Subject:	**Potential Road Access Routes (Final Draft)**
Project feature:	Site Development / Logistics
Prepared for:	California Department of Water Resources (DWR) / Delta Conveyance Office (DCO)
Prepared by:	Design and Construction Authority (DCA)
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1. Introduction

The DWR is conducting an environmental review and planning process for a single-tunnel Delta Conveyance Project (Project). The Project will consist of intakes, tunnels, shafts, forebays, a pumping plant, outlet and control structures, and other facilities. To construct the Project, various potential access routes will be needed to transport large quantities of materials, equipment, and workers to the construction work sites. It will be necessary to use existing roads and bridges, railroads, and watercourses in the Delta to provide the network of transportation infrastructure necessary for this Project.

This technical memorandum (TM) describes potential access routes using the existing roads and bridges in the Project area. All work sites are expected to have access by road, either primarily or in combination with rail or barge transport where appropriate. This TM discusses the physical conditions of the existing roads and their ability to be used for numerous construction trucks. However, this TM does not estimate or evaluate traffic patterns or attempt to minimize construction traffic on existing roads.

This TM includes the following sections:

- Introduction
- Summary
- Truck Routes
- Existing Roads
- Bridges
- Pavement Conditions
- Roadway Traffic
- Document History and Quality Assurance

2. Summary

The existing road network in the Project area would be anticipated to be used in combination with other potential transportation modes, such as rail or barge, to access the construction sites. The following routes near the Project could potentially be used:

- Designated Surface Transportation Assistance Act (STAA) and California Legal Truck Routes provide a network for large trucks to operate. Some segments of the state routes (SRs) have advisory limits on the length of trucks allowed.

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- SR 4 and SR 12, Byron Highway, and Interstates 5 and 205 would provide the core road access for trucks to haul equipment and materials to and from the Project work sites. SR 160 would not be a preferred access route because of its proximity to small communities along the Sacramento River and the route's location on top of a levee.
- More than 30 local roads would provide direct access to potential Project work sites in the Delta. These roads are often rural two-lane paved roadways with 10-foot-wide lanes and minimal shoulders. They are intended for residential, commercial, and agricultural vehicles and traffic.
- Seven of the nine bridges along the SRs in the Project area are moveable and could result in traffic delays when the bridges open. The SR 4 bridges across Old River and Middle River have narrow lanes and sharp turns on the approach roadways, and the State has identified these routes with advisories for longer trucks. The two SR 4 bridges require speed reduction on the approaches due to reduced lane widths and acute angle of approach. Intermittent congestion and traffic delays also occur due to the two SR 12 moveable bridges across the Mokelumne River and Little Potato Slough.
- There are more than 40 bridges on local roads in the Project area. Twelve of the bridges are moveable. The California Department of Transportation (Caltrans) has rated 14 of these local bridges as functionally obsolete or structurally deficient.
- Pavement conditions on existing roads in the Project area range from poor to good. SRs are, in general, in good condition although pavement condition data are not yet available for all State routes.

3. Truck Routes

The STAA of 1982 allows large trucks to operate on the Interstate and certain primary routes (collectively, the National Network). These trucks, referred to as STAA trucks, are longer than California legal trucks. The longer STAA trucks have a larger turning radius than most local roads can accommodate. On STAA routes, the maximum length of trailer of a semitrailer truck is 53 feet (ft). STAA trucks may use Terminal Access routes to exit the Interstate highways and travel onto State and local routes (Figure 1).

California Legal Trucks must meet certain requirements, such as a maximum length of 65 ft for single trailers, 40 ft from kingpin to rear axle (KPRA), and 75 ft for double trailers. Roads with geometric conditions such as sharp turning radius are classified as California Legal with KPRA Advisory.

STAA and California Legal Truck routes in the Project area include (Figure 1):

- National STAA truck routes:
  - Interstate 5
  - SR 99
  - Interstate 205
- Terminal Access for STAA Routes:
  - SR 12
  - SR 4 (Interstate 5 to Port of Stockton Expressway)
  - SR 160 (from SR 4 to Junction with Isleton Road at Sacramento River)

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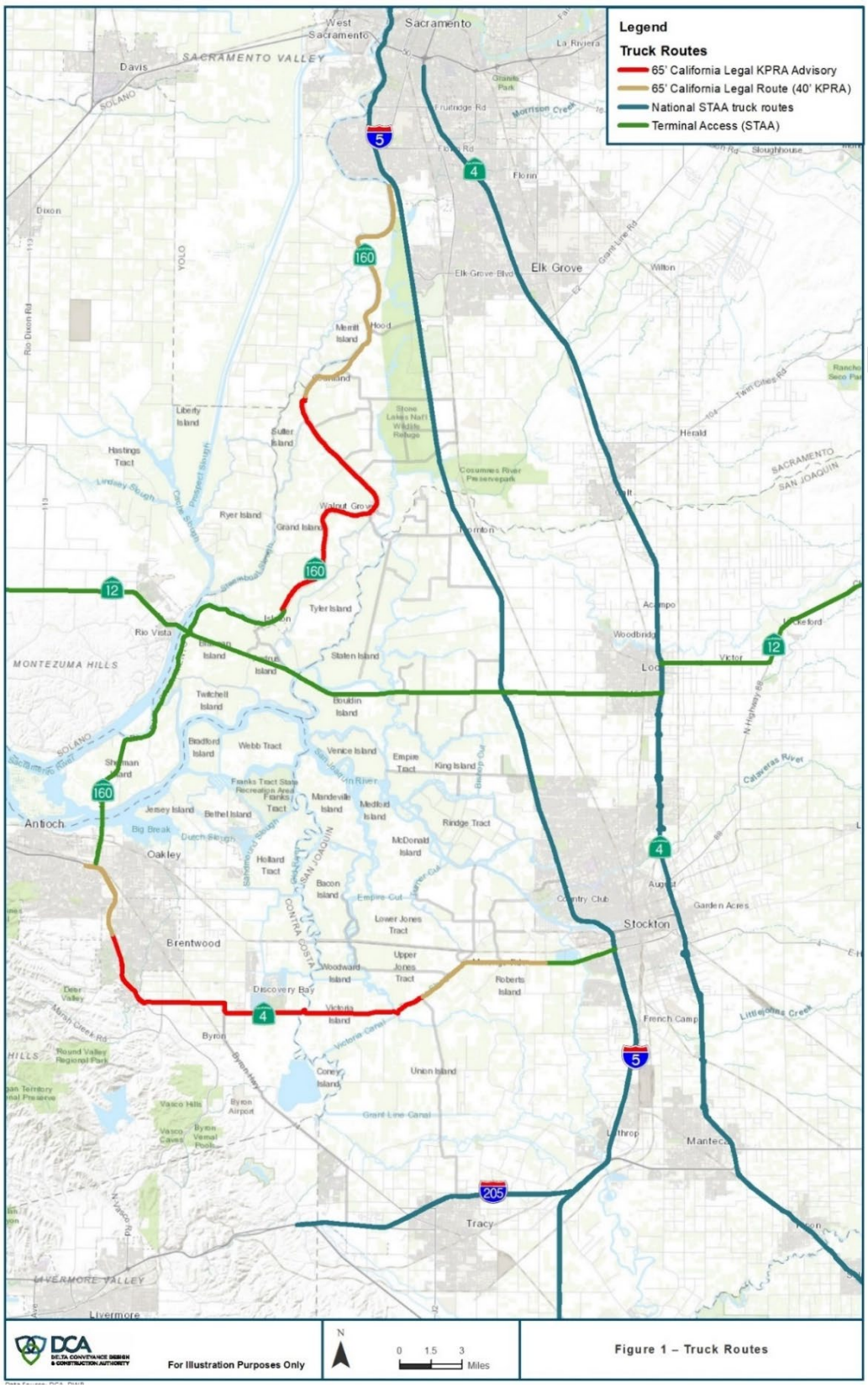

Figure 1. Truck Routes

- The 65-ft California Legal Route for 65-ft semitrailers or 40-ft KPRA length:
  - SR 4 (Port of Stockton Expressway to Tracy Boulevard in San Joaquin County)
  - SR 4 (Sand Creek Road in Brentwood to junction with SR 160)
  - SR 160 (junction with River Road 0.8 mile south of Courtland to 1 mile north of Freeport Bridge)
- The 65-ft California Legal Route with KPRA Advisory:
  - SR 4 (Tracy Boulevard in San Joaquin County to Sand Creek Road in Brentwood for 34-ft trucks)
  - SR 160 (junction with Isleton Road at Sacramento River to east of the junction with the River Road 0.8 mile south of Courtland for 30-ft trucks)

4. Existing Roads

The existing public road network in the Project area is primarily owned and maintained by the State of California, as well as the San Joaquin, Sacramento, and Contra Costa counties; and, to a lesser extent, the Solano, Yolo, and Alameda counties (Figure 2). There are also existing agricultural roads and levee crown roads maintained by Reclamation Districts and private landowners throughout the Project area.

