belonging” to their neighborhood; a level of commitment of the residents to the community; or a strong attachment to neighbors, groups and institutions, usually as a result of continued association over time
Conflict	An event between two or more vehicles where if one vehicle does not take evasive action of some kind, they will collide
Cold-plane	The process of removing part of the roadway surface to a specified depth by milling
Inside shoulder	Left-hand-side shoulder on the freeway typically reserved for emergency use, maintenance vehicles, and enforcement activities
NTCIP	A national standard protocol for communicating status or commands from a central system to a field device, or from one system to another system
Off-the-shelf	A system either hardware or software that can be purchased from multiple competitive vendors without modifications for a specific use
On time performance	The status of a transit vehicle arriving on or before its scheduled travel time from an origin to a destination
Outside shoulder	Right-hand-side shoulder on the freeway typically reserved for emergency use, maintenance vehicles, and enforcement activities
Peak period	The time of day when most traffic congestion occurs on a recurring basis (5 a.m. to 9 a.m. and 3 p.m. to 7 p.m.)
Ramp meter	The traffic signal at an on-ramp to a freeway that requires approaching traffic to stop before entering the freeway
Rapid	MTS-branded service for bus rapid transit across the MTS service area
Transit priority	A process by which transit vehicles receive preferential green time at a traffic signal/ramp meter.
Visual Landmarks	Memorable visual elements that aid in navigation and orientation, define neighborhood boundaries, and help to define the visual setting of an area.

## **ABBREVIATIONS LIST**

BSW	Blind Spot Warning
BOS	Bus on Shoulder
CALTRANS	California Department of Transportation
CDFW	California Department of Fish and Wildlife
CHP	California Highway Patrol
DAR	Direct Access Ramp
ESAL	Equivalent Six Axle Load
FCW	Forward Collision Warning
FSP	Freeway Service Patrol
FTA	Federal Transit Administration
GPS	Global Positioning System
HOV	High Occupancy Vehicle
ITS	Intelligent Transportation System
mph	Miles Per Hour
MTS	Metropolitan Transit System
R/W	Right of Way
SANDAG	San Diego Association of Governments
SDRMS	San Diego Ramp Metering System
TOL	Transit Only Lane
TPS	Transit Priority System
USFWS	U.S. Fish and Wildlife Service



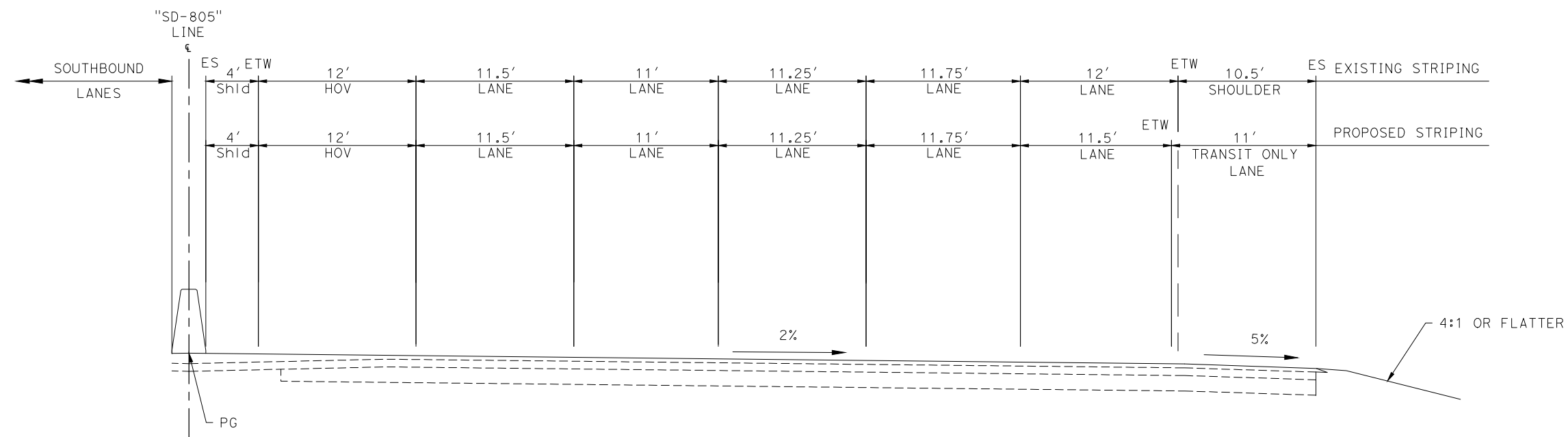
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**DESIGN DESIGNATION  
(SR-94)**

