CALTRANS
Adaptation Priorities
REPORT






DISTRICT 11

October

2020

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CCAR ADAPTATION PRIORITIES REPORT TERM AND DEFINITIONS

- **Adaptation:** The steps taken to prepare a community or modify a targeted asset prior to a weather or climate-related disruption to minimize or avoid the impacts of that event. An example would be elevating assets in areas likely to experience increased flooding in the future.
- **Exposure:** The presence of infrastructure in places and settings where it could be adversely affected by hazards and threats, for example, a road in a floodplain.[1]
- **Hazards and Stressors:** Stresses on transportation system performance and condition. Whether such impacts occur today (e.g., riverine flooding that closes major highways) or whether they are part of a long- term trend (e.g., sea level rise), mainstreaming resilience efforts into an agency's functions requires an understanding of their nature, scope, and magnitude. The terms are used interchangeably to refer to transportation impacts originating primarily from natural causes (e.g., flooding or wildfire hazards).
- **Resilience:** The characteristic of a system that allows it to absorb, recover from, or more successfully adapt to adverse events.
- **Risk***:* "A combination of the likelihood that an asset will experience a particular climate impact and the severity or consequence of that impact."[2]
- **Sensitivity:** Per the Federal Highway Administration, "refers to how an asset or system responds to, or is affected by, exposure to a climate change stressor. A highly sensitive asset will experience a large degree of impact if the climate varies even a small amount, where as a less sensitive asset could withstand high levels of climate variation before exhibiting any response."[3]
- **Uncertainty:** The degree to which a future condition or system performance cannot be forecast. Both human-caused and natural disruptions, especially for longer-term climate changes, are by their very nature uncertain events (as no one knows for sure exactly when and where and with what intensity they will occur). Sensitivity tests using multiple plausible scenarios of future conditions can help one understand the range of uncertainty and its implications. This approach is used routinely when working with climate projections to help understand the range of possible conditions given different future greenhouse gas emission scenarios.
- **Vulnerability:** Per the Federal Highway Administration, "the degree to which a system is susceptible to or unable to cope with adverse effects of climate change or extreme weather events."[4]

[1] This definition is adopted from the Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report. 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
[2] FHWA. 2017. "Vulnerability Assessment and Adaptation Framework: Third Edition." Retrieved September 25, 2020 from https://www.fhwa.dot.gov/environment/sustainability/resilience/adaptation_framework/climate_adaptation.pdf
[3] Ibid.
[4] FHWA. 2014. "FHWA Order 5520. "Transportation System Preparedness and Resilience to Climate Change and Extreme Weather Events." Dec. 15. Retrieved June 30, 2020 from https://www.fhwa.dot.gov/legsregs/directives/orders/5520.cfm

1. INTRODUCTION

California's climate is changing. Temperatures are warming, sea levels are rising, wet years are becoming wetter, dry years are becoming drier, and wildfires are becoming more intense. Most scientists attribute these changes to the unprecedented amounts of greenhouse gases in the atmosphere. Given that global emissions of these gases continue at record rates, further changes in California's climate are, unfortunately, very likely.

The hazards brought on by climate change pose a serious threat to California's transportation infrastructure. Higher than anticipated sea levels can regularly inundate roadways, extreme floods can severely damage bridges and culverts, rapidly moving wildfires present profound challenges to timely evacuations, and higher than anticipated temperatures can cause expensive pavement damage over a broad area. As Caltrans' assets such as bridges and culverts age, they may be forced to withstand increasingly severe weather conditions, adding to agency expenses and putting the safety and economic vitality of California communities at risk.

Recognizing this, Caltrans has initiated a major agency-wide effort to adapt their infrastructure so that it can withstand future conditions. The effort began by determining which assets are most likely to be adversely impacted by climate change in each Caltrans district. That assessment, described in the Caltrans Climate Change Vulnerability Assessment Report for District 11, identified stretches of the State Highway System within the district that are potentially at risk. This Adaptation Priorities Report picks up where the vulnerability assessment left off and considers the implications of those impacts on Caltrans and the traveling public, so that facilities with the greatest potential risk receive the highest priority for adaptation. District 11 anticipates that planning for, and adapting to, climate change will continue to evolve subsequent to this report's release as more data and experience is gained. One way District 11 is incorporating resiliency into agency practices is through the Strategic Management Plan; the next plan will include resiliency as a key consideration and strategy for the district.

1.1. Purpose of Report

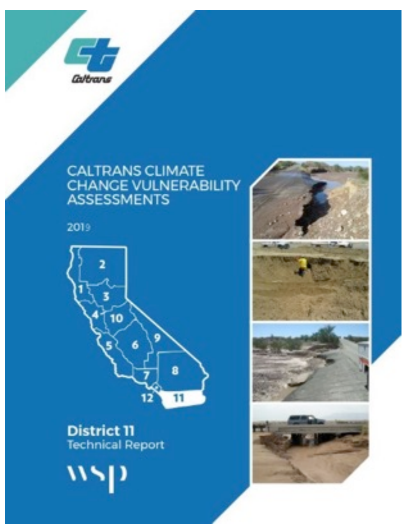
The purpose of this report is to prioritize the order in which assets found to be exposed to climate hazards will undergo detailed asset-level climate assessments. Since there are many potentially exposed assets in the district, detailed assessments will need to be done sequentially according to their priority level. The prioritization considers, amongst other things, the timing of the climate impacts, their severity and extensiveness, the condition of each asset (a measure of the sensitivity of the asset to damage), the number of system users affected, and the level of network redundancy in the area. Prioritization scores are generated for each potentially exposed asset based on these factors and used to rank them.

1.2. Report Organization

The main feature of this report is the prioritized list of potentially exposed assets within District 11. Per above, this information will inform the timing of the detailed adaptation assessments of each asset, which is the next phase of Caltrans' adaptation work. The final prioritized list of assets for District 11 can be found in Chapter 4 of this document. The interim chapters provide important background information on the prioritization process. Those interested in learning more about Caltrans' overall adaptation efforts, and how the prioritization fits into that, should refer to Chapter 2. Those who are interested in learning more about how the priorities were determined should refer to Chapter 3.

2. CALTRANS' CLIMATE ADAPTATION FRAMEWORK

Enhancing Caltrans' capability to consider adaptation in all its activities requires an agency-wide perspective and a multi-step process to make Caltrans more resilient to future climate changes. The process for doing so will take place over many years and will, undoubtedly, evolve over time as everyone learns more about climate hazards, better data is collected, and experience shows which techniques are most effective. Researchers have just started examining what steps an overarching adaptation framework for a department of transportation should entail. Figure 1 provides a graphical illustration of one such path called the Framework for Enhancing Agency Resiliency to Natural and Anthropogenic Hazards and Threats (FEAR-NAHT).[5] This framework, developed through the National Cooperative Highway Research program (NCHRP), has been adopted by Caltrans as part of its long-term plan for incorporating adaptation into its activities (hereafter referred to as the Caltrans Climate Adaptation Framework or "Framework").[6] In coastal districts, such as District 11, this work aligns with the flow chart and advice for addressing Local Coastal Programs and other plans under the California Coastal Commission's Sea Level Rise Policy Guidance.[7]



CALTRANS
CLIMATE CHANGE VULNERABILITY ASSESSMENT TECHNICAL REPORT FOR DISTRICT 11

Steps 1 through 4 of the Framework represent activities that are currently underway at Caltrans Headquarters to effectively manage its new climate adaptation program and develop policies that will help jumpstart adaptation actions throughout the organization. Step 1, *Assess Current Practice*, and Step 4, *Implement Early Wins*, are both addressed within a document called the Caltrans Climate Adaptation Strategy Report. The Adaptation Strategy Report undertook a comprehensive review of all climate adaptation policies and activities currently in place or underway at Caltrans. The report also includes numerous no-regrets adaptation actions ("early wins") that can be taken in the near-term to enhance agency resiliency. Several of these strategies also touch on elements of Step 2, *Organize for Success*, and Step 3, *Develop an External Communications Strategy and Plan*. In addition to this, a comprehensive adaptation communications strategy and plan for climate change is being developed as Step 5, *Understand the Hazards and Threats*, is the first step where detailed technical analyses are performed, and in this case, identify assets potentially exposed to various climate stressors. This step has been completed for a subset of the assets and hazards in District and the results are presented in the Caltrans Climate Change Vulnerability Assessment Report for District 11. The exposure information generated in the Vulnerability Assessment Report is used as an input to this study.

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[5] This framework and related guidance for state DOTs is being developed as part of NCHRP 20-117, Deploying Transportation Resilience Practices in State DOTs (expected completion in 2020).

[6] National Cooperative Highway Research Program, "Incorporating Resilience Concepts and Strategies in Transportation Planning" (NCHRP 08-129) Pending.

[7] California Coastal Commission, Sea Level Rise Guidance, Adopted August 2015, Updated November 2018.

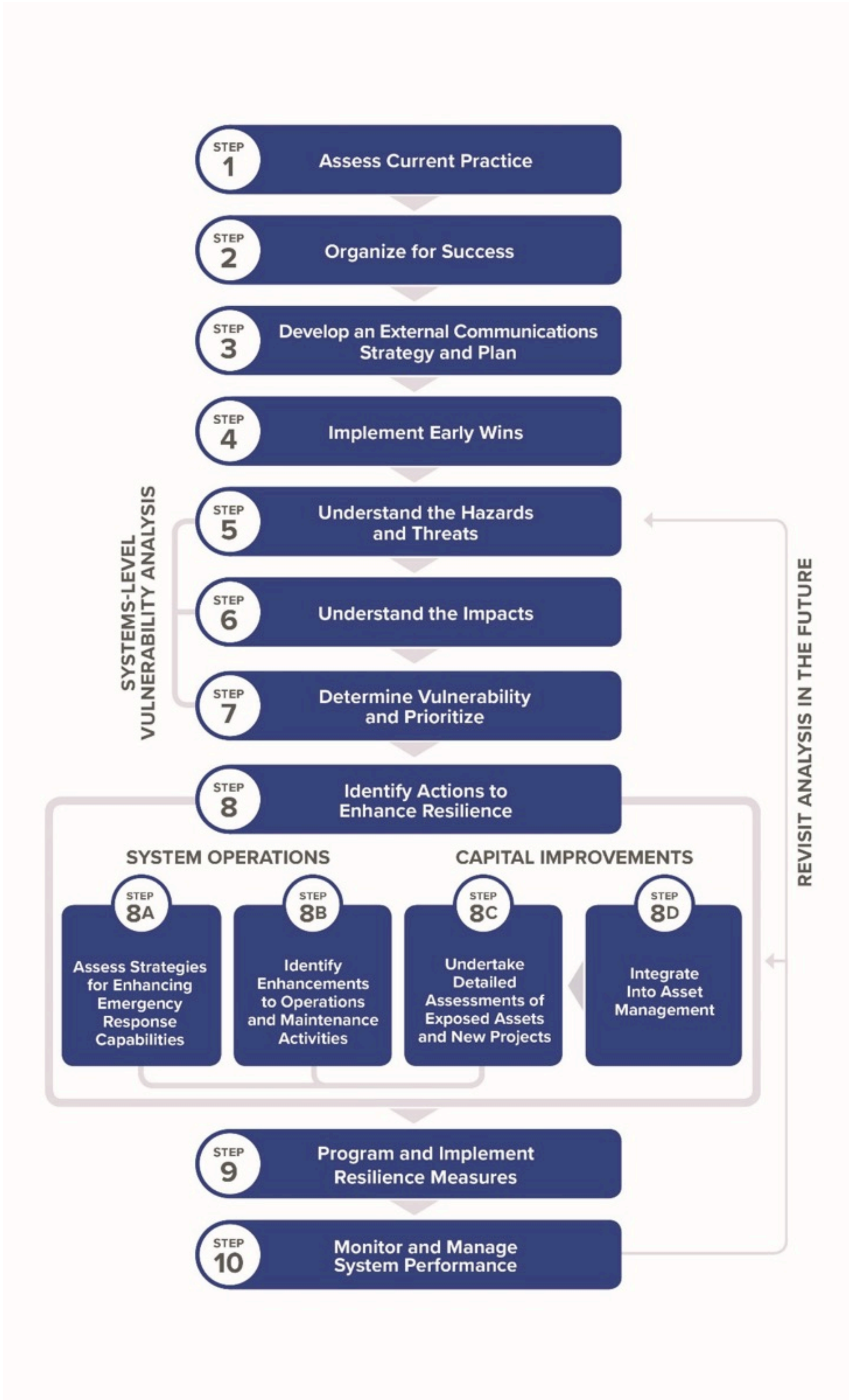

FIGURE 1: CALTRANS' CLIMATE ADAPTATION FRAMEWORK

The work undertaken for this study, the District 11 Adaptation Priorities Report, covers both Steps 6 and 7 in the Framework. Step 6, *Understand the Impacts*, is focused on the implications of the exposure identified in Step 5. This includes understanding the sensitivity of the asset to damage from the climate stressor(s) it is potentially exposed to and understanding the criticality of the asset to the functioning of the transportation network and the communities it serves. Developing an understanding of these considerations is part of the prioritization methodology described in the next chapter.

Step 7, *Determine Vulnerability and Prioritize*, focuses on creating and implementing a prioritization approach that considers both the nature of the exposure identified in Step 5 (its severity, extensiveness, and timing) and the consequence information developed in Step 6. The goal of the prioritization is to identify which assets should undergo detailed adaptation assessments first, because resource constraints will prevent all assets from undergoing detailed study simultaneously.

After Step 7, the Framework divides into two parallel tracks, one focused on operational measures to enhance resiliency and the consideration of adaptation (Steps 8A and 8B) and the other on identifying adaptation-enhancing capital improvement projects (Steps 8C and 8D). Collectively, these represent the next steps that should be undertaken using the information from this report. On the operations track, the results of this assessment should be reviewed for opportunities to enhance emergency response (Step 8A) and operations and maintenance (Step 8B). Caltrans' next step on the capital improvement track should be to undertake detailed assessments of the exposed facilities (Step 8C). The prioritization information generated as part of this assessment should also be integrated into the state's asset management system (Step 8D). All projects recommended through the asset management process should also undergo detailed adaptation assessments (hence the arrow from Step 8D to 8C).

Thus, there will be two parallel pathways for existing assets to get to detailed facility level adaptation assessments. The first is through this prioritization analysis, which is driven primarily by the exposure to climate hazards with asset condition as a secondary consideration. The second is through the existing asset management process, which is driven primarily by asset condition and will have vulnerability to climate hazards as a secondary consideration.

The detailed adaptation assessments in Step 8C will involve engineering-based analyses to verify asset exposure to pertinent climate hazards (some exposed assets featured in this report will not be exposed after closer inspection). Then, if exposure is verified, Step 8C includes the development and evaluation of adaptive measures to mitigate the risk. The highest priority assets from this study will be evaluated first and lower priority assets will be evaluated later. Once specific adaptation measures have been identified, be they operational measures or capital improvements, these projects can then be programmed (Step 9). To program a capital improvement project, it needs to be added to the State Highway Operation and Protection Program (SHOPP). Step 10 then focuses on continuous monitoring of system performance to track progress towards enhancing resiliency. Note the feedback loops from Step 10 to Steps 5 and 8. The arrow back to Step 5 indicates that the exposure analysis should be revisited in the future as new climate projections are developed. The arrow back to Step 8 indicates how one can learn from the performance indicators and use this data to modify the actions being undertaken to enhance resilience.

3. PRIORITIZATION METHODOLOGY

3.1. General Description of the Methodology

The methodology used to prioritize assets exposed to climate hazards draws upon both technical analyses and the on-the-ground knowledge of all district staff. The technical analysis component was undertaken first to provide an initial indication of adaptation priorities. These initial priorities were then reviewed with district staff at a workshop and, if necessary, adjusted to reflect local knowledge and recommendations. These adjustments are embedded in the final priorities shown in Chapter 4.

With respect to the technical analysis, there are a few different approaches for prioritizing assets based on their vulnerability to climate hazards. The approach selected for this study is known as the indicators approach. The indicators approach involves collecting data on a variety of variables that are determined to be important factors for prioritization. These are then put on a common scale, weighted, and used to create a score for each asset. The scores collectively account for all the variables of interest and can be ranked to determine priorities.

It is important to note that, since the prioritization process is focused on determining the order in which detailed adaptation assessments are conducted, only assets determined potentially exposed to a climate hazard are included in this analysis. Assets that were determined to have no exposure to the hazards studied are not included in this study.

The remainder of this chapter describes the prioritization methodology in detail. Section 3.2 begins by describing the asset types and hazards studied. Next, Section 3.3 discusses the individual prioritization metrics (factors) that were used in the technical analysis. Following this, Section 3.4 describes how those individual factors were brought together into an initial prioritization score for each asset. Lastly, Section 3.5 describes how the initial prioritization was adjusted with input from district staff.

3.2. Asset Types and Hazards Studied

Caltrans is responsible for maintaining dozens of different asset types (bridges, culverts, roadway pavement, buildings, etc.). Each of these asset types is uniquely vulnerable to a different set of climate stressors. Resource constraints only allowed this study to investigate a subset of the asset types owned by Caltrans in District 11 and, for those, only a subset of the climate stressors that could impact them. Additional exposure and prioritization analyses are needed in the future to gain a fuller understanding of Caltrans' adaptation needs.

SAN DIEGO CORONADO BRIDGE

The subset of asset types and hazards included in this study generally mirror those that were included in the District 11 Climate Change Vulnerability Assessment Report. That said, exposure to two additional hazards was included as part of this study: (1) riverine flooding impacts to bridges and culverts and (2) temperature impacts to pavement binder grade. Table 1 shows all the asset types included in this study for District 11 and marks with an "X" the hazards that were evaluated for each in the exposure analysis.

TABLE 1: ASSET-HAZARD COMBINATIONS STUDIED

	Sea Level Rise	Storm Surge	Coastal Cliff Retreat	Wildfire	Temperature	Riverine Flooding
Pavement Binder Grade					X	
At-Grade Roadways	X	X	X			
Bridges	X	X	X			X
Large Culverts[8]	X	X	X			X
Small Culverts[9]	X	X	X	X		X

The various asset-hazard combinations include:

- **Pavement binder grade exposure to temperature changes:** Binder can be thought of as the glue that holds the various aggregate materials in asphalt together. Binder is sensitive to temperature. If temperatures become too hot, the binder can become pliable and deform under the weight of traffic. On the other hand, if temperatures are too cold, the binder can shrink causing cracking of the pavement. There are various types (grades) of binder, each suited to a different temperature regime. This study considered how climate change will influence high and low temperatures and how this, in turn, could affect pavement binder grade performance.

  Assumptions were made that (1) all roadways are currently (or could be in the future) asphalt and (2) the binder grade currently in place on each segment[10] of roadway matches the specifications in the Caltrans Highway Design Manual. From here, the allowable temperature ranges of each binder grade were compared to projected temperatures in 2040, 2070, and 2100. If the temperature parameters exceeded the design tolerance of the assumed binder grade, that segment of roadway was deemed potentially exposed.

EROSION ON HIGHWAY 78

[8] Culverts 20 feet or greater in width.
[9] Culverts less than 20 feet in width.
[10] Roadway are segmented at intersections with other roads.

- **Bridge exposure to riverine flooding:** Bridges are sensitive to higher flood levels and river flows. With climate change, precipitation is generally expected to become more intense in District 11 leading to an increase in flooding on rivers and streams. These higher flows could exceed the design tolerances of bridges. In addition, wildfires are also expected to become more prevalent in District 11 with climate change. After a wildfire burns, the ground can become hard and less capable of absorbing water. As a result, flood flows can increase substantially in the aftermath of a fire, which could further exacerbate the risks to bridges. To better understand the threat posed to bridges in District 11, a flood exposure index was developed and calculated for each bridge that crosses a river or stream. The index considered both the changes in precipitation and wildfire likelihood in the area draining to the bridge in the early, mid, and late century timeframes. The index also considers the capacity of the bridge to handle higher flows using waterway adequacy information from the National Bridge Inventory (NBI). A higher score on the index indicates bridges at relatively greater risk due to a combination of higher projected flows and lower capacity.

- **Large culvert exposure to riverine flooding:** A distinction is made in the analysis between large and small culverts due to different data being available for each. Large culverts are included in the NBI and are generally 20 feet or greater in width. Small culverts are generally shorter than 20 feet in width and covered through a different inventory/inspection program. Large culverts, like bridges, are sensitive to increased flood flows. Thus, a flood exposure index was calculated for each large culvert in the same manner as was done for bridges.

- **Small culvert exposure to riverine flooding:** Small culverts (those less than 20 feet in width) are, like bridges and large culverts, also sensitive to higher flood flows. Hence, a flood exposure index like the one for bridges and large culverts was calculated for this asset type. The one difference is that the capacity component of the index for small culverts used the actual dimensions of the culvert, information that was not available for bridges and large culverts. Although the actual dimensions of small culverts were available, due to resource and data constraints, no hydraulic analyses were performed to determine overtopping potential. Instead, the size was simply used as a factor in the riverine flood exposure index.

