California Environmental Protection Agency

Central Coast Regional Water Quality Control Board

Total Maximum Daily Loads to Address Organophosphate Pesticides and Toxicity Impairments within the Lower Salinas River Watershed

Monterey County, California

Draft TMDL Report

February 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Description
Basin Plan	Water Quality Control Plan for the Central Coastal Basin
CDPR	California Department of Pesticide Regulation
CDFW	California Department of Fish and Wildlife (formerly California Department of Fish and Game)
CCAMP	Central Coast Ambient Monitoring Program
CCC	Criterion Continuous Concentration
CMC	Criterion Maximum Concentration
CMP	Cooperative Monitoring Program
GIS	Geographic Information System
NLCD	National Land Cover Database
OP	Organophosphate
PUR	Pesticide Use Report
SLR	Sea Level Rise
SWRCB	State Water Quality Control Board
TIEs	Toxicity Identification Evaluations
TMDL	Total Maximum Daily Load
TST	Test of Significant Toxicity
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey

1 BACKGROUND

On May 5, 2011, the Central Coast Regional Water Quality Control Board (Central Coast Water Board) adopted Resolution R3-2011-0005 which established total maximum daily loads (TMDLs) for chlorpyrifos and diazinon in the lower Salinas River watershed. In accordance with the Water Quality Control Policy for Addressing Impaired Waters (Impaired Waters Policy; SWRCB, 2005), the TMDLs were adopted as a single regulatory action (single vote) rather than an amendment to the Water Quality Control Plan for the Central Coastal Basin (Basin Plan). The Impaired Water Policy states:

“When an implementation plan can be adopted in a single regulatory action, such as a permit, a waiver, or an enforcement order, there is no legal requirement to first adopt the plan through a basin plan amendment. The plan may be adopted directly in that single regulatory action.”

The single vote approval by the Central Coast Water Board found that the TMDLs for chlorpyrifos and diazinon would be implemented via the Conditional Waiver of Waste Discharge Requirements for Irrigated Lands (Agricultural Order) along with its’ accompanying Monitoring and Reporting Program. On October 7, 2011, these TMDLs were subsequently approved by the United States Environmental Protection Agency (USEPA).

Central Coast Water Board staff (staff) is in the process of developing new TMDLs in the lower Salinas River watershed, as contained herein, for water column toxicity (toxicity) and three organophosphate (OP) pesticides (chlorpyrifos, diazinon, and malathion). These new TMDLs will be proposed as an amendment to the Basin Plan and will supersede the TMDLs that were formerly approved in 2011.

2 INTRODUCTION

The following TMDL Report contains information that will address OP pesticides and toxicity-related impairments within waterbodies of the lower Salinas River watershed.

Several waterbodies within the lower Salinas River watershed are on the federal Clean Water Act section 303(d) List of impaired waterbodies (303(d) List) due to one or more of the following conditions: excessive concentrations of OP pesticides chlorpyrifos, diazinon, and malathion, or toxicity as shown in Table 2-1.

Table 2-1. Organophosphate pesticide and toxicity impaired waterbodies on the 303(d) List in the lower Salinas River watershed.

Water Body Name	Water Body Identification	Impairment
Alisal Creek	CAR3097009519990222130537	toxicity
Alisal Slough	CAR3091101020090311204028	diazinon, toxicity
Blanco Drain	CAR3091101019981209161509	chlorpyrifos, diazinon, toxicity
Chualar Creek	CAR3091900020080604161337	chlorpyrifos, diazinon, malathion, toxicity
Espinosa Lake	CAL3091900020020117151744	chlorpyrifos, diazinon,
Espinosa Slough	CAR3091101019981230135152	diazinon, malathion, toxicity
Gabilan Creek	CAR3091900019990304092345	toxicity
Merritt Ditch	CAR3091101020080604152147	diazinon, toxicity
Moro Cojo Slough	CAE3060001519981209132246	toxicity
Moss Landing Harbor	CAB3060001419981214121135	chlorpyrifos, diazinon
Old Salinas River Estuary	CAE3060001419981214143807	chlorpyrifos, diazinon
Natividad Creek	CAR3091101020050531125140	diazinon, toxicity
Old Salinas River	CAR3091101020080611145518	chlorpyrifos, diazinon, toxicity
Quail Creek	CAR3091900020011227140647	chlorpyrifos, diazinon, malathion, toxicity
Salinas Reclamation Canal	CAR3091101019980828112229	chlorpyrifos, diazinon, malathion, toxicity
Salinas River (lower, estuary to near Gonzales Rd)	CAR3091101020021007193102	chlorpyrifos, diazinon, toxicity
Salinas River Lagoon (North)	CAE3091101019980828143232	chlorpyrifos, toxicity
Tembladero Slough	CAR3091101019981209131830	chlorpyrifos, diazinon, malathion, toxicity

The federal Clean Water Act requires every state to evaluate its waterbodies and maintain a list of waters that are impaired because the water does not achieve water quality standards[1] (Clean Water Act section 303(d) List). For central coast waterbodies that are on the 303(d) List, the Central Coast Water Board must develop and implement a plan to reduce pollutants so that the waterbody is no longer impaired and can be removed from the 303(d) List.

[1] USEPA defines water quality standards as consisting of three elements: designated uses for each waterbody, criteria to protect those uses, and consideration of the anti-degradation requirements.

Total maximum daily load (TMDL) is a term used to describe the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. A TMDL project identifies the probable sources of pollution, establishes TMDLs (the maximum amount of pollution a waterbody can receive and still meet water quality standards), and allocates that amount to all probable contributing sources. TMDL projects are essentially plans or strategies to restore clean water, and thus a TMDL report is a type of planning document. The California Water Plan characterizes TMDLs as *"action plans…to improve water quality."*

Central Coast Water Board staff (staff) anticipates that this TMDL project will ultimately result in a Basin Plan amendment to incorporate TMDLs for chlorpyrifos, diazinon, malathion, and toxicity into the Basin Plan.

2.1 Pollutants and Conditions Addressed

The pollutants addressed in this TMDL are the OP pesticides chlorpyrifos, diazinon, and malathion. In addition, this TMDL also broadly addresses the condition of toxicity.

Chlorpyrifos, diazinon, and malathion have been detected in surface waters at concentrations that do not meet water quality objectives and, as a result, impair aquatic life beneficial uses (see Section 6.3 for a Summary of OP Pesticide Water Quality Data). The three OP pesticides share the same mode of action and have individual and additive toxic effects on aquatic invertebrates. Table 2-2 summarizes the properties of each pesticide including soil half-life, soil sorption, water half-life, and water solubility.

Chlorpyrifos is a broad-spectrum OP insecticide that was first registered for use on food and feed crops in 1965. In 2019, California Department of Pesticide Regulation (CDPR) announced the cancellation of chlorpyrifos, ending its use on crops by December 31, 2020. Chlorpyrifos was also a widely used residential pesticide until 2001 when USEPA canceled residential use of chlorpyrifos. The properties of chlorpyrifos include relatively low water solubility, a relatively high soil sorption coefficient, and moderate half-life in soil and water.

Diazinon is a broad-spectrum contact OP insecticide. It was a very widely used home lawn and garden pesticide until residential use was restricted. In 2004 all residential sales of diazinon were stopped. Diazinon is currently used on agricultural crops within the lower Salinas River watershed, primarily strawberries and beets.

Malathion is a broad-spectrum residential and agricultural insecticide. Malathion is currently used on agricultural crops within the lower Salinas River watershed, primarily lettuce, strawberries, celery, and berries. It has a short half-life in water and soil, is highly soluble, and has a low intermediate soil sorption coefficient. These properties make malathion susceptible to run-off into surface waters and leaching into ground water.

Table 2-2. Summary of Pesticide Properties.

Common Name	Soil Half-life (days)	Adsorption Coefficient (soil Koc [1])	Water Half-life (days) Neutral pH	Water Solubility (mg/L)
Chlorpyrifos	30	6070	35-78	0.4
Diazinon	40	1000	138	60
Malathion	1	1800	1-17.4	130

Source: National Pesticide Information Center (NPIC) fact sheets.
[1] Organic carbon-water partition coefficient

From 2006 to 2018, concentrations of chlorpyrifos and diazinon in waterbodies of the lower Salinas River watershed have decreased significantly, while malathion concentrations have significantly increased over the same period (see Section 6.4 for temporal trends).

In addition to the three OP pesticides mentioned above, this TMDL also addresses the condition of toxicity. All waterbodies within the lower Salinas River watershed exhibit significant toxicity to one or more test species using the survival endpoint (see Section 6.5 for an analysis of toxicity data). Staff reviewed available toxicity sublethal effects, as measured by growth or reproduction endpoints, and concluded that all waterbodies exhibiting toxicity impairment due to the significant mortality also exhibit significant sublethal effects (growth and/or reproduction). This condition does not attain the toxicity water quality objective.

3 TMDL PROJECT LOCATION

This project will develop TMDLs for waterbodies of the lower Salinas River watershed (watershed) that are impaired due to excessive levels of chlorpyrifos, diazinon, malathion, as well as toxicity. Figure 3-1 depicts the project location.

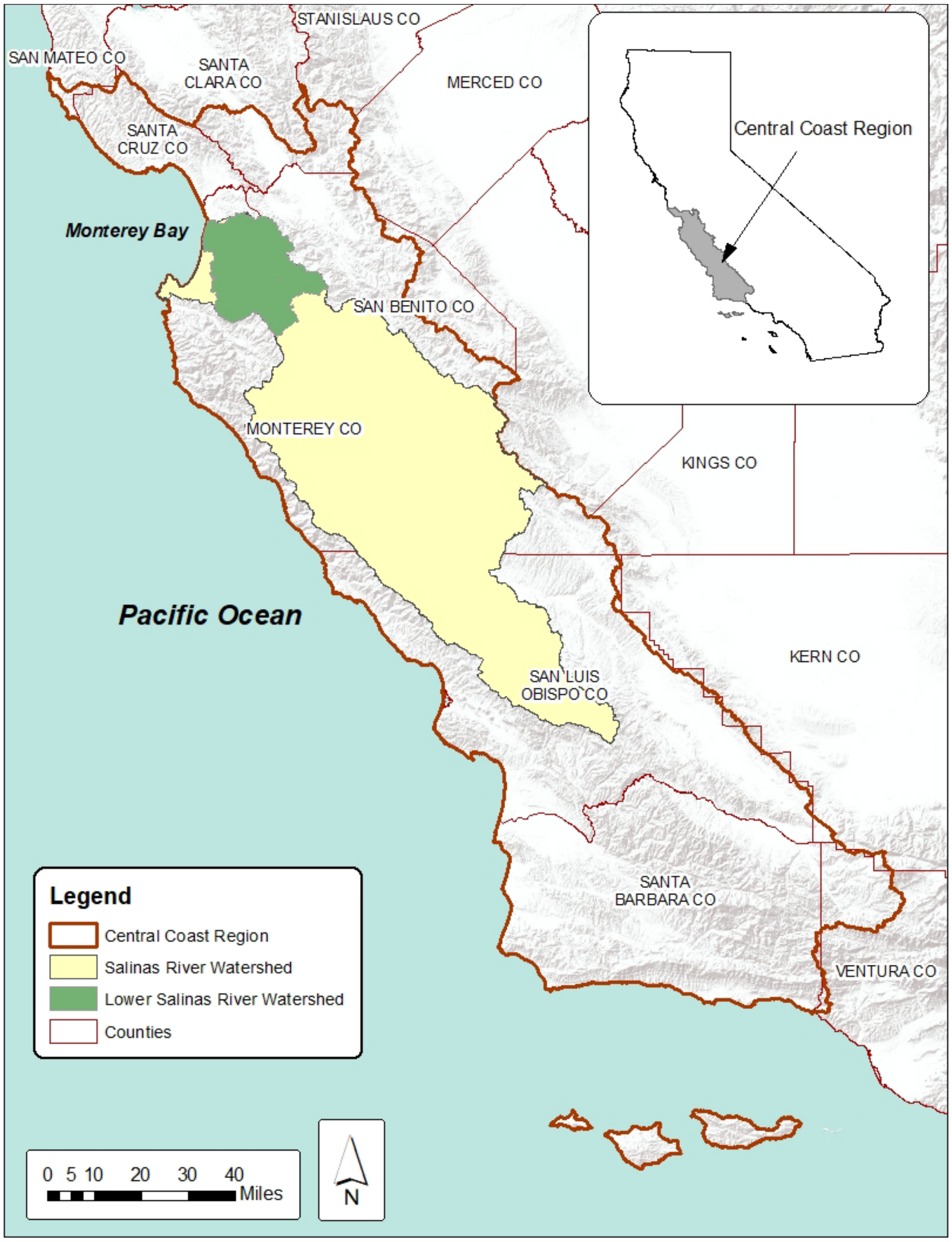

Figure 3-1. General vicinity map of the TMDL project area.

4 Watershed Description

The TMDL project area is the lower Salinas River watershed which encompasses an area of approximately 405 square miles in northern Monterey County. The project area extends north from the City of Gonzales to Monterey Bay and the Pacific Ocean. There are two major drainages in the project area which terminate at Moss Landing Harbor, one is the lower Salinas River and its tributaries, and the other is the Salinas Reclamation Canal and its tributaries. Major tributaries to the lower Salinas River include Chualar Creek, Esperanza Creek, Quail Creek, Toro Creek, and Blanco Drain. The lower portion of the Salinas River forms the Salinas

River Lagoon (North) where flows are regulated into the Old Salinas River and Moss Landing Harbor. Tributaries to the Salinas Reclamation Canal include Alisal Creek, Natividad Creek, Gabilan Creek, Santa Rita Creek, Alisal Slough, Espinosa Slough, and Merritt Ditch. The lower portion of Salinas Reclamation Canal forms the Tembladero Slough where flows join the Old Salinas River and eventually terminate at Moss Landing Harbor. Moro Cojo Slough is tributary to Moss Landing Harbor.