ADT (2014) = 137,000  
 DHV = 12,300  
 D = 81%  
 T = 3%  
 V = 65 MPH

**DESIGN DESIGNATION  
(I-805)**

ADT (2014) = 230,000  
 DHV = 17,100  
 D = 74%  
 T = 3%  
 V = 65 MPH



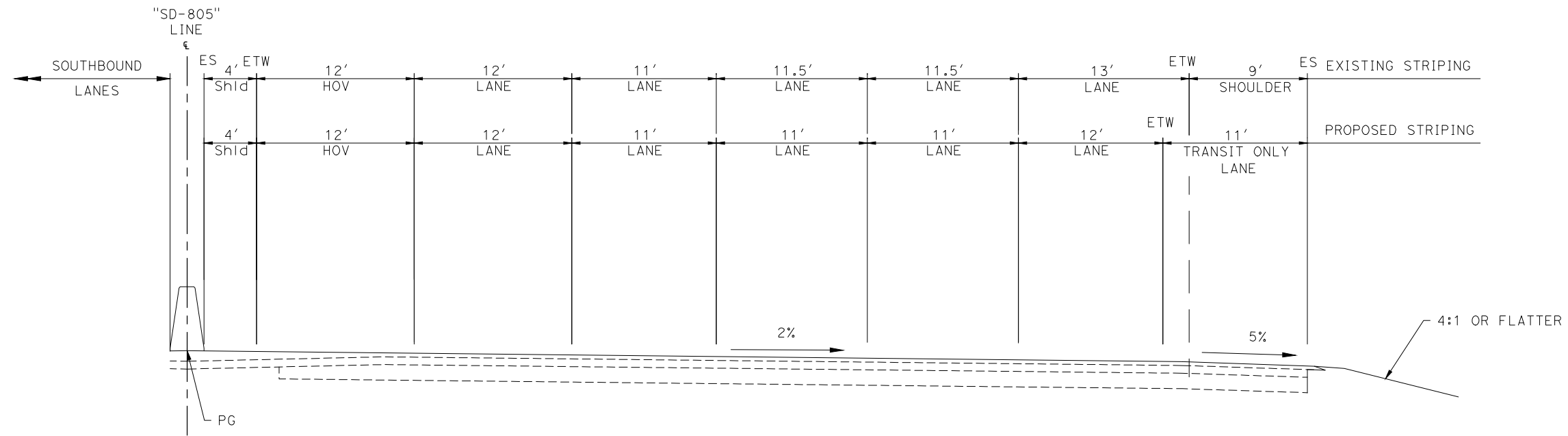
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LOCATION A