- **Small culvert exposure to wildfire:** In addition to the higher post-fire flood flows captured in the flood exposure analysis, culverts can also be sensitive to the direct impacts of fire on the structure. Certain culvert materials (e.g. wood and plastic and the coatings on corrugated metal pipes) can easily burn or be deformed during a fire. Thus, an assessment was made to determine the likelihood of a wildfire directly impacting each small culvert in the early, mid, and late century timeframes. This analysis was only conducted for small culverts because information on culvert construction materials was not available for large culverts.

- **At-grade roadway exposure to sea level rise:** Sea level rise, caused by the warming of ocean waters and the melting of land-based glaciers, is a prominent hazard brought on by climate change. In low-lying coastal areas, at-grade roads (defined here as those portions of the road network that are not elevated on a bridge) may become subject to regular inundation at high tides as sea levels rise. This can lead to frequent road closures that disrupt travel and accessibility. In some locations with regular inundation, premature degradation of the pavement may also occur.

- **Bridge exposure to sea level rise:** There are several ways in which sea level rise may adversely affect bridges. For very low bridges, a rise in sea levels may result in water overtopping the deck and impeding travel. It is important to recognize, however, that serious impacts to bridges can still occur from sea level rise even if water does not overtop the deck. For example, if there is enough sea level rise to result in waves contacting the bottom of the bridge deck, the uplifting forces may be enough to separate the deck from the rest of the structure. Even bridges whose decks are well above projected water levels may be impacted by sea level rise. For example, waves may contact piers at a higher elevation than they were designed for leading to more rapid corrosion of bridge components and unexpected strain being put on the bridge structure. The bridge abutments may also be adversely impacted by waves regularly hitting higher than initially designed and eroding the approach embankments. Furthermore, bridges could impede the navigability of shipping channels as sea levels rise and reduce ship clearances.

- **Large and small culvert exposure to sea level rise:** Culverts are primarily used to convey streams and stormwater underneath roadways (some are also used in tidally influenced environments). If sea levels rise high enough for seawater to reach the culvert, this can change the hydraulic performance of the culvert leading to more frequent overtopping of the roadway. For culverts that were not designed for a tidal setting, the frequent unanticipated presence of saltwater can also lead to corrosion and other maintenance issues that may decrease the anticipated lifespan of the asset.

- **At-grade roadway exposure to storm surge:** Storm surge refers to the elevating of coastal waters during major storm events. When strong winds blow onshore during such events, this can cause the water to pile up and reach levels much greater than during the normal tidal cycle. Sea level rise can cause the water to reach even higher during major storm events and increase the frequency of inundation. Inundation of at-grade roadways from storm surge may require the road to be closed, disrupting travel. Also, the surge and associated wave action often associated with storm events can cause erosion of the roadway embankment.

- **Bridge exposure to storm surge:** Storm surge presents many threats to bridges that may not have been fully anticipated if sea level rise was not considered during the design. Some low bridges may be overtopped by the surge and others may be affected by uplifting forces from wave action hitting the bottom of the deck. Either situation is likely to lead to the closure of the bridge and introduce the potential for serious structural damage. Even if the water is not high enough to reach the bridge deck, the elevated water levels and associated wave action can cause erosion around the bridge approaches. Furthermore, if the surge approaches or recedes at a high enough velocity, scouring of soils can occur around bridge piers and abutments weakening the structure and potentially compromising the bridge’s integrity. This is a particularly acute threat for surge impacted bridges built over other roadways or railroads (as opposed to over water) because scour may not have been considered during their initial designs.

- **Large and small culvert exposure to storm surge:** Storm surge can overtop culverts impeding travel. If the velocity of the surge is great enough, the hydraulic forcing of excessive water through too small an opening can also damage the culvert. Water overtopping the roadway embankment on top of the culvert may also cause erosion resulting in damages to the roadway and the culvert itself.

- **At-grade roadway exposure to coastal cliff retreat:** Cliff retreat refers to the erosion of coastal cliff faces. This process can be accelerated by sea level rise since higher water levels may mean more frequent instances of wave action reaching the base of the cliff and causing erosion. At-grade roadways that are immediately along the coast can be a total loss if erosion encroaches upon them. Indeed, Caltrans has had to relocate several roads already, often at significant expense, to avoid retreating coastal cliff faces.

- **Bridge exposure to coastal cliff retreat:** Any bridges in the vicinity of coastal cliff faces are at risk of a total loss should the cliff retreat towards the bridge abutment. Should the abutment of the bridge be compromised by erosion, the structural stability of the bridge will be lost and the bridge no longer usable.

- **Large and small culvert exposure to coastal cliff retreat:** As with bridges and at-grade roadways, any culverts along a segment of road exposed to coastal cliff retreat are at risk of becoming a total loss. The erosion might compromise their stability causing them, and the roadway above them, to tumble into the sea.

3.3. Prioritization Metrics

Metrics are the individual variables used to calculate a prioritization score for each asset. These can be thought of as the individual factors that, collectively, help determine the asset's priority for adaptation. Each of the asset-hazard combinations described in the previous section has its own unique set of factors that are used in the prioritization. The metrics were selected based on their relevancy to each asset-hazard combination and the data availability. For example, the condition rating of a culvert is a very relevant metric for prioritizing culverts exposed to riverine flooding, however, it is not at all relevant to prioritizing bridges exposed to the same hazard. Table 2 provides an overview of all the metrics included in this study and denotes with an "X" their application to the various asset-hazard combinations studied.

TABLE 2: METRICS INCLUDED FOR EACH ASSET-HAZARD COMBINATION STUDIED

	Sea Level Rise				Storm Surge				Coastal Cliff Retreat				Wildfire	Tempera-ture	Riverine Flooding		
Metrics	**At-Grade Roadways**	**Bridges**	**Large Culverts**	**Small Culverts**	**At-Grade Roadways**	**Bridges**	**Large Culverts**	**Small Culverts**	**At-Grade Roadways**	**Bridges**	**Large Culverts**	**Small Culverts**	**Small Culverts**	**Pavement Binder Grade**	**Bridges**	**Large Culverts**	**Small Culverts**
Exposure																	
Past natural hazard impacts	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X
Lowest impactful sea level rise (SLR) increment	X	X	X	X													
Percent of road segment exposed to 6.6 ft. of SLR	X																
Lowest impactful SLR increment with 100-year storm surge					X	X	X	X									
Percent of road segment exposed to a 100-year storm with 6.6 ft. of SLR (4.6 ft. in the Delta)					X												
Lowest SLR increment that results in damage from coastal cliff retreat									X	X	X	X					
Percent of road segment exposed to coastal cliff retreat at 6.6 ft. of SLR									X								
Initial timeframe for elevated level of concern for wildfire													X				
Highest projected wildfire level of concern													X				
Initial timeframe when asphalt binder grade needs to change														X			
Maximum riverine flooding exposure score for the 2010-2039 timeframe															X	X	X
Maximum riverine flooding exposure score															X	X	X
Consequences																	
Bridge substructure condition rating						X									X		
Channel and channel protection condition rating															X	X	
Culvert condition rating							X	X								X	X
Culvert material				X									X				
Scour rating						X									X		
Average annual daily traffic (AADT)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Average annual daily truck traffic (AADTT)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Incremental travel distance to detour around the asset													X		X	X	X
Incremental travel distance to detour around the asset for the lowest impactful SLR increment	X	X	X	X	X	X	X	X	X	X	X	X					
Incremental travel distance to detour around the asset with 6.6 ft. of SLR (4.6 ft. for storm surge in the Delta)	X	X	X	X	X	X	X	X	X	X	X	X					

The metrics included in this study fall into two categories: exposure metrics and consequence metrics. Exposure metrics capture the extensiveness, severity, and timing of a hazard's projected impact on an asset. Assets that have more extensive, more severe, and sooner exposure are given a higher priority. Consequence metrics provide an indication of how sensitive an exposed asset is to damage using information on the asset's condition. Consequence metrics also indicate how sensitive the overall transportation network may be to the loss of that asset should it be taken out of service by a hazard. The poorer the initial conditions of the potentially exposed asset and the more critical it is to the functioning of the transportation network, the higher the priority given. The specific metrics that are included within each of these categories are described in the sections that follow. The sea level rise metrics and projections used generally align with the California Coastal Commission's guidance on sea level rise scenarios for facility level assessments.[11]

3.3.1. Exposure Metrics

The following metrics were used to assess asset exposure in District 11:

SR-78 STORM DAMAGE

- **Past natural hazard impacts:** Assets that have experienced sea level rise, weather, or fire-related impacts in the past are likely to experience more issues in the future as climate changes and should be prioritized. To obtain information on past impacts, District 11 maintenance staff were surveyed and asked to identify any at-grade roadways, bridges, large culverts, or small culverts that had experienced sea level rise, storm surge, or coastal cliff retreat issues in the past. Staff was also asked to document past riverine flooding impacts for all these asset types except at-grade roadways. Care was taken to ensure that these impacts occurred on assets that had not been replaced with a more resilient design after the event occurred. In addition, staff was also asked if any small culverts were damaged directly by fire and replaced with culverts of the same material. Any asset that was identified as previously impacted by either cliff retreat, flooding, or fire was flagged, and that asset was given a higher priority for adaptation.

  In District 11 there were several unique cases where district maintenance staff identified assets with past damage impacts, but the assessment results did not indicate future exposure in that location. District 11 identified six bridges on State Route 67, State Route 86, State Route 8, and State Route 98 as having experienced past damages from riverine flooding, but these sites did not receive future riverine flooding scores. District 11 also flagged a segment of roadway on State Route 78 as having experienced recent coastal flooding, but the analysis did not indicate sea level rise or storm surge exposure in this area. Finally, the district also flagged a section of Interstate 5 as having experienced historical shoreline erosion and cliff retreat, while the cliff retreat data did not indicate exposure so far inland at this location. These assets were included in the analysis and

[11] California Coastal Commission, Sea Level Rise Policy Guidance, Adopted August 2015, Updated November 2018.

scored alongside other District 11 assets where future exposure is projected. It is possible that there are gaps in the climate hazard data used and these sites were not identified as exposed when they should have been. Because past issues have been noted in these locations, further inspection is needed to understand future climate change impacts to these assets.

- **Lowest impactful sea level rise increment:** Assets that are likely to be impacted by sea level rise sooner should receive higher priority for detailed facility level assessments. To consider this in the asset scoring, a metric was developed that captured the lowest (first) increment of sea level rise[12] to potentially impact each at-grade roadway, bridge[13], large culvert, and small culvert. This metric made use of the sea level rise data used on the District 11 Climate Change Vulnerability Assessment Report. This data was sourced from the United States Geological Survey's (USGS) Coastal Storm Modeling System (CoSMoS) dataset for an annual flooding event and utilized sea level rise increments of 0.0, 0.8, 1.6, 2.5, 3.3, 4.1, 4.9, 5.7, and 6.6 feet. The sea level rise increments used for the Climate Central data mirrored those that were used for the CoSMoS data. Whichever the data source, the lower the sea level rise increment that first impacts the asset, the higher priority it will receive.

- **Percent of road segment exposed to 6.6 ft. of sea level rise:** For at-grade roadway segments[14], not only is the timing of sea level rise impacts an important factor in prioritization, but also the extensiveness of the impacts. All else being equal, a segment of road that is impacted over a large proportion of its length should receive higher priority than one impacted over only a small proportion. The 6.6 feet sea level rise increment from the data sources mentioned above was used for this metric in order to provide an indicator of potential impacts at the end of the century under a somewhat pessimistic greenhouse gas emissions scenario.

- **Lowest impactful sea level rise increment with 100-year storm surge:** As with sea level rise, assets that are likely to be impacted by storm surge sooner should receive higher priority for detailed facility level assessments. To factor this into the analysis, this metric captures the lowest (first) sea level rise increment at which the 100-year storm surge[15] could potentially impact each at-grade roadway, bridge[16], large culvert, and small culvert. USGS CoSMoS storm surge data at increments of 0.0, 0.8, 1.6, 2.5, 3.3, 4.1, 4.9, 5.7, and 6.6 feet was used for the analysis. The lower the sea level rise increment that first impacts the asset, the higher priority it will receive.

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[12] Sea level rise areas hydrologically connected to the sea and hydrologically disconnected low-lying areas potentially vulnerable to sea level rise inundation were both used for this assessment.

[13] The lowest impactful sea level rise scenario for bridges was determined by whichever increment of sea level rise first causes inundation under the bridge. For bridges already over coastal waters, potential impacts were assumed to occur at the lowest available increment of sea level rise. No analyses were performed to compare the elevations of the bottoms of the bridge decks to the underlying water elevations. The analysis was set up this way in recognition of the impacts possible at bridges from sea level rise before water touches the deck (i.e., enhanced corrosion and structural stability, erosion, and navigability concerns).

[14] At-grade roadways are segmented at intersections with other roads thereby matching the segmentation used for the pavement binder grade analysis.

[15] Storm surge areas hydrologically connected to the sea and hydrologically disconnected low-lying areas potentially vulnerable to storm surge inundation were both used for this assessment.

[16] As with sea level rise, the lowest impactful sea level rise scenario for bridges was determined by whichever increment of sea level rise first causes storm surge inundation under the bridge. For bridges already over coastal waters, potential impacts were assumed to occur at the lowest available increment of sea level rise. No analyses were performed to compare the elevations of the bottoms of the bridge decks to the underlying water elevations. The analysis was set up this way in recognition of the impacts possible at bridges from storm surge before water touches the deck (i.e., structural stability, erosion, and scour concerns).

- **Percent of road segment exposed to a 100-year storm surge with 6.6 feet of sea level rise:** This metric measures the proportion of each at-grade roadway segment exposed to a 100-year storm surge. As with the sea level rise length metric, 6.6 feet of sea level rise was used in order to provide an indicator of potential impacts at the end of the century under a somewhat pessimistic greenhouse gas emissions scenario. All else being equal, the greater the proportion of roadway length exposed to storm surge, the higher the priority of that segment.

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- **Lowest sea level rise increment that results in damage from coastal cliff retreat:** At-grade roadways, bridges, large culverts, and small culverts that are exposed to coastal cliff retreat sooner should receive higher priority for facility level adaptation assessments. Thus, this metric was included to capture the timing of impacts. The greatest threat from coastal cliff retreat is along the open Pacific coastline where the erosive effects of waves are highest, so the analysis focused on these areas. As with sea level rise and storm surge, USGS CoSMoS data was utilized for sea level rise increments of 0.0, 0.8, 1.6, 2.5, 3.3, 4.1, 4.9, 5.7, and 6.6 feet.

- **Percent of road segment exposed to coastal cliff retreat at 6.6 ft. of sea level rise:** This metric captures the proportion of each at-grade roadway segment that is exposed to coastal cliff retreat. As with sea level rise and storm surge, 6.6 feet of sea level rise was used in order to provide an indicator of potential impacts at the end of the century under a somewhat pessimistic greenhouse gas emissions scenario. All else being equal, the greater the proportion of roadway length exposed to coastal cliff retreat, the higher the priority of that segment.

- **Initial timeframe for elevated level of concern from wildfire:** Assets that are more likely to be impacted by wildfire sooner should be prioritized first. Using the future wildfire projections developed for the District 11 Climate Change Vulnerability Assessment Report, the initial timeframe (2010-2039, 2040-2069, 2070-2099, or Beyond 2099) for heightened wildfire risk was determined for each small culvert. The most recent timeframe across the range of available climate scenarios was chosen. Assets that were impacted sooner were given a higher priority for adaptation.

- **Highest projected wildfire level of concern:** Assets that are exposed to a greater wildfire risk should be prioritized. The wildfire modeling conducted for the District 11 Climate Change Vulnerability Assessment Report classified fire risk into five levels of concern (very low, low, moderate, high, and very high) at various future time periods. Using this data, the highest level of concern was determined for each small culvert between now and 2100 and across all climate scenarios. Assets with higher levels of concern were given a higher priority for adaptation.

- **Initial timeframe when asphalt binder grade needs to change:** Roadway segments that are more likely to need binder grade changes sooner should be prioritized. Using the assumptions and data from the pavement binder grade exposure analysis described above, the initial timeframe (prior to 2010, 2010-2039, 2040-2069, or 2070-2099) for binder grade change was determined. Roadway segments that were found to need binder grade changes sooner were given a higher priority for detailed adaptation assessments.

- **Maximum riverine flooding exposure score for the 2010-2039 timeframe**: Assets that have relatively higher exposure to riverine flooding in the near-term should be prioritized. Using the riverine flood exposure index values calculated using the process described above, the highest score for the near-term (2010-2039) period was determined for each bridge, large culvert, and small culvert considering all climate scenarios and the range of outputs from all climate and wildfire models. Assets with the highest overall riverine flooding scores in this initial period received a higher priority for adaptation.

CORONADO BRIDGE

- **Maximum riverine flooding exposure score:** In addition to understanding the most pressing near-term needs for dealing with riverine flooding, assets that have relatively higher exposure to riverine flooding at any point over their lifespans should also be prioritized. To calculate this metric, the highest riverine flooding exposure score was determined for each asset considering all time periods (from now through 2100), all climate scenarios, and all climate and wildfire models. Assets with the highest overall riverine flooding scores received a higher priority for adaptation.

3.3.2. Consequence Metrics

The following metrics were used to understand the consequences of each asset's exposure, considering both the asset sensitivity to damage and network sensitivity to loss of the asset:

- **Bridge substructure condition rating:** Poor bridge substructure condition can contribute to failure during riverine flooding and storm surge events. The NBI assigns a substructure condition rating to each bridge. Values range from nine to two with lower values indicating poorer condition. Bridges with poor substructure condition ratings were given higher priority for adaptation assessments.

- **Channel and channel protection condition rating:** Poor channel conditions or inadequate channel protection measures can contribute to failure during riverine flooding events. The NBI assigns a channel and channel protection condition rating to each bridge and large culvert. Values range from nine to two with lower values indicating poorer condition. Bridges and large culverts with poor channel or channel protection ratings were given higher priority for adaptation assessments.

- **Culvert condition rating:** Poor culvert condition can contribute to failure during storm surge and riverine flooding events. The NBI assigns a culvert condition rating to each large culvert. Values range from nine to two with lower values indicating poorer condition. Caltrans has developed their own culvert condition rating system for small culverts. Possible ratings in the Caltrans system include good, fair, critical, and poor. Large and small culverts with poorer condition ratings in either system were prioritized.

- **Culvert material:** Culvert material determines the sensitivity of culverts to direct damage from wildfires and material degradation due to sea level rise. Caltrans includes material data in its databases on small culverts (no equivalent information exists for large culverts). Possible culvert materials include HDPE (high density polyethylene [plastic]), PVC (polyvinyl chloride [plastic]), corrugated steel pipe, composite, wood, masonry, and concrete. HDPE, PVC, corrugated steel pipe, composite, and wood culverts are all more sensitive to wildfire and any small culverts made from these materials that are exposed to an elevated risk from wildfire were prioritized for adaptation. Likewise, corrugated steel pipe and concrete are more sensitive to regular saltwater inundation and any small culverts made from these materials that are exposed to sea level rise were assigned a higher priority.

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- **Scour rating:** Scour is a condition where water has eroded the soil around bridge piers and abutments. Excessive scour of bridge foundations makes bridges more prone to failure, especially during storm surge and riverine flooding events. The NBI assigns a scour condition rating to each bridge. Values range from eight to two with lower values indicating greater scour concern. Bridges with lower scour values (higher scour concern) were given higher priority for adaptation assessments.

- **Average annual daily traffic (AADT):** AADT is a measure of the average traffic volume on a roadway. The consequences of weather and sea level rise-related failures/disruptions/maintenance are greater for assets that convey a higher volume of traffic. Disruptions on higher volume roads affect a greater proportion of the traveling public and there is a greater chance of congestion ripple effects throughout the network because alternate routes are less likely to be able to absorb the diverted traffic. AADT data was obtained from Caltrans databases and assigned to all the asset types included in this study. Exposed assets with higher AADT values were given greater priority for adaptation.

- **Average annual daily truck traffic (AADTT):** AADTT is a measure of the average truck volumes on a roadway. Efficient goods movement is important for maintaining economic resiliency and for providing relief supplies after a disaster. The consequences of weather and sea level rise-related failures/disruptions/maintenance are greater for assets that are a critical link in supply chains. AADTT data was obtained from Caltrans databases and assigned to all the asset types included in this study. Potentially exposed assets with higher AADTT values were given greater priority for adaptation.

- **Incremental travel distance to detour around the asset:** This metric measures the degree of network redundancy around each asset. A detour routing tool was developed for this project that can find the shortest path detour around a segment of road, bridge, large culvert, or small culvert and calculate the additional travel distance that would be required to take that detour. A simplified version of the tool that did not consider whether the detour routes would be passible during a flood event was run for each of the bridge and culvert assets studied that were exposed to riverine flooding.[17] Assets that had very long detour routes were given greater priority for adaptation.