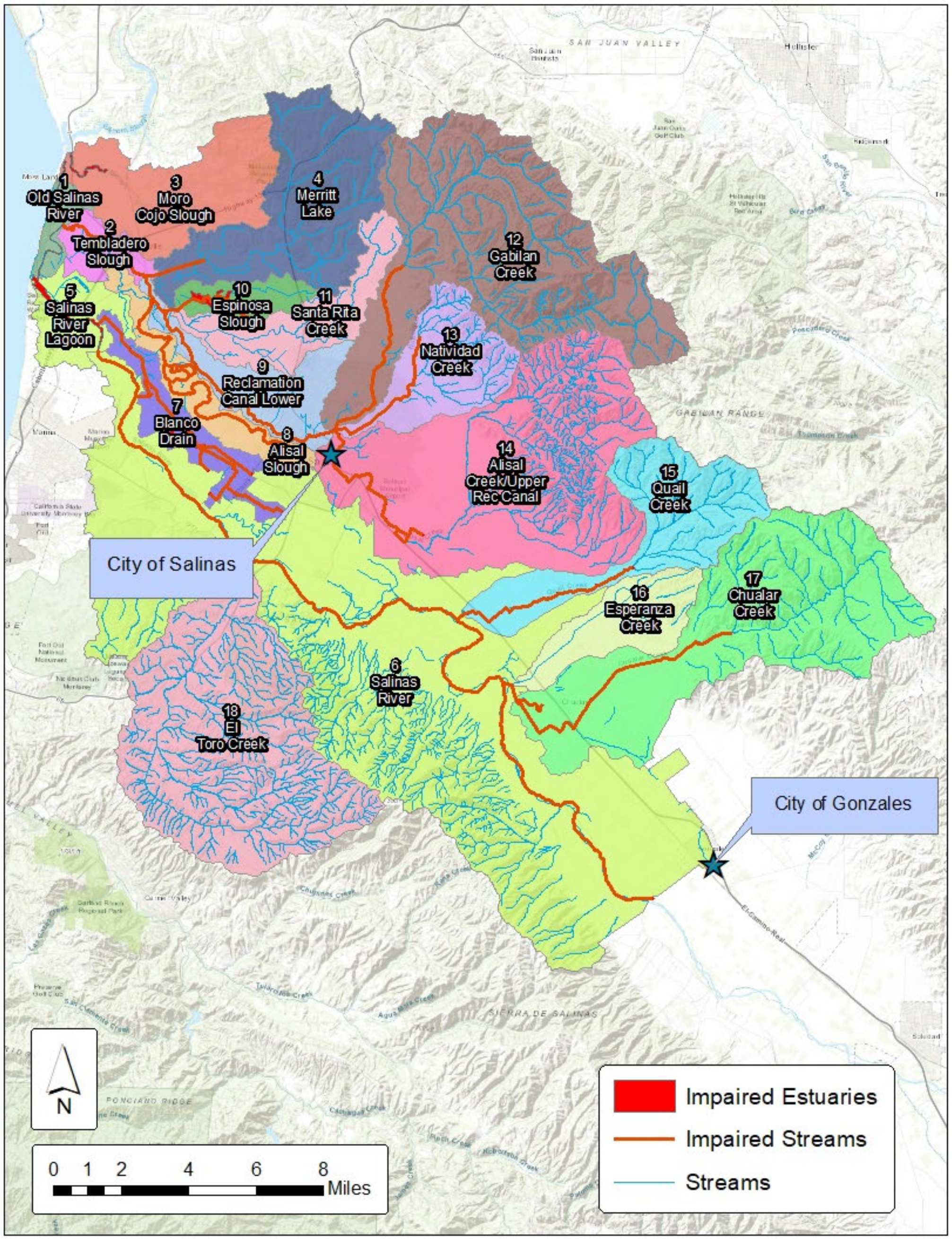

Figure 4-1. Map of subwatersheds and impaired waterbodies in the project area.

Table 4-1. Subwatersheds in the project area and associated size.

Watershed ID	Subwatershed	Acres	Square Miles
1	Old Salinas River	1,492	2.3
2	Tembladero Slough	2,154	3.4
3	Moro Cojo Slough	9,836	15.4
4	Merritt Lake (Merritt Ditch)	14,236	22.2
5	Salinas River Lagoon	3,837	6.0
6	Lower Salinas River	69,774	109.0
7	Blanco Drain	4,442	6.9
8	Alisal Slough	4,621	7.2
9	Salinas Reclamation Canal (Lower)	5,729	9.0
10	Espinosa Slough	2,655	4.1
11	Santa Rita Creek	6,348	9.9
12	Gabilan Creek	27,957	43.7
13	Natividad Creek	7,337	11.5
14	Salinas Reclamation Canal (Upper)/Alisal Creek	29,656	46.3
15	Quail Creek	11,097	17.3
16	Esperanza Creek	5,687	8.9
17	Chualar Creek	25,422	39.7
18	El Toro Creek	27,062	42.3
Total	All subwatersheds	259,342	405.1

4.1 Hydrography

The Lower Salinas River watershed is comprised of one minor subwatershed, Moro Cojo Slough, and two major subwatershed areas, the Salinas Reclamation Canal subwatershed and the lower Salinas River watershed. These three subwatersheds eventually drain to Moss Landing Harbor. The Moro Cojo Slough subwatershed is a relatively small subwatershed that directly enters the southeastern portion of Moss Landing Harbor.

Waterbodies in the Salinas Reclamation Canal subwatershed include Tembladero Slough, Merritt Ditch, Alisal Slough, Espinosa Slough, Santa Rita Creek, Salinas Reclamation Canal (Lower and Upper/Alisal Creek)[2], Gabilan Creek, and Natividad Creek. Note there is occasional hydraulic connectivity between Alisal Slough and the Lower Salinas Reclamation Canal via an agricultural ditch. Tembladero Slough is the lowermost waterbody in this subwatershed and it joins Old Salinas River halfway between Salinas River Lagoon (North) and Moss Landing Harbor.

[2] Note that the Salinas Reclamation Canal is segmented into lower and upper portions throughout much of this report with Carr Lake dividing the upper and lower segments. Alisal Creek is tributary to the upper Salinas Reclamation Canal near the airport.

Waterbodies within the lower Salinas River subwatershed include the Salinas River Lagoon (North), Salinas River, Blanco Drain, Quail Creek, Chualar Creek, Esperanza Creek, and El Toro Creek. Salinas River Lagoon (North) is the lowermost waterbody in this subwatershed and it maintains hydrologic connectivity with Old Salinas River via a slide gate and flows year-round flow into Moss Landing Harbor. The Salinas River Lagoon (North) may drain into the Pacific Ocean when the beach berm is breached during storm events or other activities.

Waterbodies in the project area may be perennial in the mountains and seasonal in the lowlands with agricultural return flows providing all, or the majority, of the flow in some waterbodies during dry seasons. Some of the waterbodies are tidally influenced, especially those joining Moss Landing Harbor; these waterbodies include Moro Cojo Slough, Old Salinas River Estuary, and lower portions of Tembladero Slough. The lower Salinas River receives water released from Lake Nacimiento and Lake San Antonio that is used to replenish groundwater in the Salinas Valley.

Natural flow conditions have been highly modified within the lower Salinas River watershed. For example, “lift” pumps in the watershed are located along Blanco Drain, Santa Rita Creek, Espinosa Slough, Merritt Ditch, Alisal Creek, and the Salinas Reclamation Canal near Carr Lake to increase surface water flow as shown in Figure 4-2 (MCWRA, 2005). Monterey County Water Resources Agency (MCWRA) operates most of the pump stations shown in the figure; however, agricultural operations operate a few such as one discharging into Alisal Creek near monitoring site 309ALG and the Salinas Airport.

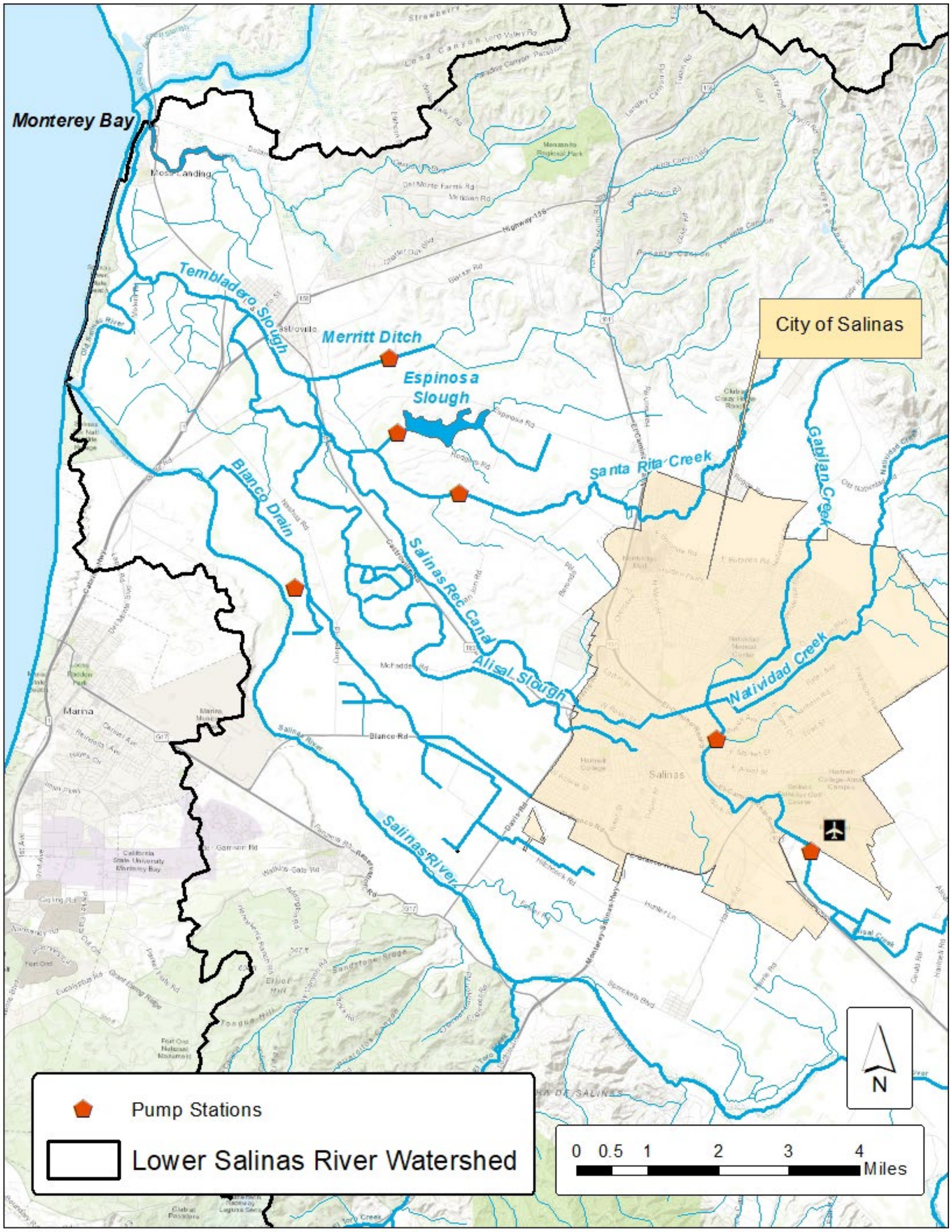

Figure 4-2. Map of pump stations in the project area.

4.2 Climate

Monterey County has a generally mild climate. Temperatures near the coast are uniform throughout the year, but the range widens as distance from the water increases. At inland locations, summers are warm to hot and winters have minimum readings below freezing.

The average annual temperature is about 55° F along the coast and in the mountains along the eastern boundary. Annual temperatures of about 60° F are characteristic of the interior valley (SCS 1978).

The growing season is as short as 150 days in some mountain areas but ranges from 200 days to more than 350 days in most areas where cultivated crops are grown.

Winds are generally less than 10 to 15 miles per hour, though stronger winds are common to some areas along the coast. Winter storms may produce damaging winds, particularly in open areas and at higher elevations.

Precipitation is concentrated in winter. Average annual rain totals, as shown in Figure 4-3, range from about 10 inches in drier locations to near or slightly above 22 inches in the mountains. Snowfall in the county is generally insignificant, although a limited amount may be observed each winter at the higher elevations.

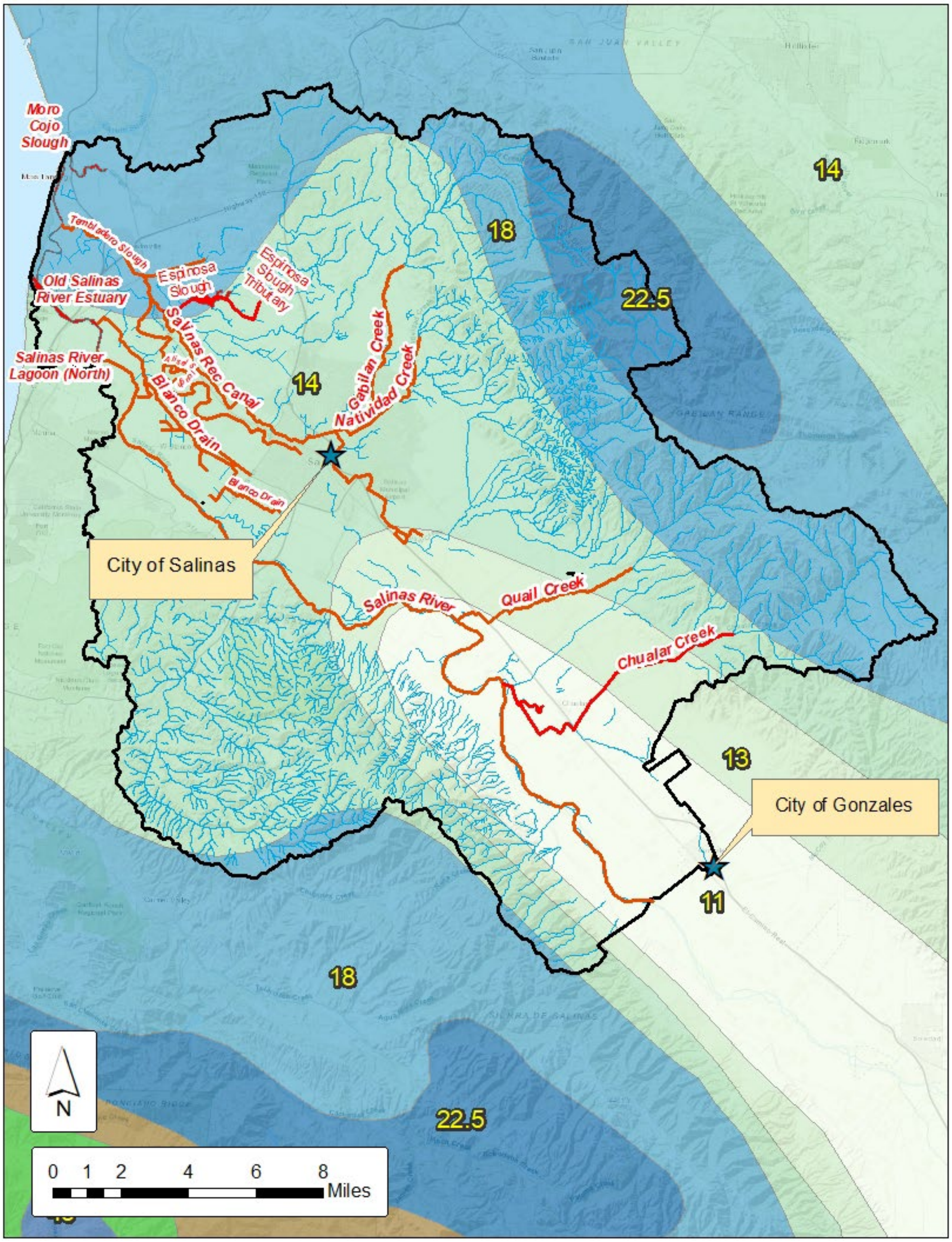

Figure 4-3. Map of precipitation isohyets (inches).
Source: United States Average Annual Precipitation (1981-2010). The PRISM Climate Group at Oregon State University (2006).