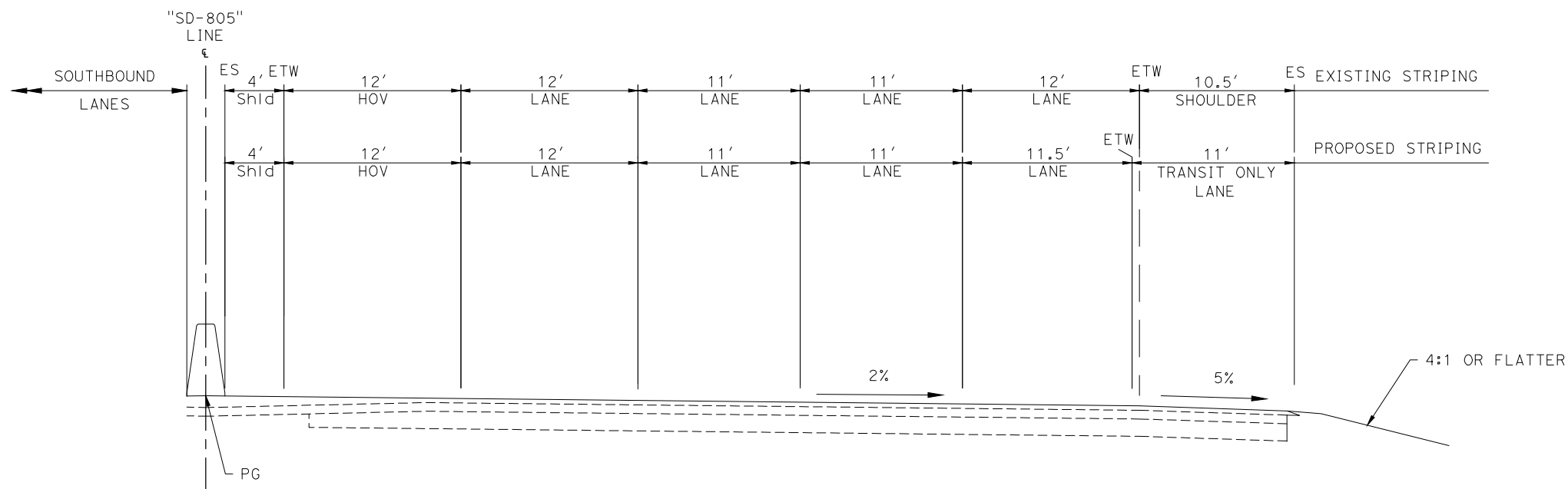
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JUNE 13, 2018  
 FOR REFERENCE ONLY