4.1 State Routes and Interstates

4.1.1 State Route 4

SR 4 from Interstate 5 to the junction with SR 160 in Contra Cost County is an important freight corridor. It experiences relatively heavy truck traffic that provides Contra Costa County and other Bay Area communities with direct access to the Port of Stockton. Different segments of SR 4 are summarized here (Figure 2).

- In Contra Costa County, SR 4 extends for 6.5 miles in the Project area from the SR4/SR 160 interchange to the Marsh Creek Road/Vasco Road intersection. SR 4 begins as a six-lane and four-lane freeway with three interchanges, transitioning to a two-lane expressway with two at-grade intersections. Right-of-way widths vary from 40 ft to 220 ft.
- In Contra Costa County, SR4 also extends for 11.8 miles in the Project area from the Marsh Creek Road/Vasco Road intersection to the County line (at the Old River Bridge). SR 4 is a two- to four-lane conventional highway, classified as a principal arterial, with left and right turn lanes and merging lanes at at-grade intersections. Signalized intersections are at Walnut Boulevard, Byron Highway, Bixler Road, and Discovery Bay Boulevard. Intersections with local streets that are not signalized are stop sign controlled. Generally, in this segment SR 4 has 12-ft-wide lanes and 0-ft- to 8-ft-wide shoulders. Right-of-way widths vary from 50 ft to 120 ft.
- In San Joaquin County, SR4 extends for 6.0 miles in the Project area from the County line (at the Old River Bridge) to Tracy Boulevard. SR 4 is two-lane conventional highway, classified as a minor arterial. It has 12-ft-wide lanes and 0-ft- to 8-ft-wide shoulders. Right-of-way widths vary from 50 ft to 140 ft. This segment of SR 4 crosses Old River Bridge (a two-lane moveable bridge built in 1915 with elevation 8 ft above mean sea level), continues across Victoria Island to the Middle River Bridge (a two-lane truss bridge built in 1915 with an 8-ft clearance above mean sea level). SR 4 includes narrow lanes and sharp turns consistent with its designation as an advisory truck route. The two bridges can require speed reduction on the approaches due to reduced lane width, the acute angle of approach, intermittent congestion, and driver delay associated with bridge openings. Nonstandard shoulders and lane widths combined with a lack of parallel roads for detour contribute to severe congestion events.

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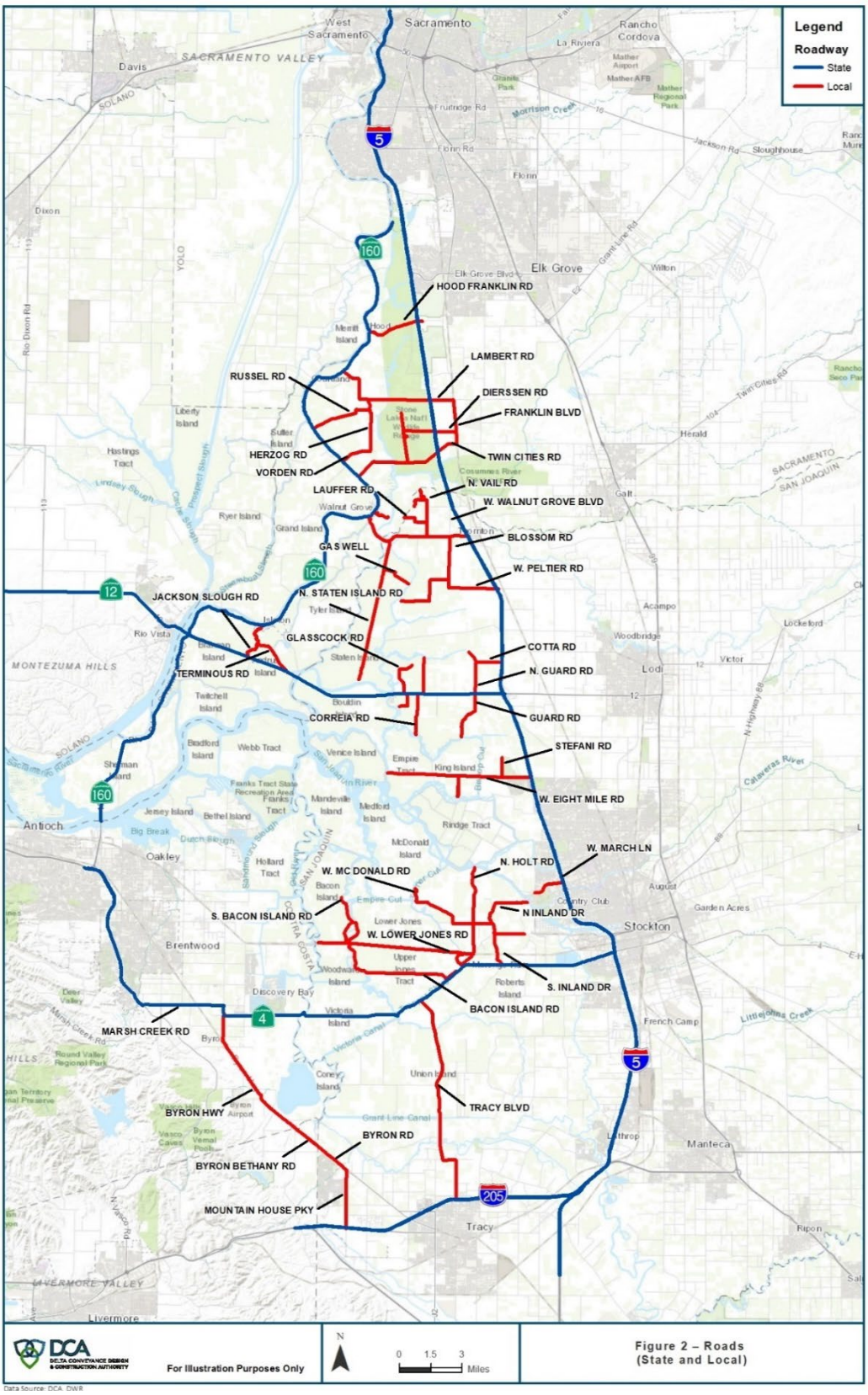

Figure 2. State and Local Roads

- In San Joaquin County, SR 4 extends for 8.1 miles in the Project area from Tracy Boulevard to the San Joaquin River Bridge. SR 4 is two-lane conventional highway, classified as a minor arterial. In this segment, SR 4 continues on top of a levee to the San Joaquin River Bridge (a two-lane through-truss swing bridge built in 1933 that is currently not moveable, with 10-ft clearance above mean sea level). This segment has 12-ft-wide lanes and 0-ft- to 8-ft-wide shoulders. Right-of-way widths vary from 50 ft to 140 ft.
- In San Joaquin County, SR 4 extends for 1.9 miles in the Project area from the San Joaquin River Bridge to Interstate 5. SR 4 is two-lane conventional highway, classified as a principal arterial, with a center two-way left-turn lane and turn lanes at intersections. This segment of SR 4 has 12-ft-wide lanes and 0-ft- to 8-ft-wide shoulders. Right-of-way widths vary from 50 ft to 125 ft.

4.1.2 State Route 12

SR 12 provides a vital link between the agricultural counties of the northern San Joaquin Valley and the counties north of the San Francisco Bay, including wineries and agricultural feed enterprises. For example, SR 12 provides a direct freight and transportation connection between wineries in San Joaquin County and the Sierra Nevada foothills with industries supporting the wineries, including Fairfield, where numerous wine bottle manufacturers are located. Similar interconnections exist with alfalfa and other feeds grown in the Delta and dairies in Sonoma County.

SR 12 is a two-lane conventional highway, classified as a principal arterial, 10.2 miles in length from Interstate 5 to SR 160, except for the segment on Bouldin Island. From the Mokelumne River Bridge to Little Potato Slough Bridge, SR 12 is a two-lane divided highway with concrete median barrier. Lanes are 12 ft wide, with shoulders varying from 4 ft to 10 ft wide. Right-of-way widths vary from 110 ft to 310 ft.

