

# Memorandum

*Making Conservation  
a California Way of Life*

**To:** ROBERT CLARKE, P.E.  
Public Works Director

**Date:** September 23, 2019

**File:** Mace Blvd  
Interchange

**From:** BRIAN ALCONCEL, P.E.  
Caltrans District 3  
Chief, Traffic Operations

**Subject:** **TRAFFIC CONGESTION ON I-80 AND THE MACE BLVD INTERCHANGE**

Eastbound (EB) I-80 through Yolo County and the City of Davis experiences heavy congestion during the PM peak commute period due to high vehicular demand and several infrastructure deficiencies including lane drops that create bottlenecks, incomplete ramp metering systems, and an absence of Intelligent Transportation Systems (ITS) elements. The corridor also experiences substantial recreational traffic, leading to significant congestion on weekends and holidays. In order to avoid congestion on I-80, travelers are using alternative routes via GPS navigation apps, which is adding traffic to the local road network, specifically Mace Blvd.

The proposed Yolo 80 Managed Lanes Project will help alleviate congestion in the area. However, interim measures are needed to help reduce congestion on EB I-80 and the local road network in the City of Davis. In a recent meeting between Caltrans and the City of Davis, several options to improve the Mace Blvd interchange were discussed. The options included:

- Option 1: Adding ramp meters to the High Occupancy vehicle (HOV) bypass lanes at the Mace Blvd interchange on-ramps.
- Option 1a: Adjusting ramp metering rates at the Mace Blvd interchange on-ramps.
- Option 2: Option 1 plus increasing the on-ramp storage at the Mace Blvd interchange on-ramps.
- Option 3: Option 1 plus moving the limit lines downstream for each of the ramp meters at the Mace Blvd interchange.

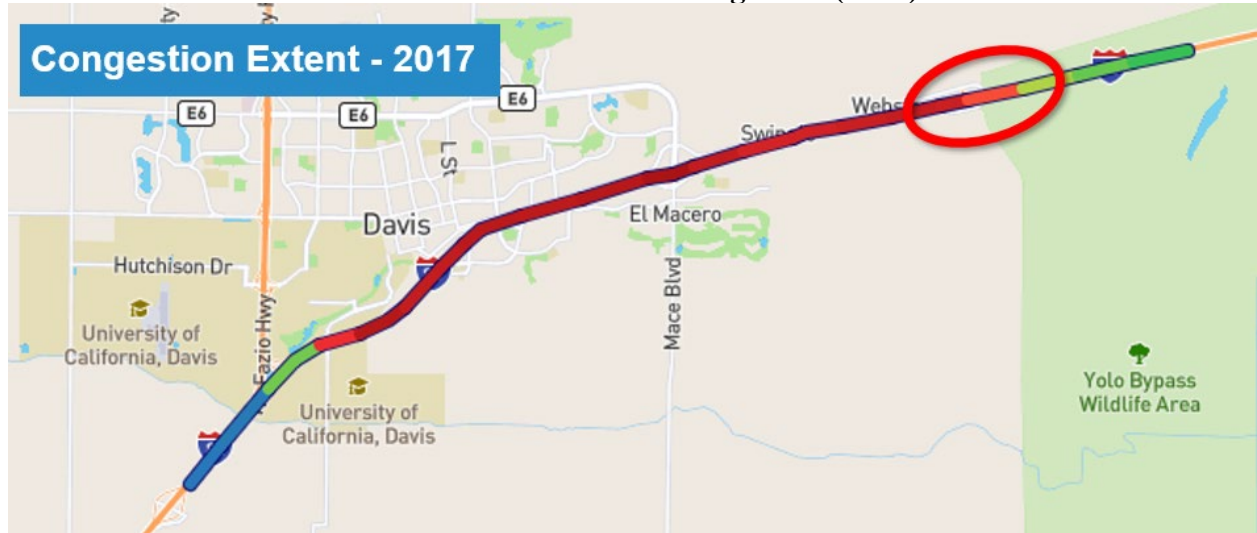
These improvements proposed by the City of Davis were discussed with the goal of alleviating congestion on Mace Blvd by reducing the amount of traffic diverting from EB I-80 to Mace Blvd, which was recently reduced from 2 lanes to 1 lane in each direction.