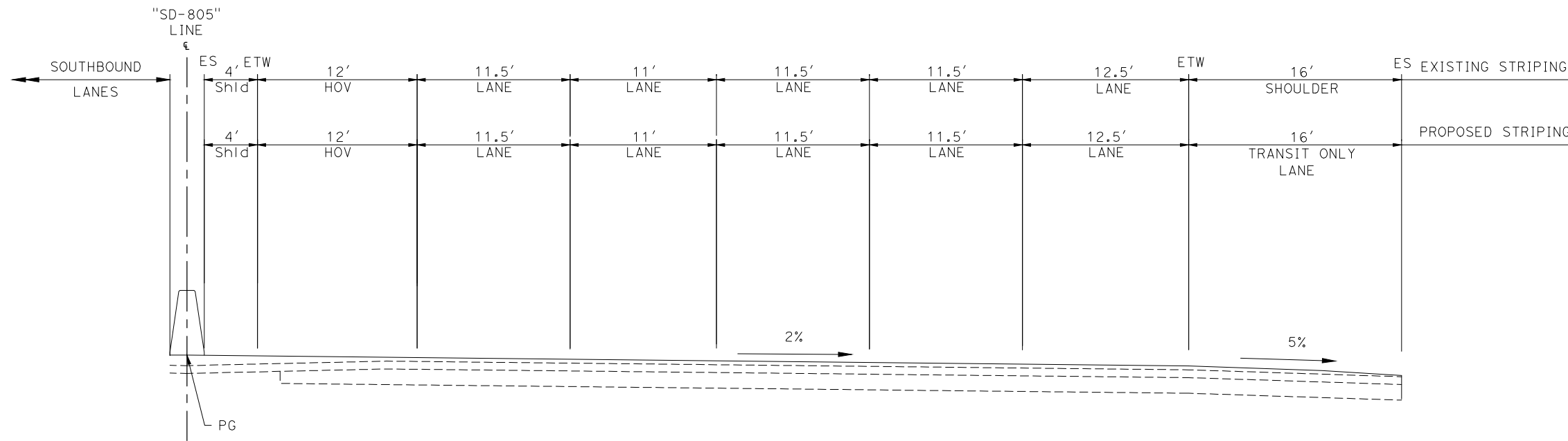
**I-805 LANE NORTHBOUND**  
LOCATION C



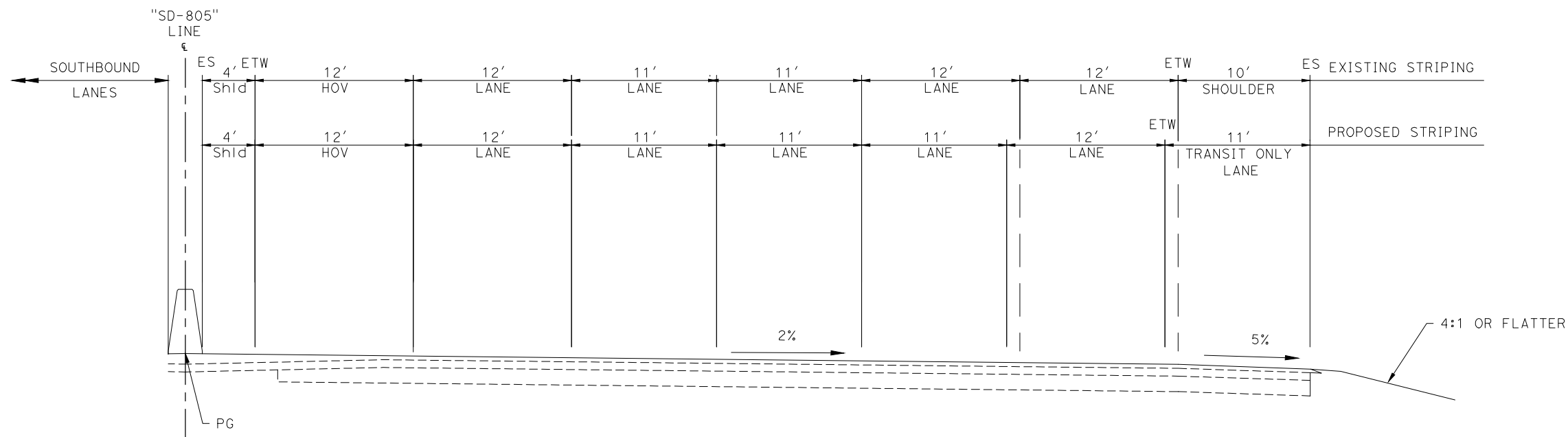
**I-805 LANE NORTHBOUND**  
LOCATION B

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JUNE 13, 2018  
FOR REFERENCE ONLY



