Delta Stewardship Council

A CALIFORNIA STATE AGENCY

DELTA ADAPTS: CREATING A CLIMATE RESILIENT FUTURE

TECHNICAL MEMORANDUM

ECONOMIC IMPACT AND EXPOSURE ANALYSIS

MAY 2021

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ACRONYMS AND OTHER ABBREVIATIONS

AF	Acre-Feet
CACASA	California Agricultural Commissioners and Sealers Association
CVP	Central Valley Project
DHS	Department of Homeland Security
DSC	Delta Stewardship Council
DWR	California Department of Water Resources
FEMA	Federal Emergency Management Agency
GSP	Groundwater Sustainability Plan
MAF	Million Acre-Feet
M&I	Municipal and Industrial
PG&E	Pacific Gas and Electric
PPIC	Public Policy Institute of California
SGMA	Sustainable Groundwater Management Act
SLR	Sea Level Rise
SWP	State Water Project
USAEC	U.S. Army Corps of Engineers
WSIP	Water Storage Investment Program

CHAPTER 1. INTRODUCTION

This memorandum documents the methods and findings of an economic analysis of exposure to climate-related water supply and flood hazard vulnerabilities within the Delta. Identifying the assets and activities exposed to climate change provides a means of focusing adaptation strategies to mitigate these potential vulnerabilities. This analysis presented here does not project potential impacts because that step requires further assessment of the extent and intensity of the hazards (e.g., depth and duration of flooding, duration of droughts), development of damage functions, and assumptions about responses to these events in the absence of any adaptation measured. An exposure analysis provides a measure of potential damages sufficient to develop a portfolio of adaptation strategies that protect the highest value assets and activities.

The exposure analysis is divided into two geographic regions. Chapter 2 summarizes the analysis of how future climate change scenarios are projected to expose economic activity and infrastructure to flood risk within the Delta. Chapter 3 details the analysis of how climate change is projected to impact water supply in the rest of the State, particularly related to movement of water through the Delta as part of the state's two major water supply projects, and how those changes might influence economic activity derived from those supplies. Current assets and activities as of 2018 are used for developing this accounting base. Projected scenarios may be prepared as part of developing the adaptation strategies. These analyses will serve as part of the foundation for creating a climate change adaptation strategy in the Delta that addresses economic risk to the region and the state.

This study entails the assessment of 15 economic scenarios. Each economic scenario is constructed of a corresponding climate change scenario, flood mapping scenario, and water supply scenario, which are outlined in Table 1-1 further described below:

Climate change scenarios were constructed for future planning horizons of 2030 (10 years ahead) and 2050 (30 years ahead). Economic analysis was not undertaken for 2085 because it was considered too speculative to project conditions 65 years in the future. The amount of uncertainty related to water supply regulations, operations, climate conditions, cropping patterns, water use, technology, and economic values that far out into the future compound in such a way that the analysis would likely provide little value. Climate change scenarios are either defined on a deterministic basis, where sea level rise (SLR) is as assumed at 6", 12", 24", or 42", or on a probabilistic basis, where results are based on a probability threshold for water surface elevation that incorporates all of the possible combinations of SLR, tidal conditions, storm surge conditions, and inflow conditions. High risk areas are those where water surface elevations exceed levee elevations 2% of the time, High + medium risk areas are those where water surface elevations exceed levee elevation 1% of the time. potential climate change outcomes. Among the deterministic scenarios projected climate change impacts become more severe at higher

levels of SLR. Among the probabilistic scenarios, the high probability scenario is relatively less severe (and more likely) than the high plus medium probability scenario.

Flood mapping scenarios were developed by the Delta Adapts team for each climate change scenario, showing all areas in the Delta that are projected to be impacted by flooding. These flood maps provide the basis for the Asset Exposure analysis in Chapter 2. In the Asset Exposure analysis, assets and economic activity exposed to flooding hazard are identified using GIS overlays with the flood maps. For assets and activity exposed to flooding, Chapter 2 estimates the current value (in 2020 dollars) of the assets and activity exposed to risk. This value does not represent the expected losses from a flood event—that requires a more extensive analysis that starts with this asset exposure and applies parameters describing a flood event and estimates the expected damage to each asset type, an analysis that could be constructed in the future based on the data presented in this report.

Water supply scenarios were developed separately from flood mapping scenarios to consider how climate change may impact State Water Project (SWP) and Central Valley Project (CVP) deliveries through the Delta. The Delta Stewardship Council provided water delivery estimates under the climate change scenarios in Table 1-1 for water supply scenarios W-1 to W-7 based on their CalLite Central Valley Water Management Screening Model (see Water Supply Technical Memorandum). Modelling results include all CVP and SWP deliveries. This analysis focuses on the impact to water supplies that depend on Delta infrastructure for delivery, including CVP South of Delta and SWP South of Delta deliveries to Contra Costa, the Central Valley, and Southern California. Water supply scenario W-8 represents a total project outage for six months based on analysis previously done for the Delta Risk Management Strategy (DWR 2009). Chapter 3 of this report provides an analysis of the economic impact of these changes to water supply for both agricultural and municipal uses.

In general, the flooding and water supply scenarios are kept separate because each represents a different type of impact with a different temporal dimension. The one exception represented in the economic scenarios is where a flood event causes enough levee failures in the Delta to compromise the salinity of water being pumped at the water projects in the South Delta. Scenarios E-4 and E-8 cover this situation. However, generally flood events are singular events that happen periodically and are generally associated with a subset of years with wet weather conditions. These are shown as economic scenarios E-1 to E-3 and E-5 to E-7. Water supply impacts on the other hand are generally represented by a weighted average computed across the spectrum of possible outcomes and the most significant changes tend to occur in drier years. Climate change shifts the probabilities of individual outcomes. These are shown as scenarios E-9 to E-15. Thus, the likelihood that flood events of concern and the largest consequences from reduced water supplies will happen in the same year are quite small, which the exception noted above.

Table 1-1 Economics, Flooding, and Water Supply Scenarios Evaluated

Economics Scenario	Description	Flood Mapping Scenario	Water Supply Scenario
E-1	2030 with 6" SLR + 100-year flooding with mid-century climate change	M-1	-
E-2	2050 with 12" SLR + 100-year flooding with mid-century climate change	M-2	-
E-3	2050 with 24" SLR + 100-year flooding with mid-century climate change	M-3	-
E-4	2050+ with 42" SLR + 100-year flooding with end-of-century climate change	M-4	W-8: No water deliveries from Delta
E-5	2030 High probability of flooding	M-5	-
E-6	2030 High + medium probability of flooding	M-5	-
E-7	2050 High probability of flooding	M-6	-
E-8	2050 High + medium probability of flooding	M-6	W-8: No water deliveries from Delta
E-9	2030 with 6" SLR (1.5 deg C increase in temperature, 10% increase in precipitation variability)	-	W-1
E-10	2050 with 12" SLR (2.0 deg C increase in temperature, 10% increase in precipitation variability)	-	W-2
E-11	2050 with 24" SLR (2.0 deg C increase in temperature, 20% increase in precipitation variability)	-	W-3
E-12	2030 range of water conditions	-	W-4
E-13	2030 5-year drought vs range of water conditions	-	W-5
E-14	2050 range of water conditions	-	W-6
E-15	2050 5-year drought vs range of water conditions	-	W-7

Economic variables are generally either stocks or flows, with stock variables such as housing stock representing a snapshot at one point in time, while flow variables such as annual agricultural income describe a change in the economy over a period of time. Both are considered in this analysis in different ways. The water supply impacts (Chapter 3) are generally expressed in lost annual economic activity represented by annual income and revenues. Reductions in water

supply do not impact stock variables over the short term, but could interrupt economic flows such as annual agricultural output or annual commercial activity. In contrast, in the analysis of flood risk exposure (Chapter 1) both economic stocks and economic flows are vulnerable to climate change risk. Because these stock and flow values differ in their bases the two sets of values cannot be added together without further analysis of the climate change scenarios, otherwise it would be like adding income to wealth or incremental change to total value.

In addition, flood risk exposure of commercial and agricultural economic activity in the Delta is reported on an annual basis, comparable to annual economic impacts of water supply reductions. However, in-Delta flood-exposure values represent total exposure and not an incremental change as a result of climate change.

Note that any potential costs of responding to a flooding event, such as reclamation of an island with levee breeches are not included in this analysis. Flood response will be considered in developing adaptation strategies in the Delta.

CHAPTER 2. ASSET AND ECONOMIC EXPOSURE ANALYSIS

2.1 Overview

2.1.1 Approach

This analysis provides an estimate of the economic value from both physical assets and economic activity that are exposed to potential flooding under a range of flood scenarios mapped using GIS. Flooding scenarios are linked to future climate change scenarios in the Sacramento-San Joaquin Delta based on:

- Future milepost years of 2030 (10 years ahead) and 2050 (30 years ahead); and either
- Deterministic scenario based on an assumed sea level rise (SLR) of 6", 12", 24", or 42" with probabilistic ranges of outcomes associated with each SLR amount; or
- Probabilistic scenario based on a probability threshold for water surface elevation that incorporates all of the possible combinations of SLR, tidal conditions, storm surge conditions, and inflow conditions. High risk areas are those where water surface elevations exceed levee elevations 2% of the time, High + medium risk areas are those where water surface elevations exceed levee elevation 1% of the time.

Economic variables can generally be categorized as either stocks or flows, with stock variables such as the number of houses representing a snapshot at one point in time, while flow variables such as annual agricultural income describe a change in the economy over a period of time. In this chapter both economic stocks and economic flows are included in the analysis as both are exposed to flood risk under future climate change scenarios. For example, flooding in a commercial center could damage the stock of commercial buildings and businesses and interrupt the flow of commercial revenues. Because these stock and flow values differ in their basis the two sets of values cannot be added together and are presented separately throughout this chapter.

Note that any potential costs of responding to a flooding event, such as reclamation of an island with levee breeches are not included in this analysis. Flood response will be considered in developing adaptation strategies in the Delta.

2.1.2 Demographics and Local Economy

The Delta is home to approximately 637,000 people with a local economy creating $42.6 billion in economic output each year (IMPLAN 2018). Agriculture and supporting industries make up a significant portion of the economy. There are approximately 415,000 farmed acres in the Delta, with revenues totaling $965 million in 2016 (Delta Protection Commission 2019). Out of total

local employment of 249,000 jobs (IMPLAN 2018), these farms created 12,400 jobs in the Delta (Delta Protection Commission 2019).

To estimate the size and scope of the local economy, we rely on economic data from IMPLAN. The IMPLAN input-output model measures how changes in economic activity and monetary flows affect economic outputs. The model data set provides estimated industry output, wage income, proprietary income, other property income, indirect business taxes, value added, and employment for 440 individual economic sectors. (See Appendix A for a further explanation of how the IMPLAN model and data set work) IMPLAN data is available at the zip code level. To create estimates for the Delta we used ESRI 2018 US Business Locations and Business Summary Data for ArcGIS (ESRI 2018), which includes sales volumes for geolocated businesses, to calculate shares of sales in each Delta zip code that lie inside and outside of the Delta boundary. We apply these shares to zip code-level IMPLAN data on demographics and other general economic indicators to create a snapshot of the Delta economy. For agricultural employment, including both farming and livestock husbandry, zip code-level employment is apportioned by the percentage of the zip code land area that lies inside the Delta boundary. See Table 2-1 for an estimate of these metrics.

The information in Table 21 provides a snapshot of the size and scope of the Delta economy. These data do not represent the total asset value in the Delta, but rather are provided to give a general understanding of the region.

Table 2-1. In-Delta Demographic and General Economic Metrics

Indicator	Estimate
Population	637,000
Employment	249,000
Agricultural Employment	12,400
Total Income ($ billions)	$35.57
Economic Output ($ billions)	$42.64
Value Added ($ billions)	$25.85

2.2 Asset Exposure

For the in-Delta asset exposure analysis flood maps were overlaid with GIS data on a range of physical assets. The Flood Hazard Technical Memorandum (DSC 2020) describes the development of the GIS data and analysis that projects potential flooding in the Delta under the scenarios listed in Table 1-1. To estimate the value of assets exposed to flooding, estimates were developed for all of the asset types on a per-unit basis (e.g. per hospital for hospitals, per mile for highways, and per acre for agricultural land, etc.). All estimates are in 2020 dollars. Asset values are generally based on an assumption that these represent replacement value, either from direct studies or through each county's property assessment process. It is important to note that these values are simply the value exposed to flooding and do not represent actual expected damages which would be some portion of the total exposed value. For example, if a house valued at $100,000 is flooded, damage could range from $0 to $100,000. Rather than

estimate the damages, this analysis estimates total exposed value, or the upper limit of $100,000 in this example. Estimating expected damages is a more complex analysis outside the scope of this project. It would require estimating damage ratios for each category of asset as well as additional assumptions about the extent of flooding and the flood response. Such an analysis could be built upon data provided in this report. However exposed value alone allows for useful comparison among climate change scenarios and provides an upper bound of economic impacts. More information on each asset type, sources and value estimates are included below and summarized in Table 2-2.

For some asset categories it is either not possible or beyond the scope of this study to estimate their full value. For example, cultural assets such as legacy towns have intrinsic value beyond the sum of its individual property values. While property values are captured under the appropriate residential and commercial property categories, the intrinsic monetary value of a legacy town cannot be estimated. Other assets such as trails and parks have recreation value and may draw tourism to the Delta. However, quantifying that value is a complex and uncertain undertaking and was not attempted in this study. For these recreational and cultural asset categories we provide a count of the impacted assets but do not attach a dollar value to them. The analysis captures direct recreation expenditures at businesses in commercial activity—it is the intangible valuation for these assets that is unknown. Exposure of these assets should be considered on a qualitative basis along with quantified asset exposure.

Table 2-2. Activities and Assets included in Analysis

Category	Asset
Agricultural Activity and Property	Agricultural Real Estate Parcels Agricultural Production Confined Animal Facilities
Residential Property	Residential Real Estate Parcels
Commercial Activity and Property	Commercial Real Estate Parcels Commercial Activity
Infrastructure--Critical Facilities	Fire Stations Hospitals Police Stations Public Schools Private Schools Wastewater Treatment Facilities Prisons
Infrastructure--Communications	Communications Facilities Cell Towers
Infrastructure--Transportation	Roads Highways County Highways Scenic Highways Railroads

Category	Asset
	Airstrips
	Bridges
	Rail Stations
	Bike Routes
Infrastructure--Water, Energy and Utilities	Water Conveyance
	Active Wells
	Natural Gas Storage
	Natural Gas Stations
	Natural Gas Pipelines
	Oil Pipelines
	Substations
	Power Plants
	Transmission Lines
Infrastructure--Other	Rock Stockpiles
	Hazardous Waste Facilities
	Solid Waste Sites
Recreation and Culture	Regional Parks
	State Parks
	Historic Places
	Legacy Towns
	National Historic Landmarks
	City Parks
	Campgrounds
	Trails

2.2.1 Summary of Exposed Economic Value

Total exposed economic value in the Delta can be classified into economic activity that would be interrupted due to flood exposure and impacts to physical infrastructure and assets. For example, if a small business flooded that would interrupt the flow of their net sales and would affect the value of the physical building itself.

Economic Activity in the Delta includes both agricultural and commercial enterprises. Table 2-3 and Table 2-4 summarizes exposed economic activity in the Delta under each of the climate change scenarios. Exposed economic activity under the deterministic scenarios range from $265 million in 2030 under the 6” sea level rise scenario to $5.1 billion in 2050 under the 42” SLR scenario. Under the probabilistic scenarios exposure ranges from $65 to $203 million in the 2030 scenarios and from $1.2 to $1.8 billion under the 2050 scenarios.

Note that under the 2030 high probability scenario (E.5) flooding is only projected to impact areas in Suisun Marsh, and therefore agricultural activity exposed to flooding is zero.