- **Incremental travel distance to detour around the asset for the lowest impactful SLR increment:** A more complex version of the detour routing tool was used to determine the shortest path detour for the lowest impactful sea level rise increment that would result in sea level rise, storm surge, and coastal cliff retreat affecting each asset. This provides an indication of the initial network redundancy issues that may be created by climate change in coastal areas. For these hazards, the detour tool considered the inundation/erosion throughout the roadway network for the increment of sea level rise to be evaluated. This ensured that detours were not routed onto roads that would also be inundated or eroded under the same amount of sea level rise. When being run for assets exposed to sea level rise or coastal cliff retreat, the detour routing algorithm ensured that no road affected by either sea level rise or coastal cliff retreat at the same increment of sea level rise that was being evaluated could be considered as a detour

[17] The exposure of detour routes to flooding was not able to be determined within the resources of this project since no future riverine flooding floodplains with climate change were available at the time of publication.

route. When being run for assets exposed to storm surge, the detour routing algorithm ensured that no road affected by either sea level rise, coastal cliff retreat, or storm surge at the same increment of sea level rise could be considered as a detour route. As with the riverine flooding detours, assets that had very long detour routes were given greater priority for adaptation.

- **Incremental travel distance to detour around the asset with 6.6 feet of SLR:** This metric captures the level of network redundancy around exposed at-grade roadways, bridges, large culverts, and small culverts at 6.6 feet of sea level rise. As with the coastal hazard exposure metrics, 6.6 feet was chosen sea level rise increment representative of end of the century conditions under a somewhat pessimistic greenhouse gas emissions scenario. The detour values for this metric were calculated the same way as was done for the lowest impactful sea level rise increment detour metrics described above. Likewise, assets that had very long detour routes under this sea level rise increment were given greater priority for adaptation.

3.4. Calculation of Initial Prioritization Scores

Once all the metrics had been gathered/developed, the next step was to combine them and calculate an initial prioritization score for each asset. Calculating prioritization scores is a multi-step process that was conducted using Microsoft Excel. The primary steps are as follows:

1. **Scale the raw metrics:** Several of the metrics described in the previous section have different units of measurement. For example, the AADT metric is measured in vehicles per day whereas the incremental travel time to detour around the asset is measured in minutes. There is a need to put each metric on a common scale to be able to integrate them into one scoring system. For this study, it was decided to use a scale ranging from zero to 100 with zero indicating a value for a metric that would result in the lowest possible priority level and 100 indicating a value for a metric that would result in the highest possible priority level. The district-wide minimum and maximum values for each metric were used to set that metric’s zero and 100 values. The past weather/fire impacts metric (which had binary values) was assigned a zero if the condition was false (i.e., there were no previous weather/fire impacts reported) and 100 if the condition was true. Categorized or incremental values, like the various condition rating metrics or the sea level rise increments, were generally parsed out evenly between zero and 100 (e.g., if there were seven condition rating values, the minimum and maximum values were coded as zero and 100, respectively, with the five remaining categories assigned values at intervals of 20). The remaining metrics with continuous values were allowed to fall at their proportional location within the re-scaled zero to 100 range.

2. **Apply weights:** Some metrics have been determined by Caltrans to be more important than others for determining priorities. Therefore, the relative importance of each metric was adjusted by multiplying the scaled score by a weighting factor. Metrics deemed more important to prioritization were multiplied by a larger weight. For consistency, Caltrans Headquarters staff harmonized the weights to be used in all districts based on national best practices and input from the districts. Table 3 shows the weighting schema applied to the asset-hazard combinations in District 11. The weights are percentage based and add to 100% for all the metrics within a given asset-hazard combination (column).

TABLE 3: WEIGHTS BY METRIC FOR EACH ASSET-HAZARD COMBINATION STUDIED

	Percentage Weights by Asset Class																
	Sea Level Rise				**Storm Surge**				**Cliff Retreat**				**Wildfire**	**Tempera-ture**	**Riverine Flooding**		
Metric	**At-Grade Roadways**	**Bridges**	**Large Culverts**	**Small Culverts**	**At-Grade Roadways**	**Bridges**	**Large Culverts**	**Small Culverts**	**At-Grade Roadways**	**Bridges**	**Large Culverts**	**Small Culverts**	**Small Culverts**	**Pavement Binder Grade**	**Bridges**	**Large Culverts**	**Small Culverts**
Exposure																	
Past natural hazard impacts	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	-	20%	20%	20%
Lowest impactful sea level rise (SLR) increment	22.5%	45%	45%	40%	-	-	-	-	-	-	-	-	-	-	-	-	-
Percent of road segment exposed to 6.6 ft. of SLR	22.5%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lowest impactful SLR increment with 100-year storm surge	-	-	-	-	22.5%	45%	45%	45%	-	-	-	-	-	-	-	-	-
Percent of road segment exposed to a 100-year storm with 6.6 ft. of SLR (4.6 ft. in the Delta)	-	-	-	-	22.5%	-	-	-	-	-	-	-	-	-	-	-	-
Lowest SLR increment that results in damage from coastal cliff retreat	-	-	-	-	-	-	-	-	22.5%	45%	45%	45%	-	-	-	-	-
Percent of road segment exposed to coastal cliff retreat at 6.6 ft. of SLR	-	-	-	-	-	-	-	-	22.5%	-	-	-	-	-	-	-	-
Initial timeframe for elevated level of concern for wildfire	-	-	-	-	-	-	-	-	-	-	-	-	17.5%	-	-	-	-
Highest projected wildfire level of concern	-	-	-	-	-	-	-	-	-	-	-	-	17.5%	-	-	-	-
Initial timeframe when asphalt binder grade needs to change	-	-	-	-	-	-	-	-	-	-	-	-	-	60%	-	-	-
Maximum riverine flooding exposure score for the 2010-2039 timeframe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.5%	22.5%	22.5%
Maximum riverine flooding exposure score	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22.5%	22.5%	22.5%
Consequences																	
Bridge substructure condition rating	-	-	-	-	-	1.5%	-	-	-	-	-	-	-	-	1%	-	-
Channel and channel protection condition rating	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5%	2.5%	-
Culvert condition rating	-	-	-	-	-	-	5%	5%	-	-	-	-	-	-	-	2.5%	5%
Culvert material	-	-	-	15%	-	-	-	-	-	-	-	-	20%	-	-	-	-
Scour rating	-	-	-	-	-	8.5%	-	-	-	-	-	-	-	-	6.5%	-	-
Average annual daily traffic (AADT)	10%	10%	10%	7%	10%	7%	7%	7%	10%	10%	10%	10%	7%	13%	7%	10%	10%
Average annual daily truck traffic	5%	5%	5%	3%	5%	3%	3%	3%	5%	5%	5%	5%	3%	27%	3%	5%	5%
Incremental travel distance to detour around the asset	-	-	-	-	-	-	-	-	-	-	-	-	15%	-	15%	15%	15%
Incremental travel distance to detour around the asset for the lowest impactful SLR increment	10%	10%	10%	7.5%	10%	7.5%	10%	10%	10%	10%	10%	10%	-	-	-	-	-
Incremental travel distance to detour around the asset with 6.6 ft. of SLR (4.6 ft. for storm surge in the Delta)	10%	10%	10%	7.5%	10%	7.5%	10%	10%	10%	10%	10%	10%	-	-	-	-	-
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

In general, higher weights were assigned to the future exposure metrics (including those considering both the hazard timing and severity) as they are the primary drivers of adaptation need. This helps ensure adaptations are considered proactively before the hazards affect the assets. It also focuses the first detailed assessments on those assets that are projected most severely affected by climate change.

Amongst the consequence metrics, more weight is given to the AADT and detour route variables relative to the condition rating related variables (bridge substructure condition rating, channel and channel protection condition rating, culvert condition rating, and scour rating). The logic for this is as follows. First, except for the scour rating, the connection between asset condition and asset failure during a hazard event is not always straightforward. Where there is less confidence in a metric, it is weighted less.[18] Second, other prioritization systems used by Caltrans, namely the asset management system, focus on condition to prioritize assets. Thus, poor condition assets will already be prioritized through that program and, per Caltrans' Climate Adaptation Framework shown in Figure 1, will also undergo detailed adaptation assessments before upgrades are made. There is little value in duplicating that prioritization system for this report; instead this effort puts more priority on assets based on their exposure to climate change-related hazards. Lastly, the traffic volume and detour length variables are the primary measures by which impacts to users of the system are captured and, given the importance of mobility to the functioning of the state, were weighted higher.[19]

An exception to some of the logic noted above can be found with small culvert exposure to wildfire and sea level rise. For these assets, nearly as much weight is given to the culvert material variable as to the AADT and detour route variables collectively. This is because the very nature of the threat to small culverts from wildfire and sea level rise is highly related to the material of the culvert. For example, if the culvert is plastic or wood, it is much more susceptible to fire damage than, say, a concrete culvert. Since they are less likely to be adversely affected by fire in the first place, one would not want to give high priority to concrete culverts for wildfire just because they convey a high AADT or have long detour routes. That is why more weight is placed on the material metric for this asset-hazard combination.

3. **Calculate prioritization scores for each hazard**: After the weights were applied, the next step was to calculate prioritization scores for each individual hazard. This was done by first summing the products of the weights and scaled values for all the metrics relevant to the particular asset-hazard combination being studied (i.e., summing up the products for each column in Table 3). Since there are different numbers of metrics used to calculate the score for each asset-hazard combination, these values were then re-scaled to range from zero to 100 with zero representing the lowest priority asset and 100 the highest priority asset. These interim scores provide useful information for understanding asset vulnerability to each specific hazard.

4. **Calculate cross-hazard prioritization scores:** While the prioritization scores for each hazard provide useful information, they do not provide the full picture on the threats posed to each

[18] Note that the scour rating metric is weighted somewhat higher than the other condition related assets because of its more direct connection to asset failure.

[19] Within the traffic volume related metrics, note that slightly more weight is given to AADT as opposed to truck AADT given that most of the traffic on a roadway is non-truck. Thus, it was reasoned that the total volume should factor in somewhat more heavily than the truck volume. One exception to this was for temperature impacts to pavement. This asset-hazard combination is unique in that the traffic volume information is not just an indicator of how many users may be affected by necessary pavement repairs but also an indicator of how much damage may occur to the pavement should temperatures exceed binder grade design thresholds. Given that, for this asset-hazard combination, more weight is given to truck volumes since trucks do disproportionately more damage to temperature-weakened pavement.

asset. It was decided that the final scores used as the basis for prioritization need to look holistically across all the hazards analyzed. This cross-hazard perspective provides a better view of the collective threats faced by each asset and a better basis for prioritization. To calculate the cross-hazard scores, the scores for each hazard analyzed for the asset were summed. These were then re-scaled yet again to a zero to 100 scale since different asset types have different numbers of hazards. As before, the higher the score, the higher the adaptation priority of that asset. These cross-hazard scores represent the final scores calculated for each asset during the technical assessment portion of the methodology.

5. **Assign priority levels**: The final step in the technical assessment was to group together assets into different priority levels based on their cross-hazard scores. This was done to make the outputs more oriented to future actions, decrease the tendency to read too much into minor differences in the cross-hazard scores, and better facilitate dialogue at the workshop with District 11 staff. Five priority levels were developed (Priority 1, 2, 3, 4, and 5) and assets were assigned to those groups on a district-wide basis. An equal number of assets were assigned to each priority level to help facilitate administration of the facility-level adaptation assessments that will follow this study.

3.5. Adjustments to Prioritization

A workshop was held with the district to explain the scoring methodology and go over the preliminary prioritization results. District 11 staff reviewed the preliminary prioritization results for assets on the State Highway System and decided to adjust the prioritizations of two bridges: 1) Bridge Number 57-0160 on State Route 67 over Prairie Creek and 2) Bridge Number 1054 on State Route 78 over Santa Ysabel Creek.

The bridge over Prairie Creek was adjusted from a Priority 2 to Priority 1 due to field staff feedback that the bridge is currently vulnerable to flood impacts. For example, a storm event in February of 2019 caused the bridge to reach its capacity. The district is undertaking a long-term hydraulics study at this location to review current flood impacts and per this study it is recommended to review future flow projections for this river crossing as part of this analysis. The bridge over San Ysabel Creek was adjusted from a Priority 5 to Priority 1 due to scour issues and frequent maintenance needs. District staff noted that the Prairie Creek bridge currently needs to be monitored for damages from major storm events and therefore is an existing problem area on the State Highway System.

4. DISTRICT ADAPTATION PRIORITIES

District 11 is the southernmost Caltrans district, which covers the counties of Imperial and San Diego. The District 11 area stretches from the Pacific Ocean to Arizona and borders Mexico to the south, including the heavily trafficked US/Mexico border crossing. District 11 is geographically diverse consisting of coastline, mountains, and desserts and is subject to various climate patterns. Additionally, District 11 has a strong military presence including Marine Corps Air Station Miramar, Marine Corps Base Camp Pendleton, Naval Base San Diego, and the US Coast Guard.

This chapter presents Caltrans' priorities for undertaking detailed adaptation assessments of assets exposed to climate change in District 11. The material presented in this chapter reflects the results of the technical analysis and the coordination with District 11 staff described in the previous chapter. The information is broken out by asset type with priorities for bridges discussed in the first section, followed by those for large culverts, small culverts, and roadways.

4.1. Bridges

A total of 209 bridges were assessed for vulnerability to sea level rise, storm surge, coastal cliff retreat, and enhanced riverine flooding associated with climate change. All these bridges should eventually undergo detailed adaptation assessments. However, due to resource limitations, this will not be possible to do all at once. Instead, the bridges will be analyzed over time according to the priorities presented here.

Figure 2 provides a map of all the bridges assessed in the district. The color of the points corresponds to the priority assigned to each bridge; darker red colors indicate higher priority assets. In District 11 there are 43 bridges that are the highest priority (Priority 1). The map shows that high priority bridges are scattered throughout the district. That said, there are a few clusters of areas that have several high priority bridges. Of the 20 bridges with the highest-ranking cross-hazard prioritization scores, 16 of them are located on Interstate 5. The Interstate 5 bridges are given high priority because of high sea level rise, storm surge, and riverine flood exposure scores). All 16 of the Interstate 5 bridges were identified as being exposed to 0 feet of sea level rise, or in other words, are in locations currently exposed to coastal flooding.
There is also a lengthy cluster of bridges along State Route 86 west and east along State Route 111 surrounding the Salton Sea. These bridges received higher priority scores primarily due to high riverine flood exposure and long detour routes.

HIGH FLOWS UNDER BRIDGE ON SR-78

As explained in Section 3.5 above, two bridges were added to the Priority 1 list based on district recommendation: 1) Bridge Number 57-0160 on State Route 67 over Prairie Creek and 2) Bridge Number

1054 on State Route 78 over Santa Ysabel Creek. These bridges are shown at the end of Table 4, which presents a summary of all the Priority 1 bridges in District 11 sorted by their cross-hazard prioritization scores. A complete listing of all bridges ranked by their prioritization scores appears in Table 8 in the appendix.

TABLE 4: PRIORITY 1 BRIDGES

Priority	Bridge Number	County[20]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
1	57 0007R	SD	INTERSTATE 5	SANTA MARGARITA RIVER	R56.43R	100.00
1	57 0007L	SD	INTERSTATE 5	SANTA MARGARITA RIVER	R56.43L	77.66
1	57 0282	SD	INTERSTATE 5	AGUA HEDIONDA LAGOON[21]	R48.68	76.94
1	57 0277	SD	INTERSTATE 5	BUENA VISTA LAGOON[21]	R50.94	76.37
1	57 0459L	SD	INTERSTATE 5	BATIQUITOS LAGOON[21]	R44.56	75.93
1	57 0713L	SD	INTERSTATE 5 - SB	SAN LUIS REY RIVER[21]	R54.04	73.66
1	57 0857	SD	STATE ROUTE 75	SAN DIEGO-CORONADO BAY BRIDGE[21]	R20.49	72.96
1	57 0713R	SD	INTERSTATE 5 - NB	SAN LUIS REY RIVER[21]	R54.04	72.75
1	57 0459R	SD	INTERSTATE 5	BATIQUITOS LAGOON[21]	R44.56	69.65
1	57 0638L	SD	INTERSTATE 805 SB	SWEETWATER RIVER	8.66	67.68
1	57 0488	SD	INTERSTATE 5	SAN DIEGUITO RIVER	R35.66	66.18
1	57 0566R	SD	I 5 NB	SAN DIEGO RIVER	R20.12	61.88
1	57 0566L	SD	I 5 SB	SAN DIEGO RIVER	R20.12	60.13
1	57 0473	SD	INTERSTATE 5	CHOLLAS CREEK	R12.73	58.61
1	57 0458L	SD	INTERSTATE 5 SB	SAN ELIJO LAGOON[22]	R38.49	58.35
1	57 0458R	SD	INTERSTATE 5 NB	SAN ELIJO LAGOON	R38.49	57.06
1	57 0794R	SD	INTERSTATE 5 NB	SWEETWATER RIVER	9.41	56.96
1	57 0794L	SD	INTERSTATE 5 SB	SWEETWATER RIVER	9.41	56.84
1	57 0638R	SD	INTERSTATE 805 NB	SWEETWATER RIVER	8.66	54.34
1	57 0126	SD	STATE ROUTE 163	SAN DIEGO RIVER	3.95	54.22
1	57 0493	SD	INTERSTATE 15	SOUTH BRANCH CHOLLAS CREEK	0.45	52.60
1	57 0767R	SD	STATE ROUTE 54	SWEETWATER RIVER	1.41R	50.33
1	57 0059	SD	STATE ROUTE 79	SOUTH BRANCH SANTA YSABEL CREEK	21.63	37.83
1	58 0306R	IMP	INTERSTATE 8 EB	ALL AMERICAN CANAL	R90.99	36.25
1	58 0306L	IMP	INTERSTATE 8 WB	ALL AMERICAN CANAL	R91.07	36.15
1	58 0139	IMP	STATE ROUTE 111	"X" DRAIN	40.82	35.61
1	58 0157	IMP	STATE ROUTE 111	NILAND CREEK	45.37	34.74

[20] IMP = Imperial; SD = San Diego
[21] Bridges will be included in the I-5 North Coast Corridor project.
[22] Bridge is currently under construction.

Priority	Bridge Number	County[20]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
1	58 0017R	IMP	STATE ROUTE 86 NB	TRIFOLIUM CANAL	R34.82	33.96
1	58 0213L	IMP	INTERSTATE 8 WB	SOUTH FORK COYOTE WASH	R14.46	32.78
1	58 0213R	IMP	INTERSTATE 8 EB	SOUTH FORK COYOTE WASH	R14.44	32.78
1	58 0312R	IMP	INTERSTATE 8 EB	COLORADO RIVER VIADUCT	R96.81	32.60
1	58 0312L	IMP	INTERSTATE 8 WB	COLORADO RIVER VIADUCT	R96.81	32.60
1	57 0068	SD	STATE ROUTE 79	SOME CREEK	41.96	28.83
1	57 0468L	SD	INTERSTATE 5 SB	CIVIC CENTER DRIVE OH	R10.75	28.02
1	58 0124	IMP	STATE ROUTE 78	SAN FELIPE CREEK	2.07	27.81
1	58 0030R	IMP	STATE ROUTE 86 NB	DEEP WASH	R35.16	26.96
1	58 0032R	IMP	STATE ROUTE 86 NB	LONE TREE WASH	R37.23	26.92
1	58 0032L	IMP	STATE ROUTE 86 SB	LONE TREE WASH	R37.23	26.80
1	57 0468R	SD	INTERSTATE 5 NB	CIVIC CENTER DRIVE OH	R10.75	26.22
1	58 0070R	IMP	STATE ROUTE 86 NB	AMBIG DITCH	64.75	25.60
1	58 0039R	IMP	STATE ROUTE 86 NB	LUPIN WASH	50.84	25.42
1	57 0160	SD	STATE ROUTE 67	PRAIRIE CREEK[23]	22.26	15.54
1	57 1054	SD	STATE ROUTE 78	SANTA YSABEL CREEK[24]	R27.17	4.58

[23] Added to Priority 1 list of bridges after District 11 staff review of priorities.
[24] Added to Priority 1 list of bridges after District 11 staff review of priorities.