**I-805 LANE NORTHBOUND**  
LOCATION E

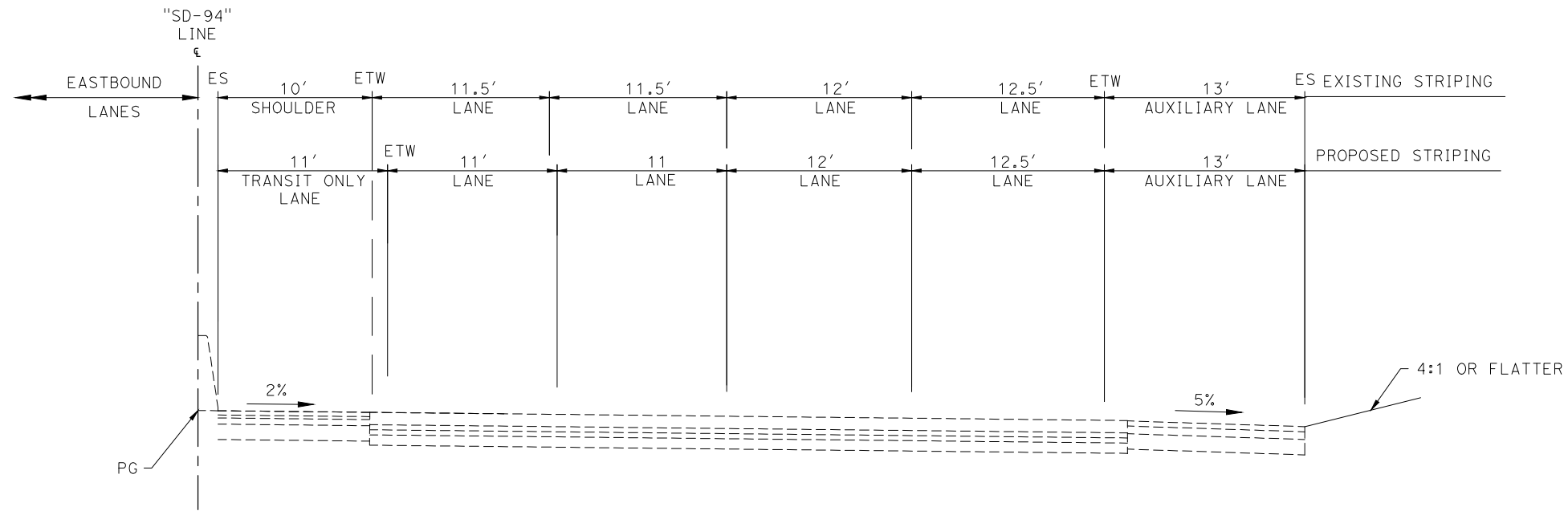


**I-805 LANE NORTHBOUND**  
LOCATION D

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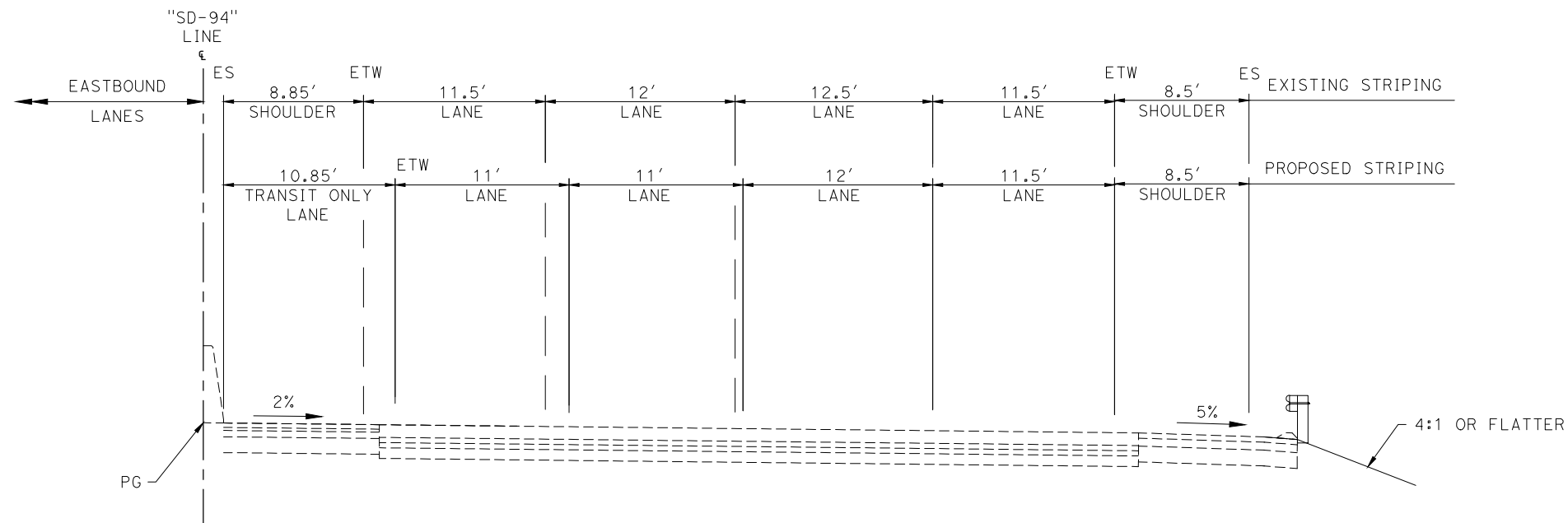
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FOR REFERENCE ONLY