## TRAFFIC ANALYSIS

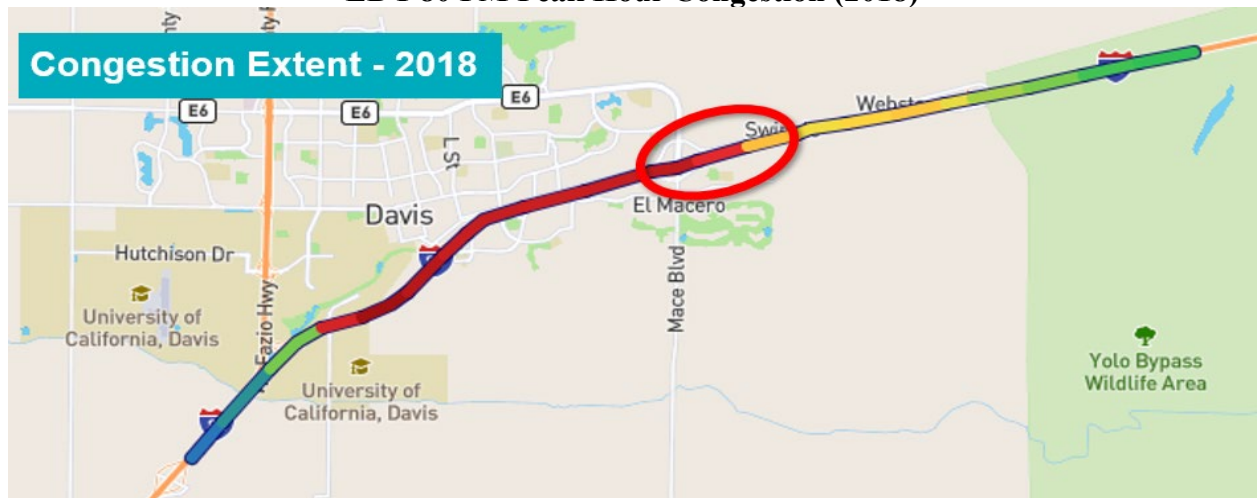
Figures 1 and 2 show the congestion on EB I-80 during the PM peak hour in 2017 and 2018. The Chiles Rd ramp meter to EB I-80, which was activated in April of 2018, reduced travel times by about 9% and eliminated a severe bottleneck along the corridor. After the activation of

the Chiles Rd temporary ramp meter, the eastern most bottleneck along the corridor is at Mace Blvd.

**Figure 1**  
**EB I-80 PM Peak Hour Congestion (2017)**



**Figure 2**  
**EB I-80 PM Peak Hour Congestion (2018)**



The severe congestion on EB I-80 and the use of GPS navigation apps have allowed drivers to make real time route changes based on travel times. The traffic diverting from EB I-80 is using two primary local road routes. The first route is exiting EB I-80 at Pedrick Road, traveling to Tremont Road, then to County Road 104, which becomes Mace Blvd, and merging back on EB I-80 at the Northbound (NB) Mace Blvd on-ramp. The second route is exiting EB I-80 to SR-113, heading north to Covell Blvd, then to Mace Blvd, and entering EB I-80 from Southbound (SB) Mace Blvd on-ramp. Table 1 shows average travel times from Pedrick Rd to Chiles Rd collected via google maps for all 3 routes.

**Table 1**  
**Travel Time Comparison (Minutes)**

<b>Time</b>	<b>Pedrick to Mace on EB I-80</b>	<b>Pedrick to NB Mace On-Ramp</b>	<b>SR-113 to Covell to SB Mace On-Ramp</b>
<b>3:30</b>	26.4	20.2	24.0
<b>4:00</b>	30.8	21.4	24.8
<b>4:30</b>	29.3	22.2	24.3
<b>5:00</b>	23.4	19.8	22.8
<b>5:30</b>	20.4	19.4	21.2

*Average Google Map Travel Times: 7-30-2019 thru 8-9-2019*

Travel times on the local road routes were faster for almost all time periods during the PM peak period, making the local road routes more attractive options for travelers. These diverting trips are the primary cause of the congestion on NB and SB Mace Blvd. The added vehicles coupled with the reduction in capacity on Mace Blvd, is the cause of the queuing and congestion experienced by travelers on Mace Blvd.