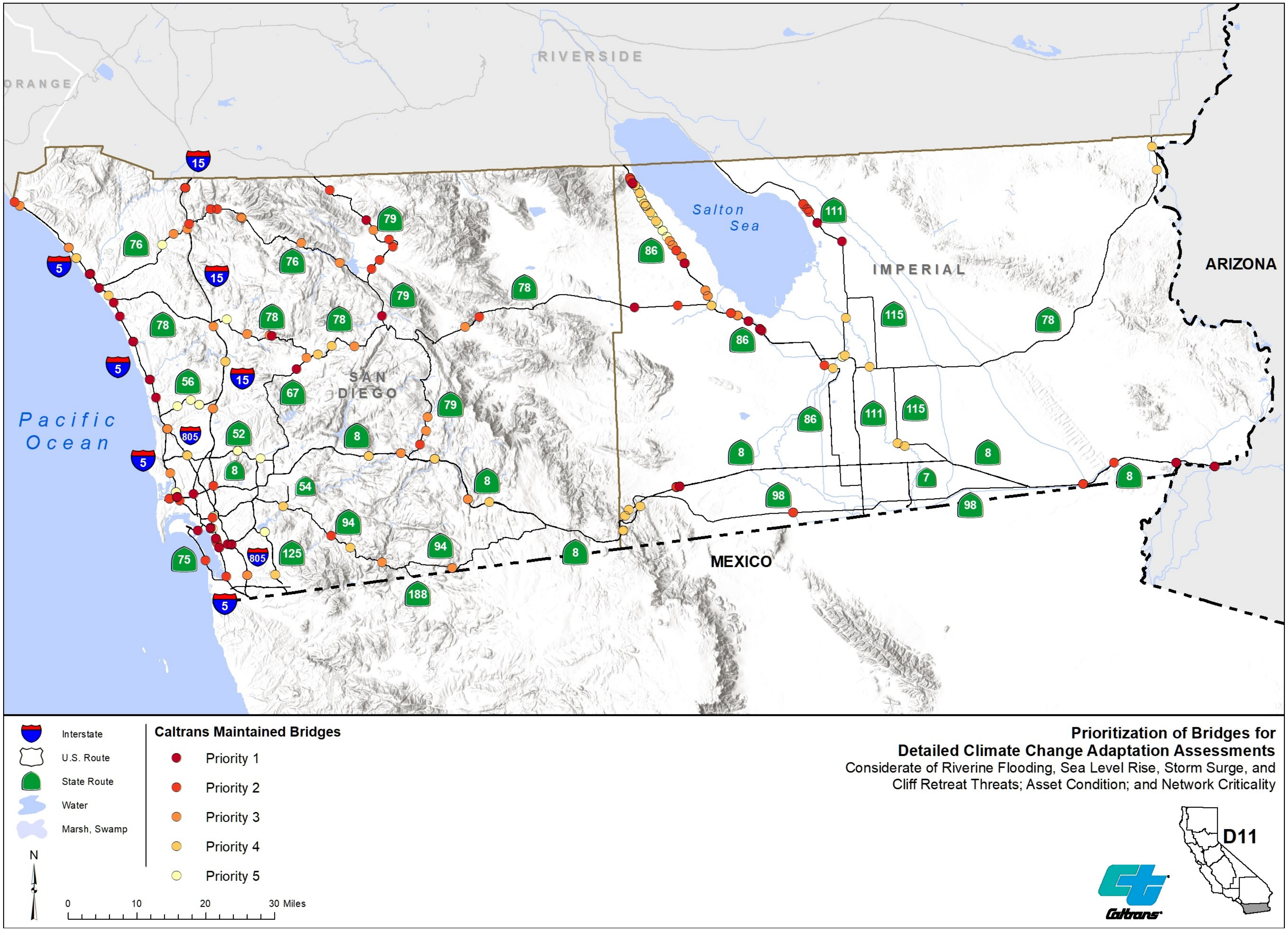


FIGURE 2: PRIORITIZATION OF BRIDGES FOR DETAILED ADAPTATION ASSESSMENTS

4.2. Large Culverts

A total of 33 large culverts were assessed for vulnerability to sea level rise, storm surge, coastal cliff retreat, and more severe riverine flooding associated with climate change. Figure 3 provides a map of all the large culverts assessed and colored by their priority level. Given the limited number of large culverts in District 11, it is hard to draw spatial patterns to the vulnerabilities. That said, it is worth nothing that four of the six Priority 1 large culverts are located on an approximately six-mile stretch of State Route 111 east of Salton Sea. Many of the large culverts in this area are high priority due to having received high riverine flooding exposure scores and due to long detour routes around these locations.

Table 5 presents a summary of all the Priority 1 large culverts in District 11 sorted by their cross-hazard prioritization scores. A complete listing of all large culverts ranked by their prioritization scores appears in Table 9 in the appendix.

TABLE 5: PRIORITY 1 LARGE CULVERTS

Priority	Bridge Number	County [25]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
1	58 0352	IMP	STATE ROUTE 111	"Z" DRAIN	44.7	100.00
1	57 0865M	SD	INTERSTATE 805	TELEGRAPH CANYON DRAIN	6.12	55.75
1	58 0174	IMP	STATE ROUTE 111	BEE WASH	49.38	53.06
1	58 0172	IMP	STATE ROUTE 111	ED WASH	49.03	52.03
1	57 0209	SD	STATE ROUTE 76	BOMPAS WASH	24.3	51.17
1	58 0178	IMP	STATE ROUTE 111	CLAY WASH	50.65	44.86

[25] IMP = Imperial; SD = San Diego

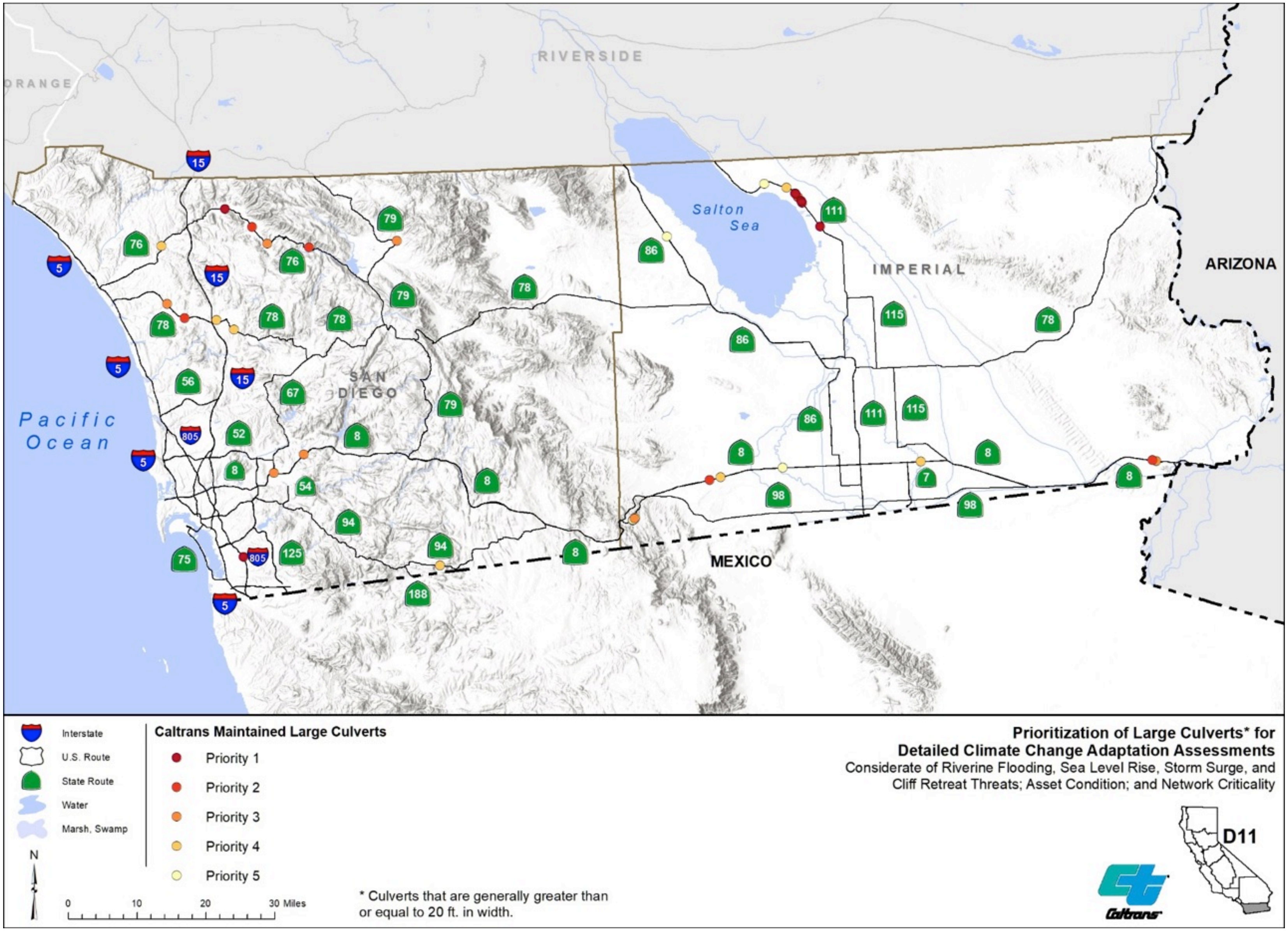


FIGURE 3: PRIORITIZATION OF LARGE CULVERTS FOR DETAILED ADAPTATION ASSESSMENTS

4.3. Small Culverts

A total of 347 small culverts were assessed for exposure to sea level rise, storm surge, coastal cliff retreat, more severe riverine flooding, and wildfire associated with climate change. Figure 4 provides a map of all the small culverts prioritized across the district, colored according to their priority level.

REPAIRS TO SR-78 ROADWAY AFTER STORM DAMAGE

The map indicates several clusters of high priority small culverts. Most high priority small culverts are in San Diego County, particularly on highways that traverse vegetated areas like Cuyamaca Rancho State Park where there is a high existing wildfire risk. Notable clusters can be found along State Route 8, State Route 79, and State Route 76 in central San Diego County. Small culverts along these routes have a high risk of exposure to wildfire as well as high riverine flooding in the mountain areas. The Priority 1 small culverts in these clusters were given high priorities for a variety of reasons, including having had past impacts recorded by District 11, sea level rise and storm surge exposure, near term wildfire exposure, and high riverine flooding scores. Several of these assets also have long detour routes around them and high AADT.

Table 6 presents a summary of all the Priority 1 small culverts in District 11 sorted by their cross-hazard prioritization scores. A complete listing of all small culverts ranked by their prioritization scores appears in Table 10 in the appendix.

TABLE 6: PRIORITY 1 SMALL CULVERTS

Priority	Culvert System Number	County[26]	Route	Postmile	Cross-Hazard Prioritization Score
1	570050004872	SD	5	48.72	100.00
1	570542000047	SD	54	0.47	84.43
1	570154004764	SD	15	47.64	80.93
1	570760000026	SD	76	0.26	76.01
1	570760000026	SD	76	0.26	75.91
1	570150001640	SD	15	16.4	64.42
1	570150001640	SD	15	16.4	57.72
1	570670001570	SD	67	15.7	55.67
1	570050006262	SD	5	62.62	55.30
1	570780006230	SD	78	62.3	53.76
1	570780006295	SD	78	62.95	53.75

[26] IMP = Imperial; SD = San Diego

Priority	Culvert System Number	County[26]	Route	Postmile	Cross-Hazard Prioritization Score
1	570764002155	SD	76	21.55	52.83
1	570084004240	SD	8	42.4	51.85
1	570150001640	SD	15	16.4	50.93
1	570764001560	SD	76	15.6	50.76
1	570084004119	SD	8	41.19	50.65
1	570150001271	SD	15	12.71	50.59
1	570154004848	SD	15	48.48	50.53
1	570154004889	SD	15	48.89	49.84
1	570154004889	SD	15	48.89	49.84
1	570780005710	SD	78	57.1	49.73
1	570784005304	SD	78	53.04	49.23
1	570084004240	SD	8	42.4	49.03
1	570080004424	SD	8	44.24	48.98
1	570082004425	SD	8	44.25	48.83
1	570154004750	SD	15	47.5	48.74
1	570080004460	SD	8	44.6	48.32
1	570080004460	SD	8	44.6	48.32
1	570780005870	SD	78	58.7	48.25
1	570794001841	SD	79	18.41	47.94
1	570154004848	SD	15	48.48	47.73
1	570764001940	SD	76	19.4	47.47
1	570080004344	SD	8	43.44	47.30
1	570080004344	SD	8	43.44	47.26
1	570764001677	SD	76	16.77	46.38
1	570764004297	SD	76	42.97	46.26
1	570760004865	SD	76	48.65	45.45
1	570794000548	SD	79	5.48	45.32
1	570794001429	SD	79	14.29	45.22
1	570764004423	SD	76	44.23	45.20
1	570150001378	SD	15	13.78	45.17
1	570084004905	SD	8	49.05	45.16
1	570764004545	SD	76	45.45	44.72
1	570084004603	SD	8	46.03	44.66
1	570790000147	SD	79	1.47	44.63
1	570790001187	SD	79	11.87	44.24
1	570760004785	SD	76	47.85	44.09
1	570794001072	SD	79	10.72	43.76
1	570080005588	SD	8	55.88	43.70
1	570084005499	SD	8	54.99	43.68
1	570084005499	SD	8	54.99	43.68

Priority	Culvert System Number	County[26]	Route	Postmile	Cross-Hazard Prioritization Score
1	570790100095	SD	79	0.95	43.67
1	570764004470	SD	76	44.7	43.53
1	570764004602	SD	76	46.02	43.49
1	570784007130	SD	78	71.3	43.45
1	570760005095	SD	76	50.95	43.21
1	570084006110	SD	8	61.1	43.20
1	570084006202	SD	8	62.02	43.18
1	570790002270	SD	79	22.7	43.02
1	570790002890	SD	79	28.9	42.97
1	570790001538	SD	79	15.38	42.91
1	570054006258	SD	5	62.58	42.90
1	570154004188	SD	15	41.88	42.82
1	570084003941	SD	8	39.41	42.81
1	570084003941	SD	8	39.41	42.67
1	570784004905	SD	78	49.05	42.65
1	570944006145	SD	94	61.45	42.40
1	578050001452	SD	805	14.52	42.40
1	570764001308	SD	76	13.08	42.32

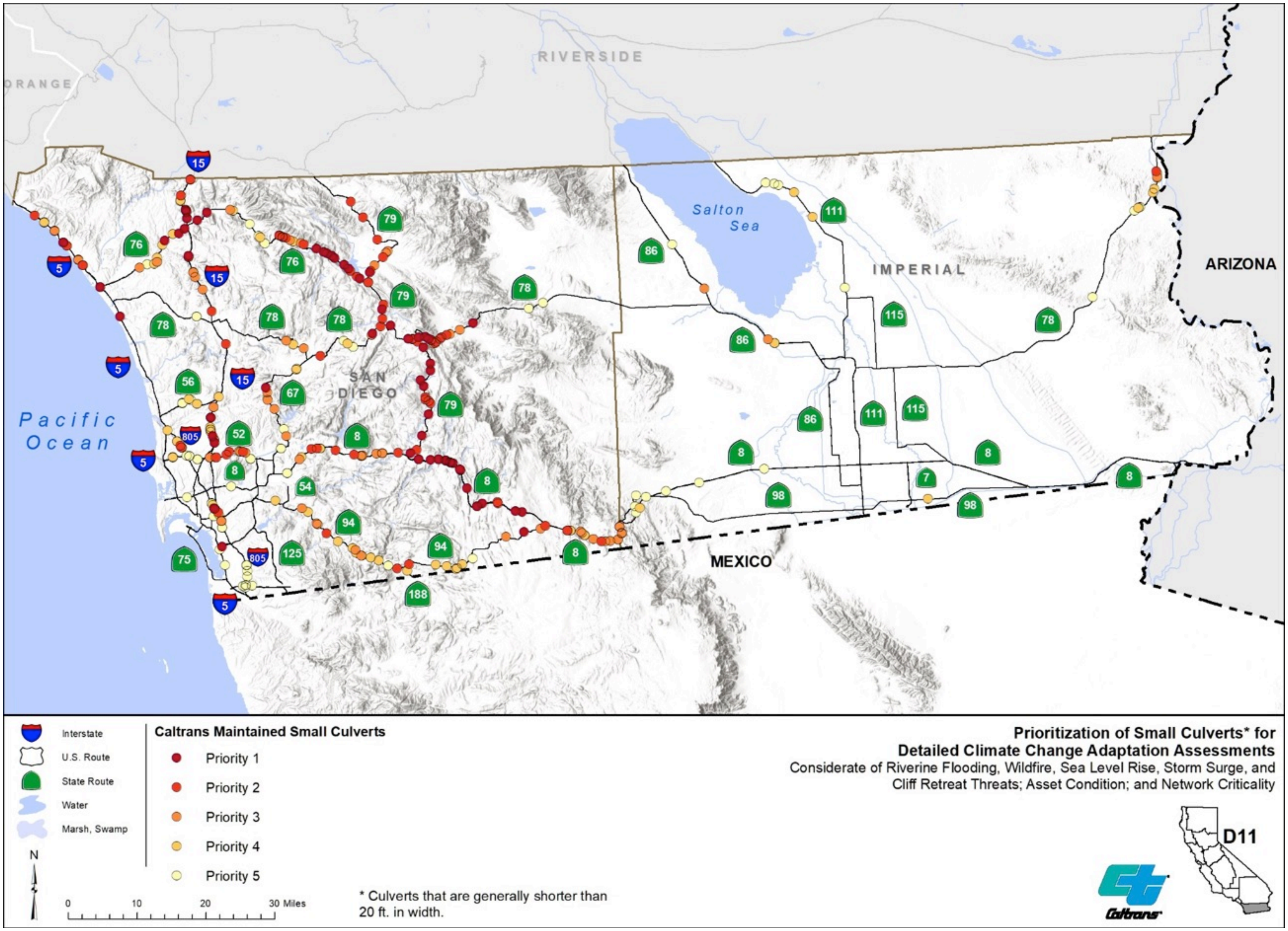


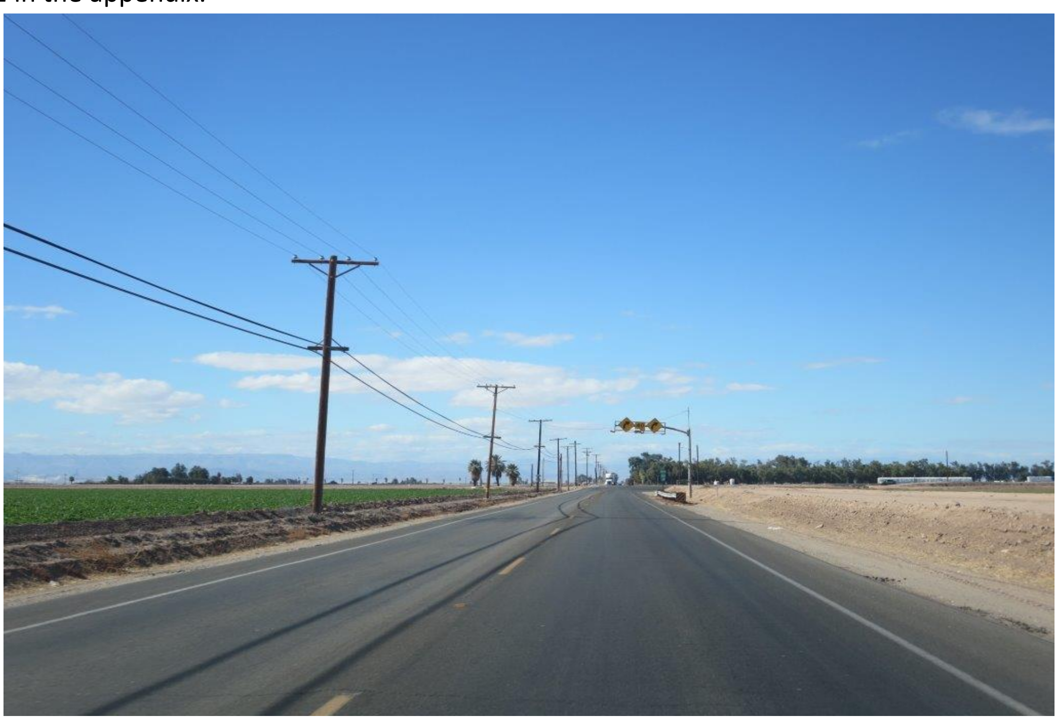
FIGURE 4: PRIORITIZATION OF SMALL CULVERTS FOR DETAILED ADAPTATION ASSESSMENTS

4.4. Roadways

A total of 3,343 roadway segments were assessed for vulnerability to sea level rise, storm surge, coastal cliff retreat, and temperature changes that affect pavement performance. Only roadways that are owned and maintained by Caltrans District 11 were included in the analysis. To make the analysis as detailed as possible, the original segments were short with beginning and end points at intersections with other streets (including smaller local streets) in the roadway network. Once the processing of vulnerability scores was complete, smaller segments sharing the same priority score as their neighbors on the same route were consolidated into longer segments to simplify the presentation of the results. This reduced the number of segments to those presented here.

Figure 5 provides a map of the consolidated roadway segments potentially exposed to sea level rise, storm surge, coastal cliff retreat, and temperature changes that affect pavement performance in the district. Each segment of roadway is colored by priority level. The top priority roadway segments are along State Route 75, which receives high scores due to sea level rise and storm surge exposure and limited detour routes. It is important to note that ownership and maintenance of a portion of State Route 75 will no longer be under Caltrans jurisdiction as a result the future maintenance of this Priority 1 roadway will not be the responsibility of District 11. The next highest priority segments are along State Route 8 and a stretch of State Route 86 west of Salton Sea due to near term exposure to temperature rise that can affect pavements and having high AADT. A segment of Interstate 5 is also given high priority due to exposure to cliff retreat. Most roadway segments in the district (of varying priorities) will be exposed to temperature changes that could result in the need to change pavement binder grades from current specifications.

Table 7 presents a summary of all the Priority 1 roadways in District 11 sorted by their cross-hazard prioritization scores. A complete listing of all roadways ranked by their prioritization scores appears in Table 11 in the appendix.