SR 12 crosses two moveable bridges (Little Potato Slough and Mokelumne River). The moveable bridges present operational considerations with speed reduction on the approaches to the bridges due to reduced lane width, intermittent congestion and driver delay associated with bridge openings, and unscheduled maintenance or repair of bridges. Nonstandard shoulders and lane widths, combined with a lack of parallel streets and roads for detour, contribute to severe congestion events.

4.1.3 State Route 160

SR 160 was built on top of levees next to the Sacramento River and is a vital transportation corridor for the communities and land uses along the Sacramento River and elsewhere in the Delta. It provides regional connectivity to Sacramento and other major population centers. It serves the City of Isleton and the small unincorporated communities of Courtland, Hood, and Freeport are located along SR 160.

SR 160 extends 6.0 miles from SR 12 to Isleton Bridge. This segment continues along the river through the City of Isleton and serves as its Main Street, until it reaches the Isleton Bridge to cross the river to Grand Island. This reach is a two-lane conventional road, classified as a Major Collector, with narrow shoulders and limited passing sight distance. SR 160 has 12-ft-wide lanes and 0-ft- to 4-ft-wide shoulders.

SR 160 extends 28.9 miles from the Isleton Bridge to a location north of the community of Freeport. SR 160 is a two-lane conventional road, classified as a major collector, with narrow shoulders and limited passing sight distance. SR 160 has 12-ft-wide lanes and 0-ft- to 2-ft-wide shoulders. This segment of SR 160 continues on Grand Island, passing through Walnut Grove, and continues along Grand Island and crosses

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the Sacramento River to a location near Paintersville. The route continues on the eastern side of the Sacramento River north to Freeport. SR 160 north of Isleton Bridge is a California Legal Advisory Route. This route designation means California Legal Trucks are allowed but are not advised to take the route if the KPRA length is over 30 ft.

4.1.4 Interstate 5

Interstate 5 is the primary north-south facility through the eastern portion of the Project area connecting Sacramento and Stockton. Interchanges are located at Hood Franklin Road, Twin Cities Road, W. Walnut Grove Road, Peltier Road, Turner Road, SR 12, and Eight Mile Road; there are also several within the Stockton area, including at SR 4. Interstate 5 is a four-lane divided freeway north of SR 12, six lanes south of SR 12, and expands to eight lanes north of SR 4.

4.1.5 Interstate 205

Interstate 205 is a six-lane divided freeway connecting Interstate 580 in Contra Costa County with Interstate 5. There are five interchanges along the thirteen miles of Interstate 205 in San Joaquin County, including: S. MacArthur Drive, Tracy Boulevard, Pavilion Parkway, W. 11th Street, and Mountain House Parkway.

4.2 Local Roads

Figure 2 shows local roads in the Project area and Table 1 summarizes their basic characteristics. The following local roads play major roles in providing access to the Delta, including Principal Arterials from urban communities:

- Hood Franklin Road is the northern-most connector between Interstate 5 and SR 160.
- Twin Cities Road originates at SR 160 north of Locke, heads easterly across Interstate 5 and SR 99 to eastern Sacramento County.
- West Walnut Grove Road is a major collector and one of the most heavily used county roads in the north part of the Delta. It links Walnut Grove to Thornton and Interstate 5 and provides access to several marinas and an industrial area near Walnut Grove.
- West Eight Mile Road is an east-west major collector connecting Interstate 5 and agricultural lands to the west including King Island and Empire Tract.
- West March Lane is a principal arterial, linking Interstate 5 to March Lane and Buckley Cove Marina along the San Joaquin River (Stockton Deep Water Ship Channel).
- West Byron Road is a principal arterial west of Mountain House Parkway in San Joaquin County. Byron Bethany Road is the short segment in Alameda County. Byron Highway connects to SR 4 in Contra Costa County. These three segments form a continuous road connecting SR 4 with Mountain House Parkway.
- Mountain House Parkway is a north-south principal arterial connecting Interstate 205 with West Byron Road.
- Tracy Boulevard is a north-south major collector connecting SR 4 and Interstate 205.

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Table 1. Local Roads

County	Road	Type	Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Segment	Comment
Sacramento	Hood Franklin Rd	paved	2	12	2	I-5 to SR 160	N/A
Sacramento	Lambert Rd	paved	2	10	1	I-5 to SR 160	N/A
Sacramento	Dierssen Rd	gravel	2	9	0	Franklin Blvd to 1.4 miles west of I-5	N/A
Sacramento	Twin Cities Rd	paved	2	10	1	I-5 to River Rd	N/A
Sacramento	Franklin Blvd	paved	2	12	2 to 4	Lambert Rd to Twin Cities Blvd	N/A
Sacramento	Russell Rd	paved	2	10	0 to 1	River Rd to Herzog Rd	N/A
Sacramento	Vorden Rd	paved	2	10	0 to 1	River Rd to Herzog Rd	N/A
Sacramento	Herzog Rd	paved	2	10	0 to 1	Vorden Rd to Lambert Rd	N/A
Sacramento	Jackson Slough Rd	paved	2	10	0 to 1	SR 160 to SR 12	Connector between Isleton and SR 12
Sacramento	Terminous Rd	paved	2	10	0 to 1	Jackson Slough Rd to SR 12	N/A
San Joaquin	W Walnut Grove Rd	paved	2	12	4	I-5 to River Rd	N/A
San Joaquin	Lauffer Rd	gravel	2	10	0	Vail Rd to Mokelumne River	N/A
San Joaquin	Vail Rd	paved	2	10	0 to 1	W. Walnut Grove Rd to Mokelumne River	N/A
San Joaquin	Blossom Rd	paved	2	10	0 to 1	Peltier Rd to W. Walnut Grove Blvd	N/A
San Joaquin	Staten Island Rd	paved	2	10	1	W. Walnut Grove Rd to S. Fork Mokelumne River	gravel south of Gas Well Rd
San Joaquin	Gas Well Rd	gravel	2	8	0	Staten Island Rd to S. Fork Mokelumne River	N/A

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Table 1. Local Roads

County	Road	Type	Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Segment	Comment
San Joaquin	Gotta Rd	paved	2	10	0 to 1	N. Jacob Brack Rd to N. Guard Rd	N/A
San Joaquin	N. Jacob Brack Rd	paved	2	10	0 to 1	Turner Rd/I-5 interchange to Gotta Rd	N/A
San Joaquin	N. Guard Rd	paved	2	10	0 to 1	SR 12 to Gotta Rd	N/A
San Joaquin	Stefani Rd	paved	2	8	0	W. 8 Mile Rd to Telephone Cut	gated at W. Eight Mile Rd
San Joaquin	Glasscock Rd	paved	2	10	0 to 1	SR 12 to south of Sycamore Slough	N/A
San Joaquin	Correia Rd	paved	2	10	0 to 1	SR 12 to Potato Rd at White Slough	N/A
San Joaquin	Peltier Rd	paved	2	10	0 to 1	I-5 to Blossom Rd	N/A
San Joaquin	W Eight Mile Rd	paved	2	10	0 to 1	I-5 to Empire Tract Rd at Little Connection Slough	N/A
San Joaquin	W March Ln	paved	6	12		I-5 to March Ln	Median divided
San Joaquin	Holt Rd	paved	2	10	0 to 1	SR 4 to San Joaquin River	N/A
San Joaquin	Jacobs Rd	paved	2	10	0 to 1	Holt Rd to Burns Cutoff Rd	N/A
San Joaquin	Inland Dr	paved	2	10	0 to 1	SR 4 to House Rd at Burns Cut	N/A
San Joaquin	Bacon Island Rd	paved	2	10	0 to 2	SR 4 to S. Bacon Island Rd Bridge at Middle River	N/A
San Joaquin	S. Bacon Island Rd	paved	2	10	0 to 2	S. Bacon Island Rd Bridge at Middle River to Connection Slough Swing Bridge	N/A
San Joaquin	Lower Jones Rd	paved	2	10	0 to 1	Holt Rd to W. Lower Jones Rd	N/A
San Joaquin	W. Lower Jones Rd	gravel	2	8	0	Lower Jones Rd to Bacon Island Rd	N/A