**POTENTIAL INTERIM SOLUTIONS**

One of the potential solutions to the Mace Blvd queuing issue would be to make Mace Blvd a less attractive alternative route to EB I-80 and decreasing travel times on EB I-80 by metering the HOV bypass lanes on the Mace Blvd on-ramps. Currently, over 40% of the on-ramp volumes use the HOV bypass lane during metering hours, which is a greater than expected amount. These currently unmetered HOV bypass vehicles are reducing the effectiveness of the ramp metering system by “queue jumping” the metered vehicles on the Mace Blvd on-ramps. Recently Caltrans metered its first HOV bypass lane on NB SR 99 at Mack Rd. The travel times in the area decreased by over 4 percent. Metering both HOV bypass lanes at the Mace Blvd interchange could improve travel times along EB I-80 between 4% and 8% (1.25 to 2.6 minutes).

In summary, metering the HOV bypass lanes (Option 1) at the Mace Blvd interchange will help:

- Eliminate queue jumpers.
- Eliminate the speed differential between the onramp lanes, which could help alleviate safety concerns.
- Break up tightly packed platooning vehicles, allowing for safer and manageable merging on EB I-80.
- Maximize the efficiency of the ramp meters.
- Reduce congestion on EB I-80,
- Incentivize vehicles to stay on EB I-80.
  - o Reduce queuing and congestion on Mace Blvd.

Increasing metering rates for the Mace Blvd ramp meters (Option 1a) would have the inverse desired impact. While the meters would let more vehicles onto EB I-80, the increase in vehicles would:

- Worsen the mainline bottleneck EB I-80.
- Increase travel times on EB I-80.
- Incentivize more vehicles to divert from EB I-80 to Mace Blvd.
  - o Increase congestion on Mace Blvd.
  - o Increase congestion on EB I-80.

Increasing metering rates is not a recommended strategy. However, if the HOV bypass lanes are metered, the opportunity to slightly increase metering rates may exist due to the potential reduction of congestion on EB I-80.

Increasing the on-ramp storage at the Mace Blvd interchange on-ramps and moving the limit lines downstream for each of the ramp meters at the Mace Blvd interchange (Options 2 and 3) would have a minimal impact on the congestion on Mace Blvd. With the Mace Blvd loop onramp already built out to maximum capacity, only the Mace Blvd slip onramp has room for added storage. The proposed lengthening of lane 1 on the Mace Blvd slip onramp and movement of the limit line downstream would create storage for only an additional 12 vehicles, which would have a negligible impact on the Mace Blvd queuing problem. The negligible impact of the additional storage combined with the additional project costs and environmental requirements would make Options 2 and 3 less viable and not recommended. Attachment 1 shows layouts of the proposed improvements (Options 1-3) with projected capital and support costs, level of environmental effort, and benefits.

**TRAFFIC SAFETY**

Table 2 shows collision data from 2016-2018 for EB I-80 through the proposed project area. The collision rates are higher than the statewide average and reflect collision patterns of a typical congested area. Implementing Option 1 may help reduce collisions by breaking up platooning vehicles in the merge area and eliminating the speed differential between lanes on the on-ramps.

**Table 2  
 Mainline I-80  
 TASAS Table B**

Location	Actual			Average		
	Fatal	F+I	Total	Fatal	F+I	Total
03-YOL-802.17/3.17	0.013	0.51	1.41	0.006	0.32	0.95

## **RECOMMENDATION**

Option 1 is the recommended alternative due to its positive impact on congestion on EB I-80 and Mace Blvd and relatively low project and project support costs. Options 2 and 3 would only add up to 12 vehicles of storage and would have minimal impact outside of the HOV bypass metering. Options 2 and 3 would also have more project and project support costs than Option 1.