HIGHWAY IN CLEAR WEATHER

TABLE 7: PRIORITY 1 ROADWAYS

Priority	Route	Carriageway[27]	From County & Postmile / To County & Postmile[28]	Average Cross-Hazard Prioritization Score[29]
1	75	P	SD 75 10.994 / SD 75 13.973[30]	74.49
1	75	P	SD 75 14.351 / SD 75 18.535[30]	74.49
1	75	S	SD 75 10.996 / SD 75 18.141[30]	62.91
1	75	S	SD 75 18.421 / SD 75 18.566[30]	62.91
1	5	S	SD 5 R67.502 / SD 5 R70.99	50.00
1	15	P	SD 15 M27.919 / SD 15 M27.948	48.17
1	15	S	SD 15 R54.062 / SD 15 R54.23	45.58
1	8	S	IMP 8 R37.278 / IMP 8 R41.266	43.63
1	8	S	IMP 8 R54.968 / IMP 8 R68.652	43.63
1	8	S	SD 8 R18.737 / SD 8 R31.159	43.63
1	8	S	SD 8 R67.832 / SD 8 R77.613	43.63
1	8	P	IMP 8 R37.269 / IMP 8 R41.201	43.50
1	8	P	IMP 8 R54.972 / IMP 8 R68.671	43.50
1	8	P	SD 8 R18.74 / SD 8 R31.175	43.50
1	8	P	SD 8 R67.838 / SD 8 R77.618	43.50
1	67	P	SD 67 19.179 / SD 67 24.377	41.80
1	67	P	SD 67 R3.919 / SD 67 12.17	41.80
1	86	P	IMP 86 17.309 / IMP 86 R22.603	41.62
1	86	P	IMP 86 2.082 / IMP 86 L8.151	41.62
1	86	P	IMP 86 R34.431 / IMP 86 R36.523	41.62
1	86	P	IMP 86 R39.683 / RIV 86 0	41.62
1	78	P	IMP 78 R10.809 / IMP 78 R11.832	41.58
1	78	P	IMP 78 R13.391 / IMP 78 16.261	41.58
1	78	P	SD 78 19.222 / SD 78 23.113	41.58
1	78	P	SD 78 25.024 / SD 78 40.37	41.58
1	111	P	IMP 111 23.45 / IMP 111 23.639	41.51
1	111	P	IMP 111 R0 / IMP 111 R2.209	41.51
1	111	P	IMP 111 R18.395 / IMP 111 R22.016	41.51
1	111	P	IMP 111 R5.238 / IMP 111 R10.783	41.51
1	67	S	SD 67 20.116 / SD 67 R20.488	41.51
1	67	S	SD 67 22.264 / SD 67 24.376	41.51
1	67	S	SD 67 6.691 / SD 67 6.854	41.51
1	67	S	SD 67 7.782 / SD 67 7.855	41.51

[27] Caltrans' alignment codes designate the carriageway on divided roadways: "P" always represents northbound or eastbound carriageways whereas "S" always represents southbound or westbound carriageways. Undivided roadways are always indicated with a "P".
[28] IMP = Imperial; SD = San Diego
[29] These values represent the average of the cross-hazard prioritization scores amongst all the abutting small segments on the same route sharing a common priority level that were aggregated to form the longer segments listed in this table.
[30] In 2021 Caltrans District 11 will relinquish control of State Route 75 to the City of Coronado (SR-75 postmile 11.2/R21.1).

Priority	Route	Carriageway[27]	From County & Postmile / To County & Postmile[28]	Average Cross-Hazard Prioritization Score[29]
1	67	S	SD 67 8.311 / SD 67 8.53	41.51
1	67	S	SD 67 9.225 / SD 67 11.062	41.51
1	67	S	SD 67 R3.917 / SD 67 R5.731	41.51
1	111	S	IMP 111 R0.052 / IMP 111 R2.209	41.46
1	111	S	IMP 111 R18.395 / IMP 111 R22.016	41.46
1	111	S	IMP 111 R5.238 / IMP 111 R11.297	41.46
1	188	P	SD 188 0 / SD 188 1.849	41.15
1	86	S	IMP 86 17.55 / IMP 86 19.054	41.09
1	86	S	IMP 86 19.965 / IMP 86 R22.874	41.09
1	86	S	IMP 86 5.879 / IMP 86 6.294	41.09
1	86	S	IMP 86 7.308 / IMP 86 L8.15	41.09
1	86	S	IMP 86 R32.519 / IMP 86 R36.517	41.09
1	86	S	IMP 86 R39.685 / IMP 86 R0.02	41.09
1	98	P	IMP 98 29.517 / IMP 98 34.757	41.08
1	98	P	IMP 98 R56.825 / IMP 98 R56.939	41.08
1	78	S	IMP 78 R13.39 / IMP 78 15.499	41.03
1	78	S	SD 78 19.223 / SD 78 19.345	41.03
1	78	S	SD 78 33.618 / SD 78 33.882	41.03
1	78	S	SD 78 37.04 / SD 78 37.136	41.03
1	78	S	SD 78 R22.324 / SD 78 R22.654	41.03
1	94	P	SD 94 24.557 / SD 94 30.439	40.95
1	94	P	SD 94 30.908 / SD 94 40.377	40.95
1	98	S	IMP 98 31.133 / IMP 98 31.312	40.84
1	98	S	IMP 98 31.938 / IMP 98 33.733	40.84
1	7	S	IMP 7 S0.012 / IMP 7 S0.445	40.56
1	7	S	IMP 7 S0.445 / IMP 7 0.001	40.56
1	7	S	IMP 7 S0.445 / IMP 7 1.188	40.56
1	7	S	IMP 7 S0.536 / IMP 7 S0.445	40.56
1	7	P	IMP 7 S0 / IMP 7 S0.457	40.44
1	7	P	IMP 7 S0.457 / IMP 7 0	40.44
1	7	P	IMP 7 S0.457 / IMP 7 1.188	40.44
1	7	P	IMP 7 S0.536 / IMP 7 S0.457	40.44
1	94	S	SD 94 29.801 / SD 94 29.86	40.26
1	94	S	SD 94 29.877 / SD 94 29.975	40.26
1	94	S	SD 94 30.066 / SD 94 30.177	40.26
1	188	S	SD 188 0.1 / SD 188 0.231	40.25
1	76	P	SD 76 24.273 / SD 76 29.311	39.56
1	76	P	SD 76 30.356 / SD 76 32.886	39.56

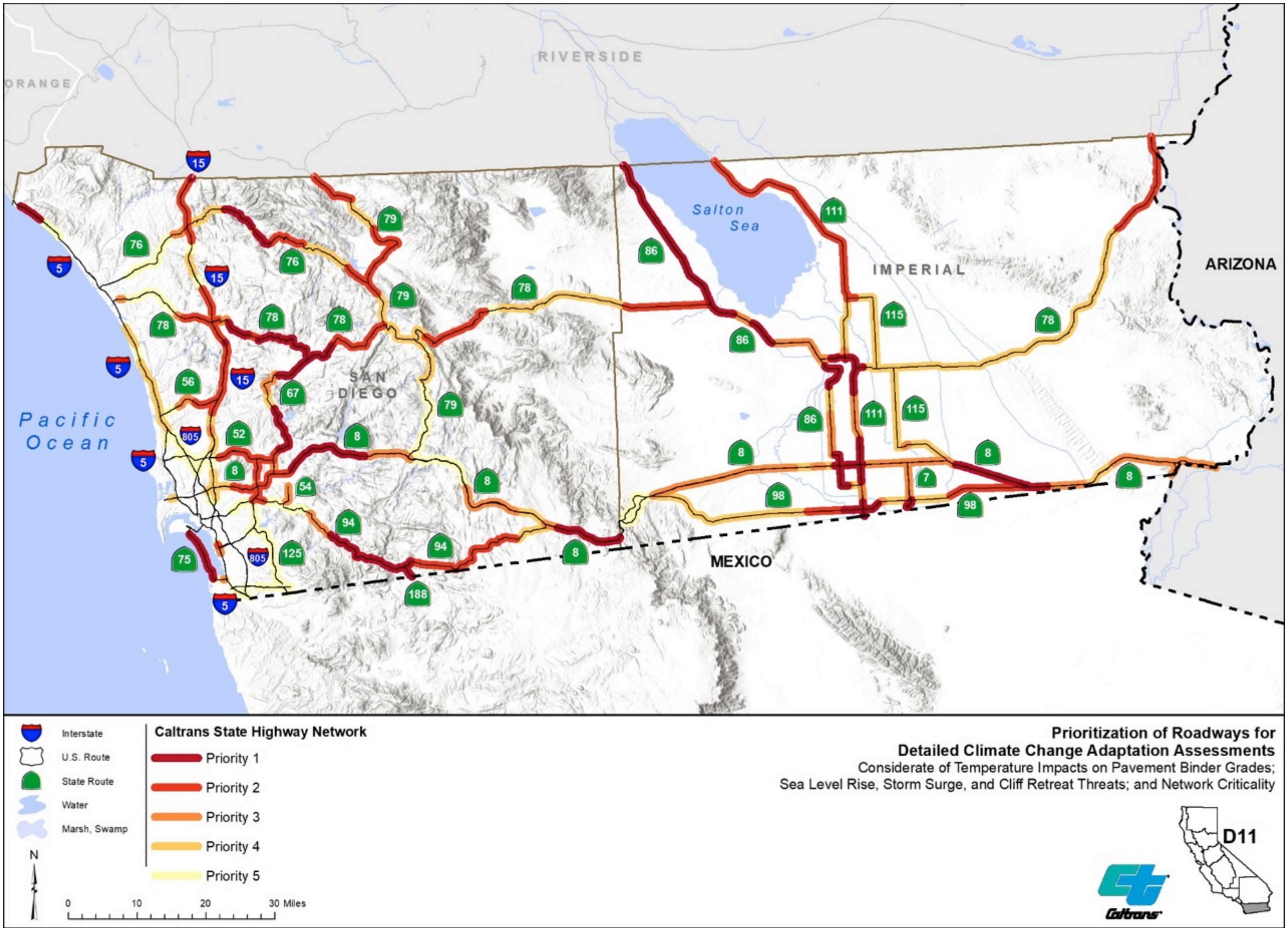


FIGURE 5: PRIORITIZATION OF ROADWAYS FOR DETAILED ADAPTATION ASSESSMENTS

5. NEXT STEPS

This report has identified the bridge, large culvert, small culvert, and roadway assets exposed to a variety of climate hazards in District 11 and assigned them priority levels for detailed assessments based on their vulnerability rating.

A next step for Caltrans will be to begin these detailed, site-specific adaptation assessments for the identified assets starting with the highest priority (Priority 1) and then proceeding to lower priority assets. These detailed adaptation assessments will take a closer look at the exposure to each asset using more localized climate projections and detailed engineering analyses. The benefit of performing these detailed adaptation assessments is determining the bounds of the studies, including whether and how to amalgamate the individual exposed assets prioritized in this study into a facility level assessment that considers multiple exposed assets simultaneously. If impacts are verified, Caltrans will develop and evaluate adaptation options for the asset to ensure that it is able to withstand future climate changes. Importantly, the detailed adaptation assessments should include coordination with key stakeholder groups whose actions affect or are affected by the asset and its adaptation.

Since weather and climate-related impacts are ongoing in the district, District 11 is also addressing these disruptions as they come up while continuing to evaluate and prepare for future climate change. District 11 has experienced several severe wildfires (2003 and 2007) followed by heavy rain events in subsequent winter seasons. To address run off, flash flood, and debris impacts District 11 implemented several different mitigation measures on the State Highway System to accommodate higher stormwater and debris flows. Appropriate mitigation measures should be determined based on the specifics of the individual locations.

Another next step will be to integrate the prioritization measures into the asset management system used in the district. This will ensure that climate change is a consideration in the identification of future projects alongside traditional asset condition metrics. As noted previously, assets identified for capital investments, especially those flagged as being a high priority for climate change, should then undergo detailed climate change assessments prior to project programming.

More broadly speaking, this assessment and coordination with asset management should spur further coordination across Caltrans districts and departments. Assessing climate change impacts at the site level will require a multi-disciplinary effort across engineering areas of expertise and others like environmental and planning. Responding to these vulnerabilities across the State Highway System will require a coordinated effort across departments. For example, any capital improvements made to the State Highway System to respond to a climate hazard will need to be integrated into the SHOPP. Tracking and monitoring adaptative improvements and their effectiveness can also be integrated into the district asset management system.

Relatedly, district staff can use the results of this study as a useful starting point to begin discussions with various important stakeholders in the district about addressing climate change and its impacts. This includes state and federal environmental agencies, major landowners in the district whose actions directly affect the road network, regional stakeholders such as nonprofits and community-based organizations, and others. Multi-agency stakeholder coordination and involvement of the private sector is also essential because the impacts from climate change, and ability to effectively address those impacts, cross both jurisdictional and ownership boundaries. A multi-disciplinary team should be employed to evaluate and determine the appropriate mitigation strategies for each location. The approach to climate change cannot just be Caltrans-centric. A common framework across all state agencies must be established for truly effective long-term solutions to be achieved.

6. APPENDIX

TABLE 8: PRIORITIZATION OF BRIDGES FOR DETAILED CLIMATE CHANGE ADAPTATION ASSESSMENTS

Priority	Bridge Number	County[31]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
1	57 0007R	SD	INTERSTATE 5	SANTA MARGARITA RIVER	R56.43R	100.00
1	57 0007L	SD	INTERSTATE 5	SANTA MARGARITA RIVER	R56.43L	77.66
1	57 0282	SD	INTERSTATE 5	AGUA HEDIONDA LAGOON[32]	R48.68	76.94
1	57 0277	SD	INTERSTATE 5	BUENA VISTA LAGOON[32]	R50.94	76.37
1	57 0459L	SD	INTERSTATE 5	BATIQUITOS LAGOON[32]	R44.56	75.93
1	57 0713L	SD	INTERSTATE 5 - SB	SAN LUIS REY RIVER[32]	R54.04	73.66
1	57 0857	SD	STATE ROUTE 75	SAN DIEGO-CORONADO BAY BRIDGE[32]	R20.49	72.96
1	57 0713R	SD	INTERSTATE 5 - NB	SAN LUIS REY RIVER[32]	R54.04	72.75
1	57 0459R	SD	INTERSTATE 5	BATIQUITOS LAGOON[32]	R44.56	69.65
1	57 0638L	SD	INTERSTATE 805 SB	SWEETWATER RIVER	8.66	67.68
1	57 0488	SD	INTERSTATE 5	SAN DIEGUITO RIVER	R35.66	66.18
1	57 0566R	SD	I 5 NB	SAN DIEGO RIVER	R20.12	61.88
1	57 0566L	SD	I 5 SB	SAN DIEGO RIVER	R20.12	60.13
1	57 0473	SD	INTERSTATE 5	CHOLLAS CREEK	R12.73	58.61
1	57 0458L	SD	INTERSTATE 5 SB	SAN ELIJO LAGOON	R38.49	58.35
1	57 0458R	SD	INTERSTATE 5 NB	SAN ELIJO LAGOON	R38.49	57.06
1	57 0794R	SD	INTERSTATE 5 NB	SWEETWATER RIVER	9.41	56.96
1	57 0794L	SD	INTERSTATE 5 SB	SWEETWATER RIVER	9.41	56.84
1	57 0638R	SD	INTERSTATE 805 NB	SWEETWATER RIVER	8.66	54.34
1	57 0126	SD	STATE ROUTE 163	SAN DIEGO RIVER	3.95	54.22
1	57 0493	SD	INTERSTATE 15	SOUTH BRANCH CHOLLAS CREEK	0.45	52.60
1	57 0767R	SD	STATE ROUTE 54	SWEETWATER RIVER	1.41R	50.33
1	57 0059	SD	STATE ROUTE 79	SOUTH BRANCH SANTA YSABEL CREEK	21.63	37.83
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1	58 0306L	IMP	INTERSTATE 8 WB	ALL AMERICAN CANAL	R91.07	36.15
1	58 0139	IMP	STATE ROUTE 111	"X" DRAIN	40.82	35.61
1	58 0157	IMP	STATE ROUTE 111	NILAND CREEK	45.37	34.74
1	58 0017R	IMP	STATE ROUTE 86 NB	TRIFOLIUM CANAL	R34.82	33.96
1	58 0213L	IMP	INTERSTATE 8 WB	SOUTH FORK COYOTE WASH	R14.46	32.78
1	58 0213R	IMP	INTERSTATE 8 EB	SOUTH FORK COYOTE WASH	R14.44	32.78

[31] IMP = Imperial; SD = San Diego
[32] Bridges will be included in the I-5 North Coast Corridor project.

Priority	Bridge Number	County[31]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
1	58 0312R	IMP	INTERSTATE 8 EB	COLORADO RIVER VIADUCT	R96.81	32.60
1	58 0312L	IMP	INTERSTATE 8 WB	COLORADO RIVER VIADUCT	R96.81	32.60
1	57 0068	SD	STATE ROUTE 79	SOME CREEK	41.96	28.83
1	57 0468L	SD	INTERSTATE 5 SB	CIVIC CENTER DRIVE OH	R10.75	28.02
1	58 0124	IMP	STATE ROUTE 78	SAN FELIPE CREEK	2.07	27.81
1	58 0030R	IMP	STATE ROUTE 86 NB	DEEP WASH	R35.16	26.96
1	58 0032R	IMP	STATE ROUTE 86 NB	LONE TREE WASH	R37.23	26.92
1	58 0032L	IMP	STATE ROUTE 86 SB	LONE TREE WASH	R37.23	26.80
1	57 0468R	SD	INTERSTATE 5 NB	CIVIC CENTER DRIVE OH	R10.75	26.22
1	58 0070R	IMP	STATE ROUTE 86 NB	AMBIG DITCH	64.75	25.60
1	58 0039R	IMP	STATE ROUTE 86 NB	LUPIN WASH	50.84	25.42
1	57 0160	SD	STATE ROUTE 67	PRAIRIE CREEK	22.26	15.54
1	57 1054	SD	STATE ROUTE 78	SANTA YSABEL CREEK	R27.17	4.58
2	57 0937L	SD	INTERSTATE 15	RAINBOW CREEK	R52.49	25.17
2	57 0937R	SD	INTERSTATE 15	RAINBOW CREEK	R52.49	25.12
2	57 0158	SD	STATE ROUTE 76	GOMEZ CREEK	22.23	24.88
2	58 0030L	IMP	STATE ROUTE 86 SB	DEEP WASH	R35.16	24.49
2	58 0039L	IMP	STATE ROUTE 86 SB	LUPIN WASH	50.84	23.22
2	57 0705L	SD	INTERSTATE 8 WB	MIDWAY DRIVE UC	L1.21	23.14
2	58 0074R	IMP	STATE ROUTE 86 NB	COOLIDGE SPRINGS DITCH	65.35	21.43
2	58 0195R	IMP	INTERSTATE 8 EB	ALL AMERICAN CANAL	81.69	21.42
2	58 0199	IMP	STATE ROUTE 78	BONDIT DITCH	8.34	21.19
2	58 0165	IMP	STATE ROUTE 111	SAND WASH	47.35	20.87
2	57 0014	SD	STATE ROUTE 79	CHIHUAHUA CREEK	49.9	19.61
2	57 0332L[33]	SD	STATE ROUTE 75	SILVER STRAND UC	13.97	19.40
2	58 0035R	IMP	STATE ROUTE 86 NB	ALFALFA DITCH	R40.04	18.68
2	57 1200	SD	ROUTE 76	PALA CREEK	23.23	18.66
2	57 1029	SD	SR 76	HORSE RANCH CREEK	17.75	18.35
2	58 0070L	IMP	STATE ROUTE 86 SB	AMBIG DITCH	64.75	18.34
2	57 0549	SD	INTERSTATE ROUTE 5	OLD TOWN VIADUCT	R19.41	18.03

[33] In 2021 Caltrans will relinquish control of this bridge on State Route 75 to the City of Coronado.