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Table 1. Local Roads

County	Road	Type	Lanes	Lane Width (ft.)	Shoulder Width (ft.)	Segment	Comment
San Joaquin	McDonald Rd	paved	2	10	0 to 1	Inland Dr to Whiskey Slough	N/A
San Joaquin	Tracy Blvd	paved	2	12	0 to 4	SR 4 to I-205	N/A
San Joaquin	Mountain House Pkwy	paved	4 to 6	12	4	I-205 to Byron Rd	Median divided Major Arterial
San Joaquin	Byron Rd	paved	2	12	2	Mountain House Pkwy to SR 4	San Joaquin County segment; median divided with turn lanes at intersection with Great Valley Pkwy
Contra Costa	Byron Hwy	paved	2	12	2 to 4	Mountain House Pkwy to SR 4	Contra Costa County segment
Alameda	Byron Bethany Rd	paved	2	12	2 to 4	Mountain House Pkwy to SR 4	Alameda County segment

Notes:

Dr = Drive
ft = foot
Hwy = Highway
N/A = not applicable
Pkwy = Parkway
Rd = Road

5. Bridges

5.1 State Highway Bridges

Figure 3 shows the significant bridges on the SRs in the Project area and Table 2 lists them. Seven of the nine bridges in Table 2 are moveable bridges. Located on the primary roads, especially SR 12 and SR 4, they present special challenges as access routes. When in the open position, moveable bridges can result in traffic backups especially during commute hours.

SR 12 includes two swing bridges (Little Potato Slough and Mokelumne River). The moveable bridges, especially the Mokelumne River Bridge, present operational considerations with speed reduction on the bridge approaches due to reduced lane widths, intermittent congestion, bridge openings, and unscheduled bridge maintenance or repair.

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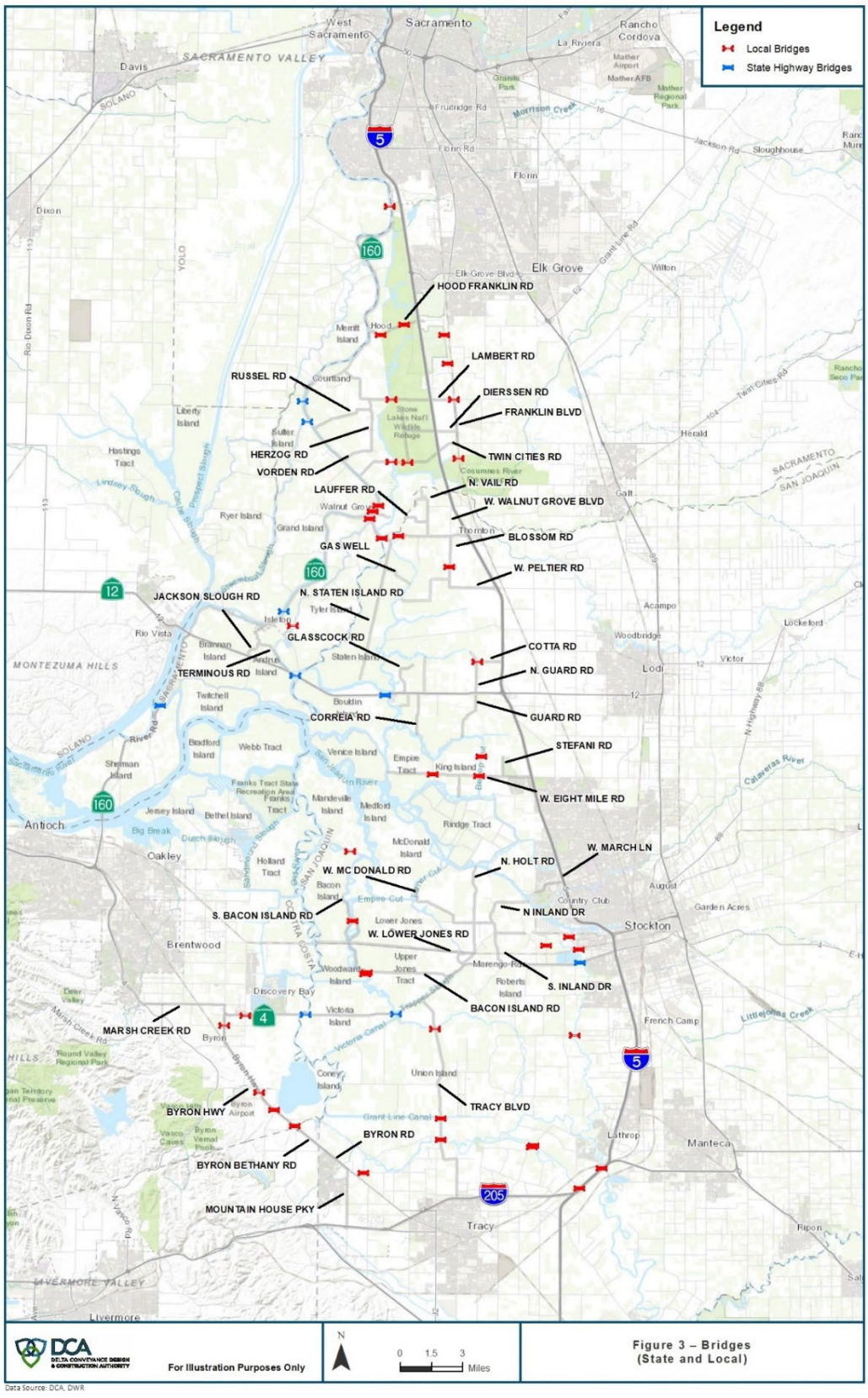

Figure 3. State and Local Bridges

Table 2. State Highway Bridges

State Route	County	Bridge Number	Structure Name	Type of Bridge
4	San Joaquin	29-0045	Old River SR 4	Moveable - Swing
4	San Joaquin	29-0049	Middle River SR 4	Fixed
4	San Joaquin	29-0050	San Joaquin River	Fixed (swing not operable)
12	San Joaquin	29-0043	Mokelumne River	Moveable - Swing
12	San Joaquin	29-0101	Little Potato Slough	Moveable - Swing
160	Sacramento	24-0121	Three Mile Slough	Moveable - Vertical Lift
160	Sacramento	24-0051	Sacramento River (Isleton)	Moveable - Bascule
160	Sacramento	24-0052	Steamboat Slough	Moveable - Bascule
160	Sacramento	24-0053	Sacramento River (Paintersville)	Moveable - Bascule

SR 4 crosses Old River Bridge (a two-lane swing bridge) and Middle River Bridge (a two-lane truss bridge). These bridges have narrow lanes and sharp turns on the approach roadway consistent with its designation as an advisory truck route. The two bridges present operational considerations with speed reduction on the bridge approaches due to reduced lane widths, acute angles along the bridge approaches, intermittent congestion, and bridge openings.

5.2 Local Bridges

Figure 3 shows bridges on local roads in the Project area, also listed in Table 3. These bridges are inspected by Caltrans and, where applicable, classified as structurally deficient or functionally obsolete according to Federal Highway Administration (FHWA) criteria. A bridge is considered functionally obsolete if it has deck geometry, load carrying capacity, clearance or approach roadway geometry that no longer meets the criteria for the system the bridge is a part of. Bridges are considered structurally deficient where significant load carrying elements are found to be in poor condition due to deterioration or damage (or both), or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point of causing intolerable traffic interruptions. Additional information and details can be found on the FHWA website. The following subsections summarize noteworthy statuses of local bridges.