4.2.1 Climate Change Considerations

This section is a brief presentation of anticipated climate change impacts within the lower Salinas River watershed and is not intended to provide potential climate change resiliency, adaptation, or mitigation methods that will address the current water quality impairments.

Freshwater stream hydrology and associated aquatic habitat are climate dependent, whereby changes in climate may greatly impact the aquatic ecosystems that this TMDL Project is designed to protect and restore. Much of the information presented in this section was obtained from a publication titled "*California's Fourth Climate Change Assessment, Central Coast Summary Report"* (Langridge, 2018). The climate change assessment report presents an overview of climate science (temperature, precipitation, storms, and droughts), the physical impacts of climate change (sea level rise, floods, and fires), a description of natural resource systems (biological resources, rivers, streams, and coastal systems), along with the potential impacts to central coastal communities (freshwater resources, agriculture, health, energy, and others).

As contained in the climate change assessment report, average maximum and minimum temperatures within the region are projected to increase from historical levels. For example, at the current rate of global greenhouse gas emissions, average maximum temperatures in Monterey County are projected to increase 7.5 degrees Fahrenheit by the end of the century relative to the historical period (1961-1990) and average minimum temperatures are predicted to rise 7.7 degrees. Average annual precipitation is also projected to increase from the 1961-1990 historical average of 19.3 inches to 24.4 inches, a total increase of 5.1 inches by the end of the century. Extreme temperatures above established thresholds are projected, and wet and dry years may become more severe.

Sea level rise (SLR) could greatly affect communities, agriculture, and aquatic and riparian habitats in the lower Salinas River watershed. Historical SLR rates in Monterey County are documented by just a small number of tide gages with relatively short records, however a relative sea level change[3] rate of 1.63 millimeters per year was estimated from 1973 to 2020. This rate is equivalent to 0.53 feet in 100 years. The combined effects of SLR and intensified storm events present considerable risks to residents and property within the Central Coast. In a Pacific Institute Report (Heberger et al, 2011) predicted that 25,900 residents within the Central Coast region would be exposed to coastal flooding from 1.41 meters of SLR combined with a 100 year-storm, with Monterey County (14,000 residents and $2.2 billion in property exposed) being the most vulnerable county. Figure 4-4 is a representation of the maximum inundation depth based on the 1.41 meter SLR scenario and a likely 100-year storm event.

[3] Relative sea level change refers to how the height of the ocean rises or falls relative to the land at a particular location.

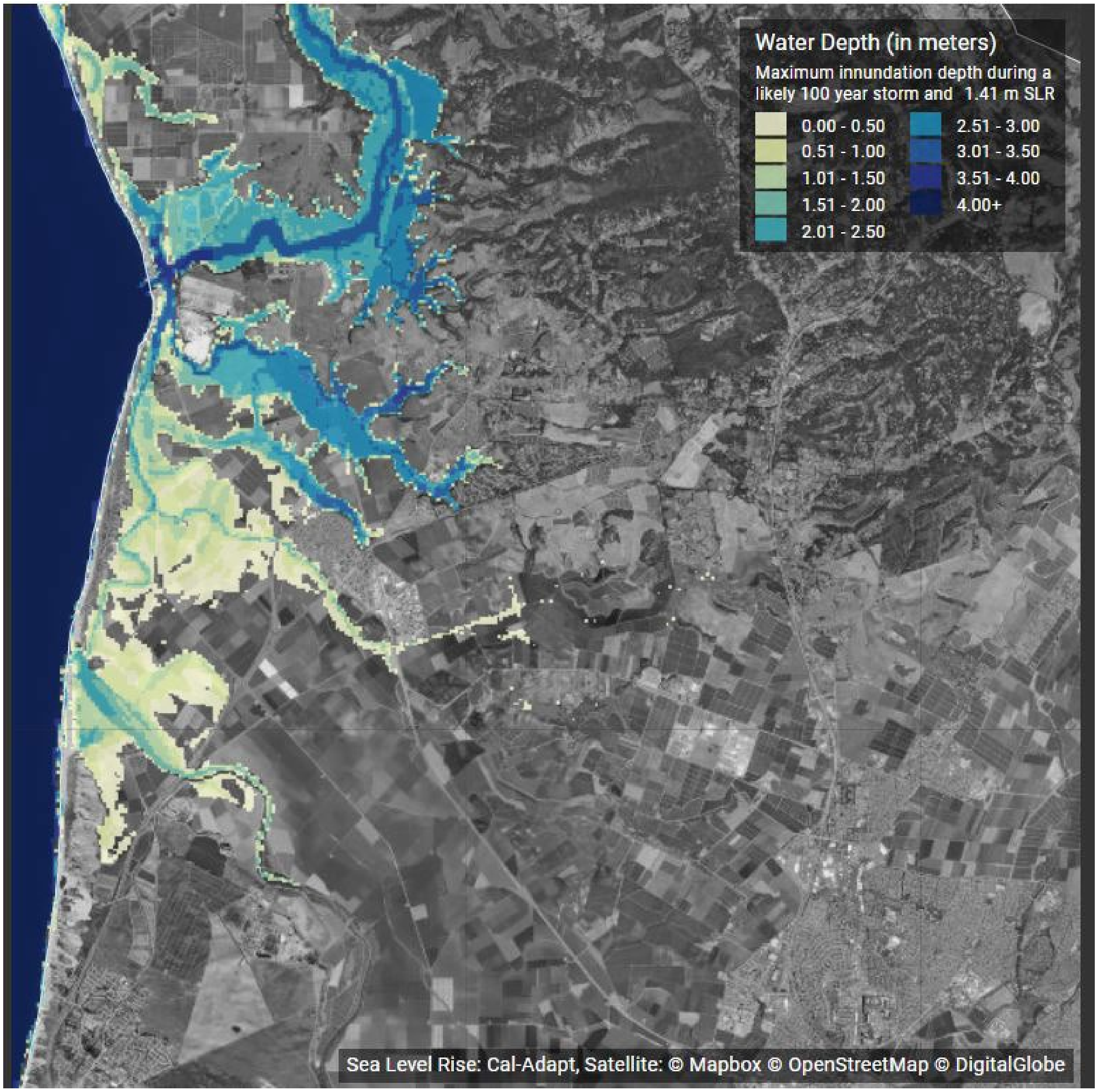

Figure 4-4. Inundation depth based on the 1.41 SLR scenario and 100-year storm. Source: Cal-Adapt (https://cal-adapt.org/tools/slr-calflod-3d). Accessed February 16, 2022.

Tidally influenced areas of the lower Salinas River watershed, such as Moss Landing Harbor and Elkhorn Slough, are vulnerable to the effects of SLR where tidal inundation may drown the marshes or transition these estuarine ecosystems into shallow mudflats. This would lead to a loss in ecosystem function (e.g., shelter, foraging, and nurseries for many wildlife species) and reduce beneficial carbon sequestration. The extension of tidal water inland would impact adjacent lands by increasing the soil salinity of adjacent agricultural lands and displace or contaminate fresh groundwater resources via saltwater intrusion. It important to note that communities and irrigated agricultural lands are nearly 100 percent reliant on groundwater resources within the lower Salinas River watershed.

The climate report evaluated potential increases in wildfires and post fire impacts such as increased runoff and streamflow. The research was not definitive, but the authors expressed concerns that large wildfires in the region will continue to be a major issue followed by increased post fire runoff and sedimentation, along with higher streamflow variability. Recently, the River Fire of August 2020 burned over 48,000 acres near the City of Salinas.

Waterbodies within the lower Salinas River watershed are severely degraded and climate change could hinder their recovery and further delay the restoration of aquatic habitats. Changes in hydrology due to episodic storm events that degrade channel structure or alter riparian function may impact aquatic species such as fish and benthic macroinvertebrates. An increase in air temperature would also increase water temperature, thereby lowering concentrations of dissolved oxygen that support aquatic life. In a model developed of Sierra Nevada watersheds, temperatures were projected to rise 1 to 5.5 degrees Celsius and DO was modeled to decrease 10% by 2100 in spring and summer flows (Ficklin et al., 2013). As water temperatures rise, the distribution of cold water species may shift towards higher elevations with cooler temperatures (Filipe et al., 2013).

The above climate change considerations are necessary to guide future TMDL implementation planning projects and related actions that will address OP pesticide and toxicity impairments in the watershed.

4.3 Land Use/Land Cover

Staff used National Land Cover Data (NLCD, 2011) to summarize major land uses in the watershed. A map of the NLCD land use and land cover for the lower Salinas River watershed is presented in Figure 4-5. Table 4-2 and Figure 4-6 provide summaries of the NLCD within the project area. Forest, scrub, and grasslands occupy the mountain and upland areas within the project area (50%) while cultivated crops or croplands are located within the valley floor (29%). Land has been developed at various levels of intensity such as roads, residential, commercial, and industrial uses (17%) and wetlands (open water, woody wetlands, and emergent herbaceous wetlands) comprise only a small area of the total land cover (2%).

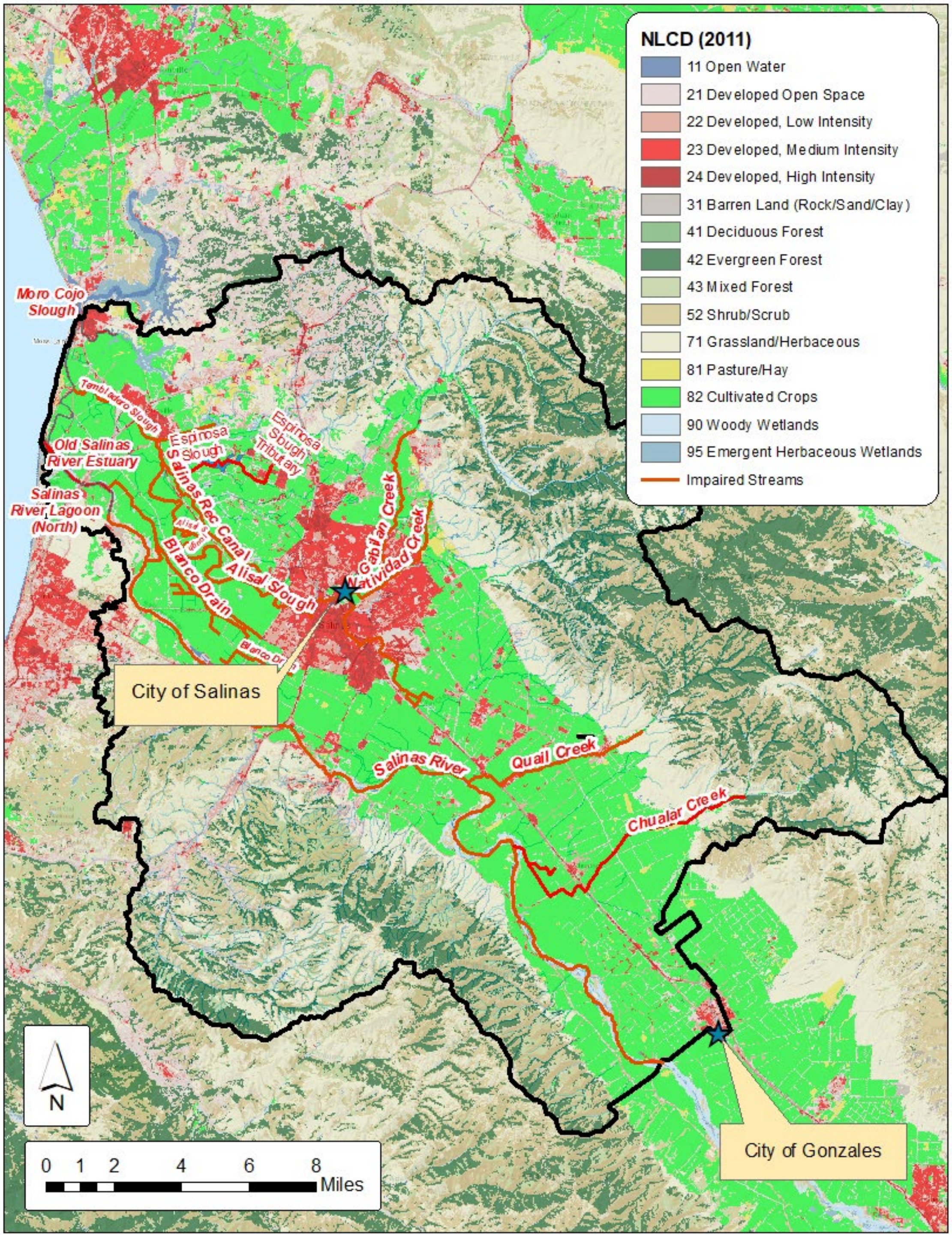

Figure 4-5. Map of project area land use and land cover (NLCD, 2011).