Table 2-3. Total Exposed Economic Activity ($mil) Inside the Delta for Deterministic Scenarios

Activity	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Total Agricultural Activity	$21	$79	$111	$137
Total Commercial Activity	$244	$1,756	$2,242	$4,967
Total Economic Activity	**$265**	**$1,835**	**$2,353**	**$5,105**

Table 2-4. Total Exposed Economic Activity ($mil) Inside the Delta for Probabilistic Scenarios

Activity	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Total Agricultural Activity	$0	$21	$38	$79
Total Commercial Activity	$65	$182	$1,117	$1,763
Total Economic Activity	**$65**	**$203**	**$1,155**	**$1,842**

Other physical infrastructure and assets in the Delta include the parcel value of all agricultural, residential, and commercial improvements (not including the value of the land itself). These assets are typically valued at their assets' replacement value. (Note that these valuations lag actual full value due to the escalation limit of 2 percent per year imposed by Proposition 13.) While it is not certain that the asset will need to be fully replaced under all flooding conditions, its full replacement value represents the value that is exposed to flooding. Table 2-5 and Table 2-6 summarize the total exposed asset values under each scenario for the entire Delta.

Under the deterministic scenarios the value of exposed assets ranges from $2.5 billion under the 2030 scenario with 6 inches of sea level rise to $21.8 billion under the 2050 scenario with 42 inches of sea level rise. Under the probabilistic scenarios the value of exposed assets ranges from $507 million to $2.4 billion in 2030 and from $5.5 billion to $10.9 billion in 2050.

Table 2-5. Deterministic Scenarios Total Exposed Asset Value ($mil) Inside the Delta

Economic Value	E.1: 2030 6" SLR	E.2" 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Total Agricultural, Residential, and Commercial Property Value	$298	$3,822	$4,635	$10,206
Total Infrastructure Asset Value	$2,244	$7,070	$9,686	$11,615
Total Exposed Economic Value	**$2,542**	**$10,892**	**$14,321**	**$21,821**

Table 2-6. Probabilistic Scenarios Total Exposed Asset Value ($mil) Inside the Delta

Economic Value	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Total Agricultural, Residential, and Commercial Property Value	$27	$261	$1,048	$3,823
Total Infrastructure Asset Value	$480	$2,179	$4,495	$7,069
Total Exposed Economic Value	**$507**	**$2,440**	**$5,543**	**$10,892**

The following sections cover each asset category as outlined in Table 2-2 to describe how these value estimates were constructed and provide summaries for each by scenario and county. Detailed tables describing the exposure risks for activity and assets are included in Appendix B.

2.2.2 Agricultural Activity and Property

Agriculture plays a large role in the Delta economy, particularly in the Delta's primary zone, which is heavily dependent on agriculture and its supporting industries. In 2016 agriculture supported 12,367 jobs in the Delta and $1.7 billion in output (DPC 2019). About two-thirds of the Delta's area is productive farmland and 45 percent of the Delta is designated as Prime Farmland (Delta Stewardship Council 2021).

To represent how agriculture is exposed to flooding, this report provides the annual productivity value (value added) for crops that fall within projected flood maps. Annual and permanent crops may differ in how they are actually impacted by flooding, with the potential for permanent crops to have longer-term impacts. However, this report summarizes annual productivity value as a measure to easily compare climate change scenarios without additional assumptions on the extent of flooding, impact to different crops particularly between annual versus permanent

crops, and flood response efforts. These additional considerations can be taken up in developing the Delta's adaptation strategy.

The value of agricultural production is broken up into permanent and annual crops. Permanent crop productivity (the value added of annual production) exposed to flooding is summarized in Table 2-7 and Table 2-8. The same summary for annual crops is provided in Table 2-9 and Table 2-10.

Table 2-7. Permanent Crops Agricultural Production Exposed to Flooding--Net value Added ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Alameda	acres	0	0	0	0
Alameda	$	$0	$0	$0	$0
Contra Costa	acres	5	7	58	169
Contra Costa	$	$11	$16	$103	$364
Sacramento	acres	0	1,878	1,878	4,021
Sacramento	$	$0	$4,865	$4,865	$11,432
San Joaquin	acres	6,061	18,441	23,333	28,369
San Joaquin	$	$13,405	$46,163	$62,838	$72,987
Solano	acres	1	1	1	84
Solano	$	$2	$2	$2	$289
Yolo	acres	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	**acres**	**6,067**	**20,326**	**25,269**	**32,644**
Total	**$**	**$13,418**	**$51,046**	**$67,808**	**$85,071**

Table 2-8. Permanent Crops Agricultural Production Exposed to Flooding--Net value added ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	acres	0	0	0	0
Alameda	$	$0	$0	$0	$0
Contra Costa	acres	5	5	7	7
Contra Costa	$	$11	$11	$16	$16
Sacramento	acres	0	0	550	1,878
Sacramento	$	$0	$0	$1,681	$4,865
San Joaquin	acres	0	6,061	8,158	18,457
San Joaquin	$	$0	$13,405	$19,438	$46,213
Solano	acres	1	1	1	1
Solano	$	$2	$2	$2	$2
Yolo	acres	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	**acres**	**5**	**6,067**	**8,716**	**20,342**
Total	**$**	**$13**	**$13,418**	**$21,136**	**$51,096**

Table 2-9. Annual Crops Agricultural Production Exposed to Flooding--Net value added ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6” SLR	E.2: 2050 12” SLR	E.3: 2050 24” SLR	E.4: 2050 42” SLR
Alameda	acres	0	117	117	155
Alameda	$	$0	$22	$22	$27
Contra Costa	acres	187	5,896	11,376	13,111
Contra Costa	$	$2	$986	$2,418	$3,268
Sacramento	acres	1	11,759	14,570	15,377
Sacramento	$	$0	$3,596	$4,157	$4,395
San Joaquin	acres	13,295	48,982	74,661	85,427
San Joaquin	$	$7,460	$22,871	$36,420	$43,460
Solano	acres	2,403	2,720	2,759	5,638
Solano	$	$249	$260	$268	$971
Yolo	acres	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	**acres**	**15,886**	**69,473**	**103,483**	**119,708**
Total	**$**	**$7,711**	**$27,734**	**$43,285**	**$52,123**

Table 2-10. Annual Crops Agricultural Production Exposed to Flooding--Net value added ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	acres	0	0	0	117
Alameda	$	$0	$0	$0	$22
Contra Costa	acres	13	13	5,544	5,896
Contra Costa	$	$0	$0	$915	$986
Sacramento	acres	1	1	5,883	11,757
Sacramento	$	$0	$0	$1,769	$3,596
San Joaquin	acres	785	13,295	21,230	48,982
San Joaquin	$	$215	$7,460	$13,481	$22,871
Solano	acres	2,361	2,395	2,685	2,720
Solano	$	$242	$249	$252	$260
Yolo	acres	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	**acres**	**3,160**	**15,704**	**35,342**	**69,471**
Total	**$**	**$458**	**$7,709**	**$16,417**	**$27,734**

In addition to agricultural production, the category also considers the physical assets required to produce agricultural goods. For farming, this includes agricultural real estate parcels. Other agricultural equipment is not included in this analysis under the assumption that mobile equipment can be moved in anticipation of flooding. For livestock-based production assets include confined animal facilities. Once again, only the value of the physical facility is included rather than any mobile equipment. The total economic value of these assets is summarized by county in Table 2-11 and Table 2-12.

Table 2-11. Total Agricultural Assets Exposed to Flooding ($1000s) for Deterministic Scenarios

	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Alameda	$0	$0	$0	$180
Contra Costa	$0	$1,033	$5,540	$13,208
Sacramento	$33	$22,286	$24,859	$44,586
San Joaquin	$16,938	$49,117	$61,383	$79,919
Solano	$248	$248	$248	$2,467
Yolo	$0	$0	$0	$0
Total	**$17,219**	**$72,684**	**$92,030**	**$140,360**

Table 2-12. Total Agricultural Assets Exposed to Flooding ($1000s) for Probabilistic Scenarios

Scenario	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	$0	$0	$0	$0
Contra Costa	$0	$0	$1,033	$1,033
Sacramento	$33	$33	$6,666	$22,286
San Joaquin	$0	$16,938	$22,101	$49,117
Solano	$248	$248	$248	$248
Yolo	$0	$0	$0	$0
Total	**$281**	**$17,219**	**$30,048**	**$72,684**

Agricultural Production—Agricultural production for a single year is the metric used to evaluate flood risk exposure. The total damages would be a function of the total length of time that production is impacted. The estimated value of agricultural production are based on estimates of crop value for each county and each of the 36 crop types included in the LandIQ geographic data (LandIQ 2018). Because LandIQ data is based on remote sensing, it covers the entire Delta for one point in time in the summer, and therefore does not fully capture double cropping or winter crops. Other data sources such as the California Agricultural Commissioners and Sealers Association's (CACASA) dataset provides a better understanding of year round cropping patterns and was recently used by the Delta Protection Commission in their report on Delta Agriculture (Delta Protection Commission 2019) but is does not cover the entire Delta. Based on its complete coverage, this report relies on LandIQ data to provide estimates of agricultural land use in the Delta. These may underestimate some aspects of crop value in the Delta but still provide a useful comparison among climate change scenarios.

Estimates of economic value draw on agricultural commissioner crop reports for each of the six Delta counties (Alameda County Department of Weights and Measures 2018; Contra Costa

County Agricultural Commissioner 2018; Sacramento County Department of Agriculture 2018; San Joaquin County Department of Agriculture 2018; Solano County Agricultural Commissioner 2018; Yolo County Agricultural Commissioner 2018), which provide gross output and value (revenue) per acre for a variety of local crop categories. For any crop that was not reported specifically in the county crop report, an average value from the available data in the other counties was used.

To get from gross revenues to value added (revenues net of expenditures or 'net revenues'), the value that would be exposed to loss under a flooding scenario, we applied expenditure-to-output ratios from IMPLAN modelling software. IMPLAN is an input-output modelling software and is the industry standard for estimating regional economic impacts (See Appendix A). As such it includes both expenditure and output estimates by county and industry, including 10 agricultural categories. We mapped these categories to the 36 crop types to estimate net revenue.

Value-added estimates are shown in Table 2-13 by crop category and county. Note that any county crops that do not have a net revenue estimate are not shown to have that crop in production in the LandIQ geographic data (LandIQ 2018). The crop categories of flowers, nursery and Christmas tree farms, and young perennials cannot be estimated on a per acre basis as the other categories can and they were excluded from this analysis. Under the most severe scenario E-4 these categories comprise approximately 3,100 acres out of 62,200 acres exposed to flood risk.

Table 2-13. Crop Value Added per Acre (County Commissioners, IMPLAN)

Crop Category	Alameda	Contra Costa	Sacramento	San Joaquin	Solano	Yolo
Alfalfa and Alfalfa Mixtures	$130	$300	$490	$420	$300	$350
Almonds	$1,770	$2,040	$1,570	$3,170	$1,090	$1,760
Apples	N/A	$3,510	$3,070	$3,960	$3,080	$3,260
Beans (Dry)	N/A	$810	$840	$840	$700	N/A
Bush Berries	N/A	N/A	$15,230	$13,430	N/A	N/A
Carrots	N/A	N/A	$2,230	$2,270	N/A	N/A
Cherries	N/A	$2,470	$3,060	$2,130	$2,210	$2,340
Citrus	N/A	N/A	$7,500	N/A	$2,730	$3,160
Cole Crops	N/A	$2,260	$2,230	$2,270	N/A	N/A
Corn, Sorghum and Sudan	$210	$170	$260	$250	$170	$390
Grapes	$3,510	$2,360	$2,750	$2,090	$3,450	$2,620
Kiwis	N/A	N/A	$7,500	N/A	N/A	N/A
Lettuce/Leafy Greens	N/A	N/A	N/A	N/A	N/A	$994
Melons, Squash and Cucumbers	N/A	$2,460	$2,810	$2,240	$1,910	$2,140

Crop Category	Alameda	Contra Costa	Sacramento	San Joaquin	Solano	Yolo
Miscellaneous Deciduous	$3,510	$5,050	$6,290	$4,700	$2,730	$3,160
Miscellaneous Grain and Hay	$230	$160	$190	$650	$220	$130
Miscellaneous Grasses	$130	$300	$150	$420	$300	$350
Miscellaneous Subtropical Fruits	N/A	$5,050	N/A	N/A	N/A	N/A
Miscellaneous Truck Crops	$1,810	$2,260	$2,230	$2,270	$5,420	$990
Mixed Pasture	$10	$10	$40	$20	$10	$20
Olives	N/A	$1,050	N/A	$910	$3,120	$900
Onions and Garlic	N/A	$3,540	N/A	$3,220	N/A	$3,090
Peaches/Nectarines	N/A	$6,910	N/A	$3,450	N/A	$4,900
Pears	N/A	N/A	$4,110	$1,240	$2,250	$2,380
Peppers	N/A	$3,710	N/A	$3,370	N/A	N/A
Pistachios	N/A	$1,480	N/A	$2,290	$790	$1,270
Plums, Prunes and Apricots	N/A	$7,440	N/A	$4,030	$2,140	$2,620
Pomegranates	N/A	$5,050	N/A	$4,700	N/A	N/A
Potatoes and Sweet Potatoes	N/A	N/A	$2,470	$1,970	$1,680	$1,890
Rice	N/A	N/A	$1,060	$1,120	N/A	$990
Safflower	N/A	$500	$390	$610	$510	$470
Strawberries	N/A	$11,440	$12,340	$10,880	N/A	N/A
Sunflowers	N/A	N/A	N/A	N/A	$2,720	$100
Tomatoes	N/A	$1,510	$1,300	$1,430	$840	$1,070
Walnuts	N/A	$1,690	$1,130	$1,480	$1,150	$910
Wheat	N/A	$240	$340	$320	$260	$310

Agricultural Real Estate Parcels— County assessors' offices of the six Delta counties provided data on 2018 assessed property values for all parcels in the Delta as well as their zoned use (Alameda County Assessor's Office 2018; Contra Costa County Assessor's Office 2018; Sacramento County Assessor's Office 2018; San Joaquin County Assessor's Office 2018; Solano County Assessor's Office 2018; Yolo County Assessor's Office 2018; data provided by the Delta Stewardship Council). The value used in this analysis is the property improvement value, which includes the value of all improvements on a parcel but not the value of the land itself. We assume that under flood conditions all buildings and infrastructure on a parcel will be exposed to risk. The long-term value of the land itself is considered to not change under the assumption that the land can continue to be used in future years after flood conditions subside. However, this assumption may not hold if a flooded island is not recovered or if returning to production is deemed not to be financially feasible. We list one season's worth of agricultural activity as being

impacted, but the period will be further analyzed depending on response strategies and that impact is captured below under Agricultural Production.

Confined Animal Facility—The value of confined animal facilities in the Delta has been estimated in past asset exposure studies, most recently in DWR's 2013 Asset Exposure Information to Support Delta Levee Improvement Prioritization (DWR 2013). We do not anticipate the value of these facilities to have changed significantly over time. Therefore, we inflate the previously used values to 2020 dollars using the Construction Cost Index (USACE 2018) to arrive at a replacement value of $283,000 per confined animal facility. This represents the estimated cost of building a replacement facility and does not include the value of the underlying land.

2.2.3 Residential Property

Residential Property includes the value of homes and other improvements on residential parcels in the Delta. Note that this analysis only considers existing residential properties and does not factor in estimates of growth in residential construction. Total residential property values exposed to flood risk are summarized in Table 2-14 and Table 2-15. In the deterministic scenarios, the number of parcels exposed to flooding ranges from 1,364 under the 2030 scenario with 6 inches of sea level rise to 41,946 under the 2050 scenario with 42 inches of sea level rise. In the probabilistic scenarios exposed parcels range from 96 to 1,168 under the 2030 scenario and 5,095 to 15,744 under the 2050 scenarios, reflecting the high and medium-and-high combined probabilities. The corresponding appraised values of these parcel improvements are summarized in Table 2-14 and Table 2-15.