Table 3. Local Bridges

County	Bridge Number	Road	Feature Intersected	SD/FO	Moveable Bridge
Sacramento County	24C0001	FREEPORT	SACRAMENTO RIVER	SD	Bascule
Sacramento County	24C0005	WALNUT GROVE XING	SACRAMENTO RIVER	SD	Bascule
Sacramento County	24C0012	Twin Cities Road	McCormac Creek		

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Table 3. Local Bridges

County	Bridge Number	Road	Feature Intersected	SD/FO	Moveable Bridge
Sacramento County	24C0039	Isleton Rd (WG)	Georgiana Slough	FO	Swing
Sacramento County	24C0042	Tyler Is Br Rd	Georgiana Slough	SD	Swing
Sacramento County	24C0053	Twin Cities Road	Snodgrass Slough	FO	Swing
Sacramento County	24C0151	Franklin Blvd	Drainage Ditch		
Sacramento County	24C0152	Franklin Blvd	Drainage Ditch		
Sacramento County	24C0153	Franklin Blvd	Stone Lake Drain		
Sacramento County	24C0155	Franklin Blvd	Mokelumne River Overflow	SD	
Sacramento County	24C0167	River Road	Delta Cross Channel	SD	
Sacramento County	24C0188	Hood-Franklin Rd	Stone Lake Canal	FO	
Sacramento County	24C0449	Lambert Road	Stone Lake Drain		
Sacramento County	24C0513	Hood-Franklin Road	Beach Lake Canal		
Contra Costa County	28C0121	Byron Hwy	California Aqueduct	SD	
Contra Costa County	28C0122	Byron Hwy	Kellogg Creek		
Contra Costa County	28C0125	Byron Hwy	Delta-Mendota Canal		
Contra Costa County	28C0135	Byron Hwy	Brushy Creek		
Contra Costa County	28C0404	Bixler Road	Kellogg Creek	FO	
San Joaquin County	29C0010	Walnut Grove Road	South Fork Mokelumne River		
San Joaquin County	29C0022	Tracy Boulevard	Grant Line Canal		Bascule
San Joaquin County	29C0023	Navy Drive	San Joaquin River		
San Joaquin County	29C0028	S. Tracy Boulevard	Old River		
San Joaquin County	29C0073	Tracy Boulevard	Middle River		
San Joaquin County	29C0108	Bacon Island Road	Middle River		Swing
San Joaquin County	unknown	S. Bacon Island Rd	Connection Slough		Swing
San Joaquin County	29C0114	Eight Mile Road	Bishop Canal		Swing
San Joaquin County	29C0116	Blossom Rd	Beaver Slough		
San Joaquin County	29C0118	Paradise Road	Paradise Cut		
San Joaquin County	29C0119	Paradise Road	Paradise Cut		
San Joaquin County	29C0122	Manthey Road	Paradise Cut		

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Table 3. Local Bridges

County	Bridge Number	Road	Feature Intersected	SD/FO	Moveable Bridge
San Joaquin County	29C0127	Manthey Road	San Joaquin River 02		Bascule (not operable)
San Joaquin County	29C0131	Walnut Grove Road	Mokelumne River	SD	Swing
San Joaquin County	29C0209	BNSF Ry & Amtrak	Navy Drive		
San Joaquin County	29C0219	Eight Mile Rd	White Slough (Honker Cut)	FO	Swing
San Joaquin County	29C0231	Howard Road	San Joaquin River 01		
San Joaquin County	29C0290	Rio Blanco Rd	Telephone Cut	FO	
San Joaquin County	29C0292	Cotta Road	Upland Canal	SD	
San Joaquin County	29C0420	Port Stockton Expr	San Joaquin River (Burns Cut)		
San Joaquin County	29C0421	Bethany Road	W. Side Irrigation Canal		
San Joaquin County	29C0415	Woodward Island Br	Middle River		

5.2.1 Structurally Deficient (SD) Bridges

- Byron Highway at California Aqueduct is in the environmental review process by Contra Costa County and is planned to be replaced.
- Walnut Grove Road over Mokelumne River is a swing bridge programmed on the Highway Bridge Program to be replaced.
- Franklin Boulevard at Mokelumne River Overflow is programmed on the Highway Bridge Program to be replaced.
- Walnut Grove Crossing of the Sacramento River is programmed on the Highway Bridge Program to be replaced or rehabilitated.
- Cotta Road at Upland Canal is programmed on the Highway Bridge Program to be replaced.

5.2.2 Functionally Obsolete (FO) Bridges

- Twin Cities Road at Snodgrass Slough is planned to be replaced by a new structure on a different alignment. Sacramento County has completed an environmental review and is in the process of final design and right-of-way acquisition.
- Eight Mile Rd at White Slough (Honker Cut) is programmed on the Highway Bridge Program to be replaced. This bridge is expected to be rehabilitated during 2020.
- Manthey Road at San Joaquin River is inoperable bascule bridge to be replaced with a fixed bridge on a new alignment and is currently in environmental review.

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6. Pavement Conditions

Each county and Caltrans are responsible for their respective pavement management systems (PMS), which evaluate, track, and rank pavement conditions based on field inspections. The frequency of roadway inspection ranges from annually to once every 3 years, depending on the type of roadway. Detailed field inspections categorize and quantify pavement deficiencies such as cracks, patches, and utility trench cuts.

- Sacramento, Contra Costa, and Yolo Counties calculate a Pavement Condition Index (PCI) for each roadway under their jurisdiction. PCI values range from zero (very poor or dirt road) to 100 (excellent). The PCI measures two conditions: (1) the type, extent and severity of pavement surface distresses (typically cracks and rutting; and (2) the smoothness and ride comfort of the road.
- San Joaquin County utilizes the Overall Condition Index (OCI) as a measure of the overall serviceability provided by a pavement to the vehicle driver. The OCI varies between 0 and 100, with 0 representing the poorest possible pavement, and 100 representing the best possible pavement.
- Caltrans classifies pavement condition into five categories ranging from 5 (pavement with high level of distresses) to 1 (pavement considered relatively good condition).

Figure 4 shows the pavement conditions reported by the counties and Caltrans in their respective indexes. For ease of interpretation, these three separate indices were mapped in Table 4 into a single classification with two pavement condition categories (not acceptable and acceptable). Figure 5 shows the results of this two-category evaluation. Except for the State highways, roads within the Project area are predominantly classified as having an unacceptable pavement condition.

Roadways receive periodic surface treatments that extend their lives and provide a new riding surfaces. Surface treatments include asphalt overlays, slurry seals, and chip seals. The type of surface treatment is based on the pavement condition, types of roadway uses (such as urban, rural, residential, thoroughfare), amount of traffic, type of traffic (such as trucks, cars), and other engineering factors.

A representative maintenance and rehabilitation treatment based on PCI values is as follows:

- Good to excellent pavements (PCI>70) are best suited for pavement preservation techniques, (such as preventive maintenance treatments like chip seals or slurry seals). These criteria are usually applied at intervals of 5 to 7 years, depending on the type of road and their traffic volumes.
- As pavements deteriorate, treatments that address structural adequacy are required. For a PCI of 25 to 69, hot mix asphalt (HMA) overlays are usually applied at varying thicknesses. This may be accompanied by milling or recycling techniques.
- When the pavement has failed (PCI<25), reconstruction is usually required.

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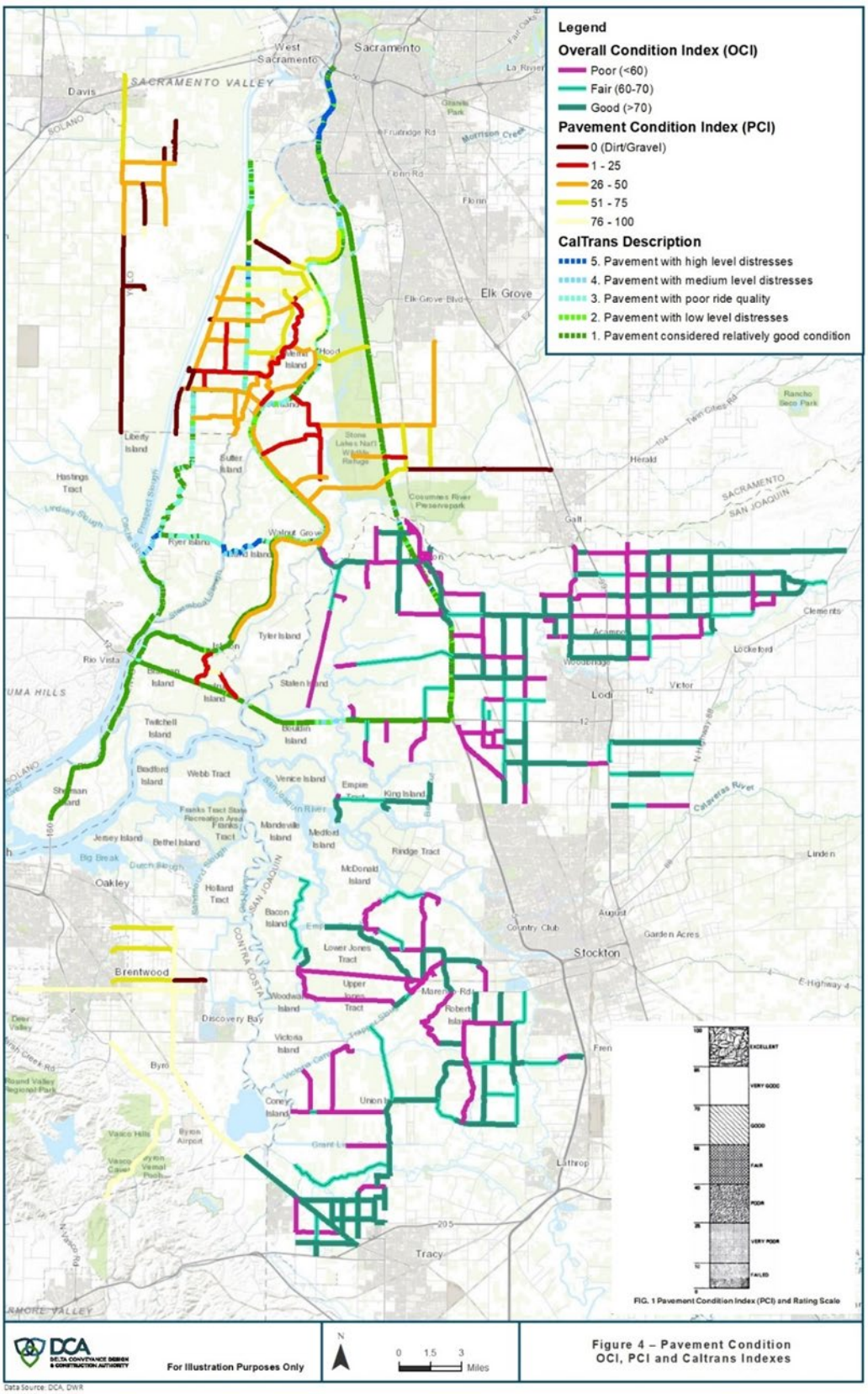