Table 4-2. Land cover in the project area summarized as percent cover and acres (NLCD, 2011).

Id - Land Cover	Percent	Acres
11 - Open Water (Wetlands)	0.2	559.8
21 - Developed Open Space	9.0	23,275.8
22 - Developed, Low Intensity	4.5	11,556.5
23 - Developed, Medium Intensity	4.1	10,674.0
24 - Developed, High Intensity	0.9	2,234.2
31 - Barren Land (Rock/Sand/Clay)	0.2	577.1
41 - Deciduous Forest	< 0.01	5.3
42 - Evergreen Forest	13.6	35,273.3
43 - Mixed Forest	2.8	7,387.5
52 - Shrub/Scrub	16.4	42,428.2
71 - Grassland/Herbaceous	17.2	44,666.4
81 - Pasture/Hay	0.6	1,595.5
82 - Cultivated Crops	28.9	74,851.8
90 - Woody Wetlands	1.2	2,997.4
95 - Emergent Herbaceous Wetlands	0.5	1,258.8
Total	100%	259,341.6

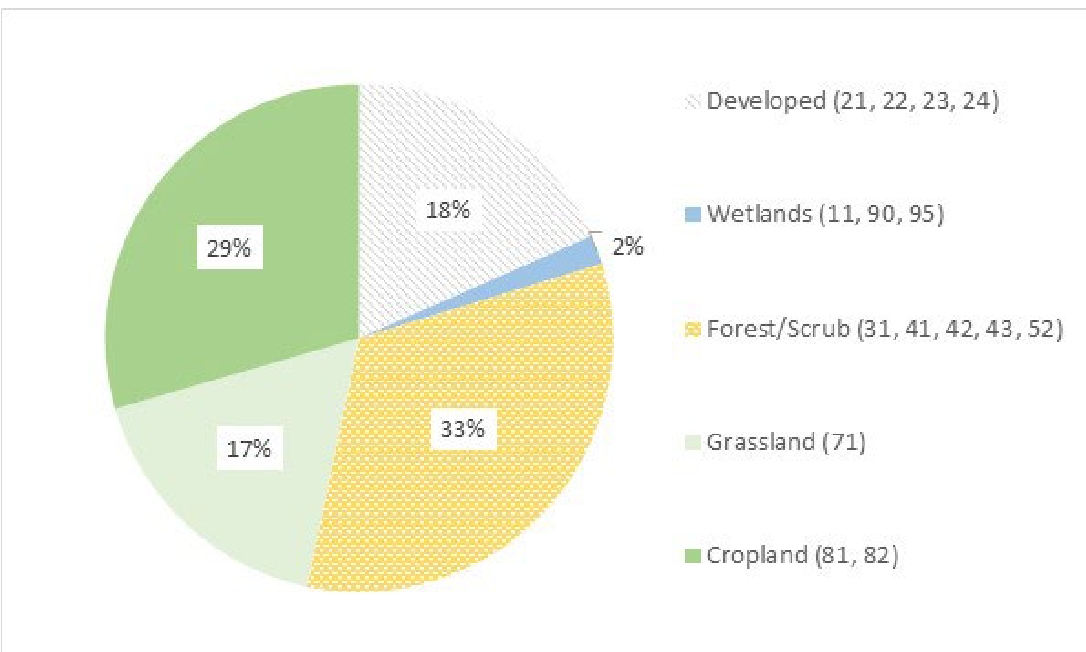

Figure 4-6. Pie chart of percent NLCD 2011 land cover and aggregated land cover type.

4.3.1 Major Agricultural Crops

The lower Salinas River watershed is located in Monterey County, one of the most productive agricultural regions in the world with annual crop production in the billions of dollars. The value and production of the county's major crops are summarized in Table 4-3 (Monterey, 2019). The highest value crops in Monterey County are lettuce (leaf and head), strawberries, and broccoli. Except for grapes, all of the major crops are grown extensively on prime land in the lower Salinas River watershed. Note that mushrooms are reported as pounds, not as acres, and 45,703,000 pounds were reported for 2019.

Table 4-3. Major crops of Monterey County (2019).

Crops	Acres*	Value
Artichokes	3,835	$53,152,000
Broccoli	54,027	$457,390,000
Cauliflower	18,989	$212,375,000
Celery	10,005	$186,391,000
Grapes (Wine)	44,683	$186,096,000
Head Lettuce	40,277	$514,088,000
Leaf Lettuce	58,846	$840,555,000
Mushrooms	N/A	$86,836,000
Nursery Products	745	$143,979,000
Spinach	13,550	$127,120,000
Strawberries	9,232	$732,761,000
Crop Totals	254,189	$3,540,743,000

4.3.2 Urban Areas, Housing and Populations

The lower Salinas River watershed contains the City of Salinas, the City of Gonzales, and the unincorporated communities of Castroville, Boronda, and Chualar. The unincorporated communities are also referred to as Census Designated Places (CDP) as described in the next section. Salinas is the largest city in Monterey County with an estimated population of over 156,000 (U.S. Census Bureau: 2019 American Community Survey 5-Year Estimates). According to the U.S. Census Bureau, the City of Salinas has a higher poverty rate (16.8%) and lower education rate (13.3%) as compared to Monterey County and California census tabulations; however, the employment rate is nearly the same. The unincorporated community of Chualar has the highest poverty rate (23.3%), and lowest education rate (4.5%) and median household income (MHI: $46,146) when compared to all communities in the watershed. Table 4-4 contains U.S. Census Bureau data for the communities within the lower Salinas River watershed.

Table 4-4. U.S. Census Bureau data for communities in the lower Salinas River watershed.

Community Metric	City of Salinas	City of Gonzales	Castroville CDP	Boronda CDP	Chualar CDP	Monterey County	State of CA [A]
Population	156,143	8,375	6,521	1,763	1,512	433,410	39,512,223
Employment rate	60.6%	60.1%	57.9%	47.3%	61.1%	56.6%	60.3%
Housing units	42,366	2,114	1,601	410	316	141,820	14,367,012
Median household income (MHI)	$61,527	$65,527	$57,656	$47,383	$46,146	$71,015	$80,440
Poverty rate	16.8%	10.1%	10.8%	12.9%	23.3%	13.1%	11.8%
Education: Bachelor's Degree or higher	13.3%	9.5%	5.4%	15.0%	4.5%	27.4%	35.0%

Source: U.S. Census Bureau 2019 American Community Survey 5-Year Estimates.
[A] U.S. Census Bureau 2019 American Community Survey 1-Year Estimates.

4.3.3 Disadvantage Communities

The Central Coast Water Board implements regulatory activities and water quality projects in a manner that ensures the fair treatment of people of all ethnicities, cultures, backgrounds, and income levels, including disadvantaged communities (DACs). Therefore, staff conduct focused outreach during development of this TMDL to ensure all interested parties are notified of opportunities to participate in the planning and implementation elements of this project. DACs are located within the TMDL project area and staff recognizes that the cost of implementing this TMDL may be pose a potential financial burden to these communities. By identifying DACs in the project area, staff and stakeholders will be able to improve coordination and pursue grant funds that may be used to reduce implementation costs.

California Public Resources Code (PRC) §75005 (g) defines DACs as "a community with a median household income less than 80% of the statewide average." The PRC also defines severely disadvantaged community (SDACs) as "a community with a median household income (MHI) less than 60% of the statewide average." According to the United States Census Bureau's Annual Community Survey (ACS 2014-2018), the estimated MHI for the State of California was $71,228. As such, 80% and 60% of that value represents the DAC and SDAC thresholds of $56,982 and $42,737, respectively. Note that the ACS 2014-2018 MHI estimate of $71,228 differs from the ACS 2019 MHI estimate of $80,440 as contained Table 4-4; however, the DAC and SDAC thresholds used herein are consistent with current determinations made by the California Department of Water Resources.

Staff used U.S. Census Bureau ACS data to identify DACs and SDACs in the lower Salinas River watershed, based on Census Designated Place (CDP) and Census Block Group geographies. A CDP is the statistical counterpart of incorporated places, and they are delineated to provide data for settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located. Census Block Groups are statistical divisions of census tracts, are generally defined to contain between 600 and 3,000 people and are used to present data and control block numbering. A Block Group consists of clusters of blocks within the same census tract that have the same first digit of their four-digit census block number.

Based on median household income and as shown in Figure 4-7, the CDPs of Castroville, Boronda, and Chualar are all DACs, with Boronda also meeting the criteria for a SDAC.

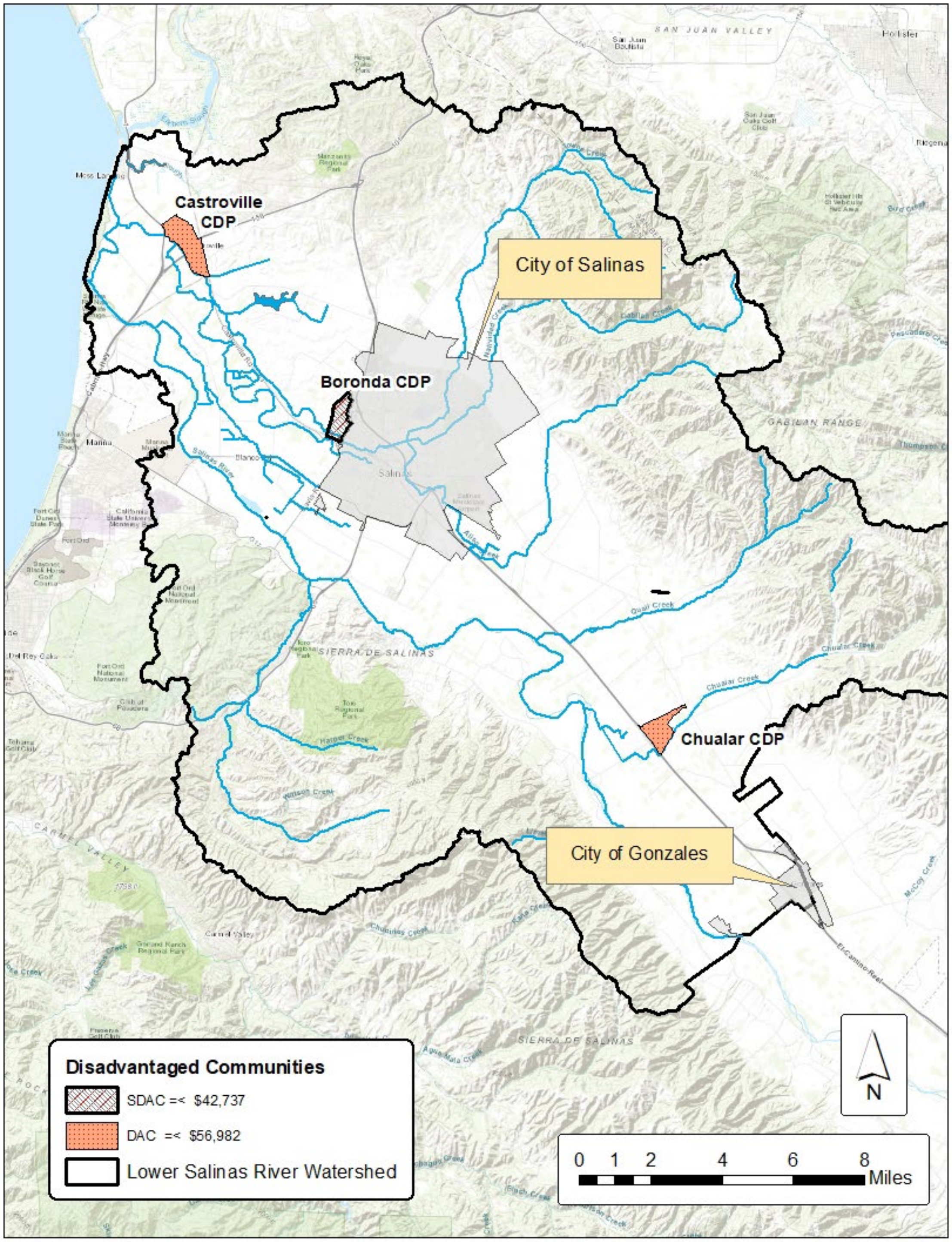

Figure 4-7. Disadvantaged and severely disadvantaged communities by census designated place (CDP).

Figure 4-8 represents median household incomes based on the Block Group geography. There are 42 Block Groups that meet the DAC criteria, of which 23 Block Groups meet the SDAC criteria. Nearly all the SDACs are located within or adjacent to the City of Salinas.