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**SR-94 LANE WESTBOUND**

LOCATION G



**SR-94 LANE WESTBOUND**

LOCATION F

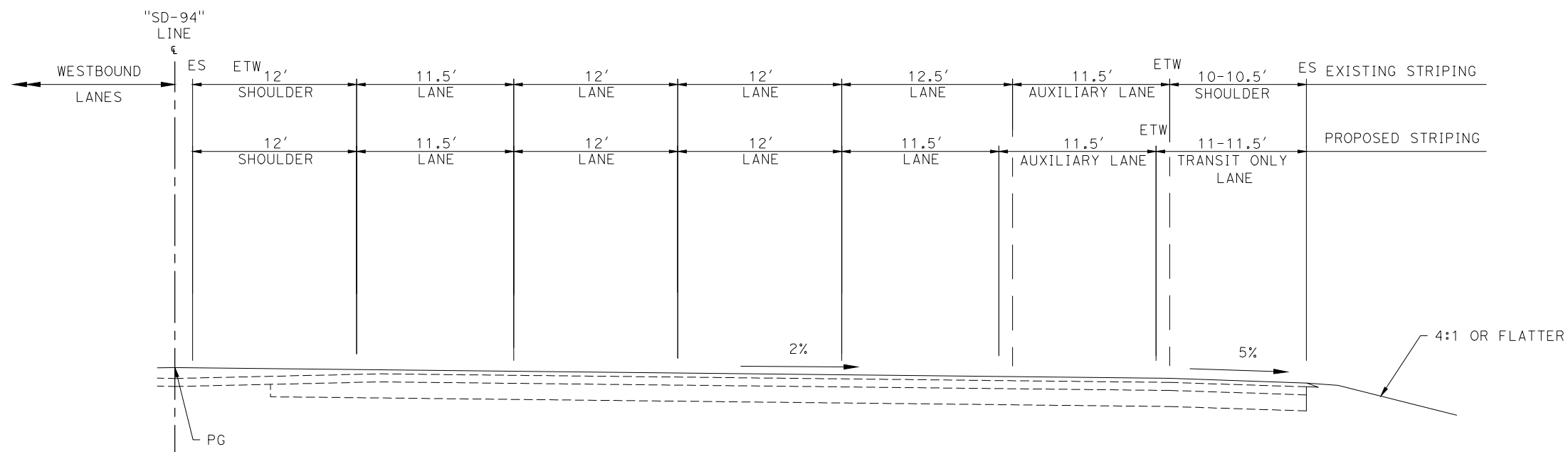
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FOR REFERENCE ONLY



I-805 / SR-94 TRANSIT ONLY LANE PROJECT  
DECISION DOCUMENT  
CROSS SECTIONS  
SHEET 4 OF 6

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**SR-94 LANE EASTBOUND**  
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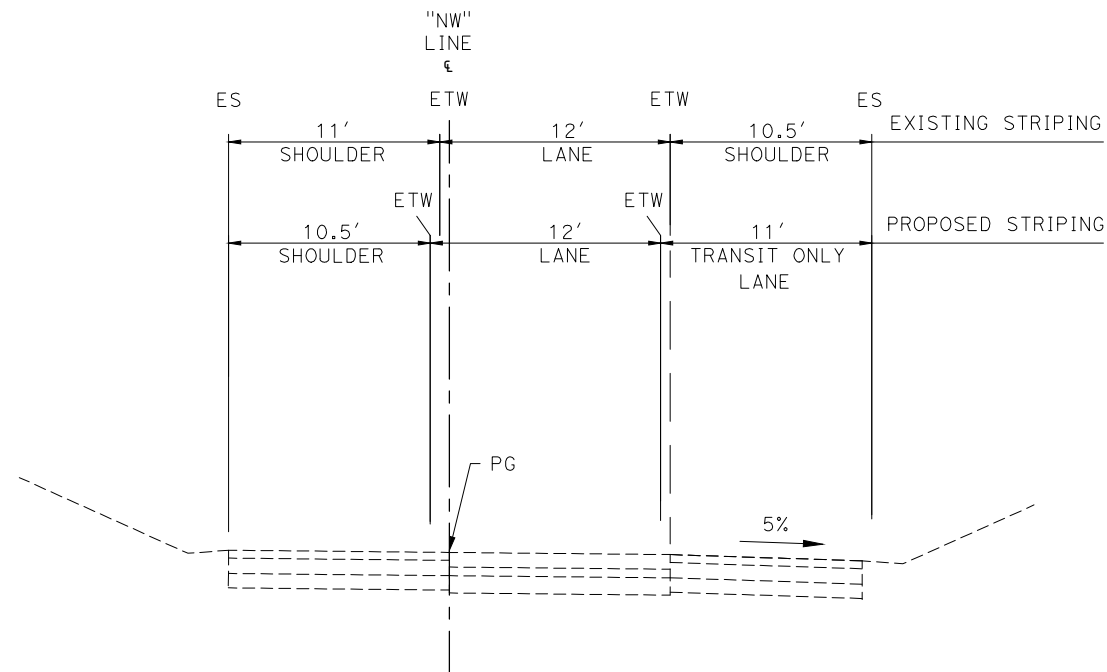
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FOR REFERENCE ONLY

