



TECHNICAL MEMORANDUM

DATE: January 17, 2005

TO: Ted Idlof, URS

FROM: Jeff Clark, Fehr & Peers

RE: U.S. 50 Interchange Planning Study

1042-2011

This memorandum describes conceptual improvements for the Bass Lake Road, Cambridge Road, Cameron Park Drive, and Ponderosa Road interchanges with U.S. 50 in El Dorado County under 2025 conditions. These conceptual improvements were developed quickly as input to the 2004 El Dorado County traffic impact fee program update, which is being done under a compressed schedule that does not allow time for a comprehensive interchange analysis process normally used to identify future interchange improvements. As such, consultation with Caltrans has not been conducted.

Because of on-going political and legal constraints affecting the El Dorado County General Plan, the conceptual improvements were developed for two 2025 scenarios. Scenario 1 is based on the No Project General Plan Alternative (No Project GP) from the El Dorado County General Plan EIR and represents conditions assuming the current writ of mandate affecting the 1996 General Plan stays in place through 2025. Scenario 2 is based on the 2004 General Plan (2004 GP) and represents conditions assuming that this general plan version is upheld by voters in March 2005 without any other modifications.

The remainder of this memorandum includes the following sections.

- Existing Conditions – description of the existing interchanges and intersection operations.
- Methodology – discussion of how the conceptual improvements were developed.
- Future Conditions – summary of planned improvements already contained in the El Dorado County General Plan.
- Recommendations – description of conceptual improvements for each interchange and mainline Route 50.

EXISTING CONDITIONS

The existing physical characteristics of Route 50 and each study interchange are briefly described below. This information provides a baseline to compare the proposed improvements needed to accommodate future traffic. Figure 1 presents the existing lane configurations and peak hour freeway ramps volumes at the four study interchanges and Route 50.

Route 50

Route 50 is a major east-west regional highway connecting Sacramento and the Central Valley with Lake Tahoe and the Sierra Nevada mountains. Beginning at the Interstate 80 separation, Route 50 travels through Yolo County, Sacramento County, El Dorado County, and ends at the California/Nevada State Line. Within the study area, Route 50 is four-lane divided freeway and runs east-west through western El Dorado County. As the transportation backbone facility in El Dorado County, Route 50 carries a significant amount of commuter and local traffic and recreational travel to ski resorts and Nevada casinos.

Bass Lake Road

Bass Lake Road is a two-lane north-south roadway that extends from Route 50 to Green Valley Road. It becomes Marble Valley Road south of Route 50. Existing and future land uses in the Bass Lake Road corridor are residential in nature and predominately north of Route 50. The Bass Lake Road interchange is a tight diamond (Type L-1) design.

Cambridge Road

Cambridge Road is a two-lane north-south roadway that extends from Route 50 to Green Valley Road. It becomes Flying C Road south of Route 50. Existing and future land uses in the Cambridge Road corridor are predominately residential in nature and north of Route 50. The Cambridge Road interchange is a Type L-7 design with loop on-ramps and slip off-ramps.

Cameron Park Drive

Cameron Park Drive is a two- to four-lane north-south roadway that extends from Rodeo Drive to Green Valley Road. Cameron Park Drive becomes Durock Road south of Rodeo Drive. Existing and future land uses in the Cameron Park Drive corridor are predominately residential north of Route 50 and commercial and residential in nature south of Route 50. The Cameron Park Drive interchange is a tight diamond (Type L-1) design for the eastbound Route 50 ramps and a partial-cloverleaf (Type L-9) design for the westbound Route 50 ramps.

Ponderosa Road

Ponderosa Road is a two-lane north-south roadway that extends from Route 50 to Green Valley Road. It becomes South Shingle Road south of Route 50. Existing and future land uses in the Ponderosa Road/South Shingle Road corridor are a mixture of residential, commercial and employment. Ponderosa High School is located on Ponderosa Road north of Route 50. The Ponderosa Road interchange is a Type L-7 design for the eastbound ramps and a partial-cloverleaf (Type L-9) for the westbound ramps.

Existing Intersection Operations

Traffic operations of the study intersections were evaluated using Level of Service (LOS). LOS is a qualitative description of an intersection’s operation ranging from LOS A, or free-flow conditions with little or no delay, to LOS F, or oversaturated conditions with high levels of delay.