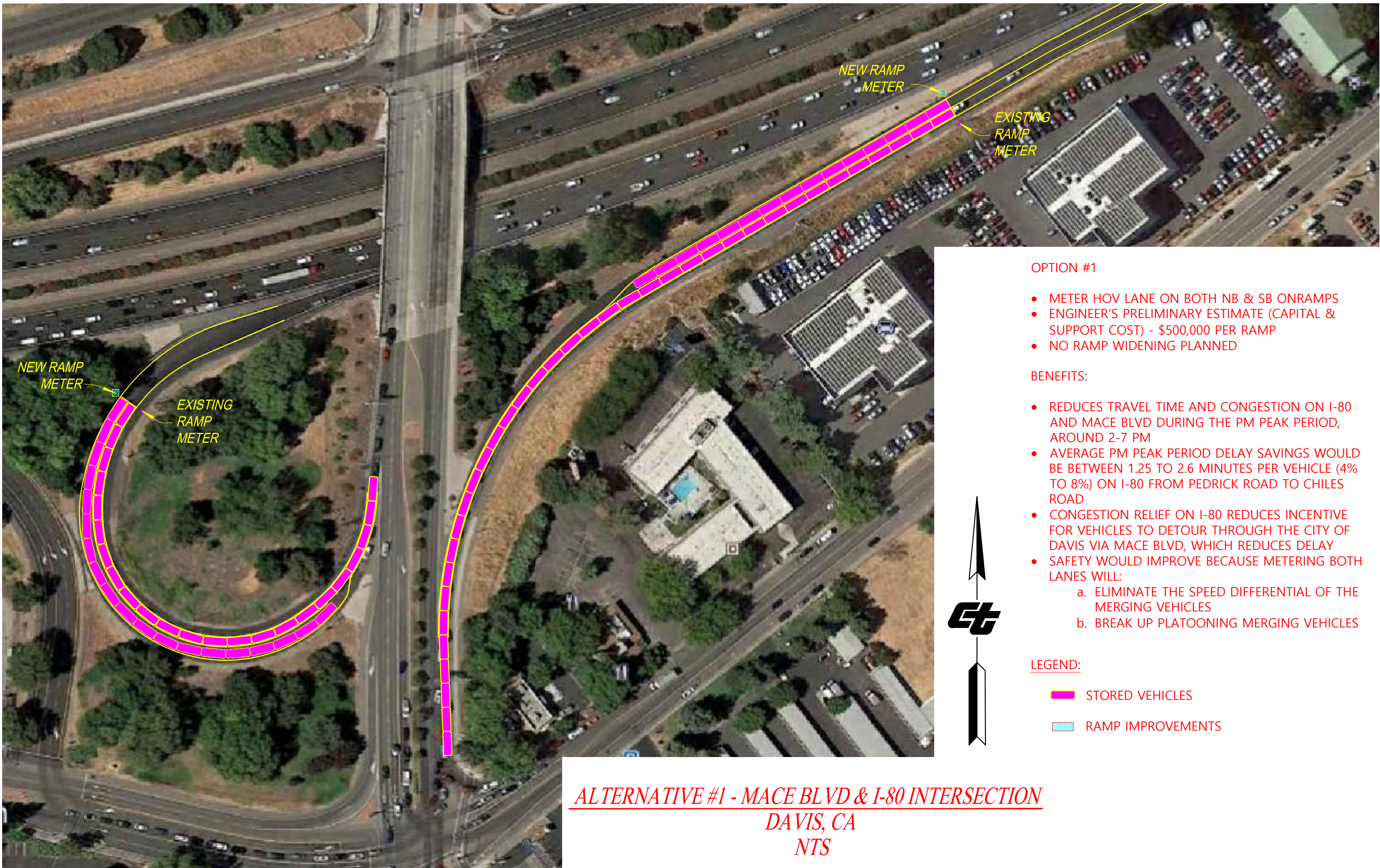
### Attachments

Attachment 1: Project Exhibits for Options 1-3

- c: Tom Brannon, Caltrans D3, Deputy District Director, Maintenance and Traffic Operations
- Darren Pytel, Chief of Police, City of Davis
- Darlene Comingore, Yolo County Public Works

# ATTACHMENT 1





**OPTION #1**

- METER HOV LANE ON BOTH NB & SB ONRAMPS
- ENGINEER'S PRELIMINARY ESTIMATE (CAPITAL & SUPPORT COST) - \$500,000 PER RAMP
- NO RAMP WIDENING PLANNED