Priority	Bridge Number	County[31]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
2	58 0196R	IMP	INTERSTATE 8 EB	ALL AMERICAN CANAL	R73.91	17.99
2	57 0501	SD	INTERSTATE 15	SAN DIEGO RIVER	R6.26	17.98
2	57 0065	SD	STATE ROUTE 79	AGUA CALIENTE CREEK	36.52	17.91
2	57 0063	SD	STATE ROUTE 79	BUENA VISTA CREEK	31.31	17.47
2	57 0064	SD	STATE ROUTE 79	CANADA VERDE CREEK	34.17	17.33
2	57 0353	SD	INTERSTATE 15	CHOLLAS CREEK	2.08	17.25
2	58 0035L	IMP	STATE ROUTE 86 SB	ALFALFA DITCH	R40.04	17.07
2	58 0166	IMP	STATE ROUTE 111	WISTER WASH	47.87	16.72
2	57 0251L	SD	INTERSTATE 5 SB	24TH STREET UC	R10.04	16.47
2	58 0019R	IMP	STATE ROUTE 86 NB	TAMARACK CANAL	R22.96	16.28
2	57 0246	SD	INTERSTATE 5	OTAY RIVER	5.01	16.20
2	57 0055	SD	STATE ROUTE 79	SAMAGATUMA CREEK	0.12	16.09
2	58 0171	IMP	STATE ROUTE 111	CEDAR WASH	48.85	15.85
2	58 0274	IMP	STATE ROUTE 98	WESTSIDE MAIN CANAL	22.02	15.74
2	58 0014R	IMP	STATE ROUTE 86 NB	TULE WASH	53.07	15.53
2	58 0196L	IMP	INTERSTATE 8 WB	ALL AMERICAN CANAL	R73.92	15.41
2	57 0062	SD	STATE ROUTE 79	MATAGUAL CREEK	29.47	15.28
2	58 0075R	IMP	STATE ROUTE 86 NB	SHORELINE DITCH	65.68	15.15
2	58 0075L	IMP	STATE ROUTE 86 SB	SHORELINE DITCH	65.68	15.14
2	57 0241	SD	STATE ROUTE 94	DULZURA CREEK	24.66	15.11
2	57 0096	SD	STATE ROUTE 78	SAN FELIPE CREEK	72.92	15.08
2	57 0001R	SD	INTERSTATE 5 NB	SAN MATEO CREEK	R71.94	14.84
2	58 0212L	IMP	INTERSTATE 8 WB	COYOTE WELLS OH	R13.97	14.58
2	58 0212R	IMP	INTERSTATE 8 EB	COYOTE WELLS OH	R13.93	14.58
3	57 0005R	SD	INTERSTATE 5	LAS FLORES CREEK	R61.43	14.49
3	57 0095	SD	STATE ROUTE 78	SAN FELIPE CREEK	69.91	14.39
3	57 0070	SD	STATE ROUTE 76	LIVE OAK CREEK	14.76	13.97
3	57 0067	SD	STATE ROUTE 79	SAN LUIS REY RIVER	R39.9	13.93
3	57 0157	SD	STATE ROUTE 79	DESCANSO CREEK	2.57	13.89
3	57 0171	SD	STATE ROUTE 76	SAN LUIS REY RIVER	47.08	13.80
3	58 0169	IMP	STATE ROUTE 111	FLY WASH	48.37	13.73
3	58 0038L	IMP	STATE ROUTE 86 SB	BARLEY DITCH	44.79	13.60
3	57 0871R	SD	INTERSTATE 15	SAN LUIS REY RIVER	R45.92	13.56
3	57 0115	SD	STATE ROUTE 94	COTTONWOOD CREEK	34.97	13.41

Priority	Bridge Number	County[31]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
3	58 0014L	IMP	STATE ROUTE 86 SB	TULE WASH	53.07	13.41
3	58 0137R	IMP	STATE ROUTE 86 NB	SURPRISE DITCH	54	13.38
3	57 0056	SD	STATE ROUTE 79	SWEETWATER RIVER	4.97	13.26
3	58 0034R	IMP	STATE ROUTE 86 NB	WILLOW WASH	R39.01	13.25
3	58 0013R	IMP	STATE ROUTE 86 NB	ARROYO SALADA DITCH	54.7	13.22
3	58 0015L	IMP	STATE ROUTE 86 SB	CAMPBELL WASH	51.88	13.18
3	58 0275	IMP	STATE ROUTE 98	WORMWOOD CANAL	22.07	13.14
3	57 0688L	SD	INTERSTATE 8 WB	SWEETWATER RIVER	R36.53	13.13
3	58 0015R	IMP	STATE ROUTE 86 NB	CAMPBELL WASH	51.88	13.11
3	58 0072R	IMP	STATE ROUTE 86 NB	PAROSA DITCH	65	12.79
3	57 0169	SD	STATE ROUTE 76	LA JOLLA AMAGO CREEK	39.86	12.71
3	57 0075	SD	AQUA TIBIA BRIDGE	AQUA TIBIA CREEK	27.2	12.71
3	57 0002L	SD	INTERSTAE 5 - SB	SAN ONOFRE CREEK	R70.97	12.32
3	57 0005L	SD	INTERSTATE 5	LAS FLORES CREEK	R61.43	12.20
3	57 0076	SD	FREY CREEK BRIDGE	FREY CREEK	27.38	12.11
3	57 0810L	SD	INTERSTATE 15 S/B	ESCONDIDO FLOOD CONTROL CHANNEL	R30.81	11.91
3	57 0916	SD	STATE ROUTE 78	GUEJITO CREEK	R26.79	11.73
3	57 0081	SD	STATE ROUTE 78	SAN PASQUAL VALLEY CREEK	23	11.67
3	57 0958	SD	STATE ROUTE 78	SANTA MARIA CREEK	35.33	11.61
3	57 0705R	SD	INTERSTATE 8 EB	MIDWAY DRIVE UC	L1.23	11.59
3	58 0113L	IMP	STATE ROUTE 86 SB	SOUTH SAND DUNE WASH	45.69	11.47
3	57 0631L	SD	INTERSTATE 805 SB	OTAY RIVER	3.34	11.37
3	57 0631R	SD	INTERSTATE 805 NB	OTAY RIVER	3.34	11.28
3	57 0289	SD	INTERSTATE 5	ROSE CANYON CREEK	R23.82	10.95
3	58 0034L	IMP	STATE ROUTE 86 SB	WILLOW WASH	R39.01	10.95
3	57 0698R	SD	INTERSTATE 8 EB	KITCHEN CREEK	R50.64	10.85
3	57 0161	SD	STATE ROUTE 78	BALLENA CREEK	45.01	10.75
3	57 0779L	SD	INTERSTATE 805 SB	LOS PENASQUITOS CREEK	28.49	10.73
3	57 0779R	SD	INTERSTATE 805 NB	LOS PENASQUITOS CREEK	28.49	10.73

Priority	Bridge Number	County[31]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
3	57 0698L	SD	INTERSTATE 8 WB	KITCHEN CREEK	R50.64	10.73
3	57 0118	SD	STATE ROUTE 94	CAMPO CREEK	46.91	10.46
3	57 0106R	SD	INTERSTATE 15 NB	LOS PENASQUITOS CREEK	M17.82	10.36
4	57 0125	SD	INTERSTATE 5	LOMA ALTA CREEK	R52.18	10.36
4	57 0962	SD	STATE ROUTE 94	SWEETWATER RIVER	15.27	10.26
4	58 0295L	IMP	INTERSTATE 8 WB	BOULDER CREEK	R.87L	10.21
4	58 0072L	IMP	STATE ROUTE 86 SB	PAROSA DITCH	65	10.17
4	58 0061R	IMP	STATE ROUTE 86 NB	TORTIF DITCH	62.97	10.00
4	57 0094	SD	STATE ROUTE 78	HATFIELD CREEK	40.38	9.97
4	57 0019L	SD	INTERSTATE 8 WB	VIEJAS CREEK	R31.79	9.76
4	57 0093	SD	STATE ROUTE 78	HATFIELD CREEK	37.26	9.66
4	58 0074L	IMP	STATE ROUTE 86 SB	COOLIDGE SPRINGS DITCH	65.35	9.59
4	57 0756L	SD	INTERSTATE 8 WB	LA POSTA CREEK	R56.83L	9.54
4	57 0692L	SD	INTERSTATE 8 WB	PINE VALLEY CREEK	R41.7	9.52
4	57 0692R	SD	INTERSTATE 8 EB	PINE VALLEY CREEK	R41.7	9.52
4	57 0113	SD	STATE ROUTE 94	DULZURA CREEK	28.5	9.45
4	58 0299	IMP	STATE ROUTE 78	PALO VERDE OUTFALL	79.19	9.40
4	57 0511L	SD	SBND INTERSTATE 5	LOS PENASQUITOS CREEK	R30.65L	9.33
4	58 0270R	IMP	INTERSTATE 8 EB	MYER CREEK	R7.22R	8.97
4	58 0298	IMP	STATE ROUTE 78	PALO VERDE DRAIN	75.57	8.52
4	57 0921L	SD	STATE ROUTE 52 WB	SAN CLEMENTE CREEK	3.87	8.37
4	57 0106L	SD	INTERSTATE 15 SB	LOS PENASQUITOS CREEK	M17.82	8.19
4	58 0295R	IMP	INTERSTATE 8 EB	BOULDER CREEK	R.96R	7.95
4	57 0019R	SD	INTERSTATE 8 EB	VIEJAS CREEK	R31.78	7.46
4	58 0329	IMP	STATE ROUTE 86	NEW RIVER	21.57	7.37
4	58 0293L	IMP	INTERSTATE 8 WB	DEVIL'S CANYON BR NO. 1	R3.88L	7.30
4	57 0006R	SD	INTERSTATE 5	ALISO CREEK	R59.62	7.19
4	58 0294L	IMP	INTERSTATE 8 WB	DEVIL'S CANYON BR NO. 2	R4.94L	7.05
4	58 0120	IMP	STATE ROUTE 111	NEW RIVER	23.91	6.88
4	58 0038R	IMP	STATE ROUTE 86 NB	BARLEY DITCH	44.78	6.87
4	57 1133R	SD	INTERSTATE 15	GREEN VALLEY CREEK	M25.06	6.65
4	58 0016L	IMP	STATE ROUTE 86 SB	SAN FELIPE CREEK	43.3	6.50
4	58 0016R	IMP	STATE ROUTE 86 NB	SAN FELIPE CREEK	43.3	6.39

Priority	Bridge Number	County[31]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
4	58 0007	IMP	STATE ROUTE 115	ALAMO RIVER	L10.31	6.23
4	58 0046L	IMP	STATE ROUTE 86 SB	PALM WASH	58.24	6.15
4	58 0292	IMP	STATE ROUTE 115	ALAMO RIVER	10.09	6.15
4	58 0118	IMP	STATE ROUTE 78	ALAMO RIVER	17.48	6.12
4	57 1186	SD	ROUTE 125	OTAY RIVER BRIDGE	L.64	6.05
4	58 0068R	IMP	STATE ROUTE 86 NB	CALYX DITCH	64.33	6.05
4	58 0048L	IMP	STATE ROUTE 86 SB	GRAVEL WASH	59.77	5.97
4	58 0052L	IMP	STATE ROUTE 86 SB	VIRGO WASH	60.9	5.93
4	58 0054R	IMP	STATE ROUTE 86 NB	VERBENA DITCH	61.36	5.88
4	58 0142	IMP	STATE ROUTE 111	ALAMO RIVER	29.51	5.86
4	58 0137L	IMP	STATE ROUTE 86 SB	SURPRISE DITCH	53.99	5.81
4	58 0052R	IMP	STATE ROUTE 86 NB	VIRGO WASH	60.9	5.77
5	57 1211	SD	ROUTE 76	OSTRICH FARM CREEK	12.36	5.70
5	58 0054L	IMP	STATE ROUTE 86 SB	VERBENA DITCH	61.37	5.60
5	57 0934	SD	STATE ROUTE 78	ESCONDIDO CREEK	T19.19	5.59
5	57 0981R	SD	STATE ROUTE 52 EB	OAK CANYON	11.8	5.54
5	58 0045R	IMP	STATE ROUTE 86 NB	ANZA DITCH	57.81	5.44
5	57 0981L	SD	STATE ROUTE 52 WB	OAK CANYON	11.8	5.42
5	58 0042R	IMP	STATE ROUTE 86 NB	IBERIA DITCH	56.59	5.38
5	58 0065R	IMP	STATE ROUTE 86 NB	ENCILIA DITCH	63.49	5.24
5	57 0921R	SD	STATE ROUTE 52 EB	SAN CLEMENTE CREEK	3.85	5.22
5	57 0252L	SD	INTERSTATE 5 SB	18TH STREET UC	R10.43	4.94
5	57 1100	SD	STATE ROUTE 52	FORESTER CREEK	15.59	4.69
5	57 0107L	SD	STATE ROUTE 94 WB	CHOLLAS CREEK	3.36	4.59
5	58 0113R	IMP	STATE ROUTE 86 NB	SOUTH SAND DUNE WASH	45.68	4.44
5	57 1133L	SD	INTERSTATE 15	GREEN VALLEY CREEK	M25.06	4.41
5	58 0337R	IMP	STATE ROUTE 78 EB	NEW RIVER	R12.48	4.11

Priority	Bridge Number	County[31]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
5	58 0337L	IMP	STATE ROUTE 78 WB	NEW RIVER	R12.48	4.11
5	57 0252R	SD	INTERSTATE 5 NB	18TH STREET UC	R10.43	4.10
5	58 0050L	IMP	STATE ROUTE 86 SB	TESLA WASH	60.47	3.91
5	58 0047L	IMP	STATE ROUTE 86 SB	CORAL WASH	59.18	3.81
5	58 0050R	IMP	STATE ROUTE 86 NB	TESLA WASH	60.47	3.63
5	58 0013L	IMP	STATE ROUTE 86 SB	ARROYO SALADA DITCH	54.7	3.59
5	58 0047R	IMP	STATE ROUTE 86 NB	CORAL WASH	59.18	3.57
5	58 0068L	IMP	STATE ROUTE 86 SB	CALYX DITCH	64.33	3.45
5	58 0058L	IMP	STATE ROUTE 86 SB	TONALEE DITCH	62.2	3.43
5	57 0436	SD	INTERSTATE 5	SOUTH CHOLLAS CREEK	R12.43	3.38
5	58 0040L	IMP	STATE ROUTE 86 SB	ZENAS DITCH	55.51	3.37
5	58 0042L	IMP	STATE ROUTE 86 SB	IBERIA DITCH	56.6	3.37
5	58 0058R	IMP	STATE ROUTE 86 NB	TONALEE DITCH	62.2	3.33
5	57 0006L	SD	INTERSTATE 5	ALISO CREEK	R59.62	3.16
5	58 0045L	IMP	STATE ROUTE 86 SB	ANZA DITCH	57.82	2.98
5	57 1082L	SD	STATE ROUTE 56	MCGONIGLE CREEK	5.42	2.98
5	58 0065L	IMP	STATE ROUTE 86 SB	ENCILIA DITCH	63.49	2.68
5	57 1072L	SD	STATE ROUTE 56	PENASQUITOS CREEK	6.84	2.67
5	57 1072R	SD	STATE ROUTE 56	PENASQUITOS CREEK	6.84	2.67
5	58 0061L	IMP	STATE ROUTE 86 SB	TORTIF DITCH	62.98	2.67
5	57 1198L	SD	ROUTE 125 SB	SAN MIGUEL CREEK	6.8	2.29
5	57 1198R	SD	ROUTE 125 NB	SAN MIGUEL CREEK	6.8	2.29
5	57 0051L	SD	INTERSTATE ROUTE 5	TECOLOTE CREEK	R20.88	0.97
5	57 0051R	SD	INTERSTATE ROUTE 5	TECOLOTE CREEK	R20.88	0.86
5	57 0464L	SD	INTERSTATE 5 SB	19TH STREET UC	R10.39	0.00
5	57 1078L	SD	STATE ROUTE 56	GONZALES CREEK	2.97	0.00

TABLE 9: PRIORITIZATION OF LARGE CULVERTS FOR DETAILED CLIMATE CHANGE ADAPTATION ASSESSMENTS

Priority	Culvert System Number	County[34]	Route	Feature Crossed	Postmile	Cross-Hazard Prioritization Score
1	58 0352	IMP	STATE ROUTE 111	"Z" DRAIN	44.7	100.00
1	57 0865M	SD	INTERSTATE 805	TELEGRAPH CANYON DRAIN	6.12	55.75
1	58 0174	IMP	STATE ROUTE 111	BEE WASH	49.38	53.06
1	58 0172	IMP	STATE ROUTE 111	ED WASH	49.03	52.03
1	57 0209	SD	STATE ROUTE 76	BOMPAS WASH	24.3	51.17
1	58 0178	IMP	STATE ROUTE 111	CLAY WASH	50.65	44.86
2	58 0345	IMP	INTERSTATE 8	EAST COYOTE WASH #1	R18.88	42.05
2	58 0179	IMP	STATE ROUTE 111	ALKY WASH	50.79	38.96
2	58 0176	IMP	STATE ROUTE 111	SHLITZ WASH	50.1	37.00
2	57 0077	SD	PAUMA CREEK BRIDGE	PAUMA CREEK	29.46	34.89
2	57 0170	SD	STATE ROUTE 76	LUKET CREEK	41.63	32.73
2	57 0514	SD	STATE ROUTE 78	SAN MARCOS CREEK	12.42	32.36
2	58 0104	IMP	INTERSTATE 8	PLATE DITCH	R87.58	29.71
3	58 0105	IMP	INTERSTATE 8	TRIANGLE DITCH	R88.12	29.39
3	57 0516	SD	STATE ROUTE 78	BUENA CREEK	9.07	28.45
3	57 0197	SD	YUIMA CREEK BRIDGE	YUIMA CREEK	32.83	28.05
3	57 0084	SD	STATE ROUTE 67	FORESTER CREEK	R.09	28.02
3	57 0593	SD	INTERSTATE 8	LOS COCHES CREEK	R21.51	26.81
3	57 0984	SD	STATE ROUTE 79	WARNER SPRINGS RANCH CREEK	35.42	25.30
3	58 0263R	IMP	INTERSTATE 8 EB	MYER CREEK	R5.19R	23.26
4	58 0281	IMP	STATE ROUTE 111	FRINK WASH OVERFLOW	52.33	22.11
4	58 0219	IMP	INTERSTATE 8	ALAMO RIVER	R49.75	18.19
4	58 0346	IMP	INTERSTATE 8	EAST COYOTE WASH #2	R20.51	17.55
4	57 0579	SD	STATE ROUTE 78	REIDY CREEK	R17.23	14.93
4	57 1242	SD	STATE ROUTE 78	SAN PASQUAL CREEK	20.64	14.72
4	57 1210	SD	ROUTE 76	BONSALL CREEK	12.07	14.50
4	57 0774	SD	STATE ROUTE 94	BELL CREEK	R44.85	12.18
5	58 0264R	IMP	INTERSTATE 8 EB	MYER CREEK	R5.31R	8.10
5	58 0262R	IMP	INTERSTATE 8 EB	MYER CREEK	R4.89R	8.09
5	58 0261R	IMP	INTERSTATE 8 EB	MYER CREEK	R4.76R	8.09
5	58 0284	IMP	STATE ROUTE 111	KEN WASH	55.77	3.93
5	58 0040R	IMP	STATE ROUTE 86 NB	ZENAS DITCH	55.5	1.18
5	58 0245	IMP	INTERSTATE 8	NEW RIVER	R29.7	0.00

[34] IMP = Imperial; SD = San Diego

TABLE 10: PRIORITIZATION OF SMALL CULVERTS FOR DETAILED CLIMATE CHANGE ADAPTATION ASSESSMENTS

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
1	570050004872	SD	5	48.72	100.00
1	570542000047	SD	54	0.47	84.43
1	570154004764	SD	15	47.64	80.93
1	570760000026	SD	76	0.26	76.01
1	570760000026	SD	76	0.26	75.91
1	570150001640	SD	15	16.4	64.42
1	570150001640	SD	15	16.4	57.72
1	570670001570	SD	67	15.7	55.67
1	570050006262	SD	5	62.62	55.30
1	570780006230	SD	78	62.3	53.76
1	570780006295	SD	78	62.95	53.75
1	570764002155	SD	76	21.55	52.83
1	570084004240	SD	8	42.4	51.85
1	570150001640	SD	15	16.4	50.93
1	570764001560	SD	76	15.6	50.76
1	570084004119	SD	8	41.19	50.65
1	570150001271	SD	15	12.71	50.59
1	570154004848	SD	15	48.48	50.53
1	570154004889	SD	15	48.89	49.84
1	570154004889	SD	15	48.89	49.84
1	570780005710	SD	78	57.1	49.73
1	570784005304	SD	78	53.04	49.23
1	570084004240	SD	8	42.4	49.03
1	570080004424	SD	8	44.24	48.98
1	570082004425	SD	8	44.25	48.83
1	570154004750	SD	15	47.5	48.74
1	570080004460	SD	8	44.6	48.32
1	570080004460	SD	8	44.6	48.32
1	570780005870	SD	78	58.7	48.25
1	570794001841	SD	79	18.41	47.94
1	570154004848	SD	15	48.48	47.73
1	570764001940	SD	76	19.4	47.47
1	570080004344	SD	8	43.44	47.30
1	570080004344	SD	8	43.44	47.26
1	570764001677	SD	76	16.77	46.38
1	570764004297	SD	76	42.97	46.26

[35] IMP = Imperial; SD = San Diego

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
1	570760004865	SD	76	48.65	45.45
1	570794000548	SD	79	5.48	45.32
1	570794001429	SD	79	14.29	45.22
1	570764004423	SD	76	44.23	45.20
1	570150001378	SD	15	13.78	45.17
1	570084004905	SD	8	49.05	45.16
1	570764004545	SD	76	45.45	44.72
1	570084004603	SD	8	46.03	44.66
1	570790000147	SD	79	1.47	44.63
1	570790001187	SD	79	11.87	44.24
1	570760004785	SD	76	47.85	44.09
1	570794001072	SD	79	10.72	43.76
1	570080005588	SD	8	55.88	43.70
1	570084005499	SD	8	54.99	43.68
1	570084005499	SD	8	54.99	43.68
1	570790100095	SD	79	0.95	43.67
1	570764004470	SD	76	44.7	43.53
1	570764004602	SD	76	46.02	43.49
1	570784007130	SD	78	71.3	43.45
1	570760005095	SD	76	50.95	43.21
1	570084006110	SD	8	61.1	43.20
1	570084006202	SD	8	62.02	43.18
1	570790002270	SD	79	22.7	43.02
1	570790002890	SD	79	28.9	42.97
1	570790001538	SD	79	15.38	42.91
1	570054006258	SD	5	62.58	42.90
1	570154004188	SD	15	41.88	42.82
1	570084003941	SD	8	39.41	42.81
1	570084003941	SD	8	39.41	42.67
1	570784004905	SD	78	49.05	42.65
1	570944006145	SD	94	61.45	42.40
1	578050001452	SD	805	14.52	42.40
1	570764001308	SD	76	13.08	42.32
2	570764004025	SD	76	40.25	42.09
2	570764003550	SD	76	35.5	41.98
2	570940003765	SD	94	37.65	41.89
2	570084004620	SD	8	46.2	41.74
2	570084007470	SD	8	74.7	41.68
2	570764003535	SD	76	35.35	41.63
2	570794000726	SD	79	7.26	41.58