The LOS methodology evaluates an intersection’s operation based on the average control delay calculated using the methodology described in the *Highway Capacity Manual* (Transportation Research Board, 2000). Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration. For signalized and all-way stop-controlled intersections, control delay and LOS are reported for the intersection as a whole. For side-street stop-controlled intersections, control delay and LOS are reported for the intersection as a whole and for the worst-case (longest-delayed) approach. Intersection delays at the Bass Lake Road/US 50 Interchange and Cambridge Road/US 50 Interchange were calculated using the HCS2000 LOS software package. Intersection delays at the Cameron Park Drive/US 50 interchange and Ponderosa Road/US 50 interchange were calculated using the SimTraffic software package. Intersection operations are correlated to a LOS designation as described in Table 1.

Table 1 Level of Service Description at Intersections			
LOS	Description	Average Control Delay (Seconds/Vehicle)	
		Signalized Intersections	Unsignalized Intersections
A	Very low delay, extremely favorable progression.	≤ 10.0	≤ 10.0
B	Low delay, short cycle lengths, good progression.	10.1 - 20.0	10.1 - 15.0
C	Moderate delay, fair progression.	20.1 - 35.0	15.1 - 25.0
D	Noticeable congestion and cycle failures.	35.1 - 55.0	25.1 - 35.0
E	High delays, poor progression, some cycle failures.	55.1 - 80.0	35.1 - 50.0
F	Oversaturation, frequent cycle failures.	> 80.0	> 50.0

Source: *Highway Capacity Manual* – Transportation Research Board, 2000.

The turning movement volumes and existing intersection geometrics were used to calculate peak hour LOS at the study intersections. The peak hour turning volumes at the study area intersections are shown on Figures 2 and 3. The intersection LOS results are summarized in Table 2.

Intersection	Traffic Control	AM Peak Hour		PM Peak Hour	
		Delay ¹	LOS ²	Delay ¹	LOS ²
Bass Lake Rd/US 50 Interchange	Side-Street	7.4	A	7.3	A
Bass Lake/US 50 EB Ramps	Stop Control	(14.0)	(B)	(21.7)	(C)
	Side-Street	10.6	B	8.2	A
Bass Lake/US 50 WB Ramps	Stop-Control	(17.3)	(C)	(24.1)	(C)
	Side-Street	8.2	A	10.5	B
Bass Lake/Country Club	Stop-Control	(>50)	(F)	(>50)	(F)
Cambridge Rd/US 50 Interchange	Side-Street	7.5	A	7.5	A
Cambridge/US 50 EB Ramps	Stop-Control	(12.9)	(B)	(25.4)	(D)
	All Way				
Cambridge/US 50 WB Ramps	Stop-Control	>50	F	35.5	E
Cameron Park/US 50 Interchange					
Cameron Park/Coach	Signal	19.3	B	46.4	D
Cameron Park/US 50 EB Ramps	Signal	24.3	C	41.0	D
Cameron Park/US 50 WB Ramp – Country Club	Signal	24.7	C	52.7	D
Cameron Park/Palmer	Signal	17.0	B	110.7	F
Ponderosa/US 50 Interchange					
S. Shingle/Durock	Signal	31.4	C	76.9	E
Ponderosa/US 50 EB Ramp – Mother Lode	Signal	65.6	E	71.9	E
Ponderosa/US 50 WB Ramp	Signal	42.4	D	34.9	C
Ponderosa/N. Shingle – Wild Chaparral	Signal	65.8	E	60.2	E
Notes:					
¹ Average control delay expressed in seconds per vehicle using methodologies presented in the <i>Highway Capacity Manual</i> (Transportation Research Board, 2000). For signalized intersections, average control delay is for the intersection as a whole. For side-street stop-controlled intersections, average control delay is reported for both the intersection as a whole and the worst-case approach or turning movement. XX (YY) = Whole Intersection (Worst-Case Approach).					
² LOS = Level of Service					
Source: Fehr & Peers, 2005					

There are three intersections operating at LOS F or have specific movements operating at LOS F.

- Bass Lake Road/Country Club Drive (AM and PM Peak Hour – Country Club Drive approach)
- Cambridge Road/US 50 westbound ramps (AM peak hour)
- Cameron Park Drive/Palmer Drive (PM peak hour)

Observations made during the collection of field data indicate that generally interchange operations are affected by tight spacing between intersections (Bass Lake Road, Cameron Park Drive, and Ponderosa Road interchanges), split phase operation of traffic signals (Ponderosa Road

interchange), and school traffic (Cambridge Road and Ponderosa Road interchanges). Specific observations are as follows:

- The queue of vehicles on the eastbound off ramp at the Ponderosa Road/US 50 eastbound off-ramp – Mother Lode Drive intersection rarely clears during the PM peak hour. This leads to aggressive driver behavior. We observed three vehicles running the red light in the hour that we observed the intersection.
- Northbound vehicles on South Shingle Road are “metered” into the US 50 interchange at the South Shingle Road/Durock Road intersection.
- Drivers make their own right turn lane on southbound Ponderosa Road between Mother Lode Drive and Durock Road.
- Eastbound vehicles on Coach Lane are provided little space to turn left onto Cameron Park Drive resulting in long waits and queues during the PM peak hour.
- The lane drop northbound on Cameron Park Drive at Palmer Drive results in LOS F operation on that approach to the Cameron Park Drive/Palmer Drive intersection.