**BENEFITS:**

- REDUCES TRAVEL TIME AND CONGESTION ON I-80 AND MACE BLVD DURING THE PM PEAK PERIOD, AROUND 2-7 PM
- AVERAGE PM PEAK PERIOD DELAY SAVINGS WOULD BE BETWEEN 1.25 TO 2.6 MINUTES PER VEHICLE (4% TO 8%) ON I-80 FROM PEDRICK ROAD TO CHILES ROAD
- CONGESTION RELIEF ON I-80 REDUCES INCENTIVE FOR VEHICLES TO DETOUR THROUGH THE CITY OF DAVIS VIA MACE BLVD, WHICH REDUCES DELAY
- SAFETY WOULD IMPROVE BECAUSE METERING BOTH LANES WILL:
  - a. ELIMINATE THE SPEED DIFFERENTIAL OF THE MERGING VEHICLES
  - b. BREAK UP PLATOONING MERGING VEHICLES

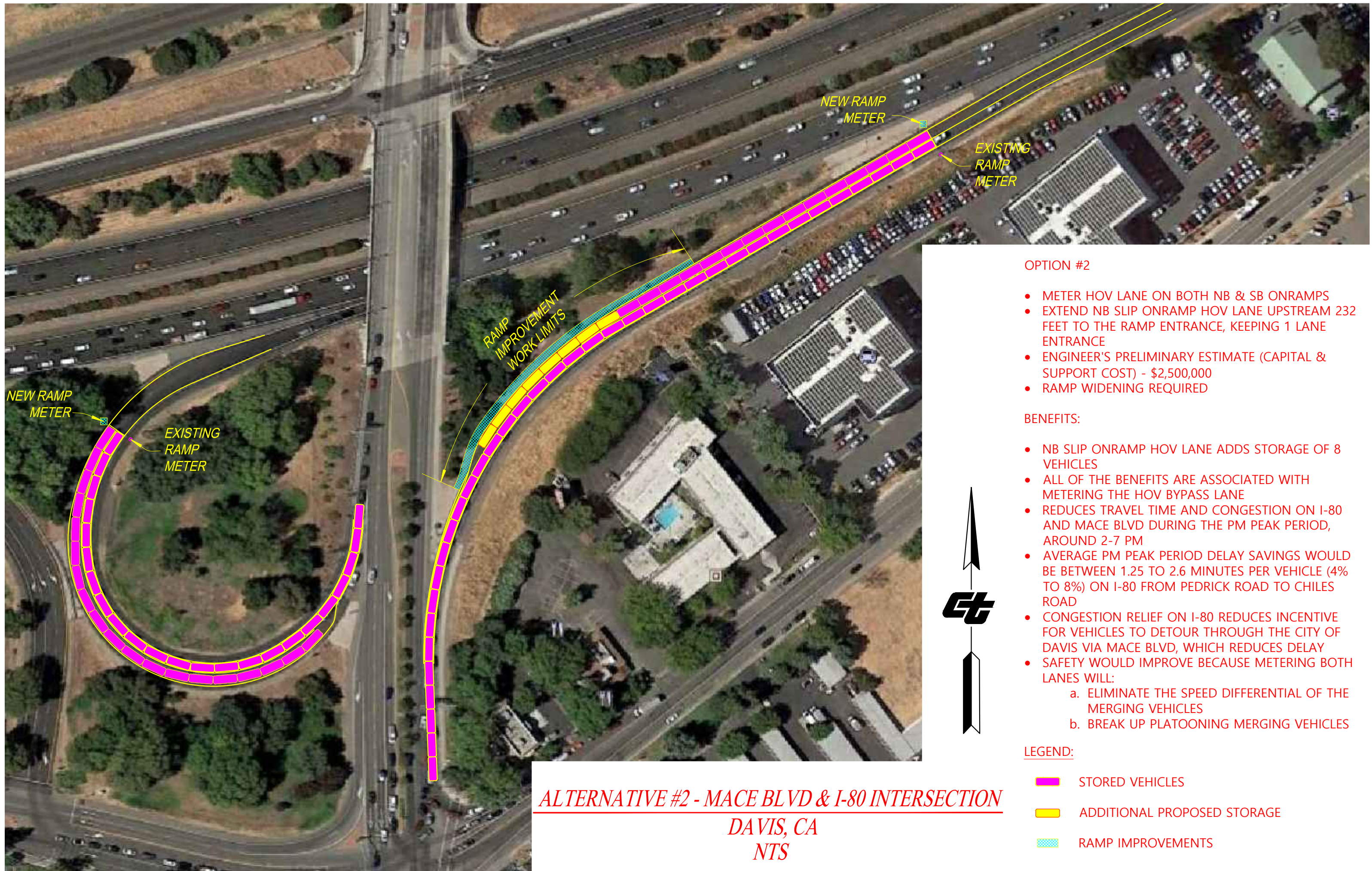


**LEGEND:**

- STORED VEHICLES
- RAMP IMPROVEMENTS

**ALTERNATIVE #1 - MACE BLVD & I-80 INTERSECTION**  
 DAVIS, CA  
 NTS





**ALTERNATIVE #2 - MACE BLVD & I-80 INTERSECTION**  
**DAVIS, CA**  
**NTS**

**OPTION #2**

- METER HOV LANE ON BOTH NB & SB ONRAMPS
- EXTEND NB SLIP ONRAMP HOV LANE UPSTREAM 232 FEET TO THE RAMP ENTRANCE, KEEPING 1 LANE ENTRANCE
- ENGINEER'S PRELIMINARY ESTIMATE (CAPITAL & SUPPORT COST) - \$2,500,000
- RAMP WIDENING REQUIRED