Table 2-14. Real estate parcels--value of parcel improvements ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Alameda	parcels	0	3	3	3
Alameda	$	$0	$210	$210	$210
Contra Costa	parcels	271	956	3,510	8,647
Contra Costa	$	$47,770	$282,258	$957,018	$2,598,465
Sacramento	parcels	0	431	472	492
Sacramento	$	$0	$44,263	$49,936	$53,384
San Joaquin	parcels	1,071	14,329	14,484	32,743
San Joaquin	$	$186,784	$2,329,202	$2,364,932	$5,076,020
Solano	parcels	22	24	34	61
Solano	$	$3,837	$4,316	$6,604	$11,989
Yolo	parcels	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	**parcels**	**1,364**	**15,743**	**18,503**	**41,946**
Total	**$**	**$238,391**	**$2,660,249**	**$3,378,700**	**$7,740,068**

Table 2-15. Real estate parcels--value of parcel improvements ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	parcels	0	0	0	3
Alameda	$	$0	$0	$0	$210
Contra Costa	parcels	75	75	453	956
Contra Costa	$	$13,846	$13,846	$79,055	$282,258
Sacramento	parcels	0	0	5	431
Sacramento	$	$0	$0	$1,241	$44,263
San Joaquin	parcels	0	1,071	4,613	14,330
San Joaquin	$	$0	$186,784	$553,889	$2,329,474
Solano	parcels	21	22	24	24
Solano	$	$3,668	$3,837	$4,316	$4,316
Yolo	parcels	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	**parcels**	**96**	**1,168**	**5,095**	**15,744**
Total	**$**	**$17,514**	**$204,467**	**$638,501**	**$2,660,521**

Based on the zoning codes from the county assessor data sets we identified residential properties. The value used in this analysis is the improvement value for each residential property, which includes the value of homes and other physical infrastructure but does not include the value of the land itself. The long-term value of the land itself is considered to not change under the assumption that the land can continue to be used in future years after flood conditions subside. However, this assumption may not hold if a flooded island is not recovered.

2.2.4 Commercial Activity and Property

This category covers the economic value of business and commercial activity and property exposed to flood risk under the climate change scenarios. The data underlying these estimates represent existing commercial development and activity. Estimates do not reflect planned growth or projected commercial activity in the future. Table 2-16 and Table 2-17 below summarize the annual commercial activity that is exposed to flooding under each scenario, represented by annual net value added from businesses. The second type of value that falls under this category is the value of all physical assets used to carry out commercial activities in the Delta such as commercial storefronts, warehouses, and offices. Table 2-18 and Table 2-19 summarize the value of commercial property exposed to flooding.

Each of these two values—commercial activity and commercial property—is explained in more detail below.

Table 2-16. Total Commercial Activity Exposed to Flooding ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Alameda	$	$0	$0	$0	$0
Contra Costa	$	$108,896	$180,188	$511,025	$885,203
Sacramento	$	$0	$82,168	$82,168	$83,163
San Joaquin	$	$117,069	$1,471,182	$1,625,507	$3,976,240
Solano	$	$18,052	$22,847	$22,847	$22,847
Yolo	$	$0	$0	$0	$0
Total	$	$244,017	$1,756,385	$2,241,547	$4,967,453

Table 2-17. Total Commercial Activity Exposed to Flooding ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	$	$0	$0	$0	$0
Contra Costa	$	$46,597	$46,597	$138,549	$180,188
Sacramento	$	$0	$0	$9,672	$82,168
San Joaquin	$	$0	$117,069	$946,413	$1,477,593
Solano	$	$18,052	$18,052	$22,847	$22,847
Yolo	$	$0	$0	$0	$0
Total	$	$64,649	$181,718	$1,117,481	$1,762,796

Table 2-18. Commercial Property Exposed to Flooding ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Alameda	parcels	0	1	1	1
Alameda	$	$0	$222	$222	$222
Contra Costa	parcels	25	42	194	256
Contra Costa	$	$7,753	$14,376	$68,301	$138,274
Sacramento	parcels	0	120	123	124
Sacramento	$	$0	$20,719	$21,154	$21,157
San Joaquin	parcels	37	580	626	1,366
San Joaquin	$	$33,599	$1,052,808	$1,073,203	$2,165,897
Solano	parcels	13	13	13	13
Solano	$	$5,185	$5,185	$5,185	$5,185
Yolo	parcels	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	parcels	75.00	756.00	957.00	1,760.00
Total	$	$46,537	$1,093,310	$1,168,065	$2,330,735

Table 2-19. Commercial Property Exposed to Flooding ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	parcels	0	0	0	1
Alameda	$	$0	$0	$0	$222
Contra Costa	parcels	12	12	34	42
Contra Costa	$	$4,261	$4,261	$13,144	$14,376
Sacramento	parcels	0	0	11	120
Sacramento	$	$0	$0	$2,601	$20,719
San Joaquin	parcels	0	37	302	582
San Joaquin	$	$0	$33,599	$362,337	$1,053,633
Solano	parcels	13	13	13	13
Solano	$	$5,185	$5,185	$5,185	$5,185
Yolo	parcels	0	0	0	0
Yolo	$	$0	$0	$0	$0
Total	parcels	25.00	62.00	360.00	758.00
Total	$	$9,446	$43,045	$383,267	$1,094,135

Commercial Property Value-- Based on the zoning codes from the county assessor data sets we identified commercial properties. The value used in this analysis is the improvement value for each commercial property, which includes the value of commercial buildings and other physical infrastructure but does not include the value of the land itself. We assume that all improvements on a property are subject to flood exposure, but that land will retain its real estate value once flood conditions subside. However, this assumption may not hold if a flooded island is not recovered.

Commercial Activity—This study relies on IMPLAN business data to capture commercial activity in the Delta. The real estate parcel GIS databases were used to identify individual parcels exposed to flood risk under each scenario. We used ESRI 2018 US Business Locations and Business Summary Data (ESRI 2018) based on business license data from Infogroup to estimate the proportions of each zip code's business activity that lie inside and outside of the Delta boundary. We then estimate the share of Delta businesses impacted flooding by dividing the number of commercially zoned parcels impacted under each scenario by the total number of commercial parcels in the Delta in each zip code. We use these proportions of business activity in the Delta and commercial parcels impacted to scale the IMPLAN data and create estimates of total activity splitting zip codes by whether it is within the Delta.

To estimate business activity we use the total annual output value for all non-agricultural industry codes net of intermediate expenses to arrive at a net value added estimate.

2.2.5 Infrastructure – Critical Facilities

Critical Facilities infrastructure includes critical local resources that are necessary to everyday life in the Delta. These include fire stations, hospitals, police stations, schools, wastewater facilities,

and prisons. All of these infrastructure types are valued at the amount it would cost to replace them, also known as replacement value. Replacement values have been used in past Delta flood exposure studies based on HAZUS estimates (Department of Homeland Security, Federal Emergency Management Agency 2012).

Table 2-20 and Table 2-21 provides a summary of the value of Critical Facilities Infrastructure by county. Detailed values and the number of facilities exposed to flood risk under each scenario are provided in Appendix B.

Table 2-20. Total Critical Facility Infrastructure Value Exposed to Flooding ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Alameda	$	$0	$0	$0	$0
Contra Costa	$	$99,681	$99,681	$200,129	$503,063
Sacramento	$	$0	$102,098	$102,098	$102,098
San Joaquin	$	$1,298,571	$2,874,065	$2,874,450	$2,907,046
Solano	$	$2,357	$2,357	$2,357	$2,357
Yolo	$	$0	$0	$0	$0
Total	**$**	**$1,400,609**	**$3,078,201**	**$3,179,034**	**$3,514,564**

Table 2-21. Total Critical Facility Infrastructure Value Exposed to Flooding ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	$	$0	$0	$0	$0
Contra Costa	$	$99,681	$99,681	$99,681	$99,681
Sacramento	$	$0	$0	$0	$102,098
San Joaquin	$	$0	$1,298,571	$2,571,568	$2,874,065
Solano	$	$2,357	$2,357	$2,357	$2,357
Yolo	$	$0	$0	$0	$0
Total	**$**	**$102,038**	**$1,400,609**	**$2,673,606**	**$3,078,201**

Value Estimates—All of the infrastructure types in this category are valued at their replacement cost according to HAZUS estimates as used in past Delta studies. All of these categories have been considered in past asset exposure studies, most recently in DWR's 2013 Asset Exposure Information to Support Delta Levee Improvement Prioritization (California Department of Water Resources 2013). We do not anticipate the replacement value of these facilities to have changed significantly over time. Therefore, we inflate the previously used values to 2020 dollars using the Construction Cost Index (USACE 2018) to arrive at replacement values for use in this study. These values are summarized in Table 2-22.

Table 2-22. Critical Facilities Infrastructure Replacement Values

Infrastructure type	Basis	Value
Fire Station	each	$2,357,000
Hospital	each	$17,341,000
Police	each	$2,033,000
Schools	each	$384,000
Wastewater Treatment Facilities	each—Small	$112,394,000
Wastewater Treatment Facilities	each—Large	$1,348,725,000
Prisons	each	$25,900,000

Source: Department of Homeland Security 2012.

2.2.6 Infrastructure – Communications

Communications Infrastructure types included in this analysis include Communication Facilities and Cell Towers. Both of these infrastructure types are valued at the amount it would cost to replace them, also known as replacement value

Table 2-23 and Table 2-24 provide a summary of the value of Critical Facilities Infrastructure by county. Detailed values and the number of facilities exposed to flood risk under each scenario are provided in Appendix A.

Table 2-23. Total Communications Infrastructure Value Exposed to Flooding ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6” SLR	E.2: 2050 12” SLR	E.3: 2050 24” SLR	E.4: 2050 42” SLR
Alameda	$	$0	$0	$0	$0
Contra Costa	$	$0	$0	$0	$0
Sacramento	$	$3,746	$4,092	$4,266	$4,439
San Joaquin	$	$0	$1,559	$1,559	$1,905
Solano	$	$0	$3,746	$3,746	$3,746
Yolo	$	$0	$0	$0	$0
Total	**$**	**$3,746**	**$9,397**	**$9,571**	**$10,090**

Table 2-24. Total Communications Infrastructure Value Exposed to Flooding ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	$	$0	$0	$0	$0
Contra Costa	$	$0	$0	$0	$0
Sacramento	$	$3,746	$3,746	$3,746	$4,092
San Joaquin	$	$0	$0	$173	$1,559
Solano	$	$0	$0	$3,746	$3,746
Yolo	$	$0	$0	$0	$0
Total	**$**	**$3,746**	**$3,746**	**$7,665**	**$9,397**

Value Estimates—These infrastructure types have been considered in past asset exposure studies, most recently in DWR's 2013 Asset Exposure Information to Support Delta Levee Improvement Prioritization (DWR 2013). We do not anticipate the replacement value of these facilities to have changed significantly over time. Therefore, we inflate the previously used values to 2020 dollars using the Construction Cost Index (USACE 2018) to arrive at replacement values for use in this study. These values are summarized in Table 2-25.

Table 2-25. Communication Value Estimates

Infrastructure category	unit	Value estimate	Source
Cell Tower	each	$173,000	DWR
Communications Facility	each	$3,746,000	HAZUS

2.2.7 Infrastructure – Transportation

Transportation infrastructure includes all of the roads, highways and other routes that are necessary to the movement of people and goods within and through the Delta. These include roads, highways, rail, airstrips, bridges, rail stations and bike routes. We do not place values on bridges, rail stations and bike routes. The remaining infrastructure types are valued at the amount it would cost to replace them, also known as replacement value. Replacement values have been used in past Delta flood exposure studies based on HAZUS estimates (DHS, FEMA 2012). Note that replacement value is a proxy for the value of exposed transportation infrastructure. While we do not expect that all transportation infrastructure would require replacement if it were exposed to flooding, replacement value is a common way to estimate the value of exposed assets in a way that is comparable under different scenarios.

Table 2-26 and Table 2-27 provide a summary of the value of Transportation Infrastructure by county. Detailed values and the number and length of infrastructure exposed to flood risk under each scenario are provided in Appendix B.

Table 2-26. Total Transportation Infrastructure Value Exposed to Flooding ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Alameda	$	$0	$0	$0	$281
Contra Costa	$	$18,366	$69,545	$203,243	$294,566
Sacramento	$	$3,106	$104,167	$134,012	$150,145
San Joaquin	$	$183,916	$627,098	$717,144	$1,001,239
Solano	$	$246,656	$258,765	$261,764	$371,076
Yolo	$	$157	$157	$157	$157
Total	**$**	**$452,201**	**$1,059,732**	**$1,316,320**	**$1,817,464**

Table 2-27. Total Transportation Infrastructure Value Exposed to Flooding ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	$	$0	$0	$0	$0
Contra Costa	$	$9,646	$9,646	$48,004	$69,545
Sacramento	$	$3,106	$3,106	$35,787	$103,380
San Joaquin	$	$6,655	$183,916	$312,744	$627,341
Solano	$	$245,817	$246,612	$258,165	$258,765
Yolo	$	$157	$157	$157	$157
Total	**$**	**$265,381**	**$443,437**	**$654,857**	**$1,059,188**

Value Estimates--For transportation infrastructure, past Delta studies have relied on 2012 HAZUS estimates of typical replacement costs on a per mile or per unit basis (DHS-FEMA 2012) to set asset values. We do not anticipate the value of these facilities to have changed significantly over time. On that basis, we inflate the previously used values to 2020 dollars using the Construction Cost Index (USACE 2018). These estimates are summarized in Table 2-28.

Bridges, Rail Stations, and Bike routes do not have an associated value estimate in Table 2-28 and are not included in the valuation analysis. We assume that bridges will have minimal exposure risk to flooding and will continue to be operational and retain their value after flood conditions subside. Rail stations are captured under the commercial real estate category of this study. Bike routes are assumed to be relatively low in replacement value and are excluded from this analysis. Although none of these infrastructure values are included in this analysis, we do provide a count of bridges, rail stations, and bike routes that fall within the flooding boundary under each scenario in Appendix B.

Table 2-28. Transportation value estimates

Facility	Estimate basis	Value
Roads All	per mile	$715,000
Highway	per mile	$2,430,000
County Highway	per mile	$1,429,000
Scenic Highway	per mile	$1,429,000
Railroad	per mile	$2,144,000
Airstrip	each	$220,000
Bridges	-	Not valued
Rail Stations	-	Not valued
Bike Routes	-	Not valued

2.2.8 Infrastructure – Water, Energy, and Utilities

Water, Energy and Utilities infrastructure includes water conveyance canals, aqueducts, and pipelines, active oil and gas wells, gas storage facilities, natural gas pipelines, electrical substations, power plants, and transmission lines. These infrastructure assets are all valued at their typical replacement cost from a variety of sources.

Table 2-29 and Table 2-30 provide a summary of the value of Water, Energy and Utility Infrastructure by county. Detailed values and the number and length of infrastructure exposed to flood risk under each scenario are provided in Appendix B.