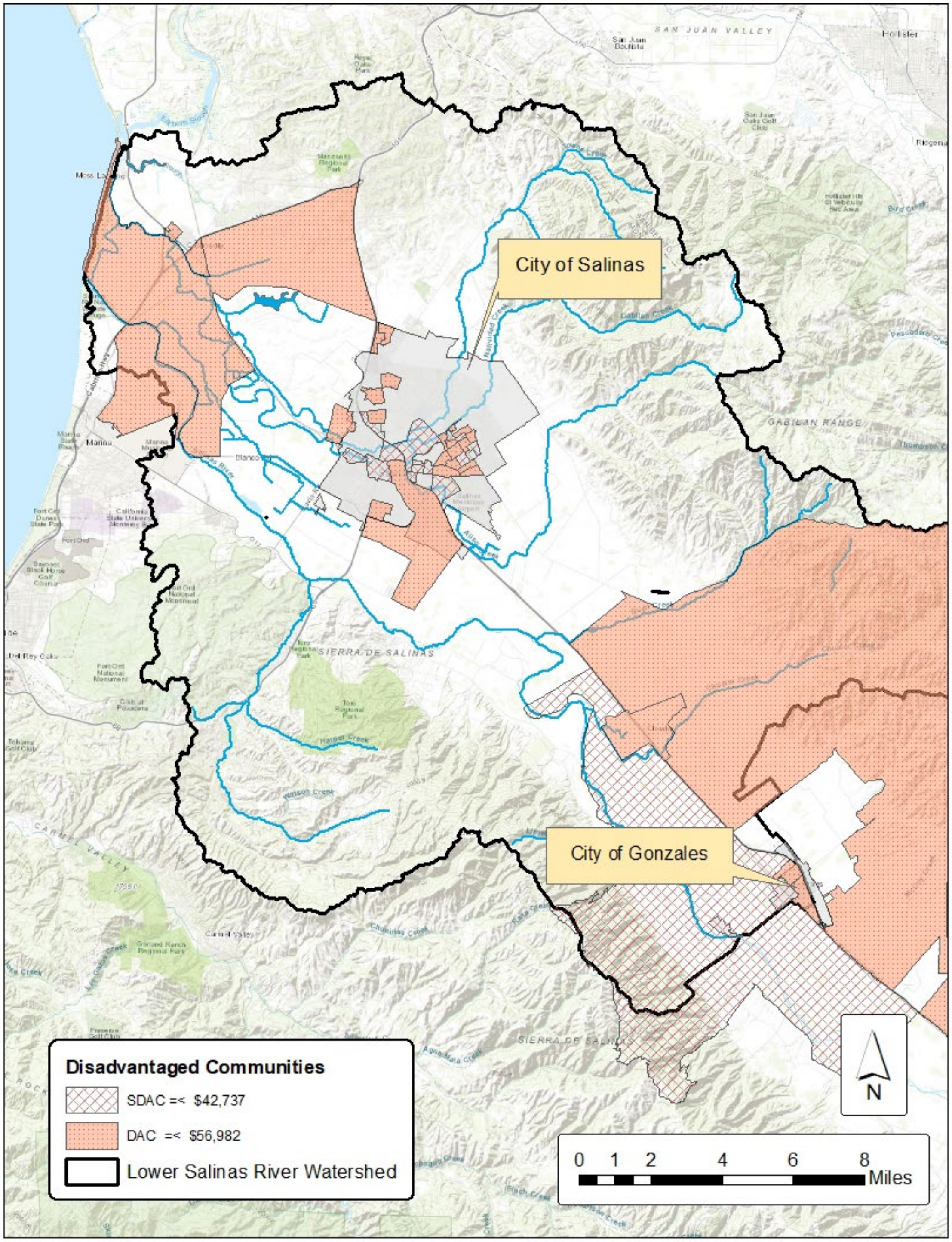

Figure 4-8. Disadvantaged and severely disadvantaged communities by Block Group.

5 WATER QUALITY STANDARDS

TMDLs are requirements pursuant to the federal Clean Water Act. The broad objective of the federal Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Water quality standards are provisions of state and federal law intended to implement the federal Clean Water Act. In accordance with state and federal law, California's water quality standards consist of:

- Beneficial uses: which refer to legally-designated uses of waters of the state that may be protected against water quality degradation (e.g., drinking water supply, recreation, aquatic habitat, agricultural supply, etc.).
- Water quality objectives: which refer to limits or levels (numeric or narrative) of water quality constituents or characteristics that provide for the reasonable protection of beneficial uses of waters of the state.
- Anti-degradation policies: which are implemented to maintain and protect existing water quality, and high quality waters.

Therefore, beneficial uses, water quality objectives, and anti-degradation policies collectively constitute water quality standards. Beneficial uses, relevant water quality objectives pertaining to specific beneficial uses, and anti-degradation requirements that pertain to this TMDL Project are presented below in Section 5.1, Section 5.2, and Section 5.3, respectively.

5.1 Beneficial Uses

The Central Coast Water Board is required under both State and Federal Law to regulate discharges to waters of the state and to protect beneficial uses designated to all waters of the state.

The Basin Plan designates beneficial uses to all waters of the state. Some waterbodies are designated beneficial uses in Table 2-1 of the Basin Plan. Waterbodies that are not named in Table 2-1 of the Basin Plan are assigned the following designations: municipal and domestic water supply, recreation, and aquatic life beneficial uses. Beneficial uses exist regardless of whether the waterbody is perennial or ephemeral, or the flow is intermittent or continuous.

The Basin Plan specifically identifies beneficial uses for the 303(d) listed waterbodies included in this project. The description of the beneficial uses for waterbodies within the lower Salinas River watershed are shown in Table 5-1.

Table 5-1. Abbreviations and descriptions of beneficial uses.

Abbreviations	Descriptions
AGR	Agricultural supply
BIOL	Preservation of biological habitats of special significance
COLD	Cold fresh water habitat
COMM	Commercial and sport fishing
EST	Estuarine habitat
FRSH	Fresh water replenishment
GWR	Ground water recharge
IND	Industrial service supply
MAR	Marine habitat
MIGR	Migration of aquatic organisms
MUN	Municipal and domestic water supply
NAV	Navigation
PROC	Industrial process supply
RARE	Rare, threatened, or endangered species
REC1	Water contact recreation
REC2	Non-contact water recreation
SHELL	Shellfish harvesting
SPWN	Spawning, reproduction, and/or early development
WARM	Warm fresh water habitat
WILD	Wildlife habitat

Table 5-2. Waterbodies and beneficial uses that are designated in the Basin Plan.

Waterbodies	Beneficial Uses
Moss Landing Harbor	REC1, REC2, IND, NAV, MAR, SHELL [1], COMM, RARE, WILD
Moro Cojo Slough	GWR, REC1, REC2, WILD, COLD, WARM, SPWN, BIOL, RARE, EST, COMM, SHELL
Old Salinas River Estuary, downstream of Potrero Rd	REC1, REC2, WILD, COLD, WARM, MIGR, SPWN, BIOL RARE, EST, COMM, SHELL
Old Salinas River	REC1, REC2, WILD, COLD, WARM, MIGR, SPWN, BIOL, RARE, EST, COMM
Salinas River Lagoon (North)	REC1, REC2, WILD, COLD, WARM, MIGR, SPWN, BIOL, RARE, EST, COMM, SHELL
Tembladero Slough	REC1, REC2, WILD, WARM, MIGR, SPWN, RARE, EST, COM, SHELL
Espinosa Lake	REC1, REC2, WILD, WARM, COMM
Espinosa Slough	REC1, REC2, WILD, WARM, COMM
Salinas Reclamation Canal	REC1, REC2, WILD, WARM, MIGR, COMM
Gabilan Creek	MUN, AGR, GWR, REC1, REC2, WILD, COLD, WARM, MIGR, SPWN, RARE, COMM
Alisal Creek	MUN, AGR, GWR, REC1, REC2, WILD, COLD, WARM, SPWN, COMM
Blanco Drain	REC1, REC2, WILD, WARM, COMM
Salinas River, downstream of Spreckels Gage	MUN, AGR, REC1, REC2, WILD, COLD, WARM, MIGR, FRSH, COMM
Salinas River, Spreckels Gage-Chualar	MUN, AGR, PROC, IND, GWR, REC1, REC2, WILD, COLD, WARM, MIGR, SPWN, RARE, COMM
Merritt Ditch [2]	MUN, REC1, REC2, WARM, COLD
Alisal Slough [2]	MUN, REC1, REC2, WARM, COLD
Santa Rita Creek [2]	MUN, REC1, REC2, WARM, COLD
Natividad Creek [2]	MUN, REC1, REC2, WARM, COLD
Quail Creek [2]	MUN, REC1, REC2, WARM, COLD
Chualar Creek [2]	MUN, REC1, REC2, WARM, COLD
El Toro Creek [2]	MUN, REC1, REC2, WARM, COLD
Esperanza Creek [2]	MUN, REC1, REC2, WARM, COLD

[1] For Moss Landing Harbor, clamming is an existing beneficial use in the North Harbor and on the south side of the entrance channel to Elkhorn Slough (north of the Pacific Gas and Electric Cooling Water Intake). Presently, no shellfishing use occurs south of the Pacific Gas and Electric Intake.

[2] Waterbody is not specifically named in Table 2-1 of the Basin Plan and therefore designated the beneficial uses of municipal and domestic water supply, recreation, and aquatic life.

5.2 Water Quality Objectives

The Central Coast Region's Basin Plan contains specific water quality objectives that apply to all inland surface waters, enclosed bays and estuaries (CCRWQCB, 2019, pgs. 31 and 32). The relevant water quality objectives for this TMDL include:

5.2.1 Pesticides

No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.

5.2.2 Toxicity

All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.

Survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality conditions, shall not be less than that for the same water body in areas unaffected by the waste discharge or, when necessary, for other control water that is consistent with the requirements for "experimental water" as described in Standard Methods for the Examination of Water and Wastewater, latest edition. As a minimum, compliance with this objective shall be evaluated with a 96-hour bioassay.

In addition, effluent limits based upon acute bioassays of effluents will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data become available, and source control of toxic substances is encouraged.

5.3 Anti-degradation Policy

In accordance with Section 3.2 of the Basin Plan, wherever the existing quality of water is better than the quality of water established in the Basin Plan as objectives, **such existing quality shall be maintained** unless otherwise provided by provisions of the state anti-degradation policy. Practically speaking, this means that where water quality is *better* than necessary to support designated beneficial uses, such existing high water quality shall be maintained, and further lowering of water quality is not allowed except under conditions provided for in the anti-degradation policy.

USEPA has also issued detailed guidelines for implementation of federal anti-degradation regulations for surface waters (40 Code of Federal Regulations 131.12). To ensure consistency, the State Water Resources Control Board has interpreted Resolution No. 68-16 (i.e., the state anti-degradation policy) to incorporate the federal anti-degradation policy. It is important to note that federal policy only applies to surface waters, while state policy applies to both surface and groundwaters.

USEPA recognizes the validity of using TMDLs as a tool for implementing anti-degradation goals, as indicated in the following statement:

> "Identifying opportunities to protect waters that are not yet impaired: TMDLs are typically written for restoring impaired waters; however, states can prepare TMDLs geared towards maintaining a "better than water quality standard" condition for a given waterbody-pollutant combination, and they can be a useful tool for high quality waters." (USEPA, 2014).

6 WATER QUALITY DATA ANALYSIS

This section provides an analysis of the water quality data used to assess water quality conditions within the lower Salinas River watershed and includes an assessment of water quality impairments due to excessive levels of chlorpyrifos, diazinon, malathion, and toxicity.

To evaluate water quality conditions, staff used published water quality criterion from the California Department of Fish and Wildlife (CDFW) and the Central Valley Regional Water Quality Control Board (CVRWQCB). In 2000, CDFW published freshwater water quality criteria for diazinon and chlorpyrifos (CDFW, 2000). CDFW subsequently revised the diazinon chronic criteria in 2004 (CDFW, 2004). In addition, CVRWQCB developed freshwater invertebrate toxicity criteria for malathion through a contract with UC Davis (Faria et al., 2010). Staff selected the CDFW and the CVRWQCB water quality criteria, as shown in Table 6-1, to interpret the Basin Plan narrative pesticide water quality objective and assess water quality conditions within the lower Salinas River watershed. The water quality evaluation criteria for chlorpyrifos and diazinon are the same as those used in the earlier 2011 TMDLs.

Table 6-1. Chlorpyrifos, diazinon, and malathion evaluation criteria.

Compound	CMC [A] (ppb)	CCC [B] (ppb)	Reference
Chlorpyrifos	0.025	0.015	CDFW, 2000
Diazinon	0.16	0.10	CDFW, 2000 CDFW, 2004
Malathion	0.17	0.028	Faria et. al., 2010

[A] . CMC – Criterion Maximum Concentration or acute (1- hour average).

[B]. CCC – Criterion Continuous Concentration or chronic (4-day (96-hour) average).

The Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List (Listing Policy, 2004, amended in 2015) provides guidance on identifying waters that do not meet water quality standards. The Listing Policy was used by staff in the following data analysis section to confirm impairments on the 303(d) List for chlorpyrifos, diazinon, and malathion. Although the Listing Policy methodology is used in this TMDL data analysis, this analysis is a separate process from the 303(d) List evaluation and additional analysis and information gathering may be necessary before incorporating the results of the TMDL analysis into the 303(d) List.

The Listing Policy has specific guidance for different types of pollutants, for example toxicants or conventional pollutants. Organophosphate pesticides are considered toxicants, therefore Listing Policy guidance for evaluating impairment is provided below in Table 6-2.

Table 6-2. Minimum number of measured exceedances needed to place a water segment on the section 303(d) List for toxicants.

Sample Size	List if the number of exceedances is equal or greater than
2 – 24	2
25 – 36	3
37 – 47	4
48 – 59	5
60 – 71	6
72 – 82	7

It is important to note CDFW and CVRWQCB water quality criteria is expressed as acute and chronic averaging periods. For example, the criterion maximum concentration or acute guideline is a 1- hour average, while the criterion continuous concentration or chronic guideline is a 4-day average (see Table 6-1). Because the available data does not contain multiple sample results collected within these averaging periods, staff will employ guidance provided by the Listing Policy. Section 6.1.5.6 of the Listing Policy states:

> "If sufficient data are not available for the stated averaging period, the available data shall be used to represent the averaging period."

As such, if only one sample was collected withing the averaging period, staff will conclude impairment based on single samples that exceed CDFW and CVRWQCB water quality criteria for both acute and chronic aquatic life toxicity in accordance with the minimum number of measured exceedances needed to place a water segment on the section 303(d) List for toxicants (see Table 6-2).

6.1 Organophosphate Pesticides Data Sources and Assessment

This section describes organophosphate pesticide data sources, associated time periods, and an assessment of monitoring results for a variety of water quality monitoring programs.

Staff used the following data for the development of these TMDLs:

- Cooperative Monitoring Program (CMP), Central Coast Water Quality Preservation, Inc. Surface water quality monitoring data and reporting from 2006 to 2018. Organophosphate pesticides (chlorpyrifos, diazinon, and malathion) data is maintained in the CEDEN database.
- Central Coast Ambient Monitoring Program (CCAMP). Surface water quality monitoring data and reporting from 2010 to 2018. Organophosphate pesticides (chlorpyrifos, diazinon, and malathion) data was collected for projects associated with coastal confluences, lagoons, and special studies. This data is maintained in the CEDEN database.
- California Department of Pesticide Regulation (CDPR). Surface water quality monitoring data and reporting was conducted over the course of several studies between 2003 and 2017 and included laboratory analysis for organophosphate pesticides (chlorpyrifos, diazinon, and malathion). This data is maintained in the CEDEN database.