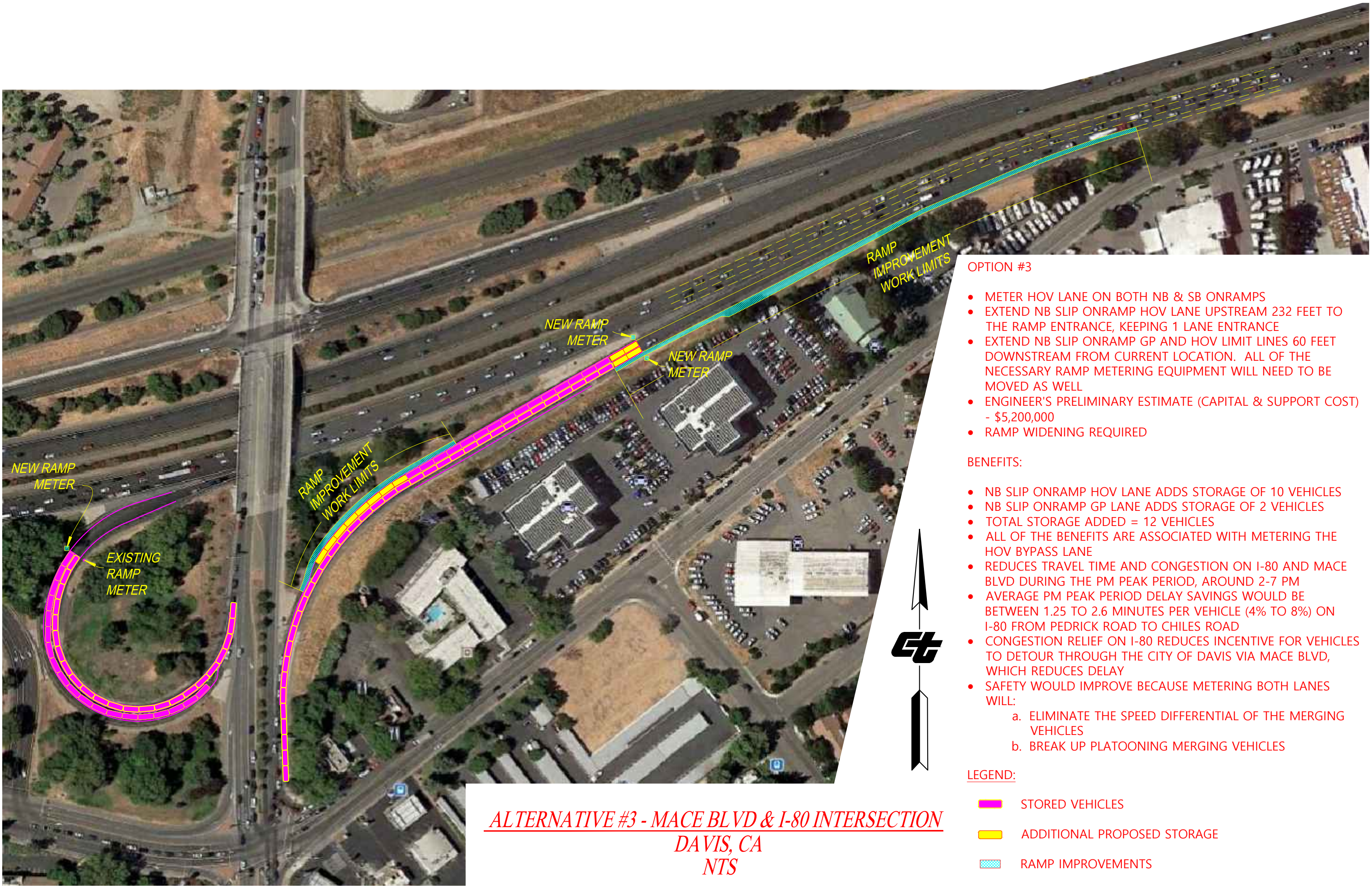
**BENEFITS:**

- NB SLIP ONRAMP HOV LANE ADDS STORAGE OF 8 VEHICLES
- ALL OF THE BENEFITS ARE ASSOCIATED WITH METERING THE HOV BYPASS LANE
- REDUCES TRAVEL TIME AND CONGESTION ON I-80 AND MACE BLVD DURING THE PM PEAK PERIOD, AROUND 2-7 PM
- AVERAGE PM PEAK PERIOD DELAY SAVINGS WOULD BE BETWEEN 1.25 TO 2.6 MINUTES PER VEHICLE (4% TO 8%) ON I-80 FROM PEDRICK ROAD TO CHILES ROAD
- CONGESTION RELIEF ON I-80 REDUCES INCENTIVE FOR VEHICLES TO DETOUR THROUGH THE CITY OF DAVIS VIA MACE BLVD, WHICH REDUCES DELAY
- SAFETY WOULD IMPROVE BECAUSE METERING BOTH LANES WILL:
  - a. ELIMINATE THE SPEED DIFFERENTIAL OF THE MERGING VEHICLES
  - b. BREAK UP PLATOONING MERGING VEHICLES

**LEGEND:**

- STORED VEHICLES
- ADDITIONAL PROPOSED STORAGE
- RAMP IMPROVEMENTS





***ALTERNATIVE #3 - MACE BLVD & I-80 INTERSECTION  
DAVIS, CA  
NTS***

**OPTION #3**

- METER HOV LANE ON BOTH NB & SB ONRAMPS
- EXTEND NB SLIP ONRAMP HOV LANE UPSTREAM 232 FEET TO THE RAMP ENTRANCE, KEEPING 1 LANE ENTRANCE