Table 2-29. Total Water, Energy, and Utilities Infrastructure Value Exposed to Flooding ($1000s) for Deterministic Scenarios

County	Unit	E.1: 2030 6” SLR	E.2: 2050 12” SLR	E.3: 2050 24” SLR	E.4: 2050 42” SLR
Alameda	$	$0	$3,491	$3,491	$80,708
Contra Costa	$	$69,826	$124,817	$953,957	$1,423,588
Sacramento	$	$0	$457,208	$568,015	$578,686
San Joaquin	$	$218,056	$2,236,287	$3,554,298	$3,870,583
Solano	$	$99,148	$100,411	$101,273	$319,510
Yolo	$	$0	$0	$0	$0
Total	**$**	**$387,030**	**$2,922,214**	**$5,181,034**	**$6,273,075**

Table 2-30. Total Water, Energy, and Utilities Infrastructure Value Exposed to Flooding ($1000s) for Probabilistic Scenarios

County	Unit	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	$	$0	$0	$0	$3,491
Contra Costa	$	$14,400	$14,400	$81,487	$124,817
Sacramento	$	$0	$0	$69,472	$456,982
San Joaquin	$	$0	$218,056	$929,681	$2,236,856
Solano	$	$94,231	$99,148	$78,185	$100,411
Yolo	$	$0	$0	$0	$0
Total	**$**	**$108,631**	**$331,604**	**$1,158,825**	**$2,922,557**

Asset Values—Water, Energy and Utility infrastructure values are based on estimated replacement costs. We rely on past DWR Delta studies for the majority of these infrastructure value estimates, which originally are sourced from FEMA's HAZUS values, updating them to 2020 dollars (DWR 2013). Water conveyance replacement costs are based on estimates for the Mokelumne Aqueduct, though small portions of the Contra Costa Canal, North Bay Aqueduct, Delta Mendota Canal, Los Vaqueros Pipeline, and Victoria Canal are exposed to flood risk under Flooding Scenario M4. Typical replacement costs for water conveyance, natural gas pipelines, and oil pipelines are on a per mile basis.

Transmission line replacement values are based on Pacific Gas and Electric's (PG&E) 2018 Draft per Unit Cost Guide (PG&E 2018), which bases its estimates on the size of lines and the size and type of towers used with each line. Note that separate value estimates are not included for transmission line towers because the typical replacement value of towers is included in the transmission line estimates.

Table 2-31 summarizes the Water, Energy and Utility typical replacement costs, their unit bases and source. Note that all replacement value estimates have been escalated into 2020 dollars.

Table 2-31. Water, Energy, and Utility Infrastructure Value Estimates

Infrastructure category	unit	Subcategory	Value estimate	Source
Water Conveyance	mi	-	$37,731,000	DWR--HAZUS
Gas Well Active	each	-	$5,235,000	DWR--HAZUS
Gas Storage	each	-	$1,873,000	DWR--HAZUS
Natural Gas Station	each	-	$1,873,000	DWR--HAZUS
Nat Gas Pipeline	mi	-	$1,393,000	DWR--HAZUS
Oil Pipeline	mi	-	$1,572,000	DWR--HAZUS
Substation	each	Small (<110 kV)	$18,732,000	DWR--HAZUS
Substation	each	Large (110 and 220 kV)	$37,465,000	DWR--HAZUS
Operational Power Plant	each	Small (<500 MW)	$187,323,000	DWR--HAZUS
Operational Power Plant	each	Large (>=500 MW)	$936,615,000	DWR--HAZUS
Transmission Line	mi	60 kV lines/wood poles	$2,962,000	PG&E
Transmission Line	mi	115 kV lines/tubular steel poles	$2,962,000	PG&E
Transmission Line	mi	230 kV lines/steel towers	$4,039,000	PG&E
Transmission Line	mi	500 kV lines/steel towers	$5,282,000	PG&E
Transmission Line Tower		-	Included in Transmission line estimates	

2.2.9 Infrastructure – Other

Other infrastructure includes rock stockpiles, hazardous waste facilities, and solid waste sites. Although hazardous waste facilities and solid waste sites were considered in this analysis, none were impacted under any of the scenarios considered. One rock stockpile, used for flood response in the Delta is impacted in Solano County under several of the scenarios. Given that the intent of this rockpile is to be used in the flood scenarios, we ignore its value as it will have been used. However, because of the intermittent use of this resource and the relatively low value of its replacement we do not attach an asset value to these stockpiles.

2.2.10 Recreation and Culture

Recreation and Cultural Assets include regional and state parks, historical places, legacy towns, national historical landmarks, city parks, campgrounds and trails. These resources are part of the unique natural and historical character of the Delta. The majority of these resources have value that cannot be estimated readily in dollar terms. Some campgrounds, legacy towns, and regional parks are captured in terms of their property value in the commercial property section of this analysis. However, all of the assets have additional value beyond their simple replacement value.

Details on the number of recreation and cultural assets exposed to flood risk under each scenario are provided in Appendix B.

2.3 Summary

Exposed economic value in the Delta can be divided into the stock of productive assets or infrastructure, and the economic activity that would be exposed to interruption in the event of flooding. Both of these categories of economic value are exposed to risk under future climate-change related flooding scenarios.

Under the E.5 High probability scenario, estimated economic value exposed to flood risk is the lowest at $65 million in interrupted economic activity and $507 million in exposed infrastructure. Scenario E.4 with 42 inches of sea level rise is the scenario that poses the greatest risk of economic exposure at $5.1 billion in interrupted economic activity and $21.8 billion in exposed infrastructure. Table 2-32 and Table 2-33 summarize total exposed economic activity for all scenarios. Table 2-34 and Table 2-35 lay out total exposed asset values for all of the scenarios.

Note that these estimates are understating risk in particular to assets whose economic value cannot be easily quantified, such as recreational and cultural resources.

Table 2-32. Total Exposed Economic Activity ($mil) in the Delta for Deterministic Scenarios

Category	E.1: 2030 6” SLR	E.2: 2050 12” SLR	E.3: 2050 24” SLR	E.4: 2050 42” SLR
Agricultural Activity	$21	$79	$111	$137
Commercial Activity	$244	$1,756	$2,242	$4,967
Total	**$265**	**$1,835**	**$2,353**	**$5,105**

Table 2-33. Total Exposed Economic Activity ($mil) in the Delta for Probabilistic Scenarios

Category	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Agricultural Activity	$0	$21	$38	$79
Commercial Activity	$65	$182	$1,117	$1,763
Total	**$65**	**$203**	**$1,155**	**$1,842**

Table 2-34. Total Exposed Asset Value ($mil) in the Delta for Deterministic Scenarios

Category	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR
Agricultural, Residential, and Commercial Property Value	$298	$3,822	$4,635	$10,206
Infrastructure Asset Value	$2,244	$7,070	$9,686	$11,615
Total	**$2,542**	**$10,892**	**$14,321**	**$21,821**

Table 2-35. Total Exposed Asset Value ($mil) in the Delta for Probabilistic Scenarios

Category	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Agricultural, Residential, and Commercial Property Value	$27	$261	$1,048	$3,823
Infrastructure Asset Value	$480	$2,179	$4,495	$7,069
Total	**$507**	**$2,440**	**$5,543**	**$10,892**

CHAPTER 3. WATER SUPPLY IMPACTS

3.1 Overview

This analysis estimates the annual economic impact of changes to water supplies dependent on exports from the Sacramento-San Joaquin Delta resulting from future climate change affecting the Delta watershed and sea levels within the Delta. The water supply impacts modeled here result from either reduced deliverability to south of Delta water users across the simulated sequence of annual water conditions (i.e., hydrological trace) used to model water system operations or from a lengthy water project diversion outage in the Delta created by failure of a sufficiently large number of island levees that impedes exports. The changes in water deliveries are translated into economic impacts as follows:

- For agriculture: reduced water supplies result in reduced irrigated acreage and production.
- For urban agencies: reduced deliveries result in costs to obtain additional alternative supplies and cost to water users from unmet shortages created by curtailments.

The water supply impacts are generally expressed in lost annual economic activity because these are economic "flows" that are changing over time. This differs from the tangible assets within the Delta that are vulnerable to climate change risks which are a "stock" of economic value.

In addition, the agricultural vulnerability assessment incorporates assumptions about how the limitations on groundwater pumping in the Sustainable Groundwater Management Act (SGMA) will affect the region's agricultural output as part of the baseline conditions. That aspect is discussed further below.

3.2 Scenarios

As discussed above, Table 1-1 outlines the water supply scenarios that are considered in this analysis, and how they correspond to the broader economic analysis scenarios. The Delta Stewardship Council provided water delivery estimates under the climate change scenarios in Table 1-1 for water supply scenarios W-1 to W-7 based on their CalLite Central Valley Water Management Screening Model (see Water Supply Technical Memorandum). Modelling results CVP and SWP deliveries. This analysis focuses on the impact to water supplies that depend on Delta infrastructure for delivery, including CVP South of Delta and SWP South of Delta deliveries to Contra Costa, the Central Valley, and Southern California. Water supply scenario W-8 represents a total project outage for six months based on analysis previously done for the Delta Risk Management Strategy (DWR 2009).

The drought scenarios are measured over the last three years of a representative five-year drought approximating the 2012-2016 event. The last three years are used for several reasons. First, two-year dry sequences are quite common and the various water projects are generally operated to accommodate these events. It is the third year when the water supply community begins to express concerns and to act in extraordinary ways. Second, the State Water Resources

Control Board in setting the 2015 Emergency Drought Regulations target used 2013 urban water usage as the baseline for establishing reduction targets. Many utilities had already set conservation targets in 2014. This action acknowledged that the first two years were not unusual occurrences. Third, the agricultural impact studies assessed only the last three years of the five-year period from 2014 to 2016. This focus reflected the fact that agricultural practices generally did not change in the first two years except to increase groundwater pumping (which always occurs in dry years). These all added up to the drought impacts falling outside of the normal wet-dry sequence after two dry years.

3.3 Municipal and Industrial Water Supply and Economic Activity Vulnerability

Estimation of municipal and industrial (M&I) impacts is based on the modelled water delivery reduction under each of the water supply scenarios when compared to either (1) historical deliveries, or (2) in the case of the drought scenarios, when compared to average deliveries under climate change. Note that for the drought scenarios it is necessary to sum the incremental impact of the drought and the baseline expected climate change impacts. Estimated reductions are summarized in Table 3-1 by scenario.

Table 3-1. Modelled Average Annual Municipal and Industrial Deliveries for Each Scenario

Scenario	Total baseline CVP and SWP (AF)	Total projected SWP and CVP under future climate scenario (AF)	Projected Change in Deliveries (AF)	Projected Change in Deliveries (%)
E-9: 2030 6”	2,187,583[a]	2,075,227	-112,356	-5%
E-10: 2050 12”	2,187,583 [a]	2,050,603	-136,980	-6%
E-11: 2050 24”	2,187,583 [a]	1,970,909	-216,674	-10%
E-12: 2030	2,187,583 [a]	2,074,529	-113,053	-5%
E-13: 2030 Drought[c]	*2,074,529*[b]	917,231	-1,157,298	-56%
E-14: 2050	2,187,583 [a]	1,995,130	-192,453	-9%
E-15: 2050 Drought[d]	*1,995,130* [b]	786,427	-1,208,702	-61%

Scenario	Total baseline CVP and SWP (AF)	Total projected SWP and CVP under future climate scenario (AF)	Projected Change in Deliveries (AF)	Projected Change in Deliveries (%)
E-4/E-8: Delta Closure	2,187,583 [a]	-	-2,187,583	-100%

Notes:
a – Historical modelled annual average deliveries
b – Projected annual average deliveries with climate change effects
c - Based on E-12 scenario
d – Based on E-14 scenario

Economic impacts of changes to M&I water deliveries were estimated by placing a value on the projected long-term average reduction in water deliveries through the Delta. Because Metropolitan Water District of Southern California is the predominant urban agency in the region, receiving at least three-quarters of the urban deliveries, we use its planning assumptions as a proxy representation of the region as a whole. In the case of annual average, non-Delta closure scenarios, E-9, E-10, E-11, E-12, and E-14, the value of the reduced water is set at the replacement cost that M&I users south of the Delta are likely to face. In order to meet their historical demands, water agencies will need to acquire new sources of water, whether through a water transfer on the open market or through developing new local supplies. The cost of sourcing new supplies will vary depending on region, types of local supplies available, technology, and water year type. However, Metropolitan's water rates can serve as a proxy for the aggregate cost of new supplies. As the largest supplier of water south of the Delta, Metropolitan purchases water transfers north of the Delta and sells that water to its member agencies when they exceed their normal water supply allotment. The cost of those transfers, which is reflected in Metropolitan's Tier 2 water rates represent the marginal cost of additional water supplies beyond established imported and local sources. We applied Metropolitan's untreated Tier 2 price as the marginal cost of securing alternative supplies to meet total M&I demand south of the Delta. Met's Tier 2 price for 2020 is $842 per acre foot (Metropolitan Water District 2020). This value was escalated using Metropolitan's average projected rate increase net of inflation (Metropolitan uses an average rate increase of 3.7 percent, and assumes an inflation rate of 2.25 percent; Metropolitan Water District 2016). However, this price may escalate more rapidly if water availability becomes more scare or transfers become more physically difficult from Northern to Southern California. This assumption can be tested when evaluating adaptation strategies.

Drought impacts in E-13 and E-15 are valued differently to reflect the fact that local water supplies and water transfers north of the Delta will not be available to fully offset the reduction in M&I deliveries in drought years. The drought scenarios consider in particular the last three years of a five-year drought on par with the most severe droughts on record. The modeled sequence of conditions are quite similar to the 2012-2016 drought but driven by climate conditions expected at 2030 and 2050, Under these severe drought conditions water users

throughout the state are assumed to be required to conserve water, as was required by statewide executive order in response to the ongoing drought in 2015. Studies have estimated that this 25 percent cutback from 2013 consumption levels was associated with an estimated welfare loss of $2,113 per AF in Southern California (Buck et al. 2015). We use this estimate of foregone economic activity or benefits (also known as "welfare loss") as the economic cost of water supply reductions in the drought scenarios. The unit cost was escalated to the years 2030 and 2050 at the average projected economic growth in California GDP net of inflation, or 2.8 percent (California Department of Finance 2020).

In the Delta closure scenarios (E-4/E-8) we assume that South of Delta water agencies will rely on emergency supplies, including any groundwater and surface water storage to meet the demands of their district during a Delta outage assumed to last six months. For Southern California, we assume that Metropolitan Water District will provide most of those emergency supplies, with those areas outside of Metropolitan's service area (e.g., San Bernardino and Ventura counties) will rely on groundwater and interconnections with Metropolitan. Santa Clara Valley will rely on its intertie with Hetch Hetchy and the Central Valley municipalities will pump groundwater in a similar manner to the agricultural users. We assume that in the case of an interruption to water deliveries from the Delta, Metropolitan will make this water available to its members to replace SWP supplies. According to their *2015 Integrated Resources Plan: 2019 Report,* Metropolitan's current storage supplies include 750,000 AF of emergency supplies, 70,000 AF of additional water banking, and 3,200,000 AF of dry-year storage (Metropolitan Water District 2019). Even if we assume that Metropolitan will use only the emergency supply portion, it will still be able to cover a six-month interruption (assuming a 50 percent reduction in annual deliveries) to its average SWP supply of 1.5 MAF. Metropolitan is planning for its SWP supply to decrease over time to 1.2 MAF by 2040, so its emergency supplies would cover a portion greater than 50 percent in future years.

Since Metropolitan is assumed to meet its demand during a six-month Delta outage with supplies on-hand, the only cost in this scenario is the cost of replacing these emergency supplies over a future period. We assume that this would take place in the years after a Delta outage through transfers from north of the Delta. Because drawing down a large portion of its emergency supplies would leave the region in a vulnerable position, replacement is assumed to occur in all but critically dry future years. As a cost estimate, water acquisition costs provided by the California Water Commission in their Water Storage Investment Program (WSIP) Technical Reference for the year 2045 by water year are used (California Water Commission 2016). Those values are weighted by water year occurrence according to the historic San Joaquin Water Year Index to arrive at $613 per acre foot in 2020 dollars (Unit values in the Technical Reference are originally given in 2015 dollars. These values have been inflated to 2020 dollars using the Consumer Price Index; California Department of Finance 2020). We escalate that value to 2050 using the trend in values established in the WSIP technical reference (California Water Commission 2016). Shortages in the Central Coast and Santa Clara Valley are assumed to be met through a combination of groundwater pumping and more severe water conservation measures. The costs for Metropolitan's efforts are used as a proxy for those costs.