Data and information from the above programs are detailed in the following sections.

6.1.1 Cooperative Monitoring Program (CMP)

The CMP fulfills surface water monitoring and reporting requirements for dischargers enrolled under the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands in the Central Coast Region (Order R3-2021-0040; the “Agricultural Order”). Monitoring and reporting is conducted by Central Coast Water Quality Preservation, Inc. (CCWQP) and the water quality sampling results are uploaded to the CEDEN database. The CMP monitoring was conducted between 2006 and 2018 with two to three organophosphate pesticide samples obtained each year in 2006, 2007, 2014, 2017, and 2018. CMP utilizes United States Environmental Protection Agency (USEPA) analytical test method 625 (EPA 625 using gas chromatography) for organophosphate pesticide analysis and toxicity testing is paired with these analyses four times in each of the above-mentioned years.

Table 6-3 identifies the 17 CMP sites within the lower Salinas River watershed and Figure 6-1 depicts CMP site locations. Table 6-4, Table 6-5, and Table 6-6 provide data summaries and criteria exceedances for chlorpyrifos, diazinon, and malathion, respectively. And finally, a discussion summarizing the exceedances for each of the organophosphate pesticides is provided at the end of this section.

Table 6-3. CMP monitoring sites.

Site Description	Site ID
Moro Cojo Slough @ Hwy 1	306MOR
Old Salinas River @ Monterey Dunes Way	309OLD
Tembladero Slough @ Haro	309TEH
Merritt Ditch upstream from Hwy 183	309MER
Espinosa Slough Upstream of Alisal Slough	309ESP
Alisal Slough @ White Barn	309ASB
Blanco Drain below Pump	309BLA
Salinas Reclamation Canal @ San Jon Rd	309JON
Salinas Reclamation Canal @ La Guardia	309ALG
Santa Rita Creek @ Santa Rita Creek Park	309RTA
Gabilan Creek @ Independence Rd and East Boranda Rd	309GAB
Natividad Creek upstream from Salinas Reclamation Canal	309NAD
Salinas River @ Spreckels Gage	309SSP
Quail Creek @ Hwy 101	309QUI
Chualar Creek west of Highway 101	309CCD
Salinas River @ Chualar River Road	309SAC
Salinas River @ Gonzales River Rd Bridge	309SAG

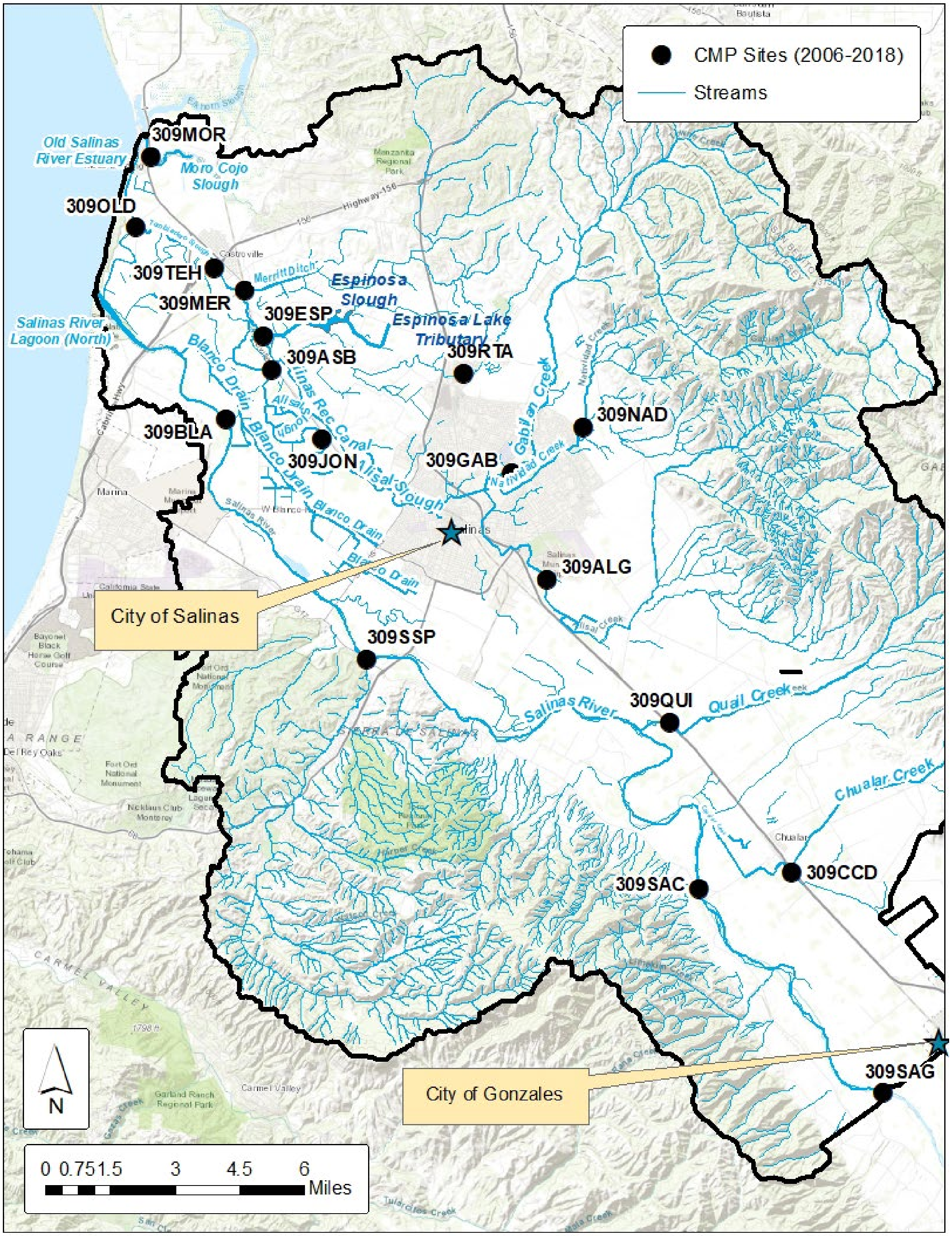

Figure 6-1. Map of CMP monitoring stations (2006-2018).

Table 6-4. Summary of CMP monitoring results for chlorpyrifos.

Site Location	Site code	Count of samples	Acute criteria exceeded[1]	Acute exceeded %	Chronic criteria exceeded[1]	Chronic exceeded %
Salinas Reclamation Canal @ La Guardia	309ALG	13	2	15.4	2	15.4
Alisal Slough @ White Barn	309ASB	13	0	0	0	0
Blanco Drain below Pump	309BLA	13	0	0	1	7.7
Chualar Creek west of Highway 101	309CCD	7	1	14.3	2	28.6
Espinosa Slough upstream of Alisal Slough	309ESP	13	1	7.7	1	7.7
Gabilan Creek @ Independence Rd and East Boranda Rd	309GAB	2	0	0	1	50
Salinas Reclamation Canal @ San Jon Rd	309JON	13	3	23.1	3	23.1
Merritt Ditch upstream from Hwy 183	309MER	13	1	7.7	1	7.7
Moro Cojo Slough @ Hwy 1	306MOR	13	0	0	0	0
Natividad Creek upstream from Salinas Reclamation Canal	309NAD	8	2	25	2	25
Old Salinas River at Monterey Dunes Way	309OLD	13	0	0	0	0
Quail Creek @ Hwy 101	309QUI	11	6	54.5	6	54.5
Santa Rita Creek @ Santa Rita Creek Park	309RTA	4	0	0	0	0
Salinas River at Chualar River Road	309SAC	4	0	0	0	0
Salinas River @ Gonzales River Rd Bridge	309SAG	3	0	0	0	0
Salinas River @ Spreckels Gage	309SSP	6	1	16.7	1	16.7
Tembladero Slough @ Haro	309TEH	13	4	30.8	4	30.8

[1] Chlorpyrifos exceedance criteria of 0.025 µg/L (acute) and 0.015 µg/L (chronic).

Table 6-5. Summary of CMP monitoring results for diazinon.

Site Location	Site code	Count of samples	Acute criteria exceeded[1]	Acute exceeded %	Chronic criteria exceeded[1]	Chronic exceeded %
Salinas Reclamation Canal @ La Guardia	309ALG	13	4	30.8	5	38.5
Alisal Slough @ White Barn	309ASB	13	2	15.4	3	23.1
Blanco Drain below Pump	309BLA	13	1	7.7	3	23.1
Chualar Creek west of Highway 101	309CCD	7	0	0	1	14.3
Espinosa Slough upstream of Alisal Slough	309ESP	13	6	46.2	6	46.2
Gabilan Creek @ Independence Rd and East Boranda Rd	309GAB	2	0	0	0	0
Salinas Reclamation Canal @ San Jon Rd	309JON	13	6	46.2	6	46.2
Merritt Ditch upstream from Hwy 183	309MER	13	2	15.4	3	23.1
Moro Cojo Slough @ Hwy 1	306MOR	13	0	0	0	0
Natividad Creek upstream from Salinas Reclamation Canal	309NAD	8	5	62.5	6	75.0
Old Salinas River at Monterey Dunes Way	309OLD	13	1	7.7	2	15.4
Quail Creek @ Hwy 101	309QUI	11	5	45.5	5	45.5
Santa Rita Creek @ Santa Rita Creek Park	309RTA	4	0	0	0	0
Salinas River at Chualar River Road	309SAC	4	0	0	0	0
Salinas River @ Gonzales River Rd Bridge	309SAG	3	0	0	0	0
Salinas River @ Spreckels Gage	309SSP	6	1	16.7	1	16.7
Tembladero Slough @ Haro	309TEH	13	3	23.1	5	38.5

[1] Diazinon exceedance criteria of 0.16 µg/L (acute) and 0.1 µg/L (chronic).

Table 6-6. Summary of CMP monitoring results for malathion.

Site Location	Site code	Count of samples	Acute criteria exceeded[1]	Acute exceeded %	Chronic criteria exceeded[1]	Chronic exceeded %
Alisal Creek/Salinas Reclamation Canal @ La Guardia	309ALG	13	1	7.7	2	15.4
Alisal Slough @ White Barn	309ASB	13	1	7.7	3	23.1
Blanco Drain below Pump	309BLA	13	0	0	2	15.4
Chualar Creek west of Highway 101	309CCD	7	0	0	0	0
Espinosa Slough upstream of Alisal Slough	309ESP	13	0	0	3	23.1
Gabilan Creek @ Independence Rd and East Boranda Rd	309GAB	2	0	0	1	50
Salinas Reclamation Canal @ San Jon Rd	309JON	13	0	0	3	23.1
Merritt Ditch upstream from Hwy 183	309MER	13	3	23.1	4	30.8
Moro Cojo Slough @ Hwy 1	306MOR	13	0	0	0	0
Natividad Creek upstream from Salinas Reclamation Canal	309NAD	8	2	25	3	37.5
Old Salinas River at Monterey Dunes Way	309OLD	13	0	0	1	7.7
Quail Creek @ Hwy 101	309QUI	11	0	0	0	0
Santa Rita Creek @ Santa Rita Creek Park	309RTA	4	1	25	2	50
Salinas River at Chualar River Road	309SAC	4	0	0	0	0
Salinas River @ Gonzales River Rd Bridge	309SAG	3	0	0	1	33.3
Salinas River @ Spreckels Gage	309SSP	6	0	0	0	0
Tembladero Slough @ Haro	309TEH	13	1	7.7	4	30.8

[1] Malathion exceedance criteria of 0.17 µg/L (acute) and 0.028 µg/L (chronic).

Based on the chlorpyrifos data shown above in Table 6-4 and following the methodology from the Listing Policy to determine impairment, staff concluded chlorpyrifos impairments for the Salinas Reclamation Canal (309ALG, 309JON), Chualar Creek (309CCD), Natividad Creek (309NAD), Quail Creek (309QUI), and Tembladero Slough (309TEH).

As shown in the diazinon information presented in Table 6-5 above, staff concluded diazinon impairments for Alisal Slough (309ASB), Blanco Drain (309BLA), Chualar Creek (309CCD), Espinosa Slough (309ESP), Merritt Ditch (309MER), Natividad Creek (309NAD), Old Salinas River (309OLD), Quail Creek (309QUI), and Tembladero Slough (309TEH), but not for stations located on the Salinas Reclamation Canal (309ALG and 309JON).

Although the information contained in Table 6-5 above indicate impairments for Salinas Reclamation Canal (309ALG, 309JON) when all data are considered, subsequent data analysis indicate that concentrations have decreased significantly following approval of the 2011 TMDLs. Specifically, data collected since 2011 supports the conclusion that this waterbody is no longer impaired due to diazinon. As a result, staff will recommend de-listing the Salinas Reclamation Canal for diazinon impairment. See Section 6.2 for further discussion on staff recommendations to de-list Salinas Reclamation Canal for diazinon impairments.

For the malathion data presented in Table 6-6, staff concluded malathion impairments for the Salinas Reclamation Canal (309ALG, 309JON), Alisal Slough (309ASB), Blanco Drain (309BLA), Espinosa Slough (309ESP), Merritt Ditch (309MER), Natividad Creek (309NAD), Santa Rita Creek (309RTA), and Tembladero Slough (309TEH). Sites where the limited available data do not indicate impairment from malathion include Chualar Creek (309CCD), Quail Creek (309QUI), and the Salinas River at Chualar and Spreckels (309SAC and 309SSP).

6.1.2 Central Coast Ambient Monitoring Program (CCAMP)

The Central Coast Ambient Monitoring Program (CCAMP) is the Central Coast Regional Water Quality Control Board's regionally scaled water quality monitoring and assessment program. CCAMP staff conducted chlorpyrifos, diazinon, and malathion sampling as part of three monitoring projects and the water quality sampling results were uploaded to the CEDEN database. The CCAMP data set evaluated for these TMDLs includes data collected between 2010 and 2018. The Coastal Confluence project was conducted in 2010 and 2012 and three to four organophosphate pesticide samples were collected from three sites. The Lagoons project was conducted in 2016 with three samples for each organophosphate pesticide obtained from three sites. Finally, Special Study projects were conducted in 2013 and 2018 with four samples for each organophosphate pesticide obtained from four sites. The analytical test method used by CCAMP for most samples was EPA 8141 however, EPA 625 was used for a few samples.