EVALUATION METHODOLOGY

The conceptual interchange improvements were developed by comparing future 2025 traffic volume forecasts to specific planning level capacity thresholds. The traffic forecasting methodology is described in detail below followed by a discussion of the capacity thresholds.

Traffic Volume Forecasts

The traffic volume forecasts were generated using a modified version of the 2025 El Dorado County General Plan travel demand forecasting model. Both the No Project GP and 2004 GP land use and roadway network data sets were used to determine the improvements needed at the four study area interchanges and to Route 50. The modifications to the models included increasing the 2025 land use amounts based on work completed by MUNI Financial for the El Dorado County traffic impact fee program update and to reflect recently approved projects. After making these modifications, 2025 a.m. and p.m. peak hour roadway segment traffic volume forecasts were generated and adjusted to account for model error.

It was necessary to adjust the existing traffic counts to ensure that they “balanced” at the study interchanges. In some cases the existing volume data was significantly different for the departure numbers when compared to the approach numbers on the same roadway segment. In essence an interchange is a closed system as no vehicles enter the system other than at controlled locations. Because of this the departure volumes from one intersection should match the approach volumes at a down stream intersection.

Capacity Thresholds

The traffic volume forecasts were compared to planning-level capacity thresholds for the freeway mainline, freeway ramps, and arterial roadway segments. The specific capacity thresholds are listed below.

- The freeway mixed-flow lane capacity was assumed to 2,000 vehicles per hour per lane.
- The freeway HOV lane capacity was assumed to 1,800 vehicles per hour per lane.
- The freeway auxiliary lane capacity was assumed to 1,200 vehicles per hour per lane.
- The freeway mixed-flow ramp capacity was assumed to 900 vehicles per hour per lane.
- The overcrossing and local road interchange approaches mixed-flow lane capacity was assumed to 700 vehicles per hour per lane.

Based on the traffic volume forecasts and capacity thresholds, improvement recommendations were developed for each interchange. The recommendations considered interchange configuration, traffic control, and number of lanes needed on the freeway on and off-ramps (mixed-flow and HOV bypass), number of lanes on Route 50 (mixed-flow, HOV and auxiliary), and number of lanes on the local roadway system in the vicinity of the interchanges. Where appropriate, the recommendations include relocation of frontage roads that would aid in the operation of the interchanges.

FUTURE YEAR (2025) CONDITIONS

The future year conditions describe the planned Route 50 improvements in the study area based on the No Project GP and 2004 GP. Both plans include the addition of HOV lanes on Route 50 from the County line to Ponderosa Road and the addition of one mixed-flow lane in each direction from the County line to Cambridge Road. The 2004 GP would extend the added mixed-flow lane to Ponderosa Road. Under both plans, the study interchanges were identified as needing improvements but left the identification of specific improvements as an implementation measure.

RECOMMENDATIONS

The peak-hour traffic volumes and recommended conceptual improvements for each study interchange and the Route 50 mainline are displayed in Figures 4 and 5 for the No Project GP and the 2004 GP, respectively. Key differences between the two plan scenarios are described below.

Bass Lake Interchange

The 2004 GP needs two mixed-flow lanes on the westbound on-ramp and eastbound off-ramp compared to just one for the No Project GP.

Cambridge Road Interchange

No differences in improvements were identified between the No Project GP and the 2004 GP.

Cameron Park Drive Interchange

No differences in improvements were identified between the No Project GP and the 2004 GP.

Ponderosa Road Interchange

No differences in improvements were identified between the No Project GP and the 2004 GP.

Route 50

Route 50 would require the following improvements under the No Project GP and the 2004 GP.

- Add one HOV lane in both directions on Route 50 between the County line and Ponderosa Road.
- Add one mixed-flow lane in both directions between the County line and Cambridge Road.
- Add one auxiliary lane in both directions between Cambridge Road and Cameron Park Drive
- Add one auxiliary lane in both directions between Cameron Park Drive and Ponderosa Road.
- Add one westbound auxiliary lane between Ponderosa Road and Shingle Springs Drive.

For the 2004 GP only, the following additional improvement would be needed.

- One mixed-flow lane in both directions between the Cambridge Road and Cameron Park Drive