All of these water values are projected to 2030 or 2050 as appropriate for the scenario. Table 3-2 shows each of the values used and their projected values in 2030 and 2050.

Table 3-2. Municipal and Industrial Water Supply Proxy Values ($/AF)

Scenario	Proxy value description	Source proxy value	Source year	2030 proxy value	2050 proxy value
Non-drought	Alternative cost--Met Tier 2 Untreated	$842	2020	$939	$1,232
Drought	Welfare loss--Buck et al.	$2,113	2016	$3,109	$5,396
Delta-closure	Replacement cost--average year water transfer	$613	2045	-	$723

Applying the water values in Table 3-2 to the water supply impacts shown in Table 3-1 gives an estimate of the direct economic vulnerability of changes to M&I water deliveries through the Delta. Table 3-3 provides a summary of this direct economic vulnerability for each of the water supply scenarios.

Note that in the drought scenarios E-13 and E-15 the results in Table 3-2 reflect the economic vulnerability compared to projected average conditions including effects from climate change. These were calculated by applying the alternative cost to the delivery reduction caused by 2050 conditions and adding to the foregone economic activity or benefit lost due to a drought. Results are for a single year only, which for the drought scenarios is an average of years 3 through 5 of a five-year drought. We assume that the existing water supply system is well designed to be resilient during a one- to two-year drought which is experienced commonly in the historical record. California's water system has experienced significant stress and required extensive additional management steps during extended three- to five-year droughts such as those that occurred during 1928 to 1935, 1987 to 1994, and 2012 to 2016 (The extreme two-year drought of 1976-1977 is not modelled here, but the five-year drought is used as a proxy for potential drought costs).

Table 3-3. Vulnerable Municipal and Industrial Annual Economic Activity ($mil/yr)

Water Delivery Scenario	Annual Economic Impact
E-9: 2030 6" SLR	$105.5
E-10: 2050 12" SLR	$168.8
E-11: 2050 24" SLR	$267.0
E-12: 2030 range	$106.2
E-13: 2030 Drought	$3,352.3

Water Delivery Scenario	Annual Economic Impact
E-14: 2050 range	$237.2
E-15: 2050 Drought	$5,721.0
E-4/E-8: Delta Closure	$1,582.3

3.4 Agricultural Water Supply and Economic Activity Vulnerability

Table 3-4 summarized the current status of agriculture in the Central Valley counties that receive water supplies from the Delta. It shows the total annual agricultural output for 2018 as reported by agricultural commissioners to the U.S. Department of Agriculture National Agricultural Statistical Service. For the affected region these total about $35.4 billion. Over 8.7 million acres is under cultivation.

Table 3-4. Total Agricultural Output and Acreage for Affected Counties for 2018

County	Total Output Value	Acreage
Kern	$6,837,981,560	865,813
Tulare	$7,213,141,400	1,622,089
Kings	$2,351,982,500	813,164
Fresno	$7,654,106,090	1,935,808
Madera	$2,056,955,000	723,300
Merced	$3,165,962,000	1,100,680
Stanislaus	$3,569,989,000	944,370
San Joaquin	$2,594,221,000	709,050
Total	**$35,444,338,550**	**8,714,274**

Estimation of agricultural economic vulnerability is based on the modelled water delivery reductions under each of the water supply scenarios when compared to historical deliveries. We present a range of potential vulnerability derived from two recent studies assessing changes in water supply availability on Central Valley agriculture. The Delta Stewardship Council provided

water delivery estimates for agricultural water contractors under the climate change scenarios in Table 1-1 based on their CalLite Central Valley Water Management Screening Model. Modelling results include all Central Valley Project and State Water Project deliveries to regions south of the Delta. Note that for the drought scenarios it is necessary to sum the incremental impact of the drought and baseline impact of the climate scenario to arrive at the total impact compared to historical conditions. Estimated reductions are summarized in Table 3-5 by scenario.

Table 3-5. Modelled Annual Average Agricultural Deliveries for Each Scenario

Scenario	Total baseline CVP and SWP (AF)	Total projected SWP and CVP (AF)	Projected Change in Deliveries (AF)	Projected Change in Deliveries (%)
E-9: 2030 6”	1,693,623[a]	1,425,108	-268,516	-16%
E-10: 2030 12”	1,693,623[a]	1,335,838	-357,786	-21%
E-11: 2030 24”	1,693,623[a]	1,296,134	-397,490	-23%
E-12: 2030	1,693,623[a]	1,464,947	-228,677	-14%
E-13: 2030 Drought[c]	*1,464,947*[b]	444,740	-1,020,207	-70%
E-14: 2050	1,693,623[a]	1,305,852	-387,771	-23%
E-15: 2050 Drought[d]	*1,305,852*[b]	380,359	-925,493	-71%
E-4/E-8: Delta Closure	1,693,623[a]	0	-1,693,623	-100%

Notes:
a – Historic modelled annual average deliveries
b – Projected annual average deliveries with climate change effects
c - Based on E-12 scenario
d – Based on E-14 scenario

To carry out this analysis it is necessary to make some assumptions about how SGMA will impact groundwater usage in the state both before and after its full implementation. A portion of the projected reduction to project water supplies delivered south of the Delta is assumed to be replaced with groundwater sources under some scenarios. The practice of groundwater substitution plays a large part in offsetting reduced surface supplies during periods of drought in the Central Valley. We necessarily made assumptions about how SGMA would impact groundwater substitution in the short and in the long term. We assume that the need to bring overdrawn Central Valley groundwater basins into compliance with SGMA will require

groundwater recharge rather than extraction in an average non-drought year before 2040. After 2040, once all basins are planned to have reached compliance, we assume that managing basins at their sustainable yields will also reduce groundwater extraction substantially in non-drought, average-year conditions. For all encompassing, non-Delta outage scenarios in 2030 and 2050 we assume a groundwater substitution rate of 0 percent for replacing reduced surface water deliveries.

In years of drought and in the Delta outage scenario however, we assume that there will be significant groundwater substitution. In 2030, before SGMA compliance is reached, we assume that Central Valley growers will use groundwater substitution on a scale similar to that used in the final three years of the most recent 2012-2016 drought. During 2014, 2015, and 2016, Central Valley growers offset on average 79 percent of their reduced SWP and CVP deliveries with local groundwater (Howitt et al. 2014; Howitt et al. 2015; Medellin-Azuara et al. 2016). In 2050, once groundwater basins are required to operate at sustainable levels we assume a 20 percent groundwater substitution rate to reflect potential limits due to SGMA compliance. (This compares to the 79 percent substitution rate during the recent drought when no replacement was required.) This rate is based on an assumption that substitution over an extended drought will be limited to what can be replaced in a five-year period (At the moment, we have no other guidance in state law and regulations or from any other planning documents. We know the bounds on the parameters—there must be some level of recovery which means the substitution rate can't be 100 percent% or even as high as historic levels, but the substitution will not be limited 0 percent% since the point of groundwater pumping is provide as a buffer against drought conditions). We are not aware of any groundwater sustainability plans (GSP) that specify operating criteria under either extended drought or emergency conditions. Nevertheless, we must make a quantitative guess for this analysis at a reasonable recovery period that might be expected in typical GSPs. (This assumption can be varied in future analyses.)

The Delta outage scenario, though it is assumed to take place after the SGMA sustainability limit is in place near 2050, is assumed to rely on the historic levels of groundwater substitution experienced during the recent drought due to its unique and catastrophic nature for agriculture in the state. Since part of SGMA's stated purpose is to provide sustainable and reliable storage for emergency situations as described in the California Water Commission's Water Storage Investment Program Technical Guide, the unprecedented situation of a Delta outage would likely warrant levels of groundwater substitution consistent with historic responses to severe droughts. (California Water Commission 2016) Note that in the drought scenarios, the groundwater substitution rate applies only to the incremental impact of the drought and not to the baseline reduction due to projected climate change conditions. Table 3-6 shows the net water supply reduction in each scenario, accounting for any groundwater substitution.

Table 3-6. Water Supply Reduction with Groundwater Substitution

Scenario	Water supply reduction--baseline year (AF)	Water supply reduction--drought/ Delta outage (AF)	Groundwater substitution rate (applied to drought/ Delta outage reduction only)	Net water supply reduction (AF)
E-13: 2030 Drought	228,677	791,530	79%	393,487
E-15: 2050 Drought	387,771	537,722	20%	817,949
E-4/E-8: Delta outage	387,771	1,305,852	79%	659,672

To estimate how water supply cutbacks to agriculture impact agricultural output we rely on a study by the Public Policy Institute of California (PPIC) that estimates agricultural impacts from SGMA implementation. To estimate the total acreage of reduced agricultural production, we use the PPIC finding of 297 thousand acres of land fallowed for every million AF of water supply reduction in their SGMA scenario with local water trading only and other potential water supply reductions, including climate change. The PPIC results show the same acre/AF impact across scenarios with and without climate change. The impacts do vary across the local trading and valley-wide trading scenarios and across crop categories. It is therefore a simplification to apply these impacts across the economic scenarios in this report, but it provides a useful estimate of the impacts to agriculture. Generally, we would expect impacts to be non-linear so that smaller water supply reductions have a lower acre/AF impact and greater water supply reductions have a higher acre/AF impact. The estimates created here therefore provide a narrower band of estimates across the scenarios than we might see with more detailed agricultural modelling. However, as detailed agricultural modelling is beyond the scope of this analysis, PPIC's results in their climate change scenario provide the best fit estimate for how water supply impacts are likely to impact agriculture. Total acreage is apportioned to the following categories based on PPIC's results: cotton, grain, oilseed; feed and other crops; fruit and tree nuts; and vegetable and non-tree fruit (Medellin-Azuara et al. 2019). These results are summarized in Table 3-7.

Table 3-7. Acreage Reduction Impact by Crop Category (Thousands of Acres)

Scenario	Cotton, grain, oilseed	Feed, other crops	Fruit and tree nuts	Vegetable and non-tree fruit	Total
E-9: 2030 6”	39	21	16	4	80
E-10: 2030 12”	52	28	21	5	106
E-11: 2030 24”	58	31	24	6	118
E-12: 2030	33	18	14	3	68
E-13: 2030 Drought[a]	57	31	23	6	117
E-14: 2050	56	30	23	6	115
E-15: 2050 Drought[b]	119	64	49	12	243
E-4/E-8: Delta Closure	96	51	39	9	196

Notes:
a - Compared to E-12 scenario
b – Compared to E-14 scenario

To assign a value to these reductions in agricultural production in Scenarios E-9 to E-12 and E-14 we rely on three studies that have modeled agricultural impacts to the Central Valley. In addition to the PPIC study, a second study that has estimated the impact of SGMA-related supply reductions on California agriculture is by Sunding et al 2020. The changes in water supply deliveries for these two studies are quite similar to each other and to the projected reductions estimated in Delta Adapts for 2050. Sunding et al use income per acre and the PPIC report uses value added per acre, which are similar but not identical metrics; however, the two sets of values differ significantly across the first three crop categories. For the drought scenarios E-13 and E-15, this analysis also draws on a set of studies completed by UC Davis researchers that estimate the impact of the recent drought on agricultural output over the final three years of the five-year drought in the individual years 2014 to 2016 (Howitt et al. 2014; Howitt et al. 2015; Medellin-Azuara et al. 2016). Table 3-8 reports the values from all three sources, including an average value from the three drought-year studies. This analysis uses the PPIC and Sunding et al values to create a range of estimates for reduced crop value. For drought scenarios, the drought values are applied only to the incremental water supply reduction from drought.

Table 3-8. Crop Values per Acre for All Encompassing and Drought Scenarios ($/acre)

Crop Type	PPIC value added/acre	Sunding et al. income/acre	UC Davis drought studies--Average Values/acre
Cotton, grain, oilseed	$1,326	$533	$1,513
Feed, other crops	$1,628	$558	$1,485
Fruit and tree nuts	$5,938	$2,355	$4,998
Vegetable and non-tree fruit	$4,325	$4,446	$4,465

Applying these values to the reduced deliveries in Table 3-5 we arrive at estimates of the economic losses from reduced agricultural production in each climate scenario. Note that for the drought scenarios, results shown are only for the incremental drought impact. To calculate the net impact compared to the historical average water deliveries it is necessary to sum the impacts for the baseline climate year and the incremental drought impact. These results are summarized in Table 3-9.

In addition to the losses from reduced agricultural production, in the scenarios where groundwater is used to replace reduced SWP and CVP supplies we include the cost of replacing that groundwater. We assume that once SGMA compliance is reached, drawdowns in groundwater supply will need to be replaced within several years in order for groundwater basins to remain in compliance. This only applies to the 2050 drought scenario and the Delta outage scenario. For these two scenarios we use water values provided by the California Water Commission in their Water Storage Investment Program Technical Reference for the year 2045, escalated to 2050 based on the trend established in the Technical Reference (The WSIP Technical Reference provides unit values for 2030 and 2045. We use this trend to extrapolate unit values for the 2050 climate scenarios). For the drought scenario, we assume that groundwater will be replaced in subsequent above normal and wet years. For the Delta outage scenario, we assume that water agencies will need to replace their emergency supplies as quickly as possible in preparation for future unforeseen circumstances. We therefore assume that their replacement will take place in all subsequent years unless it is a critically dry year. Weighting by the occurrence of these future water years arrives at a value of $612 per AF for drought water replacement and $723 per AF for Delta outage water replacement. Applying these values to the volume of groundwater used to replace Delta delivery reductions yields an additional cost for these two scenarios. These costs and total costs by scenario are shown in Table 3-9. Among the deterministic scenarios, total agricultural production vulnerable to reduced water supplies is estimated from $87 to $198 million in Scenario E-9 to $149 to $292 million in Scenario E-11. The 2030 scenario shows vulnerable agricultural activity ranging from $74 to $168 million, increasing to $349 to $442 million under a severe drought scenario. By 2050 vulnerable production is projected to range from $126 to $285 million, increasing to $762 to $921 million with drought

conditions. The greatest impacts correspond to the Delta closure scenario, which has estimated vulnerable agricultural production ranging from $962 to $1,233 million.

Table 3-9. Vulnerable Agricultural Production ($mil/year)

Scenario	Reduced agricultural production--Lower end	Reduced agricultural production--Upper end	Groundwater replacement	Total compared to baseline conditions--Lower end	Total compared to baseline conditions--Upper end
E-9: 2030 6" SLR	$87	$198	-	**$87**	**$198**
E-10: 2030 12" SLR	$116	$263	-	**$116**	**$263**
E-11: 2030 24" SLR	$129	$292	-	**$129**	**$292**
E-12: 2030	$74	$168	-	**$74**	**$168**
E-13: 2030 Drought[a]	$274	$442	-	**$349**	**$442**
E-14: 2050	$126	$285	-	**$126**	**$285**
E-15: 2050 Drought[b]	$570	$855	$66	**$762**	**$921**
E-4/E-8: Delta Closure	$214	$485	$748	**$962**	**$1,233**

Notes:
a - Compared to E-12 scenario
b – Compared to E-14 scenario

CHAPTER 4. REFERENCES

Alameda County Assessor's Office. 2018. County-wide GIS Secured Roll parcel dataset

Alameda County Department of Agricultural Weights and Measures. 2018. Alameda County 2018 Crop Report. http://www.acgov.org/cda/awm/resources/stats.htm

Buck, S., et al. The Welfare Consequences of the 2015 California Drought Mandate: Evidence from New Results on Monthly Water Demand. Selected Paper prepared for presentation at the 2016 Agricultural & Applied Economics Association and Western Agricultural Economics Association Annual Meeting, Boston, Massachusetts, July 31-August 2.