Figure 4. Pavement Condition OCI, PCI, and Caltrans Indexes

Table 4. Pavement Condition Indexes

Agency	Index	Not Acceptable	Acceptable
San Joaquin	OCI		
	Poor (<60)	X	
	Fair (60-70)	X	
	Good (>70)		X
Sacramento Contra Costa Yolo	PCI		
	0 (Dirt/Gravel)	X	
	1 to 25	X	
	26 to 50	X	
	51 to 75		X
	76 to 100		X
Caltrans	Caltrans Description		
	5 - Pavement with high level distresses	X	
	4 - Pavement with medium level distresses	X	
	3 - pavement with poor ride quality	X	
	2 - Pavement with low level distresses		X
	1 - Pavement considered relatively good condition		X

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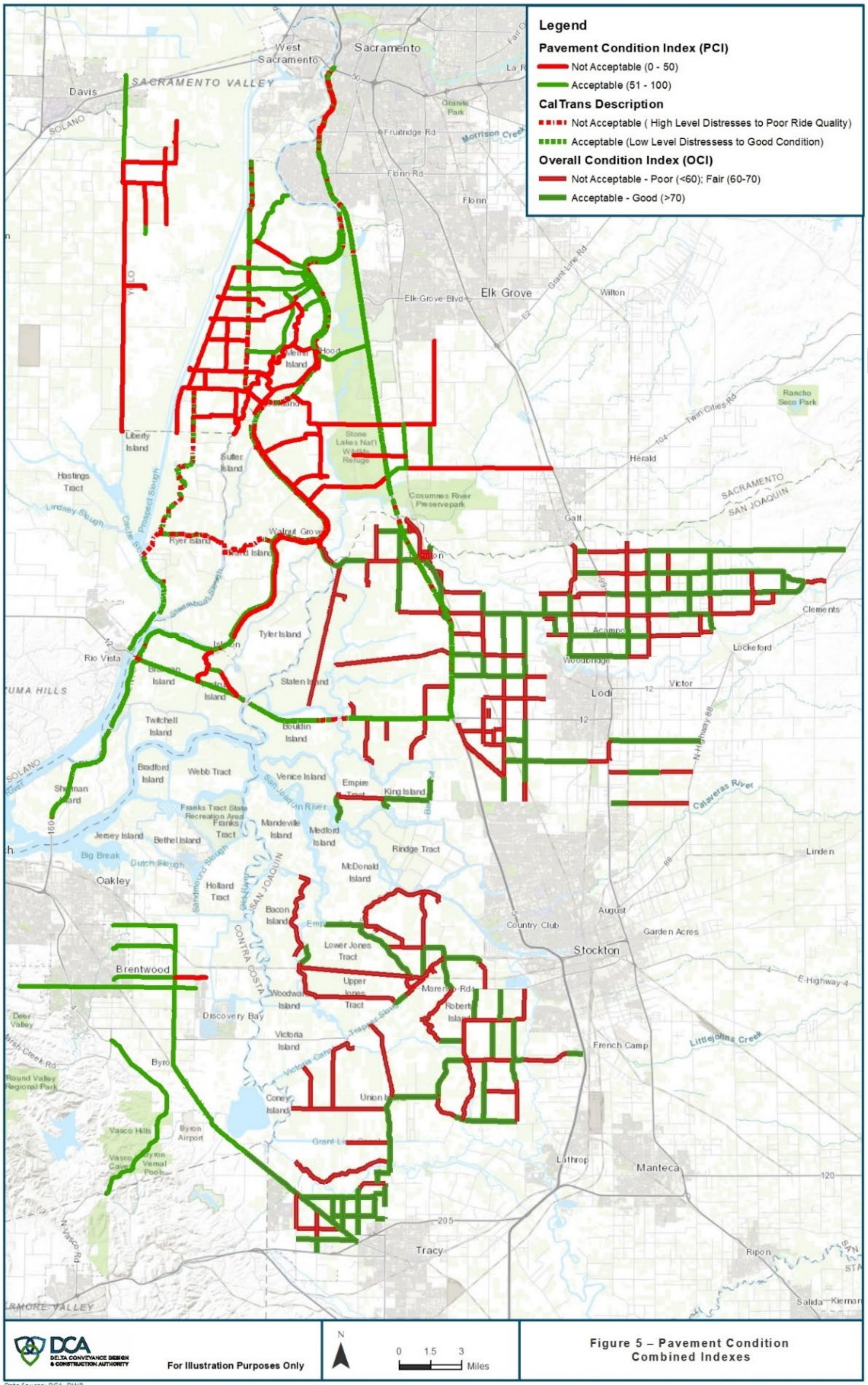

Figure 5. Pavement Condition Combined Indexes

7. Roadway Traffic

7.1 Existing Traffic Conditions

An inventory of potential access roads should include existing traffic conditions. The road network in and around the Delta is used for a variety of purposes, and its capacity and level of service (LOS) are expected to vary significantly. Routes through and within the Delta experience heavy weekday commute volumes compared to their capacity. These routes can often experience heavy Friday evening and Sunday evening volumes. There are also routes that experience heavier traffic volumes supporting agricultural activities, particularly during harvest periods with slower moving agricultural equipment. Greater-than-typical volumes can also be experienced on weekend days during festivals and recreational events.

7.2 Needs Assessment Criteria

7.2.1 Traffic Volumes

Data for existing traffic volumes will be collected and evaluated for anticipated growth and forecasted Project related traffic. This analysis will be done based on a level of service assessment.

LOS are defined as follows:

- LOS A – Free Flow - Low Volumes and no delays
- LOS B – Free Flow - Speeds restricted by travel conditions, minor delays
- LOS C – Stable Flow - Speeds and Maneuverability closely controlled because of higher volumes.
- LOS D – Stable Flow – Speeds considerably affected by change in operating conditions. High Density Traffic restricts maneuverability; volume near capacity.
- LOS E – Unstable Flow – Low speeds; considerable delay; volume at or slightly over capacity.
- LOS F – Forced Flow – Very low speeds; volumes exceed capacity; long delays with stop-and-go traffic.

The Project has developed the following targets for determining recommendations for route improvements:

- Construction Traffic creates a LOS worse than the target and the Construction Traffic is 10 percent or more of the forecasted traffic volume.
- LOS Targets are:
  - Local roads (excluding Byron Highway) LOS C
  - SRs, Interstates, and Byron Highway LOS D
  - Any new roads constructed for the Project LOS D

7.2.2 Truck Routes

Truck routes will be evaluated for existing and Project truck volumes and will be considered for improvement where Project truck traffic warrants them, based on the duration of work and expected commodities to be carried. There are minimum requirements for truck routes 12-ft-wide lanes and 4-ft-wide shoulders.