- EXTEND NB SLIP ONRAMP GP AND HOV LIMIT LINES 60 FEET DOWNSTREAM FROM CURRENT LOCATION. ALL OF THE NECESSARY RAMP METERING EQUIPMENT WILL NEED TO BE MOVED AS WELL
- ENGINEER'S PRELIMINARY ESTIMATE (CAPITAL & SUPPORT COST) - \$5,200,000
- RAMP WIDENING REQUIRED

**BENEFITS:**

- NB SLIP ONRAMP HOV LANE ADDS STORAGE OF 10 VEHICLES
- NB SLIP ONRAMP GP LANE ADDS STORAGE OF 2 VEHICLES
- TOTAL STORAGE ADDED = 12 VEHICLES
- ALL OF THE BENEFITS ARE ASSOCIATED WITH METERING THE HOV BYPASS LANE
- REDUCES TRAVEL TIME AND CONGESTION ON I-80 AND MACE BLVD DURING THE PM PEAK PERIOD, AROUND 2-7 PM
- AVERAGE PM PEAK PERIOD DELAY SAVINGS WOULD BE BETWEEN 1.25 TO 2.6 MINUTES PER VEHICLE (4% TO 8%) ON I-80 FROM PEDRICK ROAD TO CHILES ROAD
- CONGESTION RELIEF ON I-80 REDUCES INCENTIVE FOR VEHICLES TO DETOUR THROUGH THE CITY OF DAVIS VIA MACE BLVD, WHICH REDUCES DELAY
- SAFETY WOULD IMPROVE BECAUSE METERING BOTH LANES WILL:
  - a. ELIMINATE THE SPEED DIFFERENTIAL OF THE MERGING VEHICLES
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**LEGEND:**

-  STORED VEHICLES
-  ADDITIONAL PROPOSED STORAGE
-  RAMP IMPROVEMENTS