California Department of Finance. 2020. California Economic Forecast. http://www.dof.ca.gov/Forecasting/Economics/Indicators/Gross_State_Product/

California Department of Finance. Consumer Price Index. http://www.dof.ca.gov/Forecasting/Economics/Indicators/Inflation/. Accessed: September 2020.

California Department of Water Resources. Asset exposure information to support Delta levee improvement prioritization. 2013. David Ford Consulting Engineers, Inc.

California Department of Water Resources. 2009. Delta Risk Management Strategy. https://www.waterboards.ca.gov/waterrights/water_issues/programs//bay_delta/california_waterfix/exhibits/docs/SJRECWA/sjrecwa_3.pdf

California Water Commission. 2016. Water Storage Investment Program Technical Reference. November 2016.

Contra Costa County Agricultural Commissioner. 2018. Contra Costa County Agricultural Crop Report 2018. https://www.contracosta.ca.gov/2207/Crop-and-Economic-Reports

Contra Costa County Assessor's Office. 2018. County-wide GIS Secured Roll parcel dataset

Delta Protection Commission. Economic Sustainability Plan for the Sacramento-San Joaquin River Delta. Executive Summary. 2012.

Delta Protection Commission. 2019. The State of Delta Agriculture: Economic Impact, Conservation and Trends.

Delta Stewardship Council. 2021. Crop Yield and Agriculture Production Technical Memorandum.

Delta Stewardship Council. 2021. Flood Hazard Technical Memorandum.

Department of Homeland Security, Federal Emergency Management Agency (FEMA). 2012. HAZUS-MH MR 5 Technical manual. Washington D.C. (February 2012).

ESRI. 2018. 2018 US Business Locations and Business Summary Data. https://doc.arcgis.com/en/esri-demographics/data/business.htm

Howitt, R.E., Medellin-Azuara, J., MacEwan, D., Lund, J.R. and Sumner, D.A. 2014. Economic Analysis of the 2014 Drought for California Agriculture. Center for Watershed Sciences, University of California, Davis, California. 20p.

Howitt, Richard E., Duncan MacEwan, and Josué Medellin-Azuara. 2011. "Drought, Jobs, and Controversy: Revisiting 2009." *Agricultural and Resource Economics Update*, V. 14 no. 6, Jul/Aug.

Howitt, R.E., Duncan MacEwan, Josué Medellín-Azuara, Jay R. Lund, Daniel A. Sumner. 2015. "Economic Analysis of the 2015 Drought for California Agriculture". Center for Watershed Sciences, University of California – Davis, Davis, CA, 16 pp.

IMPLAN Economic Impact Analysis for Planning. 2018. Implan.com

LandIQ. Agricultural Land Use Data Set. 2018. Landiq.com

Medellin-Azuara, J., MacEwan, D., Howitt, Richard E., Medellin-Azuara, Sumner, D.A. Lund, J.R. 2016. Economic Analysis of the 2016 California Drought on Agriculture. Center for Watershed Sciences, UC Davis. Davis, CA, 17 pp.

Medellin-Azuara, J. et al. 2019. Water and the Future of the San Joaquin Valley. Technical Appendix C: Potential Economic Impacts of Reducing Water Use on San Joaquin Valley Agriculture. Public Policy Institute of California. www.ppic.org/wp-content/uploads/0219ehr-appendix-c.pdf

Metropolitan Water District. 2020. http://mwdh2o.com/WhoWeAre/Management/Financial-Information. Accessed: September 2020.

Metropolitan Water District of Southern California. 2019 Report on IRP Implementation. http://www.mwdwatertomorrow.com/IRP/index.html

Metropolitan Water District. 2016. Ten-Year Financial Forecast. February 9, 2016 Board Meeting.

PG&E. 2018 Draft Per Unit Cost Guide. https://www.caiso.com/Documents/PG_E.2011ProposedPerUnitCostGuide.pdf

Sacramento County Assessor's Office. 2018. County-wide GIS Secured Roll parcel dataset

Sacramento County Department of Agriculture. 2018. 2018 Sacramento County Crop and Livestock Report. https://agcomm.saccounty.net/Pages/CropandLivestockReports.aspx

San Joaquin County Assessor's Office. 2018. County-wide GIS Secured Roll parcel dataset

San Joaquin County Department of Agriculture. 2018. 2018 San Joaquin County Crop Report. https://www.sjgov.org/department/agcomm/crop_reports

Solano County Agricultural Commissioner. 2018. Solano County 2018 Crop and Livestock Report. http://www.solanocounty.com/depts/agriculture/crop_report/2009_2018.asp

Solano County Assessor's Office. 2018. County-wide GIS Secured Roll parcel dataset

Sunding, D., D. Roland-Holst. Blueprint Economic Impact Analysis: Phase One Results. February 2020.

US Army Corps of Engineers. Civil Works Construction Cost Index System March 31, 2018. https://www.publications.usace.army.mil/Portals/76/Publications/EngineerManuals/EM_1110-2-1304_31_Mar_2018.pdf?ver=2018-08-15-111317-117

Yolo County Agricultural Commissioner. 2018. Yolo County Agricultural Crop Report. 2018. https://www.yolofarmbureau.org/p/getconnected/stay-updated/yolo-county-crop-reports

Yolo County Assessor's Office. 2018. County-wide GIS Secured Roll parcel dataset

CHAPTER 5. APPENDICES

APPENDIX A. IMPLAN

One tool used to estimate the relative size of different economic sectors within the study area, commercial activity, and agricultural activity for this analysis was the IMPLAN regional economic model.

IMPLAN is a widely accepted economic analysis tool used to value economic sectors and impacts. IMPLAN was originally developed by the USDA Forest Service for community impact analysis and is a standard tool used by the USDA Natural Resources Conservation Service and its partners to analyze watershed and conservation projects and programs. Input-output models such as IMPLAN use area-specific data on industrial and commercial activity to trace how a dollar of investment moves through a regional economy. These models are commonly used to evaluate economic activity in which changes in the total demand for output of the industries being studied results in changes in inputs and outputs by the local economic sectors. For example, these models have been used to estimate the impacts of such projects as construction and operation of new factories, development of tourism facilities, and military base closures. A study by the University of California found that IMPLAN produced an accurate estimate of actual job losses in the Central Valley related to the 2009 drought (Howitt et al, 2011).

IMPLAN draws from economic census data to compile county-level wage and salary information at the four-digit standard industrial code level. National data is adjusted for the subject region's industrial and trading patterns. Based on this structure, IMPLAN estimates the regional economic impact that would result from a dollar change in the output of local industries delivered to final demand (i.e., to ultimate purchasers, such as consumers outside the region).

More specifically, IMPLAN data provides estimated industry output, wage income, proprietary income, other property income, indirect business taxes, value added, and employment for 440 individual economic sectors. Depending on the region in question, some sectors will show no economic activity. For example, IMPLAN sector 7 – Tobacco Farming – shows no economic activity for most regions outside of the southern United States. IMPLAN sectoring is based on the federal North American Industrial Classification System (NAICS) and the individual sectors can be aggregated to the 2-digit and 3-digit NAICS level. Each measure of economic activity contained in the IMPLAN data set is defined as follows:

Industry or Economic Output represents the value of an industry's total production, including both value added and purchased inputs. The IMPLAN data are derived from a number of sources, including U.S. Bureau of Census economic censuses, U.S. Bureau of Economic Analysis output estimates, and the U.S. Bureau of Labor Statistics employment projections. These are aggregated up to estimate the total regional output.

Gross Regional Product (GRP) as an equivalent measure to value added which equals the sum of wage income, proprietor income, other property income, and indirect business taxes. It is akin to measures of gross domestic product (GDP), in that it indicates the portion of regional output generated by economic activity occurring *within* the region in question. It is the economic value *added* to the production process beyond purchased inputs such as raw materials, energy or labor from outside the region. We report the

Employment is reported as a single number of jobs (part- and full-time) for each industry. This differs from the full-time equivalent (FTE) measure often reported that adjusts total jobs for the number of hours worked per week (typically 40 hours).

Wage Income describes the total payroll costs (including benefits) of each industry in a region. It includes the wages and salaries of workers who are paid by employers, as well as benefits such as health and life insurance, retirement payments, and non-cash compensation.

Proprietary Income consists of payments received by self-employed individuals as income. Any income received for payment of self-employed work, as reported on Federal tax forms, is counted as proprietary income. This includes income received by private business owners, doctors, lawyers, and the like.

Other Property Income consists of payments for rents, royalties, and dividends. Payments to individuals in the form of rents received on property, royalties from contracts, and dividends paid by corporations are included here as well as corporate profits earned by corporations. The IMPLAN estimates of other property income are derived from U.S. Bureau of Economic Analysis Gross State Product data.

Taxes on Production & Imports consist of sales and excise taxes, customs duties, property taxes, motor vehicle licenses, severance taxes, other taxes, and special assessments. These taxes do not include nontax payments and subsidies. IMPLAN estimates of indirect business taxes are derived from U.S. Bureau of Economic Analysis data.

Personal Income is the measure of total household income in a region. It includes all sources of income, not just direct monetary income, such as salaries, wages, self-employment, retirement and interest, which is the metric reported by the U.S. Census Bureau. The additional categories included in personal income are equity and asset returns.

We report many of the most salient measures from the IMPLAN and other data sets in this impact analysis for reference. IMPLAN is used as the primary data set since IMPLAN will be used to assess any potential impacts. The other data is used to calibrate and reconcile the IMPLAN data where needed.

APPENDIX B. DETAILED ASSET AND ECONOMIC EXPOSURE BY COUNTY

This appendix provides detailed tables on asset and economic activity exposure by county.

5.1 Agricultural Activity and Property

Table 5-1. Agricultural Real Estate Parcels—Value of parcel improvements

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	2	2	4	-	-	-	2
Alameda	($)	$0	$0	$0	$180,000	$0	$0	$0	$0
Contra Costa	(n)	-	24	94	160	-	-	24	24
Contra Costa	($)	$0	$1,033,000	$5,540,000	$13,208,000	$0	$0	$1,033,000	$1,033,000
Sacramento	(n)	3	201	304	379	3	3	81	201
Sacramento	($)	$33,000	$22,286,000	$24,859,000	$44,586,000	$33,000	$33,000	$6,666,000	$22,286,000
San Joaquin	(n)	378	776	932	1,095	1	378	456	776
San Joaquin	($)	$13,261,000	$44,874,000	$57,140,000	$74,544,000	$0	$13,261,000	$18,424,000	$44,874,000
Solano	(n)	19	20	20	66	19	19	20	20
Solano	($)	$248,000	$248,000	$248,000	$2,467,000	$248,000	$248,000	$248,000	$248,000
Yolo	(n)	2	2	2	2	2	2	2	2
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	402	1,025	1,354	1,706	25	402	583	1,025
Delta Total	($)	$13,542,000	$68,441,000	$87,787,000	$134,985,000	$281,000	$13,542,000	$26,371,000	$68,441,000

Table 5-2. Agricultural Production, Permanent Crops--Net value added ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(acres)	0	0	0	0	0	0	0	0
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(acres)	5	7	58	169	5	5	7	7
Contra Costa	($1000s)	$11	$16	$103	$364	$11	$11	$16	$16
Sacramento	(acres)	0	1,878	1,878	4,021	0	0	550	1,878
Sacramento	($1000s)	$0	$4,865	$4,865	$11,432	$0	$0	$1,681	$4,865
San Joaquin	(acres)	6,061	18,441	23,333	28,369	0	6,061	8,158	18,457
San Joaquin	($1000s)	$13,405	$46,163	$62,838	$72,987	$0	$13,405	$19,438	$46,213
Solano	(acres)	1	1	1	84	1	1	1	1
Solano	($1000s)	$2	$2	$2	$289	$2	$2	$2	$2
Yolo	(acres)	0	0	0	0	0	0	0	0
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(acres)	6,067	20,326	25,269	32,644	5	6,067	8,716	20,342
Delta Total	($1000s)	$13,418	$51,046	$67,808	$85,071	$13	$13,418	$21,136	$51,096

Table 5-3. Agricultural Production, Field Crops--Net value added ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(acres)	0	117	117	155	0	0	0	117
Alameda	($1000s)	$0	$22	$22	$27	$0	$0	$0	$22
Contra Costa	(acres)	187	5,896	11,376	13,111	13	13	5,544	5,896
Contra Costa	($1000s)	$2	$986	$2,418	$3,268	$0	$0	$915	$986
Sacramento	(acres)	1	11,759	14,570	15,377	1	1	5,883	11,757
Sacramento	($1000s)	$0	$3,596	$4,157	$4,395	$0	$0	$1,769	$3,596
San Joaquin	(acres)	13,295	48,982	74,661	85,427	785	13,295	21,230	48,982
San Joaquin	($1000s)	$7,460	$22,871	$36,420	$43,460	$215	$7,460	$13,481	$22,871
Solano	(acres)	2,403	2,720	2,759	5,638	2,361	2,395	2,685	2,720
Solano	($1000s)	$249	$260	$268	$971	$242	$249	$252	$260
Yolo	(acres)	0	0	0	0	0	0	0	0
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(acres)	15,886	69,473	103,483	119,708	3,160	15,704	35,342	69,471
Delta Total	($1000s)	$7,711	$27,734	$43,285	$52,123	$458	$7,709	$16,417	$27,734

Table 5-4. Confined Animal Facilities Asset value

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	-	-	-	-	-
Contra Costa	($)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	(n)	-	-	-	-	-	-	-	-
Sacramento	($)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	13	15	15	19	-	13	13	15
San Joaquin	($)	$3,677,000	$4,243,000	$4,243,000	$5,375,000	$0	$3,677,000	$3,677,000	$4,243,000
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)								
Delta Total	($)	13	15	15	19	-	13	13	15

5.2 Residential Property

Table 5-5. Residential Real Estate Parcels—Value of parcel improvements ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(parcels)	0	3	3	3	0	0	0	3
Alameda	($1000s)	$0	$210	$210	$210	$0	$0	$0	$210
Contra Costa	(parcels)	271	956	3,510	8,647	75	75	453	956
Contra Costa	($1000s)	$47,770	$282,258	$957,018	$2,598,465	$13,846	$13,846	$79,055	$282,258
Sacramento	(parcels)	0	431	472	492	0	0	5	431
Sacramento	($1000s)	$0	$44,263	$49,936	$53,384	$0	$0	$1,241	$44,263
San Joaquin	(parcels)	1,071	14,329	14,484	32,743	0	1,071	4,613	14,330
San Joaquin	($1000s)	$186,784	$2,329,202	$2,364,932	$5,076,020	$0	$186,784	$553,889	$2,329,474
Solano	(parcels)	22	24	34	61	21	22	24	24
Solano	($1000s)	$3,837	$4,316	$6,604	$11,989	$3,668	$3,837	$4,316	$4,316
Yolo	(parcels)	0	0	0	0	0	0	0	0
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(parcels)	1,364	15,743	18,503	41,946	96	1,168	5,095	15,744
Delta Total	($1000s)	$238,391	$2,660,249	$3,378,700	$7,740,068	$17,514	$204,467	$638,501	$2,660,521

5.3 Commercial Activity and Property

Table 5-6. Commercial Real Estate Parcels—Value of parcel improvements ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(parcels)	0	1	1	1	0	0	0	1
Alameda	($1000s)	$0	$222	$222	$222	$0	$0	$0	$222
Contra Costa	(parcels)	25	42	194	256	12	12	34	42
Contra Costa	($1000s)	$7,753	$14,376	$68,301	$138,274	$4,261	$4,261	$13,144	$14,376
Sacramento	(parcels)	0	120	123	124	0	0	11	120
Sacramento	($1000s)	$0	$20,719	$21,154	$21,157	$0	$0	$2,601	$20,719
San Joaquin	(parcels)	37	580	626	1,366	0	37	302	582
San Joaquin	($1000s)	$33,599	$1,052,808	$1,073,203	$2,165,897	$0	$33,599	$362,337	$1,053,633
Solano	(parcels)	13	13	13	13	13	13	13	13
Solano	($1000s)	$5,185	$5,185	$5,185	$5,185	$5,185	$5,185	$5,185	$5,185
Yolo	(parcels)	0	0	0	0	0	0	0	0
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(parcels)	75.00	756.00	957.00	1,760.00	25.00	62.00	360.00	758.00
Delta Total	($1000s)	$46,537	$1,093,310	$1,168,065	$2,330,735	$9,446	$43,045	$383,267	$1,094,135