Table 6-7 identifies the CCAMP sites and associated projects within the lower Salinas River watershed and Figure 6-2 depicts CCAMP site locations. Table 6-8, Table 6-9, and Table 6-10 provide data summaries and criteria exceedances for chlorpyrifos, diazinon, and malathion, respectively. Finally, a discussion summarizing the exceedances for each of the organophosphate pesticides is provided at the end of this section.

Table 6-7. CCAMP monitoring sites.

Site Description	Site ID	Project
Old Salinas River @ Monterey Dunes Way	309OLD	Coastal Confluences
Tembladero Slough @ Monterey Dunes Way	309TDW	Coastal Confluences
Salinas River@ Davis Road	309DAV	Coastal Confluences
Old Salinas River @ Potrero Road	309POT	Lagoons
Salinas River Estuary Lower near Old Salinas River Flap Gate	309SAL00L	Lagoons
Salinas River Estuary Upper near RR bridge	309SAL00U	Lagoons
Salinas Reclamation Canal @ Boranda Road	309ALD	Special Studies
Blanco Drain below Pump	309BLA	Special Studies
Alisal Creek @ Hartnell Road dogleg	309HRT	Special Studies
Tembladero Slough @ Preston Road	309TEM	Special Studies

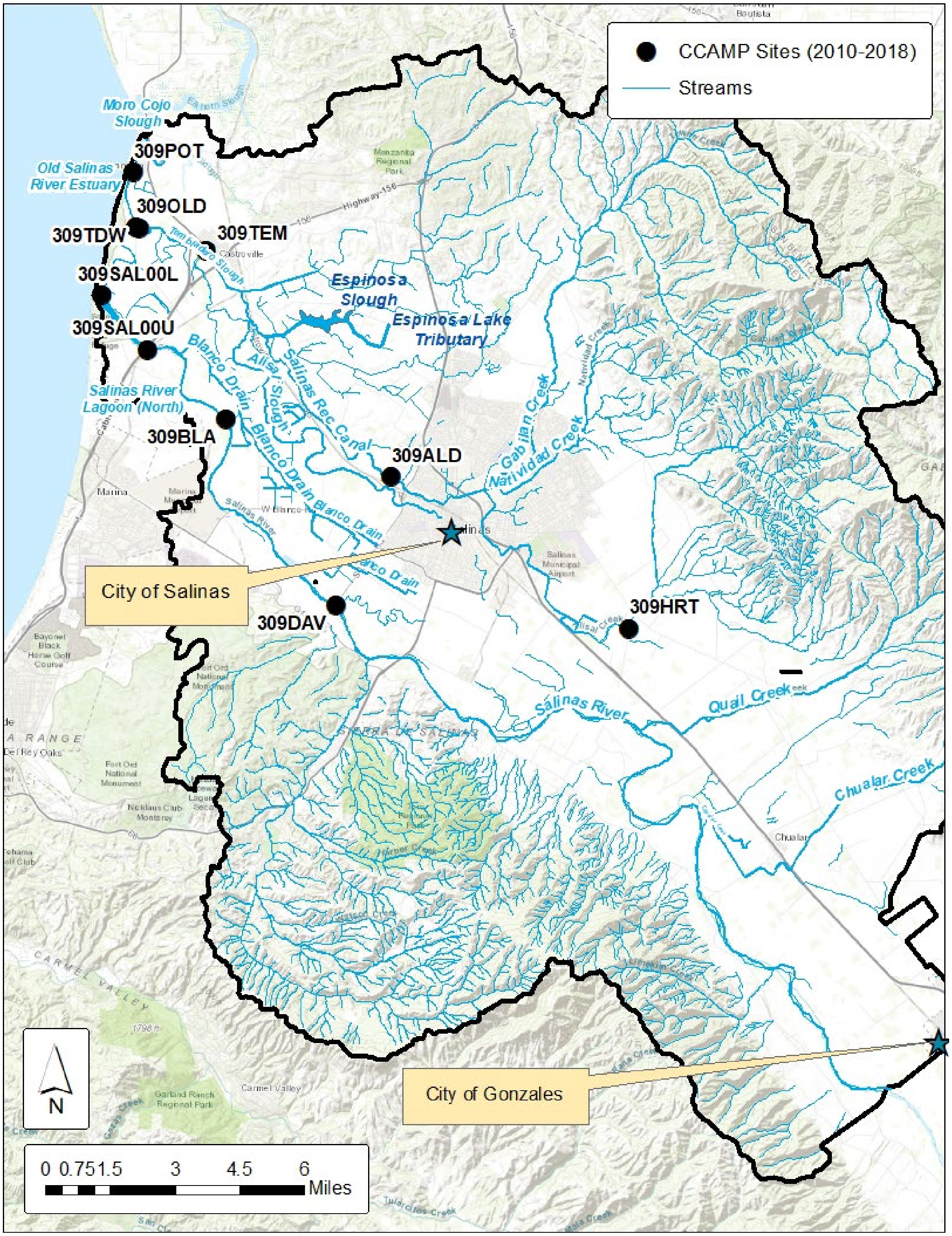

Figure 6-2. Map of CCAMP monitoring stations (2010-2018)]

Table 6-8. Summary of CCAMP monitoring results for chlorpyrifos.

Site Description (Monitoring Program [1])	Site ID	Count of acute samples	Acute criteria exceeded [2]	Acute exceeded %	Count of chronic samples	Chronic criteria exceeded [2]	Chronic exceeded %	Count of samples where method detection limit exceeds chronic criteria
Old Salinas River @ Monterey Dunes Way (CC)	309OLD	2	0	0	0	NA [3]	NA	2
Tembladero Slough @ Monterey Dunes Way (CC)	309TDW	4	1	25	1	1	100	3
Salinas River@ Davis Road (CC)	309DAV	5	0	0	1	0	0	4
Old Salinas River @ Potrero Road (LAG)	309POT	1	0	0	0	NA	NA	1
Salinas River Estuary Lower near Old Salinas River Flap Gate (LAG)	309SAL00L	1	0	0	0	NA	NA	1
Salinas River Estuary Upper near RR bridge (LAG)	309SAL00U	1	0	0	0	NA	NA	1
Salinas Reclamation Canal @ Boranda Road (SS)	309ALD	1	0	0	1	0	0	0
Blanco Drain below Pump (SS)	309BLA	1	0	0	0	NA	NA	1
Alisal Creek @ Hartnell Road dogleg (SS)	309HRT	1	0	0	1	0	0	0
Tembladero Slough @ Preston Road (SS)	309TEM	1	0	0	1	0	0	0

[1] Monitoring Program abbreviations: coastal confluences (CC), lagoons (LAG), special studies (SS).
[2] Chlorpyrifos exceedance criteria of 0.025 µg/L (acute) and 0.015 µg/L (chronic).
[3] NA indicates that an evaluation of chronic criteria exceedance cannot be determined because the laboratory method detection limit for the sample is greater than the chronic exceedance criteria.

Table 6-9. Summary of CCAMP monitoring results for diazinon.

Site Description (Monitoring Program [1])	Site ID	Count of acute samples	Acute criteria exceeded[2]	Acute exceeded %	Count of chronic samples	Chronic criteria exceeded[2]	Chronic exceeded %	Count of samples where method detection limit exceeds chronic criteria
Old Salinas River @ Monterey Dunes Way (CC)	309OLD	2	0	0	2	0	0	0
Tembladero Slough @ Monterey Dunes Way (CC)	309TDW	4	0	0	4	0	0	0
Salinas River@ Davis Road (CC)	309DAV	5	0	0	5	0	0	0
Old Salinas River @ Potrero Road (LAG)	309POT	1	0	0	1	0	0	0
Salinas River Estuary Lower near Old Salinas River Flap Gate (LAG)	309SAL00L	1	0	0	1	0	0	0
Salinas River Estuary Upper near RR bridge (LAG)	309SAL00U	1	0	0	1	0	0	0
Salinas Reclamation Canal @ Boranda Road (SS)	309ALD	1	0	0	1	0	0	0
Blanco Drain below Pump (SS)	309BLA	1	0	0	1	0	0	0
Alisal Creek @ Hartnell Road dogleg (SS)	309HRT	1	0	0	1	0	0	0
Tembladero Slough @ Preston Road (SS)	309TEM	1	0	0	1	0	0	0

[1] Monitoring Program abbreviations: coastal confluences (CC), lagoons (LAG), special studies (SS).
[2] Diazinon exceedance criteria of 0.16 µg/L (acute) and 0.1 µg/L (chronic).

Table 6-10. Summary of CCAMP monitoring results for malathion.

Site Description (Monitoring Program [1])	Site ID	Count of acute samples	Acute criteria exceeded[2]	Acute exceeded %	Count of chronic samples	Chronic criteria exceeded[2]	Chronic exceeded %	Count of samples where method detection limit exceeds chronic criteria
Old Salinas River @ Monterey Dunes Way (CC)	309OLD	2	0	0	2	0	0	0
Tembladero Slough @ Monterey Dunes Way (CC)	309TDW	4	0	0	2	0	0	2
Salinas River@ Davis Road (CC)	309DAV	5	0	0	3	0	0	2
Old Salinas River @ Potrero Road (LAG)	309POT	1	1	100	1	1	100	0
Salinas River Estuary Lower near Old Salinas River Flap Gate (LAG)	309SAL00L	1	0	0	1	0	0	0
Salinas River Estuary Upper near RR bridge (LAG)	309SAL00U	1	0	0	1	0	0	0
Salinas Reclamation Canal @ Boranda Road (SS)	309ALD	2	0	0	2	0	0	0
Blanco Drain below Pump (SS)	309BLA	1	0	0	1	0	0	0
Alisal Creek @ Hartnell Road dogleg (SS)	309HRT	1	0	0	1	0	0	0
Tembladero Slough @ Preston Road (SS)	309TEM	1	0	0	1	0	0	0

[1] Monitoring Program abbreviations: coastal confluences (CC), lagoons (LAG), special studies (SS).
[2] Malathion exceedance criteria of 0.17 µg/L (acute) and 0.028 µg/L (chronic).

Based on the chlorpyrifos analytical results presented above in Table 6-8, only one of the 18 CCAMP samples (obtained from Tembladero Slough at Monterey Dunes Way, site 309TDW) exceeded both the acute and chronic criteria for chlorpyrifos. Note that exceedance of the chlorpyrifos chronic criteria could not be evaluated for 13 of the 18 samples collected because the results were reported as non-detects (concentration is below the method detection limit), but the method detection limit was greater than the chronic criteria.

As shown in the diazinon information presented Table 6-9 above, none of the 18 CCAMP samples exceeded the acute or chronic criteria for diazinon.

The results in Table 6-10 summarize the malathion data and show that one of the 19 CCAMP samples (obtained from the Old Salinas River at Potrero Rd., site 309POT) exceeded both the acute and chronic criteria for malathion. Note that exceedance of the malathion chronic criteria could not be evaluated for 4 of the 18 samples collected because the results were reported as non-detects (concentration is below the method detection limit), but the method detection limit was greater than the chronic criteria.

6.1.3 California Department of Pesticide Regulation (CDPR)

CDPR conducted chlorpyrifos, diazinon, and malathion sampling during several CDPR surface water studies. Water quality sampling results from these studies were uploaded to the CEDEN database. For these CDPR studies, samples were obtained between 2003 and 2017 at 18 sites. The primary analytical test method used by CDPR was California Department of Food and Agriculture, Environmental Monitoring Section Method 46.0 (EMON-SM-46.0) which uses gas chromatography.

It is important to note that the method detection limit (MDL) was not reported for several of the analytical results in the CDPR dataset (approximately 18% of the samples for each of the organophosphate pesticides between 2003 and 2005) and many of these samples were reported as non-detect. When the MDL was not reported and the result was non-detect, staff used the reporting limit (RL) to compare minimum concentrations to the exceedance criteria. Where the RL is greater than the chronic evaluation guideline and the test result was non-detect, staff omitted the sample from the data summary and exceedance tables below. In the data summary and exceedance tables below, staff has indicated the number of samples that were not included because they were reported and non-detects, without an MDL, and the RL is greater than the exceedance criteria. And, as a result, staff could not determine whether the sample exceeds the criteria or not.

Table 6-11 identifies the CDPR monitoring sites within the lower Salinas River watershed along with CMP and CCAMP monitoring sites and Figure 6-3 depicts the site locations. Table 6-12, Table 6-13, and Table 6-14 provide data summaries and criteria exceedances for chlorpyrifos, diazinon, and malathion, respectively. Finally, a discussion summarizing the exceedances for each of the organophosphate pesticides is provided at the end of this section.

Table 6-11. CDPR monitoring sites.