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
2	570790002115	SD	79	21.15	41.51
2	570764003585	SD	76	35.85	41.40
2	570940003980	SD	94	39.8	41.38
2	570764003602	SD	76	36.02	41.15
2	570050005823	SD	5	58.23	41.06
2	570760005050	SD	76	50.5	40.88
2	570084002290	SD	8	22.9	40.77
2	570154005109	SD	15	51.09	40.61
2	570524000983	SD	52	9.83	40.48
2	570080005800	SD	8	58	40.38
2	570082005815	SD	8	58.15	40.33
2	570790100185	SD	79	1.85	40.27
2	570760005235	SD	76	52.35	40.26
2	570050006844	SD	5	68.44	40.22
2	570794000878	SD	79	8.78	40.15
2	570780005780	SD	78	57.8	40.11
2	570050006185	SD	5	61.85	40.10
2	570050006185	SD	5	61.85	40.10
2	578050002502	SD	805	25.02	40.08
2	570150004182	SD	15	41.82	40.07
2	570794000827	SD	79	8.27	40.06
2	570524001038	SD	52	10.38	40.02
2	570784005775	SD	78	57.75	39.94
2	578050001452	SD	805	14.52	39.88
2	570154005379	SD	15	53.79	39.87
2	570780006701	SD	78	67.01	39.82
2	570794001974	SD	79	19.74	39.81
2	570084004615	SD	8	46.15	39.78
2	570780006340	SD	78	63.4	39.75
2	570780006360	SD	78	63.6	39.62
2	570780006570	SD	78	65.7	39.55
2	570524000830	SD	52	8.3	39.43
2	570524001258	SD	52	12.58	39.31
2	570790003850	SD	79	38.5	39.11
2	570940002395	SD	94	23.95	39.10
2	570790003199	SD	79	31.99	39.07
2	570790002740	SD	79	27.4	38.92
2	570790002910	SD	79	29.1	38.67
2	570790002330	SD	79	23.3	38.40
2	570080006931	SD	8	69.31	38.31

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
2	570084003630	SD	8	36.3	38.23
2	570780005065	SD	78	50.65	38.18
2	570780006615	SD	78	66.15	38.15
2	570154002766	SD	15	27.66	37.92
2	570780006502	SD	78	65.02	37.88
2	570784003780	SD	78	37.8	37.79
2	578050001389	SD	805	13.89	37.57
2	578050002525	SD	805	25.25	37.43
2	570794004260	SD	79	42.6	37.42
2	570794000768	SD	79	7.68	37.31
2	570050005816	SD	5	58.16	37.17
2	570780006485	SD	78	64.85	37.12
2	570154005379	SD	15	53.79	37.07
2	570760003690	SD	76	36.9	36.95
2	570944106510	SD	94	65.1	36.64
2	570080002674	SD	8	26.74	36.59
2	570084002952	SD	8	29.52	36.48
2	570760004905	SD	76	49.05	36.45
2	570084002373	SD	8	23.73	36.37
2	570080006930	SD	8	69.3	36.13
2	570154003306	SD	15	33.06	36.08
2	570790004575	SD	79	45.75	36.01
2	580784007538	IMP	78	75.38	35.97
3	570674000735	SD	67	7.35	35.72
3	570150001273	SD	15	12.73	35.45
3	570080003290	SD	8	32.9	35.25
3	570524001293	SD	52	12.93	35.13
3	570084003060	SD	8	30.6	35.13
3	570524000821	SD	52	8.21	35.08
3	570084003060	SD	8	30.6	35.06
3	578054001480	SD	805	14.8	35.04
3	580864003335	IMP	86	33.35	34.69
3	570524001197	SD	52	11.97	34.64
3	570524001218	SD	52	12.18	34.60
3	570524000727	SD	52	7.27	34.58
3	570670001498	SD	67	14.98	34.50
3	570080003377	SD	8	33.77	34.45
3	570944006410	SD	94	64.1	34.44
3	570080003377	SD	8	33.77	34.28
3	570080007705	SD	8	77.05	34.27

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
3	570524000727	SD	52	7.27	34.21
3	570790003280	SD	79	32.8	34.15
3	570790003315	SD	79	33.15	34.15
3	570790003020	SD	79	30.2	34.14
3	570944002945	SD	94	29.45	34.00
3	570050005925	SD	5	59.25	33.99
3	580084000185	IMP	8	1.85	33.90
3	570760000674	SD	76	6.74	33.85
3	570674001205	SD	67	12.05	33.62
3	570780004880	SD	78	48.8	33.58
3	570150001336	SD	15	13.36	33.54
3	570150001336	SD	15	13.36	33.47
3	570154003950	SD	15	39.5	33.44
3	578050001452	SD	805	14.52	33.42
3	570150003667	SD	15	36.67	33.42
3	570944003140	SD	94	31.4	33.31
3	570080002056	SD	8	20.56	33.12
3	570154004170	SD	15	41.7	33.11
3	570050006476	SD	5	64.76	33.09
3	570050006476	SD	5	64.76	32.93
3	580864004600	IMP	86	46	32.75
3	570764002510	SD	76	25.1	32.55
3	570764003795	SD	76	37.95	32.27
3	570944002190	SD	94	21.9	32.21
3	578050001251	SD	805	12.51	32.18
3	570084003090	SD	8	30.9	32.17
3	570084007345	SD	8	73.45	32.14
3	570944002170	SD	94	21.7	32.14
3	570780003360	SD	78	33.6	32.08
3	570524000727	SD	52	7.27	32.06
3	570780002971	SD	78	29.71	32.05
3	578050001251	SD	805	12.51	32.04
3	570084007600	SD	8	76	31.82
3	570944001835	SD	94	18.35	31.79
3	570084007526	SD	8	75.26	31.72
3	570154003876	SD	15	38.76	31.71
3	570760000950	SD	76	9.5	31.56
3	570780006750	SD	78	67.5	31.55
3	570780006440	SD	78	64.4	31.45
3	570780006905	SD	78	69.05	31.19

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
3	570050005925	SD	5	59.25	31.14
3	580084000185	IMP	8	1.85	30.89
3	570944005810	SD	94	58.1	30.72
3	570082007125	SD	8	71.25	30.63
3	570670001375	SD	67	13.75	30.61
3	570764003975	SD	76	39.75	30.58
3	570080007150	SD	8	71.5	30.55
3	578050002497	SD	805	24.97	30.55
3	570154001803	SD	15	18.03	30.55
3	580784007450	IMP	78	74.5	30.51
3	580080000050	IMP	8	0.5	30.49
3	580080000050	IMP	8	0.5	30.24
4	570080006972	SD	8	69.72	30.23
4	570764001468	SD	76	14.68	30.23
4	570080002098	SD	8	20.98	30.20
4	570080006972	SD	8	69.72	30.18
4	570670001390	SD	67	13.9	30.07
4	570784004375	SD	78	43.75	29.83
4	578050001452	SD	805	14.52	29.82
4	570080007205	SD	8	72.05	29.71
4	570080007205	SD	8	72.05	29.67
4	578050002497	SD	805	24.97	29.41
4	580784007209	IMP	78	72.09	29.35
4	578050002591	SD	805	25.91	29.32
4	580784007436	IMP	78	74.36	29.30
4	570764001015	SD	76	10.15	29.00
4	580084000699	IMP	8	6.99	28.92
4	570050006676	SD	5	66.76	28.57
4	570080002419	SD	8	24.19	28.49
4	570524000171	SD	52	1.71	28.44
4	570050006676	SD	5	66.76	28.41
4	570080002419	SD	8	24.19	28.37
4	570670002214	SD	67	22.14	28.19
4	570670002224	SD	67	22.24	27.96
4	570780003180	SD	78	31.8	27.91
4	570150005029	SD	15	50.29	27.69
4	570524000171	SD	52	1.71	27.67
4	578050001452	SD	805	14.52	27.67
4	570764003870	SD	76	38.7	27.63
4	570764003130	SD	76	31.3	27.38

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
4	570150001478	SD	15	14.78	27.22
4	578050002591	SD	805	25.91	27.08
4	570940004755	SD	94	47.55	27.01
4	570944003300	SD	94	33	27.01
4	570764002550	SD	76	25.5	26.98
4	570760000950	SD	76	9.5	26.75
4	581110004645	IMP	111	46.45	26.55
4	570760000908	SD	76	9.08	26.51
4	570944002890	SD	94	28.9	26.40
4	570940002615	SD	94	26.15	26.33
4	570944001948	SD	94	19.48	25.78
4	570940004885	SD	94	48.85	25.47
4	570764001230	SD	76	12.3	25.43
4	580864003213	IMP	86	32.13	25.31
4	580864003213	IMP	86	32.13	25.29
4	570052003047	SD	5	30.47	24.78
4	580784007267	IMP	78	72.67	24.70
4	570944003000	SD	94	30	24.11
4	570150001478	SD	15	14.78	24.02
4	570150001336	SD	15	13.36	23.81
4	570154001803	SD	15	18.03	23.14
4	570080007705	SD	8	77.05	23.07
4	570940004775	SD	94	47.75	23.00
4	570150001520	SD	15	15.2	22.71
4	580784007517	IMP	78	75.17	21.91
4	570150001450	SD	15	14.5	21.37
4	570944003445	SD	94	34.45	21.28
4	570944004420	SD	94	44.2	21.20
4	571880000110	SD	188	1.1	20.91
4	570154005109	SD	15	51.09	20.14
4	580980004208	IMP	98	42.08	19.74
4	570944001366	SD	94	13.66	19.20
4	578050001452	SD	805	14.52	19.11
4	581110005105	IMP	111	51.05	18.89
4	570944003155	SD	94	31.55	18.86
4	578050001357	SD	805	13.57	18.48
4	570944004580	SD	94	45.8	18.33
4	570564000645	SD	56	6.45	18.25
4	580784006868	IMP	78	68.68	17.96
4	570564000505	SD	56	5.05	17.61

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
4	570154005048	SD	15	50.48	17.58
4	570154001988	SD	15	19.88	17.50
5	578050001150	SD	805	11.5	17.28
5	580080000775	IMP	8	7.75	17.13
5	570080000818	SD	8	8.18	16.98
5	580784006895	IMP	78	68.95	16.48
5	570940003605	SD	94	36.05	16.36
5	580084000616	IMP	8	6.16	16.34
5	580080000605	IMP	8	6.05	16.14
5	578050000401	SD	805	4.01	15.47
5	570050000912	SD	5	9.12	15.27
5	578050000331	SD	805	3.31	14.66
5	570564000640	SD	56	6.4	14.29
5	580080001232	IMP	8	12.32	13.99
5	570154003950	SD	15	39.5	13.74
5	570784004300	SD	78	43	13.72
5	580784006818	IMP	78	68.18	13.69
5	580784006915	IMP	78	69.15	13.68
5	581114003405	IMP	111	34.05	13.64
5	580784005380	IMP	78	53.8	13.47
5	579054000610	SD	905	6.1	13.30
5	580080001733	IMP	8	17.33	13.30
5	570674000850	SD	67	8.5	13.18
5	578054002363	SD	805	23.63	13.11
5	570520000416	SD	52	4.16	13.04
5	570154005048	SD	15	50.48	12.94
5	578050000483	SD	805	4.83	12.88
5	570080000144	SD	8	1.44	12.67
5	570564000375	SD	56	3.75	12.65
5	570564000375	SD	56	3.75	12.65
5	570564000546	SD	56	5.46	12.47
5	581110005548	IMP	111	55.48	12.18
5	570520000550	SD	52	5.5	12.16
5	570054000668	SD	5	6.68	12.14
5	570780008105	SD	78	81.05	12.00
5	570764003105	SD	76	31.05	11.97
5	570150001478	SD	15	14.78	11.75
5	580082000935	IMP	8	9.35	11.33
5	570942000336	SD	94	3.36	11.26
5	570150001450	SD	15	14.5	10.84

Priority	Culvert System Number	County[35]	Route	Postmile	Cross-Hazard Prioritization Score
5	581110005353	IMP	111	53.53	10.05
5	578050000478	SD	805	4.78	10.03
5	578050000193	SD	805	1.93	9.89
5	570520000550	SD	52	5.5	9.75
5	581110005422	IMP	111	54.22	9.44
5	570520001403	SD	52	14.03	9.38
5	570520001408	SD	52	14.08	9.38
5	578050000193	SD	805	1.93	9.27
5	570520000416	SD	52	4.16	8.98
5	570760000796	SD	76	7.96	8.78
5	570764002890	SD	76	28.9	8.78
5	578050001150	SD	805	11.5	8.54
5	570764003245	SD	76	32.45	8.48
5	570944005065	SD	94	50.65	7.38
5	570784001412	SD	78	14.12	7.31
5	570670000420	SD	67	4.2	7.14
5	579054000477	SD	905	4.77	7.01
5	578050001557	SD	805	15.57	6.97
5	578050001452	SD	805	14.52	6.95
5	570784001412	SD	78	14.12	6.81
5	570780008360	SD	78	83.6	6.76
5	570670000420	SD	67	4.2	5.79
5	570784004475	SD	78	44.75	5.41
5	570080001776	SD	8	17.76	5.38
5	570080001776	SD	8	17.76	4.99
5	580084002697	IMP	8	26.97	4.90
5	578050000160	SD	805	1.6	3.34
5	580864005415	IMP	86	54.15	1.59
5	570154110947	SD	15	109.47	1.56
5	570154110947	SD	15	109.47	1.55
5	580784007505	IMP	78	75.05	0.00

TABLE 11: PRIORITIZATION OF ROADWAYS FOR DETAILED CLIMATE CHANGE ADAPTATION ASSESSMENTS

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
1	75	P	SD 75 10.994 / SD 75 13.973[39]	74.49
1	75	P	SD 75 14.351 / SD 75 18.535[37]	74.49
1	75	S	SD 75 10.996 / SD 75 18.141[37]	62.91
1	75	S	SD 75 18.421 / SD 75 18.566[37]	62.91
1	5	S	SD 5 R67.502 / SD 5 R70.99	50.00
1	15	P	SD 15 M27.919 / SD 15 M27.948	48.17
1	15	S	SD 15 R54.062 / SD 15 R54.23	45.58
1	8	S	IMP 8 R37.278 / IMP 8 R41.266	43.63
1	8	S	IMP 8 R54.968 / IMP 8 R68.652	43.63
1	8	S	SD 8 R18.737 / SD 8 R31.159	43.63
1	8	S	SD 8 R67.832 / SD 8 R77.613	43.63
1	8	P	IMP 8 R37.269 / IMP 8 R41.201	43.50
1	8	P	IMP 8 R54.972 / IMP 8 R68.671	43.50
1	8	P	SD 8 R18.74 / SD 8 R31.175	43.50
1	8	P	SD 8 R67.838 / SD 8 R77.618	43.50
1	67	P	SD 67 19.179 / SD 67 24.377	41.80
1	67	P	SD 67 R3.919 / SD 67 12.17	41.80
1	86	P	IMP 86 17.309 / IMP 86 R22.603	41.62
1	86	P	IMP 86 2.082 / IMP 86 L8.151	41.62
1	86	P	IMP 86 R34.431 / IMP 86 R36.523	41.62
1	86	P	IMP 86 R39.683 / RIV 86 0	41.62
1	78	P	IMP 78 R10.809 / IMP 78 R11.832	41.58
1	78	P	IMP 78 R13.391 / IMP 78 16.261	41.58
1	78	P	SD 78 19.222 / SD 78 23.113	41.58
1	78	P	SD 78 25.024 / SD 78 40.37	41.58
1	111	P	IMP 111 23.45 / IMP 111 23.639	41.51
1	111	P	IMP 111 R0 / IMP 111 R2.209	41.51
1	111	P	IMP 111 R18.395 / IMP 111 R22.016	41.51
1	111	P	IMP 111 R5.238 / IMP 111 R10.783	41.51
1	67	S	SD 67 20.116 / SD 67 R20.488	41.51
1	67	S	SD 67 22.264 / SD 67 24.376	41.51
1	67	S	SD 67 6.691 / SD 67 6.854	41.51
1	67	S	SD 67 7.782 / SD 67 7.855	41.51

[36] Caltrans' alignment codes designate the carriageway on divided roadways: "P" always represents northbound or eastbound carriageways whereas "S" always represents southbound or westbound carriageways. Undivided roadways are always indicated with a "P".
[37] IMP = Imperial; SD = San Diego
[38] The average of the cross-hazard prioritization scores amongst all the abutting small segments on the same route sharing a common priority level that were aggregated to form the longer segments listed in this table.
[39] In 2021 Caltrans District 11 will relinquish control of State Route 75 to the City of Coronado (SR-75 postmile 11.2/R21.1).

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
1	67	S	SD 67 8.311 / SD 67 8.53	41.51
1	67	S	SD 67 9.225 / SD 67 11.062	41.51
1	67	S	SD 67 R3.917 / SD 67 R5.731	41.51
1	111	S	IMP 111 R0.052 / IMP 111 R2.209	41.46
1	111	S	IMP 111 R18.395 / IMP 111 R22.016	41.46
1	111	S	IMP 111 R5.238 / IMP 111 R11.297	41.46
1	188	P	SD 188 0 / SD 188 1.849	41.15
1	86	S	IMP 86 17.55 / IMP 86 19.054	41.09
1	86	S	IMP 86 19.965 / IMP 86 R22.874	41.09
1	86	S	IMP 86 5.879 / IMP 86 6.294	41.09
1	86	S	IMP 86 7.308 / IMP 86 L8.15	41.09
1	86	S	IMP 86 R32.519 / IMP 86 R36.517	41.09
1	86	S	IMP 86 R39.685 / IMP 86 R0.02	41.09
1	98	P	IMP 98 29.517 / IMP 98 34.757	41.08
1	98	P	IMP 98 R56.825 / IMP 98 R56.939	41.08
1	78	S	IMP 78 R13.39 / IMP 78 15.499	41.03
1	78	S	SD 78 19.223 / SD 78 19.345	41.03
1	78	S	SD 78 33.618 / SD 78 33.882	41.03
1	78	S	SD 78 37.04 / SD 78 37.136	41.03
1	78	S	SD 78 R22.324 / SD 78 R22.654	41.03
1	94	P	SD 94 24.557 / SD 94 30.439	40.95
1	94	P	SD 94 30.908 / SD 94 40.377	40.95
1	98	S	IMP 98 31.133 / IMP 98 31.312	40.84
1	98	S	IMP 98 31.938 / IMP 98 33.733	40.84
1	7	S	IMP 7 S0.012 / IMP 7 S0.445	40.56
1	7	S	IMP 7 S0.445 / IMP 7 0.001	40.56
1	7	S	IMP 7 S0.445 / IMP 7 1.188	40.56
1	7	S	IMP 7 S0.536 / IMP 7 S0.445	40.56
1	7	P	IMP 7 S0 / IMP 7 S0.457	40.44
1	7	P	IMP 7 S0.457 / IMP 7 0	40.44
1	7	P	IMP 7 S0.457 / IMP 7 1.188	40.44
1	7	P	IMP 7 S0.536 / IMP 7 S0.457	40.44
1	94	S	SD 94 29.801 / SD 94 29.86	40.26
1	94	S	SD 94 29.877 / SD 94 29.975	40.26
1	94	S	SD 94 30.066 / SD 94 30.177	40.26
1	188	S	SD 188 0.1 / SD 188 0.231	40.25
1	76	P	SD 76 24.273 / SD 76 29.311	39.56
1	76	P	SD 76 30.356 / SD 76 32.886	39.56
2	111	P	IMP 111 32.436 / IMP 111 65.394	39.29
2	115	P	IMP 115 34.019 / IMP 115 35.235	39.28