Table 5-7. Commercial Activity—Annual net revenues ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	($1000s)	$108,896	$180,188	$511,025	$885,203	$46,597	$46,597	$138,549	$180,188
Sacramento	($1000s)	$0	$82,168	$82,168	$83,163	$0	$0	$9,672	$82,168
San Joaquin	($1000s)	$117,069	$1,471,182	$1,625,507	$3,976,240	$0	$117,069	$946,413	$1,477,593
Solano	($1000s)	$18,052	$22,847	$22,847	$22,847	$18,052	$18,052	$22,847	$22,847
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	($1000s)	$244,017	$1,756,385	$2,241,547	$4,967,453	$64,649	$181,718	$1,117,481	$1,762,796

5.4 Infrastructure—Critical Facilities

Table 5-8. Critical Infrastructure—Totals by county ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	($1000s)	$99,681	$99,681	$200,129	$503,063	$99,681	$99,681	$99,681	$99,681
Sacramento	($1000s)	$0	$102,098	$102,098	$102,098	$0	$0	$0	$102,098
San Joaquin	($1000s)	$1,298,571	$2,874,065	$2,874,450	$2,907,046	$0	$1,298,571	$2,571,568	$2,874,065
Solano	($1000s)	$2,357	$2,357	$2,357	$2,357	$2,357	$2,357	$2,357	$2,357
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	($1000s)	$1,400,609	$3,078,201	$3,179,034	$3,514,564	$102,038	$1,400,609	$2,673,606	$3,078,201

Table 5-9. Critical Infrastructure—Fire Stations ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	1	1	2	6	1	1	1	1
Contra Costa	($1000s)	$2,357	$2,357	$4,713	$14,140	$2,357	$2,357	$2,357	$2,357
Sacramento	(n)	-	1	1	1	-	-	-	1
Sacramento	($1000s)	$0	$2,357	$2,357	$2,357	$0	$0	$0	$2,357
San Joaquin	(n)	3	8	8	9	-	3	5	8
San Joaquin	($1000s)	$7,070	$18,854	$18,854	$21,210	$0	$7,070	$11,784	$18,854
Solano	(n)	1	1	1	1	1	1	1	1
Solano	($1000s)	$2,357	$2,357	$2,357	$2,357	$2,357	$2,357	$2,357	$2,357
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	5	11	12	17	2	5	7	11
Delta Total	($1000s)	$11,784	$25,925	$28,281	$40,064	$4,714	$11,784	$16,498	$25,925

Table 5-10. Critical Infrastructure—Hospitals

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	-	-	-	-	-
Contra Costa	($)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	(n)	-	-	-	-	-	-	-	-
Sacramento	($)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	-	-	-	1	-	-	-	-
San Joaquin	($)	$0	$0	$0	$17,341,000	$0	$0	$0	$0
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	-	-	-	1	-	-	-	-
Delta Total	($)	$0	$0	$0	$17,341,000	$0	$0	$0	$0

Table 5-11. Critical Infrastructure—Police Stations

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	-	-	-	-	-
Contra Costa	($)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	(n)	-	1	1	1	-	-	-	1
Sacramento	($)	$0	$2,033,000	$2,033,000	$2,033,000	$0	$0	$0	$2,033,000
San Joaquin	(n)	-	-	-	2	-	-	-	-
San Joaquin	($)	$0	$0	$0	$4,065,000	$0	$0	$0	$0
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	-	1	1	3	-	-	-	1
Delta Total	($)	$0	$2,033,000	$2,033,000	$6,098,000	$0	$0	$0	$2,033,000

Table 5-12. Critical Infrastructure—Public Schools

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	2	5	-	-	-	-
Contra Costa	($)	$0	$0	$768,000	$1,920,000	$0	$0	$0	$0
Sacramento	(n)	-	1	1	1	-	-	-	1
Sacramento	($)	$0	$384,000	$384,000	$384,000	$0	$0	$0	$384,000
San Joaquin	(n)	1	17	18	36	-	1	8	17
San Joaquin	($)	$384,000	$6,529,000	$6,914,000	$13,827,000	$0	$384,000	$3,073,000	$6,529,000
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	1	18	21	42	-	1	8	18
Delta Total	($)	$384,000	$6,913,000	$8,066,000	$16,131,000	$0	$384,000	$3,073,000	$6,913,000

Table 5-13. Critical Infrastructure—Private Schools

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	1	-	-	-	-
Contra Costa	($)	$0	$0	$0	$384,000	$0	$0	$0	$0
Sacramento	(n)	-	-	-	-	-	-	-	-
Sacramento	($)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	-	1	1	6	-	-	1	1
San Joaquin	($)	$0	$384,000	$384,000	$2,305,000	$0	$0	$384,000	$384,000
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	-	1	1	7	-	-	1	1
Delta Total	($)	$0	$384,000	$384,000	$2,689,000	$0	$0	$384,000	$384,000

Table 5-14. Critical Infrastructure—Wastewater Treatment Facilities ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	1	1	2	6	1	1	1	1
Contra Costa	($1000s)	$97,324	$97,324	$194,648	$486,619	$97,324	$97,324	$97,324	$97,324
Sacramento	(n)	-	1	1	1	-	-	-	1
Sacramento	($1000s)	$0	$97,324	$97,324	$97,324	$0	$0	$0	$97,324
San Joaquin	(n)	3	8	8	9	-	3	5	8
San Joaquin	($1000s)	$1,265,210	$2,822,391	$2,822,391	$2,822,391	$0	$1,265,210	$2,530,420	$2,822,391
Solano	(n)	1	1	1	1	1	1	1	1
Solano	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	5	11	12	17	2	5	7	11
Delta Total	($1000s)	$1,362,534	$3,017,039	$3,114,363	$3,406,334	$97,324	$1,362,534	$2,627,744	$3,017,039

Table 5-15. Critical Infrastructure—Prisons ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	-	-	-	-	-
Contra Costa	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	(n)	-	-	-	-	-	-	-	-
Sacramento	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	1	1	1	1	-	1	1	1
San Joaquin	($1000s)	$25,907	$25,907	$25,907	$25,907	$0	$25,907	$25,907	$25,907
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	1	1	1	1	-	1	1	1
Delta Total	($1000s)	$25,907	$25,907	$25,907	$25,907	$0	$25,907	$25,907	$25,907

5.5 Infrastructure—Communications

Table 5-16. Communications Infrastructure—Totals by county ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	($1000s)	$3,746	$4,092	$4,266	$4,439	$3,746	$3,746	$3,746	$4,092
San Joaquin	($1000s)	$0	$1,559	$1,559	$1,905	$0	$0	$173	$1,559
Solano	($1000s)	$0	$3,746	$3,746	$3,746	$0	$0	$3,746	$3,746
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	($1000s)	$3,746	$9,397	$9,571	$10,090	$3,746	$3,746	$7,665	$9,397

Table 5-17. Communications Infrastructure—Communications Facilities

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	-	-	-	-	-
Contra Costa	($)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	(n)	1	1	1	1	1	1	1	1
Sacramento	($)	$3,746,000	$3,746,000	$3,746,000	$3,746,000	$3,746,000	$3,746,000	$3,746,000	$3,746,000
San Joaquin	(n)	-	-	-	-	-	-	-	-
San Joaquin	($)	$0	$0	$0	$0	$0	$0	$0	$0
Solano	(n)	-	1	1	1	-	-	1	1
Solano	($)	$0	$3,746,000	$3,746,000	$3,746,000	$0	$0	$3,746,000	$3,746,000
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	1	2	2	2	1	1	2	2
Delta Total	($)	$3,746,000	$7,492,000	$7,492,000	$7,492,000	$3,746,000	$3,746,000	$7,492,000	$7,492,000

Table 5-18. Communications Infrastructure—Cell Towers

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	-	-	-	-	-
Contra Costa	($)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	(n)	-	2	3	4	-	-	-	2
Sacramento	($)	$0	$346,000	$520,000	$693,000	$0	$0	$0	$346,000
San Joaquin	(n)	-	9	9	11	-	-	1	9
San Joaquin	($)	$0	$1,559,000	$1,559,000	$1,905,000	$0	$0	$173,000	$1,559,000
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	-	11	12	15	-	-	1	11
Delta Total	($)	$0	$1,905,000	$2,079,000	$2,598,000	$0	$0	$173,000	$1,905,000

5.6 Infrastructure—Transportation

Table 5-19. Transportation Infrastructure—Totals by county ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	($1000s)	$0	$0	$0	$281	$0	$0	$0	$0
Contra Costa	($1000s)	$18,366	$69,545	$203,243	$294,566	$9,646	$9,646	$48,004	$69,545
Sacramento	($1000s)	$3,106	$104,167	$134,012	$150,145	$3,106	$3,106	$35,787	$103,380
San Joaquin	($1000s)	$183,916	$627,098	$717,144	$1,001,239	$6,655	$183,916	$312,744	$627,341
Solano	($1000s)	$246,656	$258,765	$261,764	$371,076	$245,817	$246,612	$258,165	$258,765
Yolo	($1000s)	$157	$157	$157	$157	$157	$157	$157	$157
Delta Total	($1000s)	$452,201	$1,059,732	$1,316,320	$1,817,464	$265,381	$443,437	$654,857	$1,059,188

Table 5-20. Transportation Infrastructure—Roads ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	0	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$3	$0	$0	$0	$0
Contra Costa	(miles)	23	94	272	394	11	11	64	94
Contra Costa	($1000s)	$16,519	$67,411	$194,510	$281,474	$7,933	$7,933	$45,870	$67,411
Sacramento	(miles)	4	103	132	151	4	4	48	103
Sacramento	($1000s)	$3,106	$73,771	$94,264	$107,602	$3,106	$3,106	$34,406	$73,445
San Joaquin	(miles)	157	570	666	987	9	157	287	571
San Joaquin	($1000s)	$112,175	$407,534	$476,153	$705,592	$6,655	$112,175	$205,327	$407,777
Solano	(miles)	312	329	333	474	311	312	328	329
Solano	($1000s)	$223,268	$235,200	$238,036	$339,031	$222,429	$223,224	$234,600	$235,200
Yolo	(miles)	0	0	0	0	0	0	0	0
Yolo	($1000s)	$157	$157	$157	$157	$157	$157	$157	$157
Delta Total	(miles)	497	1,097	1,404	2,007	336	485	728	1,097
Delta Total	($1000s)	$355,225	$784,073	$1,003,120	$1,433,859	$240,280	$346,595	$520,360	$783,990

Table 5-21. Transportation Infrastructure—Highways ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(miles)	-	-	-	1	-	-	-	-
Contra Costa	($1000s)	$0	$0	$0	$2,275	$0	$0	$0	$0
Sacramento	(miles)	-	6	6	6	-	-	-	6
Sacramento	($1000s)	$0	$14,075	$14,075	$14,075	$0	$0	$0	$13,913
San Joaquin	(miles)	18	56	62	79	-	18	25	56
San Joaquin	($1000s)	$43,631	$136,112	$150,840	$193,079	$0	$43,631	$60,376	$136,112
Solano	(miles)	2	2	2	4	2	2	2	2
Solano	($1000s)	$3,755	$3,755	$3,756	$9,543	$3,755	$3,755	$3,755	$3,755
Yolo	(miles)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	20	63	69	90	2	20	26	63
Delta Total	($1000s)	$47,386	$153,942	$168,671	$218,972	$3,755	$47,386	$64,131	$153,780

Table 5-22. Transportation Infrastructure—County Highways ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	0	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$111	$0	$0	$0	$0
Contra Costa	(miles)	-	-	-	0	-	-	-	-
Contra Costa	($1000s)	$0	$0	$0	$208	$0	$0	$0	$0
Sacramento	(miles)	-	1	1	1	-	-	1	1
Sacramento	($1000s)	$0	$1,381	$1,381	$1,381	$0	$0	$1,381	$1,381
San Joaquin	(miles)	5	16	17	23	-	5	10	16
San Joaquin	($1000s)	$6,893	$22,487	$23,759	$32,715	$0	$6,893	$14,001	$22,487
Solano	(miles)	-	-	-	-	-	-	-	-
Solano	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(miles)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	5	17	18	24	-	5	11	17
Delta Total	($1000s)	$6,893	$23,868	$25,140	$34,415	$0	$6,893	$15,382	$23,868

Table 5-23. Transportation Infrastructure—Scenic Highways ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(miles)	0	0	0	0	0	0	0	0
Contra Costa	($1000s)	$251	$251	$251	$340	$251	$251	$251	$251
Sacramento	(miles)	-	10	17	19	-	-	-	10
Sacramento	($1000s)	$0	$14,940	$24,292	$27,087	$0	$0	$0	$14,641
San Joaquin	(miles)	-	-	-	-	-	-	-	-
San Joaquin	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Solano	(miles)	-	-	-	-	-	-	-	-
Solano	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(miles)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	0	11	17	19	0	0	0	10
Delta Total	($1000s)	$251	$15,191	$24,543	$27,427	$251	$251	$251	$14,892

Table 5-24. Transportation Infrastructure—Railroads ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	0	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$167	$0	$0	$0	$0
Contra Costa	(miles)	1	1	4	5	1	1	1	1
Contra Costa	($1000s)	$1,596	$1,883	$8,262	$10,049	$1,462	$1,462	$1,883	$1,883
Sacramento	(miles)	-	-	-	-	-	-	-	-
Sacramento	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(miles)	10	28	31	32	-	10	15	28
San Joaquin	($1000s)	$21,217	$60,745	$65,951	$69,412	$0	$21,217	$32,820	$60,745
Solano	(miles)	9	9	9	10	9	9	9	9
Solano	($1000s)	$19,633	$19,810	$19,972	$22,502	$19,633	$19,633	$19,810	$19,810
Yolo	(miles)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	20	38	44	48	10	20	25	38
Delta Total	($1000s)	$42,446	$82,438	$94,185	$102,130	$21,095	$42,312	$54,513	$82,438

Table 5-25. Transportation Infrastructure—Air Strips

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	0	0	1	1	0	0	0	0
Contra Costa	($)	$0	$0	$220,000	$220,000	$0	$0	$0	$0
Sacramento	(n)	0	0	0	0	0	0	0	0
Sacramento	($)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	0	1	2	2	0	0	1	1
San Joaquin	($)	$0	$220,000	$441,000	$441,000	$0	$0	$220,000	$220,000
Solano	(n)	0	0	0	0	0	0	0	0
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	0	0	0	0	0	0	0	0
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	0	1	3	3	0	0	1	1
Delta Total	($)	$0	$220,000	$661,000	$661,000	$0	$0	$220,000	$220,000

Table 5-26. Transportation Infrastructure—Bridges

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	1	0	0	0	0
Contra Costa	(n)	0	1	7	8	0	0	1	1
Sacramento	(n)	0	1	1	1	0	0	0	1
San Joaquin	(n)	19	60	62	88	0	19	32	60
Solano	(n)	1	1	1	5	1	1	1	1
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	20	63	71	103	1	20	34	63

Table 5-27. Transportation Infrastructure—Rail Stations

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	1	1	1	1	1	1	1	1
Sacramento	(n)	0	0	0	0	0	0	0	0
San Joaquin	(n)	0	0	0	1	0	0	0	0
Solano	(n)	0	0	0	0	0	0	0	0
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	1	1	1	2	1	1	1	1