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7.2.3 Bicycle Routes

Project roads will be evaluated for current and future planned improvements, including bicycle routes. Where road and bridge improvements are undertaken, wider shoulders would be considered to meet bicycle lane standards.

7.3 Design Criteria

Each entity that operates roads and bridges has standards for improvements on its roadways. The following are likely applicable sections of those standards.

7.3.1 Sacramento County (2018 Standards)

Applicable Standards:

The following language is an excerpt from Sacramento County Standards:

> *"Class C improvements may be installed along the roadway frontage of any property designated in the County of Sacramento's Zoning Code as "Agricultural-Residential Land Use Zone" and meeting one of the following criteria:*
>
> - *Located within the County's Urban Services Boundary and with a zoning density of less than or equal to AR-5; or*
> - *Located beyond the County's Urban Services Boundary and with a zoning density of less than or equal to AR-1.*
>
> *The minimum width of the asphalt concrete surface shall be as follows (See Standard Drawing 4-4):*

All proposed roadwork on this Project is outside of the Urban Services Boundary.

Proposed roadwork in the Project is in areas zoned less than or equal to AR-1 with the following exception:

- Town of Hood, where the zoning is RD-1.

Street Type and Design Width

For Rural Sacramento County work, all proposed Project roads are covered under the "all other streets" criteria on Figure 6.

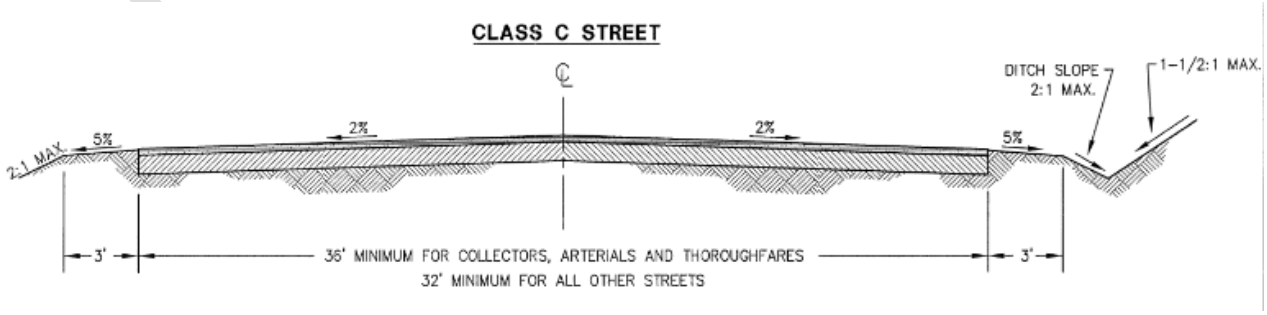

Figure 6. Classic C Streets

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7.3.2 Contra Costa County (2014 Standards)

Applicable Standards

Pavement widths and lane widths depend on design traffic volumes (ADT).

Street Type and Design Width

Roadwork planned for this Project would be in accordance with Standard Plans CA50 or CA53 (Figures 7 and 8).