**Kimley»Horn**  
401 B Street, Suite 600, San Diego, CA 92101  
Tel (619) 234-9411

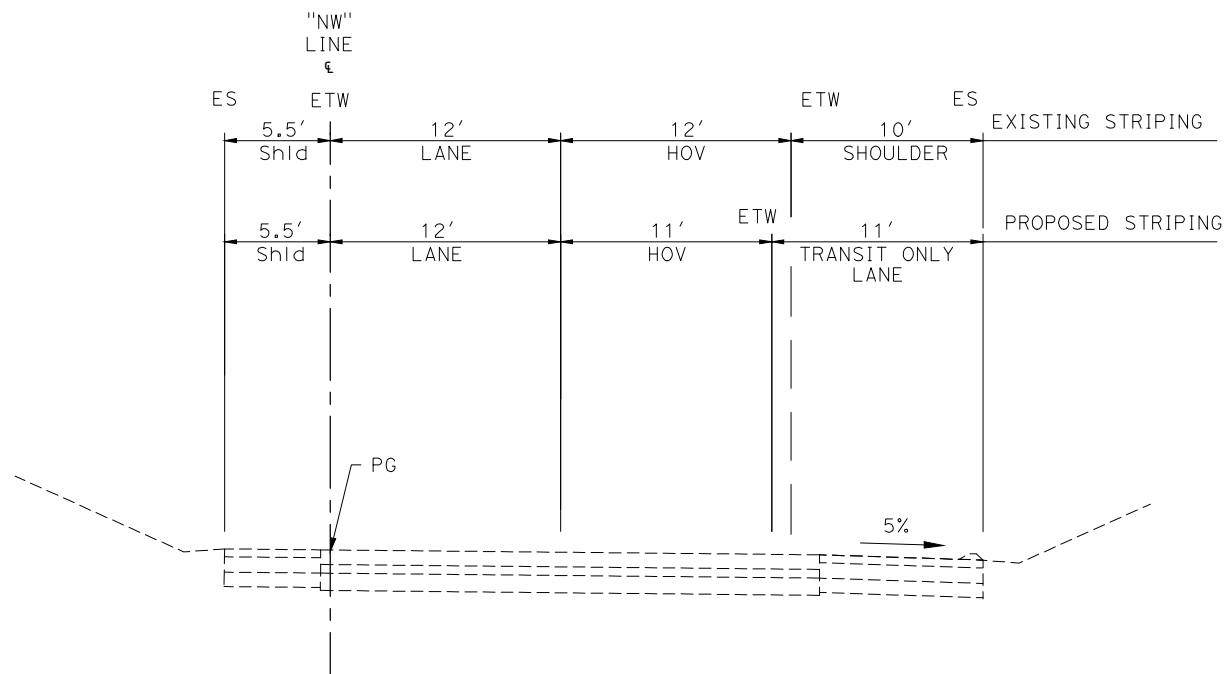


I-805 / SR-94 TRANSIT ONLY LANE PROJECT  
DECISION DOCUMENT  
CROSS SECTIONS  
SHEET 5 OF 6



**CONNECTOR RAMP EB SR-94 TO SB I-805**

LOCATION I



**CONNECTOR RAMP NB I-805 TO WB SR-94**

LOCATION J

SCALE: NOT TO SCALE

JUNE 13, 2018  
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DECISION DOCUMENT  
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SHEET 6 OF 6