Table 5-28. Transportation Infrastructure—Bike Routes

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	0	0	0	0	0	0	0	0
Contra Costa	(miles)	0	0	0	0	0	0	0	0
Sacramento	(miles)	0	0	0	0	0	0	0	0
San Joaquin	(miles)	1	13	13	39	0	1	2	13
Solano	(miles)	1	2	3	4	1	1	2	2
Yolo	(miles)	0	0	0	0	0	0	0	0
Delta Total	(miles)	2	15	16	43	1	2	4	15

5.7 Infrastructure – Water, Energy, and Utilities

Table 5-29. Water, Energy and Utility Infrastructure—Totals by County (1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	($1000s)	$0	$3,491	$3,491	$80,708	$0	$0	$0	$3,491
Contra Costa	($1000s)	$69,826	$124,817	$953,957	$1,423,588	$14,400	$14,400	$81,487	$124,817
Sacramento	($1000s)	$0	$457,208	$568,015	$578,686	$0	$0	$69,472	$456,982
San Joaquin	($1000s)	$218,056	$2,236,287	$3,554,298	$3,870,583	$0	$218,056	$929,681	$2,236,856
Solano	($1000s)	$99,148	$100,411	$101,273	$319,510	$94,231	$99,148	$78,185	$100,411
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	($1000s)	$387,030	$2,922,214	$5,181,034	$6,273,075	$108,631	$331,604	$1,158,825	$2,922,557

Table 5-30. Water, Energy and Utility Infrastructure—Water Conveyance ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	1	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$38,711	$0	$0	$0	$0
Contra Costa	(miles)	0	0	9	14	0	0	0	0
Contra Costa	($1000s)	$11,761	$13,861	$344,888	$515,601	$11,082	$11,082	$13,861	$13,861
Sacramento	(miles)	-	-	-	-	-	-	-	-
Sacramento	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(miles)	-	16	35	35	-	-	-	16
San Joaquin	($1000s)	$0	$586,943	$1,306,817	$1,306,817	$0	$0	$0	$586,943
Solano	(miles)	-	-	-	1	-	-	-	-
Solano	($1000s)	$0	$0	$0	$28,722	$0	$0	$0	$0
Yolo	(miles)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	0	16	44	50	0	0	0	16
Delta Total	($1000s)	$11,761	$600,804	$1,651,705	$1,889,851	$11,082	$11,082	$13,861	$600,804

Table 5-31. Water, Energy and Utility Infrastructure—Active Wells ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	2	2	2	-	-	2	2
Contra Costa	($1000s)	$0	$10,470	$10,470	$10,470	$0	$0	$3,144	$10,470
Sacramento	(n)	-	75	77	78	-	-	32	75
Sacramento	($1000s)	$0	$392,637	$403,107	$408,343	$0	$0	$50,308	$392,637
San Joaquin	(n)	14	28	114	114	-	14	20	28
San Joaquin	($1000s)	$73,292	$146,585	$596,808	$596,808	$0	$73,292	$31,443	$146,585
Solano	(n)	6	6	6	24	6	6	6	6
Solano	($1000s)	$31,411	$31,411	$31,411	$125,644	$31,411	$31,411	$9,433	$31,411
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	20	111	199	218	6	20	60	111
Delta Total	($1000s)	$104,703	$581,103	$1,041,796	$1,141,265	$31,411	$104,703	$94,328	$581,103

Table 5-32. Water, Energy and Utility Infrastructure—Gas Storage

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	-	-	-	-	-	-
Contra Costa	($)	$0	$0	$0	$0	$0	$0	$0	$0
Sacramento	(n)	-	-	-	-	-	-	-	-
Sacramento	($)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	-	-	1	1	-	-	-	-
San Joaquin	($)	$0	$0	$1,873,000	$1,873,000	$0	$0	$0	$0
Solano	(n)	-	-	-	-	-	-	-	-
Solano	($)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	-	-	1	1	-	-	-	-
Delta Total	($)	$0	$0	$1,873,000	$1,873,000	$0	$0	$0	$0

Table 5-33. Water, Energy and Utility Infrastructure—Natural Gas Station ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	1	2	8	9	-	-	1	2
Contra Costa	($1000s)	$1,873	$3,746	$14,986	$16,859	$0	$0	$1,873	$3,746
Sacramento	(n)	-	11	15	15	-	-	4	11
Sacramento	($1000s)	$0	$20,606	$28,098	$28,098	$0	$0	$7,493	$20,606
San Joaquin	(n)	3	8	28	29	-	3	4	8
San Joaquin	($1000s)	$5,620	$14,986	$52,450	$54,324	$0	$5,620	$7,493	$14,986
Solano	(n)	3	3	3	11	3	3	3	3
Solano	($1000s)	$5,620	$5,620	$5,620	$20,606	$5,620	$5,620	$5,620	$5,620
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	7	24	54	64	3	6	12	24
Delta Total	($1000s)	$13,113	$44,958	$101,154	$119,887	$5,620	$11,240	$22,479	$44,958

Table 5-34. Water, Energy and Utility Infrastructure—Natural Gas Pipeline ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	-	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(miles)	2	10	26	36	2	2	3	10
Contra Costa	($1000s)	$3,371	$14,056	$36,911	$49,742	$2,486	$2,486	$3,875	$14,056
Sacramento	(miles)	-	26	63	63	-	-	8	25
Sacramento	($1000s)	$0	$35,687	$87,961	$88,142	$0	$0	$11,671	$35,461
San Joaquin	(miles)	11	39	64	81	-	11	21	39
San Joaquin	($1000s)	$15,293	$53,806	$89,832	$112,647	$0	$15,293	$29,945	$53,893
Solano	(miles)	14	15	15	31	12	14	15	15
Solano	($1000s)	$20,001	$20,452	$20,883	$42,881	$17,069	$20,001	$20,452	$20,452
Yolo	(miles)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	28	89	169	211	14	27	47	89
Delta Total	($1000s)	$38,665	$124,001	$235,587	$293,412	$19,555	$37,780	$65,943	$123,862

Table 5-35. Water, Energy and Utility Infrastructure—Oil Pipeline ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	-	-	0	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$131	$0	$0	$0	$0
Contra Costa	(miles)	0	0	3	4	-	-	0	0
Contra Costa	($1000s)	$176	$176	$4,910	$7,006	$0	$0	$176	$176
Sacramento	(miles)	-	-	-	-	-	-	-	-
Sacramento	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(miles)	1	11	17	17	-	1	6	11
San Joaquin	($1000s)	$1,664	$17,426	$26,800	$26,981	$0	$1,664	$9,250	$17,426
Solano	(miles)	21	21	21	22	20	21	21	21
Solano	($1000s)	$33,359	$33,708	$33,708	$34,337	$31,674	$33,359	$33,614	$33,708
Yolo	(miles)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	22	33	42	44	20	22	27	33
Delta Total	($1000s)	$35,199	$51,310	$65,418	$68,455	$31,674	$35,023	$43,040	$51,310

Table 5-36. Water, Energy and Utility Infrastructure—Substations (1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	1	-	-	-	-
Alameda	($1000s)	$0	$0	$0	$37,465	$0	$0	$0	$0
Contra Costa	(n)	1	1	2	5	-	-	1	1
Contra Costa	($1000s)	$37,465	$37,465	$74,929	$131,126	$0	$0	$37,465	$37,465
Sacramento	(n)	-	-	-	-	-	-	-	-
Sacramento	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	3	16	17	23	-	3	9	16
San Joaquin	($1000s)	$56,197	$299,717	$318,449	$449,575	$0	$56,197	$168,591	$299,717
Solano	(n)	-	-	-	2	-	-	-	-
Solano	($1000s)	$0	$0	$0	$37,465	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
Yolo	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	4	17	19	31	-	3	10	17
Delta Total	($1000s)	$93,662	$337,182	$393,378	$655,631	$0	$56,197	$206,056	$337,182

Table 5-37. Water, Energy and Utility Infrastructure—Power Plants ($1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Contra Costa	(n)	-	-	2	3	-	-	-	-
	($1000s)	$0	$0	$374,646	$561,969	$0	$0	$0	$0
Sacramento	(n)	-	-	-	-	-	-	-	-
	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
San Joaquin	(n)	-	5	5	5	-	-	3	5
	($1000s)	$0	$936,615	$936,615	$936,615	$0	$0	$561,969	$936,615
Solano	(n)	-	-	-	-	-	-	-	-
	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Yolo	(n)	-	-	-	-	-	-	-	-
	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(n)	-	5	7	8	-	-	3	5
	($1000s)	$0	$936,615	$1,311,261	$1,498,584	$0	$0	$561,969	$936,615

Table 5-38. Water, Energy and Utility Infrastructure—Transmission Lines (1000s)

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(miles)	-	2	2	3	-	-	-	2
	($1000s)	$0	$3,491	$3,491	$4,401	$0	$0	$0	$3,491
Contra Costa	(miles)	8	21	44	71	1	1	11	21
	($1000s)	$15,180	$45,043	$92,217	$130,815	$832	$832	$21,093	$45,043
Sacramento	(miles)	-	4	23	29	-	-	-	4
	($1000s)	$0	$8,278	$48,849	$54,103	$0	$0	$0	$8,278
San Joaquin	(miles)	46	135	161	257	-	46	86	136
	($1000s)	$65,990	$180,209	$224,654	$384,943	$0	$65,990	$120,990	$180,691
Solano	(miles)	5	5	5	14	5	5	5	5
	($1000s)	$8,757	$9,220	$9,651	$29,855	$8,457	$8,757	$9,066	$9,220
Yolo	(miles)	-	-	-	-	-	-	-	-
	($1000s)	$0	$0	$0	$0	$0	$0	$0	$0
Delta Total	(miles)	59	167	235	373	5	51	102	168
	($1000s)	$89,927	$246,241	$378,862	$604,117	$9,289	$75,579	$151,149	$246,723

5.8 Infrastructure—Other

Table 5-39. Other Infrastructure—Rock Stockpiles

County	Unit	E.1: 2030 6” SLR	E.2: 2050 12” SLR	E.3: 2050 24” SLR	E.4: 2050 42” SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	0	0	0	0	0	0	0	0
Sacramento	(n)	0	0	0	0	0	0	0	0
San Joaquin	(n)	0	0	0	0	0	0	0	0
Solano	(n)	0	1	1	1	0	0	1	1
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	0	1	1	1	0	0	1	1

Table 5-40. Other Infrastructure—Hazardous Waste Facilities

County	Unit	E.1: 2030 6” SLR	E.2: 2050 12” SLR	E.3: 2050 24” SLR	E.4: 2050 42” SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	0	0	0	0	0	0	0	0
Sacramento	(n)	0	0	0	0	0	0	0	0
San Joaquin	(n)	0	0	0	0	0	0	0	0
Solano	(n)	0	0	0	0	0	0	0	0
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	0	0	0	0	0	0	0	0

Table 5-41. Other Infrastructure—Solid Waste Sites

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	0	0	0	0	0	0	0	0
Sacramento	(n)	0	0	0	0	0	0	0	0
San Joaquin	(n)	0	0	0	0	0	0	0	0
Solano	(n)	0	0	0	0	0	0	0	0
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	0	0	0	0	0	0	0	0

5.9 Recreation and Culture

Table 5-42. Recreation and Culture—Regional Parks

County	Unit	E.1	E.2	E.3	E.4	E.5	E.6	E.7	E.8
County	Unit	**E.1: 2030 6” SLR**	**E.2: 2050 12” SLR**	**E.3: 2050 24” SLR**	**E.4: 2050 42” SLR**	**E.5: 2030 High Prob**	**E.6: 2030 High + Med Prob**	**E.7: 2050 High Prob**	**E.8: 2050 High + Med Prob**
Alameda	(n)	-	-	-	-	-	-	-	-
Contra Costa	(n)	-	-	1	4	-	-	-	-
Sacramento	(n)	-	1	1	1	-	-	-	1
San Joaquin	(n)	-	5	5	8	-	-	1	5
Solano	(n)	-	-	-	-	-	-	-	-
Yolo	(n)	-	-	-	-	-	-	-	-
Delta Total	(n)	-	6	7	13	-	-	1	6

Table 5-43. Recreation and Culture—State Parks

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	-	-	-	-	-	-	-	-
Contra Costa	(n)	-	-	-	-	-	-	-	-
Sacramento	(n)	-	1	1	1	-	-	-	-
San Joaquin	(n)	-	-	-	-	-	-	-	-
Solano	(n)	-	-	-	-	-	-	-	-
Yolo	(n)	-	1	1	1	-	-	-	-
Delta Total	(n)	-	1	1	1	-	-	-	-

Table 5-44. Recreation and Culture—Historic Places

County	Unit	E.1	E.2	E.3	E.4	E.5	E.6	E.7	E.8
County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	0	0	1	1	0	0	0	0
Sacramento	(n)	0	1	1	1	0	0	0	1
San Joaquin	(n)	0	3	3	7	0	0	2	3
Solano	(n)	0	0	0	0	0	0	0	0
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	0	4	5	9	0	0	2	4

Table 5-45. Recreation and Culture—Legacy Towns

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	0	0	1	1	0	0	0	0
Sacramento	(n)	0	1	1	1	0	0	0	1
San Joaquin	(n)	0	0	0	0	0	0	0	0
Solano	(n)	1	1	1	1	1	1	1	1
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	1	2	3	3	1	1	1	2

Table 5-46. Recreation and Culture—National Historic Landmarks

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	0	0	0	0	0	0	0	0
Sacramento	(n)	0	0	0	0	0	0	0	0
San Joaquin	(n)	0	0	0	0	0	0	0	0
Solano	(n)	0	0	0	0	0	0	0	0
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	0	0	0	0	0	0	0	0

Table 5-47. Recreation and Culture—City Parks

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	3	3	3	8	0	0	3	3
Sacramento	(n)	0	3	3	3	0	0	0	3
San Joaquin	(n)	1	19	20	40	0	1	6	19
Solano	(n)	1	1	1	1	1	1	1	1
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	5	26	27	52	1	2	10	26

Table 5-48. Recreation and Culture—Campgrounds

County	Unit	E.1: 2030 6" SLR	E.2: 2050 12" SLR	E.3: 2050 24" SLR	E.4: 2050 42" SLR	E.5: 2030 High Prob	E.6: 2030 High + Med Prob	E.7: 2050 High Prob	E.8: 2050 High + Med Prob
Alameda	(n)	0	0	0	0	0	0	0	0
Contra Costa	(n)	0	0	2	2	0	0	0	0
Sacramento	(n)	0	6	8	8	0	0	0	6
San Joaquin	(n)	0	7	8	9	0	0	1	7
Solano	(n)	0	0	0	0	0	0	0	0
Yolo	(n)	0	0	0	0	0	0	0	0
Delta Total	(n)	0	13	18	19	0	0	1	13

Table 5-49. Recreation and Culture—Trails

County	Unit	E.1	E.2	E.3	E.4	E.5	E.6	E.7	E.8
County	Unit	**E.1: 2030 6" SLR**	**E.2: 2050 12" SLR**	**E.3: 2050 24" SLR**	**E.4: 2050 42" SLR**	**E.5: 2030 High Prob**	**E.6: 2030 High + Med Prob**	**E.7: 2050 High Prob**	**E.8: 2050 High + Med Prob**
Alameda	(miles)	0	0	0	0	0	0	0	0
Contra Costa	(miles)	8	9	14	23	3	3	9	9
Sacramento	(miles)	1	30	44	45	1	1	29	16
San Joaquin	(miles)	0	7	7	7	0	0	7	0
Solano	(miles)	0	0	0	0	0	0	0	0
Yolo	(miles)	0	0	0	0	0	0	0	0
Delta Total	(miles)	9	46	65	75	4	4	46	25