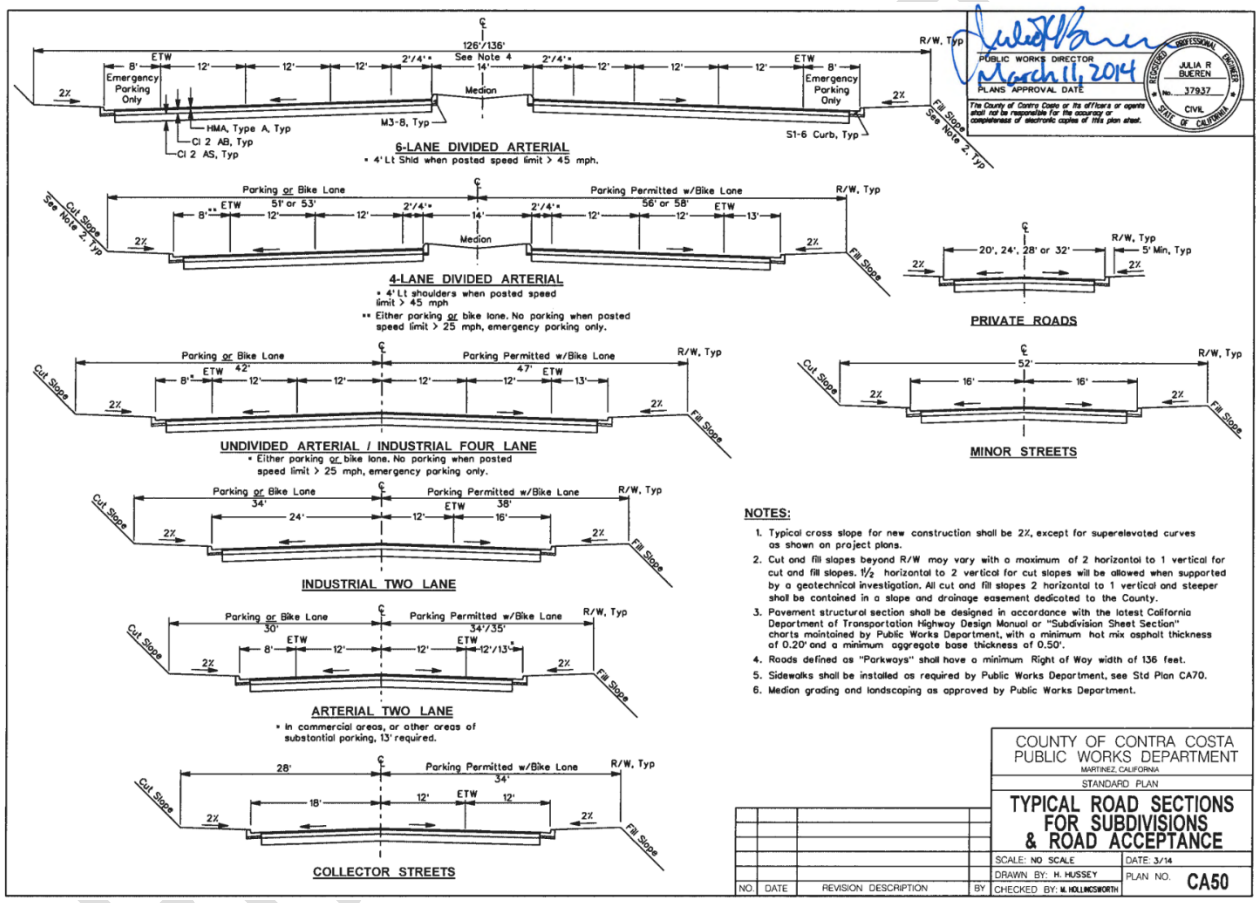

Figure 7. County of Contra Costa Standard Plan CA50

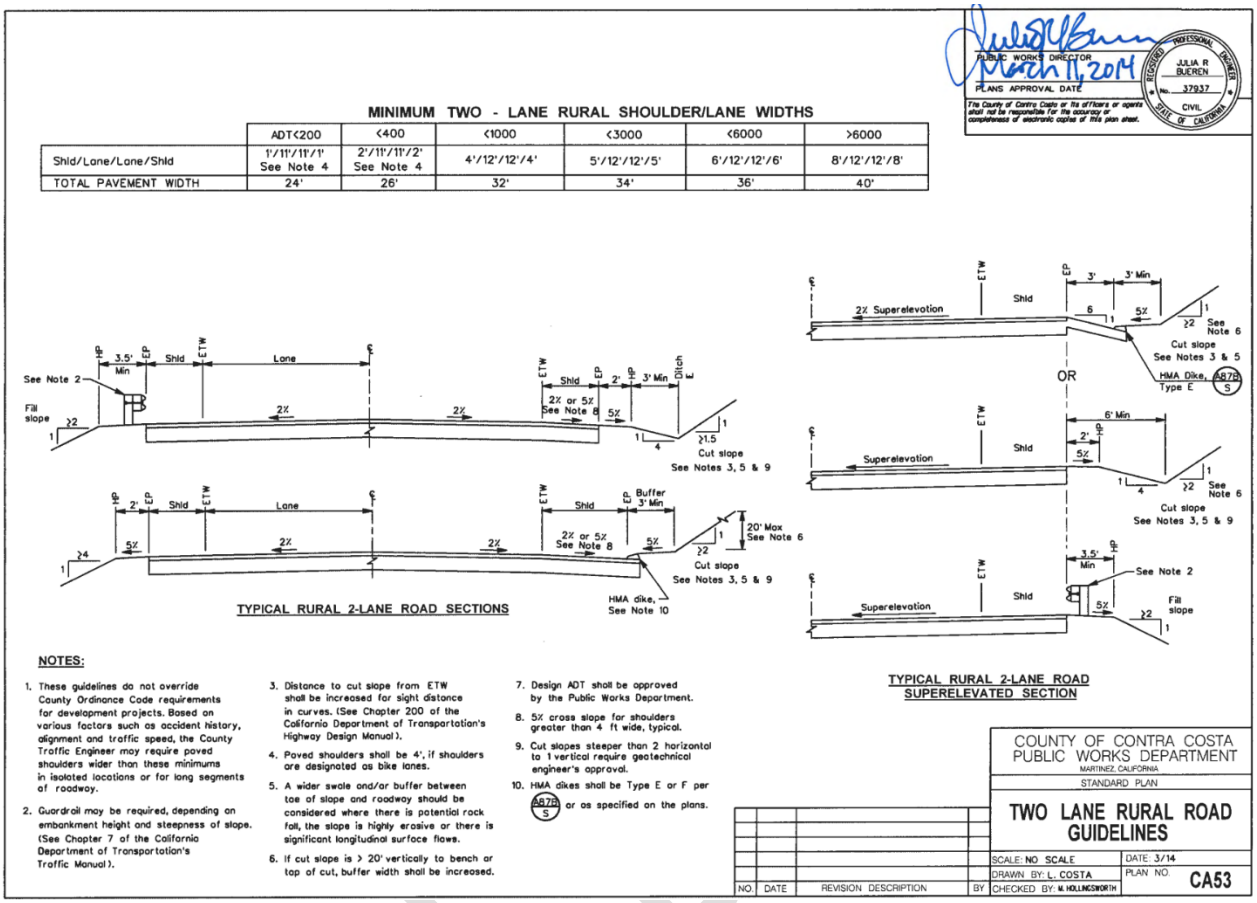

Figure 8. County of Contra Costa Standard Plan CA53

7.3.3 San Joaquin County (2014 Standards)

Applicable Standards

Road work is to take place per the General Plan definition of roadways.

Road Type and Width

Proposed roads under San Joaquin County jurisdiction would be classified as rural roads or rural collectors (Figure 9).

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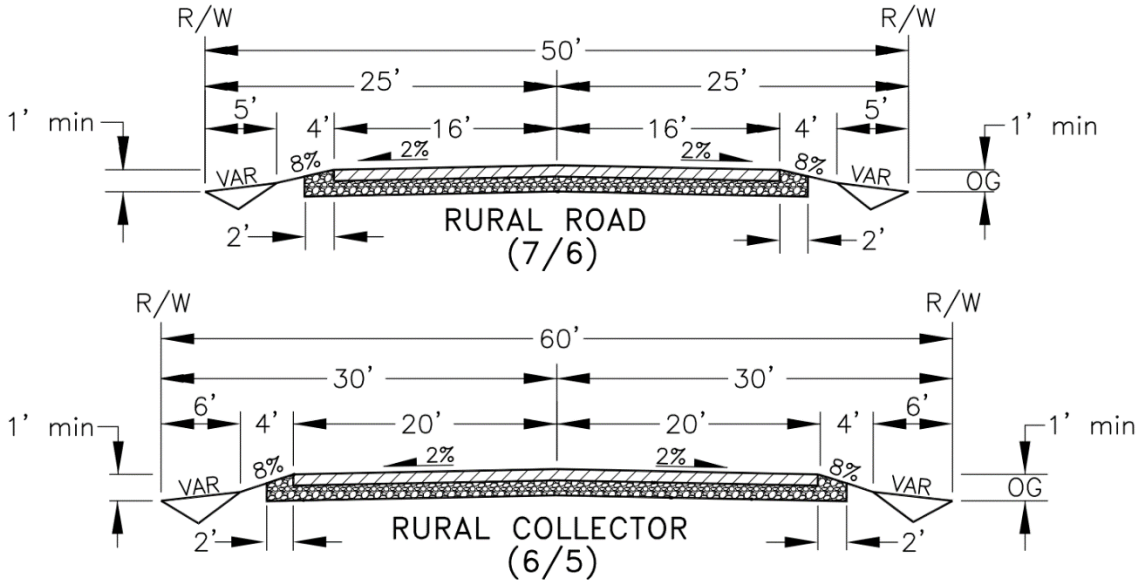

Figure 9. Rural Roads and Collectors

7.3.4 California Department of Transportation (HDM 6TH Edition)

Applicable Standards

Interstate 5 is classified as a Freeway. SR 4, SR 12, and SR 160 are classified as Conventional Highways.

7.3.4.1 Road Type and Width

The minimum lane widths should be 12 ft.

7.3.4.2 Paved Shoulders and Medians

Shoulder widths shall be in accordance with Table 302.1 (Figure 10).

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Table 302.1
Boldface Standards for Paved Shoulder Widths on Highways

Highway Type	Paved Shoulder Width (ft) Left [8]	Right [8]
Freeways & Expressways		
2 lanes [1]	--	8[6]
4 lanes [1]	5	10
6 or more lanes [1]	10	10
Auxiliary lanes	--	10
Freeway-to-freeway connections		
Single and two-lane connections	5	10
Three-lane connections	10	10
Single-lane ramps	4[2]	8
Multilane ramps	4[2]	8[3]
Multilane undivided	--	10
Collector-Distributor	5	10
Conventional Highways		
Multilane divided		
4-lanes	5	8[7]
6-lanes or more	8	8[7]
Urban areas with posted speeds less than or equal to 45 mph and curbed medians	2[4]	8[7]
Multilane undivided	--	8[7]
2-lane		
RRR	See Index 307.3	
New construction	See Table 307.2	
Slow-moving vehicle lane	--	4[5]
Local Facilities		
Frontage roads	See Index 310.1	
Local facilities crossing State facilities	See Index 308.1	

NOTES:
(1) Total number of lanes in both directions including separate roadways (see Index 305.6). If a lane is added to one side of a 4-lane facility (such as a truck climbing lane) then that side shall have 10 feet left and right shoulders. See Index 62.1.
(2) May be reduced to 2 feet upon concurrence from the Project Delivery Coordinator that a restrictive situation exists. 4 feet preferred in urban areas and/or when ramp is metered. See Index 504.3.
(3) May be reduced to 2 feet or 4 feet (4 feet preferred in urban areas) in the 2-lane section of a non-metered ramp, which transitions from a single lane upon concurrence from the Project Delivery Coordinator that a restrictive situation exists. May be reduced to 2 feet in ramp sections having 3 or more lanes. See Index 504.3.
(4) For posted speeds less than or equal to 35 mph, shoulder may be omitted (see Index 303.5(5)) except where drainage flows toward the curbed median.
(5) On right side of climbing or passing lane section only. See Index 301.2(1) for minimum width if bike lanes are present.
(6) 10-foot shoulders preferred.
(7) Where on-street parking is allowed, 10 feet shoulder width is preferred. Where bus stops are present, 10 feet shoulder width is preferred for the length of the bus stop. If a Class II bikeway is present, minimum shoulder width shall be 8 feet where on street parking is provided plus the minimum required width for the bike lane.
(8) Shoulders adjacent to abutment walls, retaining walls in cut locations, and noise barriers shall be not less than 10 feet wide. See Index 303.4 for minimum shoulder adjacent to bulbouts. See Index 309.1(4) for minimum shoulder width adjacent to high speed rail facilities.

Figure 10. Excerpt from CalTrans HDM 6TH Edition

8. Document History and Quality Assurance

Reviewers listed have completed an internal quality review check and approval process for deliverable documents that is consistent with procedures and directives identified by the Engineering Design Manager (EDM) and the DCA.

Approval Names and Roles			
Prepared by	**Internal Quality Control review by**	**Consistency review by**	**Approved for submission by**
Terry Krause / EDM Project Manager	Bob Cermak / EDM Road Engineer	Gwen Buchholz / DCA Environmental Consultant	Graham Bradner / DCA Executive Director

This interim document is considered preliminary and was prepared under the responsible charge of Bob Cermak, California Professional Engineering License C31524.

Note to Reader

This is an early foundational technical document. Contents therefore reflect the timeframe associated with submission of the initial and final drafts. Only minor editorial and document date revisions have been made to the current Conformed Final Draft for Administrative Draft Engineering Project Report version.

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