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
2	76	P	SD 76 32.886 / SD 76 40.1	39.28
2	76	P	SD 76 48.567 / SD 76 52.319	39.28
2	98	P	IMP 98 24.092 / IMP 98 29.517	39.27
2	98	P	IMP 98 45.336 / IMP 98 R56.825	39.27
2	98	P	IMP 98 R56.939 / IMP 98 R57.017	39.27
2	111	S	IMP 111 32.513 / IMP 111 32.819	39.25
2	111	S	IMP 111 36.417 / IMP 111 36.665	39.25
2	111	S	IMP 111 36.801 / IMP 111 37.044	39.25
2	111	S	IMP 111 40.173 / IMP 111 40.735	39.25
2	111	S	IMP 111 44.439 / IMP 111 44.869	39.25
2	76	S	SD 76 R34.139 / SD 76 R34.179	39.25
2	76	S	SD 76 R34.209 / SD 76 R34.316	39.25
2	79	P	SD 79 25.267 / SD 79 R40.121	39.25
2	79	P	SD 79 46.264 / RIV 79 0	39.25
2	75	S	SD 75 18.141 / SD 75 18.421	39.22
2	94	P	SD 94 40.377 / SD 94 59.607	38.75
2	94	P	SD 94 R10.405R / SD 94 R10.514R	38.75
2	94	P	SD 94 R11.098 / SD 94 R11.619	38.75
2	78	P	IMP 78 0.708 / IMP 78 13.17	37.98
2	78	P	IMP 78 64.694 / IMP 78 80.743	37.98
2	78	P	SD 78 12.154 / SD 78 R16.551	37.98
2	78	P	SD 78 23.113 / SD 78 25.024	37.98
2	78	P	SD 78 40.37 / SD 78 50.994	37.98
2	78	P	SD 78 62.4 / SD 78 74.447	37.98
2	78	P	SD 78 R16.928 / SD 78 R17.428	37.98
2	5	S	SD 5 9.706 / SD 5 9.792	34.36
2	94	S	SD 94 52.118 / SD 94 52.2	34.06
2	94	S	SD 94 M10.382L / SD 94 M10.497L	34.06
2	94	S	SD 94 R11.095 / SD 94 R11.825	34.06
2	15	P	SD 15 M17.323 / SD 15 M27.919	32.35
2	15	P	SD 15 M27.948 / SD 15 R31.522	32.35
2	15	P	SD 15 R32.878 / SD 15 R36.637	32.35
2	15	P	SD 15 R44.244 / SD 15 R54.07	32.35
2	15	S	SD 15 M17.32 / SD 15 R31.523	32.22
2	15	S	SD 15 R32.882 / SD 15 R36.638	32.22
2	15	S	SD 15 R44.251 / SD 15 R54.062	32.22
2	8	S	SD 8 8.53 / SD 8 R18.737	31.98
2	78	S	SD 78 12.17 / SD 78 R16.552	31.93
2	78	S	SD 78 23.113 / SD 78 24.315	31.93
2	78	S	SD 78 80.154 / IMP 78 0.001	31.93

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
2	78	S	SD 78 R16.926 / SD 78 R17.427	31.93
2	8	P	SD 8 8.481 / SD 8 R18.74	31.90
2	015S	P	SD 15S 19.464 / SD 15S 21.937	29.72
2	015S	P	SD 15S 22.96 / SD 15S 24.384	29.72
2	015S	P	SD 15S 27.783 / SD 15S 28.781	29.72
2	015S	P	SD 15S 30.115 / SD 15S 30.856	29.72
2	015S	S	SD 15S 19.459 / SD 15S 21.939	29.08
2	015S	S	SD 15S 22.957 / SD 15S 24.383	29.08
2	015S	S	SD 15S 27.781 / SD 15S 28.794	29.08
2	015S	S	SD 15S 30.119 / SD 15S 30.856	29.08
2	52	P	SD 52 8.718 / SD 52 17.229	28.93
2	52	S	SD 52 8.852 / SD 52 17.27	28.91
2	67	S	SD 67 R1.946 / SD 67 R3.917	28.89
2	67	P	SD 67 R1.954 / SD 67 R3.919	28.84
2	125	P	SD 125 13.063 / SD 125 R15.415	28.83
2	125	P	SD 125 19.411 / SD 125 22.105	28.83
2	125	S	SD 125 13.072 / SD 125 R15.411	28.82
2	125	S	SD 125 19.41 / SD 125 22.128	28.82
2	56	P	SD 56 6.098 / SD 56 9.647	28.74
2	56	S	SD 56 6.085 / SD 56 9.648	28.74
3	67	S	SD 67 R0 / SD 67 R1.946	27.08
3	75	P	SD 75 9.312 / SD 75 9.425	26.61
3	15	S	SD 15 R31.523 / SD 15 R32.882	26.41
3	125	P	SD 125 22.105 / SD 125 22.302	26.38
3	125	P	SD 125 R15.415 / SD 125 19.411	26.38
3	15	P	SD 15 R31.522 / SD 15 R32.878	26.37
3	15	P	SD 15 R54.07 / RIV 15 R0.001	26.37
3	75	S	SD 75 9.312 / SD 75 9.438	26.26
3	125	S	SD 125 22.128 / SD 125 22.299	26.20
3	125	S	SD 125 R15.411 / SD 125 19.41	26.20
3	67	P	SD 67 15.201 / SD 67 R17.645	25.15
3	67	P	SD 67 R0 / SD 67 R1.954	25.15
3	67	P	SD 67 R18.672 / SD 67 19.179	25.15
3	94	S	SD 94 30.439 / SD 94 30.678	23.16
3	94	S	SD 94 M10.497L / SD 94 R11.095	23.16
3	94	S	SD 94 R9.923L / SD 94 M10.382L	23.16
3	56	S	SD 56 3.104 / SD 56 6.085	23.04
3	56	S	SD 56 9.648 / SD 56 9.837	23.04
3	5	P	SD 5 8.811 / SD 5 9.256	22.93
3	5	P	SD 5 9.673 / SD 5 9.781	22.93

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
3	56	P	SD 56 3.103 / SD 56 6.098	22.91
3	56	P	SD 56 9.647 / SD 56 9.837	22.91
3	78	P	IMP 78 R11.832 / IMP 78 R13.391	22.83
3	78	P	IMP 78 R9.202 / IMP 78 R10.809	22.83
3	78	P	SD 78 1.041 / SD 78 1.496	22.83
3	78	P	SD 78 11.196 / SD 78 12.154	22.83
3	78	P	SD 78 R16.551 / SD 78 R16.928	22.83
3	78	P	SD 78 R17.428 / SD 78 19.222	22.83
3	78	S	IMP 78 R9.202 / IMP 78 R13.39	22.63
3	78	S	SD 78 11.414 / SD 78 12.17	22.63
3	78	S	SD 78 R16.552 / SD 78 R16.926	22.63
3	78	S	SD 78 R17.427 / SD 78 T18.072	22.63
3	78	S	SD 78 T18.703 / SD 78 19.223	22.63
3	111	P	IMP 111 23.639 / IMP 111 24.685	22.62
3	111	P	IMP 111 R10.783 / IMP 111 R18.395	22.62
3	111	P	IMP 111 R2.209 / IMP 111 R5.238	22.62
3	94	P	SD 94 19.773 / SD 94 24.557	22.50
3	94	P	SD 94 30.439 / SD 94 30.908	22.50
3	94	P	SD 94 R10.514R / SD 94 R11.098	22.50
3	94	P	SD 94 R9.86R / SD 94 R10.405R	22.50
3	111	S	IMP 111 R11.297 / IMP 111 R18.395	22.34
3	111	S	IMP 111 R2.209 / IMP 111 R5.238	22.34
3	8	P	IMP 8 81.676 / IMP 8 R96.986	22.31
3	8	P	IMP 8 R10.4 / IMP 8 R31.371	22.31
3	8	P	IMP 8 R34.165 / IMP 8 R35.483	22.31
3	8	P	IMP 8 R36.976 / IMP 8 R37.269	22.31
3	8	P	IMP 8 R41.201 / IMP 8 R54.972	22.31
3	8	P	IMP 8 R68.671 / IMP 8 R73.881	22.31
3	8	P	SD 8 R31.175 / SD 8 R38.17R	22.31
3	8	P	SD 8 R48.855R / SD 8 R61.014R	22.31
3	8	P	SD 8 R65.905 / SD 8 R67.838	22.31
3	8	S	IMP 8 81.67 / IMP 8 R96.986	22.30
3	8	S	IMP 8 R10.38 / IMP 8 R31.426	22.30
3	8	S	IMP 8 R34.169 / IMP 8 R35.482	22.30
3	8	S	IMP 8 R36.969 / IMP 8 R37.278	22.30
3	8	S	IMP 8 R41.266 / IMP 8 R54.968	22.30
3	8	S	IMP 8 R68.652 / IMP 8 R74.004	22.30
3	8	S	SD 8 R31.159 / SD 8 R38.057L	22.30
3	8	S	SD 8 R49.135L / SD 8 R60.986L	22.30
3	8	S	SD 8 R65.891 / SD 8 R67.832	22.30

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
3	7	P	IMP 7 1.188 / IMP 7 6.823	22.21
3	98	P	IMP 98 34.757 / IMP 98 35.64	22.02
3	98	P	IMP 98 39.181 / IMP 98 39.664	22.02
3	54	S	SD 54 T11.544 / SD 54 T14.212	21.95
3	54	P	SD 54 T11.995 / SD 54 T14.212	21.95
3	5	S	SD 5 8.563 / SD 5 9.281	21.94
3	015S	S	SD 15S 18.894 / SD 15S 19.459	21.83
3	015S	P	SD 15S 14.282 / SD 15S 14.999	21.81
3	015S	P	SD 15S 18.894 / SD 15S 19.464	21.81
3	186	P	IMP 186 0 / IMP 186 2.128	21.68
3	86	P	IMP 86 1.749 / IMP 86 2.082	21.57
3	86	P	IMP 86 27.511 / IMP 86 R34.431	21.57
3	86	P	IMP 86 L8.151 / IMP 86 13.318	21.57
3	86	P	IMP 86 R22.603 / IMP 86 R22.882	21.57
3	86	P	IMP 86 R24.052 / IMP 86 27.342	21.57
3	86	P	IMP 86 R36.523 / IMP 86 R39.683	21.57
3	86	S	IMP 86 27.511 / IMP 86 R32.519	21.56
3	86	S	IMP 86 L8.15 / IMP 86 13.317	21.56
3	86	S	IMP 86 R24.06 / IMP 86 27.342	21.56
3	86	S	IMP 86 R36.517 / IMP 86 R39.685	21.56
3	7	S	IMP 7 1.188 / IMP 7 6.541	21.26
3	76	P	SD 76 14.705 / SD 76 16.766	21.12
3	76	P	SD 76 R17.194 / SD 76 R17.412	21.12
3	76	S	SD 76 R17.19 / SD 76 R17.421	21.12
3	115	P	IMP 115 L9.753 / IMP 115 L10.391	21.11
3	79	P	SD 79 L0.058 / SD 79 L0.247	20.53
4	67	P	SD 67 12.17 / SD 67 15.201	20.28
4	67	P	SD 67 R17.645 / SD 67 R18.672	20.28
4	67	S	SD 67 R17.645 / SD 67 R18.672	20.11
4	115	S	IMP 115 9.54 / IMP 115 L10.391	20.07
4	76	S	SD 76 16.766 / SD 76 R17.19	20.03
4	76	S	SD 76 23.089 / SD 76 23.377	20.03
4	76	S	SD 76 R17.421 / SD 76 R17.639	20.03
4	86	P	IMP 86 13.318 / IMP 86 17.309	20.01
4	86	P	IMP 86 27.342 / IMP 86 27.511	20.01
4	86	P	IMP 86 R0 / IMP 86 1.749	20.01
4	86	P	IMP 86 R22.882 / IMP 86 R24.052	20.01
4	86	S	IMP 86 13.317 / IMP 86 17.55	20.01
4	86	S	IMP 86 27.342 / IMP 86 27.511	20.01
4	86	S	IMP 86 R22.874 / IMP 86 R24.06	20.01

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
4	008U	P	IMP 8U 96.946 / IMP 8U T96.546	19.99
4	76	P	SD 76 16.766 / SD 76 R17.194	19.96
4	76	P	SD 76 29.311 / SD 76 30.356	19.96
4	76	P	SD 76 40.1 / SD 76 48.567	19.96
4	76	P	SD 76 R17.412 / SD 76 24.273	19.96
4	008U	S	IMP 8U 96.946 / IMP 8U T96.546	19.94
4	015S	S	SD 15S 21.939 / SD 15S 22.957	19.79
4	015S	S	SD 15S 24.383 / SD 15S 27.781	19.79
4	015S	S	SD 15S 28.794 / SD 15S 30.119	19.79
4	98	P	IMP 98 0.444 / IMP 98 24.092	19.79
4	98	P	IMP 98 35.64 / IMP 98 39.181	19.79
4	98	P	IMP 98 39.664 / IMP 98 45.336	19.79
4	111	P	IMP 111 24.685 / IMP 111 32.436	19.79
4	78	P	IMP 78 16.261 / IMP 78 R50.834	19.71
4	78	P	IMP 78 50.528 / IMP 78 64.694	19.71
4	78	P	SD 78 50.994 / SD 78 62.4	19.71
4	78	P	SD 78 76.84 / IMP 78 0.708	19.71
4	111	S	IMP 111 26.669 / IMP 111 27.889	19.71
4	111	S	IMP 111 32.148 / IMP 111 32.436	19.71
4	94	P	SD 94 59.607 / SD 94 65.375	19.69
4	115	P	IMP 115 21.18 / IMP 115 34.019	19.68
4	115	P	IMP 115 L10.391 / IMP 115 21.17	19.68
4	115	P	IMP 115 R3.201 / IMP 115 L9.753	19.68
4	79	P	SD 79 12.112 / SD 79 16.872	19.67
4	79	P	SD 79 18.712 / SD 79 20.22	19.67
4	79	P	SD 79 20.23 / SD 79 25.267	19.67
4	79	P	SD 79 R40.121 / SD 79 46.264	19.67
4	98	S	IMP 98 42.109 / IMP 98 42.209	19.63
4	015S	P	SD 15S 13.333 / SD 15S 14.282	19.15
4	015S	P	SD 15S 14.999 / SD 15S 15.938	19.15
4	015S	P	SD 15S 17.318 / SD 15S 18.894	19.15
4	015S	P	SD 15S 21.937 / SD 15S 22.96	19.15
4	015S	P	SD 15S 24.384 / SD 15S 27.783	19.15
4	015S	P	SD 15S 28.781 / SD 15S 30.115	19.15
4	8	P	IMP 8 R31.371 / IMP 8 R34.165	17.72
4	8	P	IMP 8 R35.483 / IMP 8 R36.976	17.72
4	8	P	IMP 8 R73.881 / IMP 8 81.676	17.72
4	8	P	SD 8 4.43 / SD 8 5.646	17.72
4	8	P	SD 8 6.214 / SD 8 8.481	17.72
4	8	P	SD 8 L1.347 / SD 8 L2.045	17.72

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
4	8	P	SD 8 R61.014R / SD 8 R65.905	17.72
4	8	S	IMP 8 R31.426 / IMP 8 R34.169	17.34
4	8	S	IMP 8 R35.482 / IMP 8 R36.969	17.34
4	8	S	IMP 8 R74.004 / IMP 8 81.67	17.34
4	8	S	SD 8 4.805 / SD 8 5.648	17.34
4	8	S	SD 8 6.282 / SD 8 8.53	17.34
4	8	S	SD 8 R60.986L / SD 8 R65.891	17.34
4	15	S	SD 15 M11.441 / SD 15 M17.32	15.53
4	15	S	SD 15 M5.175 / SD 15 R6.12	15.53
4	15	S	SD 15 R39.372 / SD 15 R41.829	15.53
4	15	S	SD 15 R6.128 / SD 15 R8.363	15.53
4	5	S	SD 5 9.792 / SD 5 R10.057	15.38
4	5	S	SD 5 R30.691L / SD 5 R41.528	15.38
4	5	S	SD 5 R44.076 / SD 5 R45.841	15.38
4	5	P	SD 5 R30.701R / SD 5 R41.521	15.29
4	5	P	SD 5 R44.07 / SD 5 R47.029	15.29
4	15	P	SD 15 M11.452 / SD 15 M17.323	15.01
4	15	P	SD 15 M5.173 / SD 15 R6.111	15.01
4	15	P	SD 15 R39.359 / SD 15 R41.833	15.01
4	15	P	SD 15 R6.126 / SD 15 R8.37	15.01
5	805	P	SD 805 0.173 / SD 805 1.786	12.41
5	805	P	SD 805 15.95 / SD 805 16.571	12.41
5	805	P	SD 805 20.811 / SD 805 28.785	12.41
5	805	S	SD 805 0.169 / SD 805 1.527	12.04
5	805	S	SD 805 15.957 / SD 805 16.438	12.04
5	805	S	SD 805 20.679 / SD 805 28.62	12.04
5	15	P	SD 15 M4.664 / SD 15 M5.173	11.77
5	15	P	SD 15 R36.637 / SD 15 R39.359	11.77
5	15	P	SD 15 R41.833 / SD 15 R44.244	11.77
5	15	P	SD 15 R6.111 / SD 15 R6.126	11.77
5	15	P	SD 15 R8.37 / SD 15 M11.452	11.77
5	15	S	SD 15 M4.665 / SD 15 M5.175	11.62
5	15	S	SD 15 R36.638 / SD 15 R39.372	11.62
5	15	S	SD 15 R41.829 / SD 15 R44.251	11.62
5	15	S	SD 15 R6.12 / SD 15 R6.128	11.62
5	15	S	SD 15 R8.363 / SD 15 M11.441	11.62
5	56	S	SD 56 0.005 / SD 56 3.104	9.26
5	56	P	SD 56 0 / SD 56 3.103	9.25
5	52	S	SD 52 2.316 / SD 52 8.852	8.52
5	52	P	SD 52 2.654 / SD 52 8.718	8.45

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
5	5	S	SD 5 9.394 / SD 5 9.706	8.25
5	5	S	SD 5 R0.312 / SD 5 2.969	8.25
5	5	S	SD 5 R28.422 / SD 5 R30.691L	8.25
5	5	S	SD 5 R41.528 / SD 5 R44.076	8.25
5	5	S	SD 5 R63.686 / SD 5 R67.502	8.25
5	78	S	SD 78 1.497 / SD 78 11.414	8.13
5	163	S	SD 163 7.196 / SD 163 R11.662	8.08
5	125	S	SD 125 L1.202 / SD 125 13.072	8.06
5	125	P	SD 125 L1.125 / SD 125 13.063	7.99
5	5	P	SD 5 9.256 / SD 5 9.357	7.90
5	5	P	SD 5 9.781 / SD 5 R10.054	7.90
5	5	P	SD 5 R0.305 / SD 5 3.083	7.90
5	5	P	SD 5 R28.429 / SD 5 R30.701R	7.90
5	5	P	SD 5 R41.521 / SD 5 R44.07	7.90
5	5	P	SD 5 R63.623 / SD 5 R70.984	7.90
5	163	P	SD 163 7.171 / SD 163 R11.59	7.63
5	78	P	IMP 78 R50.834 / IMP 78 50.528	6.67
5	78	P	SD 78 1.72 / SD 78 11.196	6.67
5	78	P	SD 78 74.447 / SD 78 76.84	6.67
5	54	P	SD 54 4.993 / SD 54 6.331	6.60
5	54	P	SD 54 T10.993 / SD 54 T11.995	6.60
5	54	S	SD 54 5.066 / SD 54 6.334	6.29
5	54	S	SD 54 T10.993 / SD 54 T11.544	6.29
5	75	P	SD 75 9.089 / SD 75 9.312	5.16
5	75	P	SD 75 9.425 / SD 75 9.584	5.16
5	75	P	SD 75 9.813 / SD 75 10.068	5.16
5	94	S	SD 94 16.067 / SD 94 16.267	4.97
5	94	S	SD 94 16.313 / SD 94 17.682	4.97
5	94	S	SD 94 19.421 / SD 94 19.525	4.97
5	94	S	SD 94 6.153 / SD 94 R9.923L	4.97
5	94	S	SD 94 R11.825 / SD 94 14.86	4.97
5	8	P	IMP 8 R3.389R / IMP 8 R10.4	4.48
5	8	P	SD 8 5.646 / SD 8 6.214	4.48
5	8	P	SD 8 R38.17R / SD 8 R48.855R	4.48
5	8	S	IMP 8 R3.092L / IMP 8 R10.38	4.19
5	8	S	SD 8 5.648 / SD 8 6.282	4.19
5	8	S	SD 8 R38.057L / SD 8 R49.135L	4.19
5	94	P	SD 94 6.17 / SD 94 R9.86R	3.83
5	94	P	SD 94 R11.619 / SD 94 19.773	3.83
5	905	S	SD 905 R6.725 / SD 905 R11.737	3.49

Priority	Route	Carriageway[36]	From County & Postmile / To County & Postmile[37]	Average Cross-Hazard Prioritization Score[38]
5	76	P	SD 76 R4.545 / SD 76 14.705	3.27
5	76	S	SD 76 9.346 / SD 76 13.058	3.08
5	76	S	SD 76 R4.529 / SD 76 R8.081	3.08
5	905	P	SD 905 R6.723 / SD 905 R11.737	3.01
5	75	S	SD 75 9.036 / SD 75 9.312	1.97
5	75	S	SD 75 9.438 / SD 75 9.561	1.97
5	75	S	SD 75 9.861 / SD 75 9.995	1.97
5	015S	P	SD 15S 11.89 / SD 15S 13.333	0.36
5	015S	P	SD 15S 15.938 / SD 15S 17.318	0.36
5	015S	S	SD 15S 11.89 / SD 15S 11.975	0.21
5	79	P	SD 79 16.872 / SD 79 18.712	0.14
5	79	P	SD 79 L0.247 / SD 79 12.112	0.14
5	98	P	IMP 98 R0.115 / IMP 98 0.444	0.06
5	98	S	IMP 98 R0 / IMP 98 R0.436	0.05
5	11	P	SD 11 1.401 / SD 11 1.401	0.00
5	11	S	SD 11 1.401 / SD 11 1.401	0.00