Site Description	CDPR Site ID	CMP or CCAMP Site ID	Start Date	End Date
Moro Cojo Slough at HWY 1	Monterey 48	306MOR	1/7/2008	1/7/2008
Old Salinas River at Potrero Road	309POT	309POT	9/13/2004	6/11/2013
Old Salinas River at Monterey Dunes Way	Monterey 50	309OLD	5/18/2010	8/13/2015
Tembladero Slough at Molera	Monterey 58	309TDW	7/22/2008	8/13/2015
Tembladero Slough at Haro	309SMHR43	309TEH	8/27/2007	9/11/2017
Espinosa Slough at HWY 183	Monterey 15	N/A	6/6/2012	6/6/2012
Salinas Reclamation Canal at San Jon Road	309JON	309JON	9/13/2004	9/11/2017
Gabilan Creek near E. Boronda at drain pipe	Monterey 16	309GAB	6/6/2012	6/6/2012
Gabilan Creek	309ST0509	309GAB	6/6/2012	6/6/2012
Natividad Creek	309NC3799	N/A	6/6/2012	6/11/2013
Rec Ditch III near Airport Blvd	309SLRC66	N/A	6/16/2003	9/15/2015
Alisal Creek at Hartnell Road	309SLHR83	309HRT	4/15/2008	9/12/2017
Quail Creek at SR-101	309SLQL69	309QUI	6/16/2003	9/11/2017
Chualar Creek at Chualar River Road	309CHUCRR	N/A	6/16/2003	9/11/2017
Blanco Drain at Cooper Road (0.2 mi. S of Nashua Road, drains to Salinas River)	Monterey 9	N/A	6/17/2003	8/13/2015
Salinas River at HWY 1 Bridge	309ST1345	309SAL00U	9/13/2004	8/13/2015
Salinas River at Davis Road	Monterey 13	309DAV	9/13/2004	9/11/2017
Salinas River at Chualar River Road	309SAC	309SAC	6/5/2012	6/5/2012

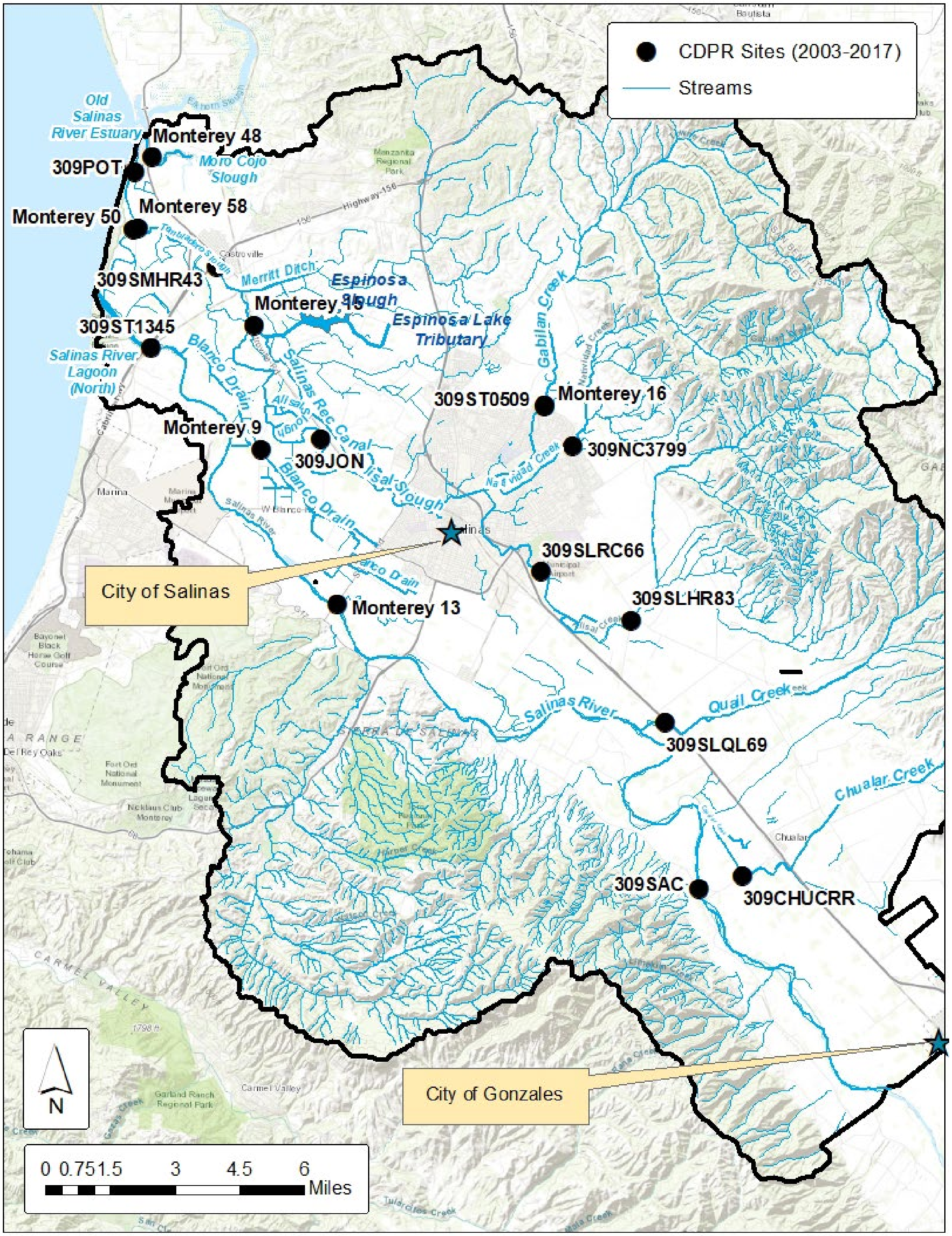

Figure 6-3. Map of CDPR monitoring stations.

Table 6-12. Summary of CDPR monitoring results for chlorpyrifos.

Site location	Site code	Count of acute samples	Acute criteria exceeded[1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded[1]	Chronic criteria exceeded %	Count of NDs, without MDL, and RL is greater than 0.025 µg/L [2]
Moro Cojo Slough at HWY 1	Monterey 48	1	0	0	1	0	0	0
Old Salinas River at Potrero Rd	309POT	39	4	10.3	39	7	17.9	0
Old Salinas River at Monterey Dunes Way	Monterey 50	9	0	0	9	0	0	0
Tembladero Slough at Molera	Monterey 58	11	0	0	11	1	9.1	0
Tembladero Slough at Haro	309SMHR43	67	3	4.5	67	7	10.4	0
Espinosa Slough at HWY 183	Monterey 15	1	0	0	1	0	0	0
Salinas Reclamation Canal at San Jon Road	309JON	29	5	17.2	29	5	17.2	0
Gabilan Creek near E. Boronda at drain pipe	Monterey 16	1	0	0	1	0	0	0
Gabilan Creek	309ST0509	1	0	0	1	0	0	0
Natividad Creek	309NC3799	2	1	50	2	1	50	0
Rec Ditch III near Airport Blvd	309SLRC66	46	18	39.1	46	18	39.1	15
Alisal Creek at Hartnell Road	309SLHR83	53	18	34.0	53	21	39.6	0
Quail Creek at SR-101	309SLQL69	72	40	55.6	72	46	63.9	0
Chualar Creek at Chualar River Road	309CHUCRR	68	42	61.8	68	44	64.7	4
Blanco Drain at Cooper Road (0.2 mi. S of Nashua Road, drains to Salinas River)	Monterey 9	7	1	14.3	7	1	14.3	15
Salinas River at HWY 1 Bridge	309ST1345	33	0	0	33	0	0	0
Salinas River at Davis Road	Monterey 13	27	0	0	27	0	0	0
Salinas River at Chualar River Road	309SAC	1	0	0	1	0	0	0

[1] Chlorpyrifos exceedance criteria of 0.025 µg/L (acute) and 0.015 µg/L (chronic).

[2] Count of samples in the CEDEN database reported as non-detect (ND), without a method detection limit (MDL), and the reporting limit (RL) is greater than the acute exceedance criteria of 0.025 µg/L. Samples not included in the exceedance summary table above.

Table 6-13. Summary of CDPR monitoring results for diazinon.

Site location	Site code	Count of acute samples	Acute criteria exceeded[1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded[1]	Chronic criteria exceeded %
Moro Cojo Slough at HWY 1	Monterey 48	1	0	0	1	0	0
Old Salinas River at Potrero Road	309POT	41	6	14.6	41	11.0	26.8
Old Salinas River at Monterey Dunes Way	Monterey 50	5	0	0	5	1	20
Tembladero Slough at Molera	Monterey 58	7	1	14.3	7	4	57.1
Tembladero Slough at Haro	309SMHR43	62	15	24.2	62	19	30.6
Espinosa Slough at HWY 183	Monterey 15	1	0	0.0	1	0.0	0
Salinas Reclamation Canal at San Jon Road	309JON	23	2	8.7	23	2	8.7
Gabilan Creek near E. Boronda at drain pipe	Monterey 16	1	0	0.0	1	0.0	0
Gabilan Creek	309ST0509	1	0	0	1	0	0
Natividad Creek	309NC3799	2	0	0.0	2	0.0	0
Rec Ditch III near Airport Blvd	309SLRC66	58	34	58.6	58	37	63.8
Alisal Creek at Hartnell Road	309SLHR83	48	9	18.75	48	12	25
Quail Creek at SR-101	309SLQL69	68	19	27.9	68	24.0	35.3
Chualar Creek at Chualar River Road	309CHUCRR	67	26	38.8	67	35	52.2
Blanco Drain at Cooper Road (0.2 mi. S of Nashua Road, drains to Salinas River)	Monterey 9	18	6	33.3	18	8	44.4
Salinas River at HWY 1 Bridge	309ST1345	31	2	6.5	31	3	9.7
Salinas River at Davis Road	Monterey 13	20	0	0	20	0	0
Salinas River at Chualar River Road	309SAC	1	0	0.0	1	0.0	0

[1] Diazinon exceedance criteria of 0.16 μg/L (acute) and 0.1 μg/L (chronic).

Table 6-14. Summary of CDPR monitoring results for malathion.

Site location	Site code	Count of acute samples	Acute criteria exceeded[1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded[1]	Chronic criteria exceeded %	Count of NDs, without MDL, and RL is greater than 0.028 µg/L [2]
Moro Cojo Slough at HWY 1	Monterey 48	1	0	0	1	0	0	0
Old Salinas River at Potrero Road	309POT	39	1	2.6	36	1	2.8	3
Old Salinas R. at Monterey Dunes Way	Monterey 50	9	0	0	9	0	0	0
Tembladero Slough at Molera	Monterey 58	11	0	0	11	1	9.1	0
Tembladero Slough at Haro	309SMHR43	67	3	4.5	67	11	16.4	0
Espinosa Slough at HWY 183	Monterey 15	1	0	0	1	0	0	0
Salinas Reclamation Canal at San Jon Road	309JON	29	1	3.4	26	5	19.2	3
Gabilan Creek near E. Boronda at drain pipe	Monterey 16	1	0	0	1	0	0	0
Gabilan Creek	309ST0509	1	0	0	1	0	0	0
Natividad Creek	309NC3799	2	0	0	2	0	0	0
Rec Ditch III near Airport Blvd	309SLRC66	61	7	11.5	46	16	34.8	15
Alisal Creek at Hartnell Road	309SLHR83	53	14	26.4	53	23	43.4	0
Quail Creek at SR-101	309SLQL69	72	3	4.2	56	12	21.4	16
Chualar Creek at Chualar River Road	309CHUCRR	72	2	2.8	59	8	13.6	13
Blanco Drain at Cooper Road (0.2 mi. S of Nashua Road, drains to Salinas River)	Monterey 9	22	0	0	6	0	0	16
Salinas River at HWY 1 Bridge	309ST1345	33	0	0	30	0	0	3
Salinas River at Davis Road	Monterey 13	27	1	3.7	24	1	4.2	3
Salinas River at Chualar River Road	309SAC	1	0	0	1	0	0	0

[1] Malathion exceedance criteria of 0.17 µg/L (acute) and 0.028 µg/L (chronic).

[2] Count of samples in the CEDEN database reported as non-detect (ND), without a method detection limit (MDL), and the reporting limit (RL) is greater than the chronic exceedance criteria of 0.028 µg/L. Samples not included in the exceedance summary table above.

Based on the CDPR data contained in Table 6-12 and following the methodology from the Listing Policy to determine impairment, staff has concluded chlorpyrifos water quality impairments for the Old Salinas River (309POT), Tembladero Slough (309SMHR43), Salinas Reclamation Canal (309JON and 309SLRC66), Alisal Creek (309SLHR83), Quail Creek (309SLQL69), and Chualar Creek (309CHUCRR).

As shown in Table 6-13, staff has concluded diazinon impairments for the Old Salinas River (309POT), Alisal Creek (309SLHR83), Quail Creek (309SLQL69), Chualar Creek (309CHUCRR), Tembladero Slough (Monterey 58 and 309SMHR43), and Blanco Drain (Monterey 9). Although Table 6-5 shows diazinon exceedances for Salinas Reclamation Canal (309JON and 309SLRC66), subsequent data analysis indicate that concentrations have decreased significantly following approval of the 2011 TMDL. As a result, staff will recommend de-listing the Salinas Reclamation Canal for diazinon impairment. See Section 6.2 for further discussion on staff's recommendation to de-list Salinas Reclamation Canal for diazinon impairments.

For the malathion data presented in Table 6-14, staff has concluded malathion impairments for Tembladero Slough (309SMHR43), Salinas Reclamation Canal (309JON and 309SLRC66), Alisal Creek (309SLHR83), Quail Creek (309SLQL69) and Chualar Creek (309CHUCRR).

6.2 Recommendation to De-list Salinas Reclamation Canal for Diazinon Impairment

Following approval of the previous TMDLs in 2011, staff evaluated the results of all diazinon water quality data and found concentrations within the Salinas Reclamation Canal no longer exceed the acute or chronic evaluation criteria. As a result, staff recommend de-listing the Salinas Reclamation Canal for diazinon impairment during the 2020-2022 listing cycle, approved by the State Water Resources Control Board (State Water Board) in January 2022. The State's 2020-2022 303(d) List will be submitted to USEPA for approval in April 2022. This recommendation is consistent with table 4-1 of Listing Policy which defines the minimum number of measured exceedances allowed to remove a water segment from the 303(d) List for toxicants as shown below in Table 6-15.

Table 6-15. Maximum number of measured criteria exceedances allowed to remove a water segment from the 303(d) List for toxicants.

Sample Size	De-list if the number of exceedances equals or is less than
28 – 36	2
37 – 47	3
48 – 59	4

Since approval of the previous TMDLs on October 7, 2011, a total of 59 diazinon samples were collected from the Salinas Reclamation Canal which included monitoring sites 309ALD (n=5), 309ALG (n=8), 309ALU (n=4), 309JON (n=28), and 309SLRC66 (n=14). Only one of the 59 samples from the Salinas Reclamation Canal exceeded the acute and chronic evaluation criteria for diazinon. Figure 6-4 shows diazinon concentrations over time for all Salinas Reclamation Canal monitoring sites (309ALD, 309ALG, 309ALU, 309JON, and 309SLRC66).

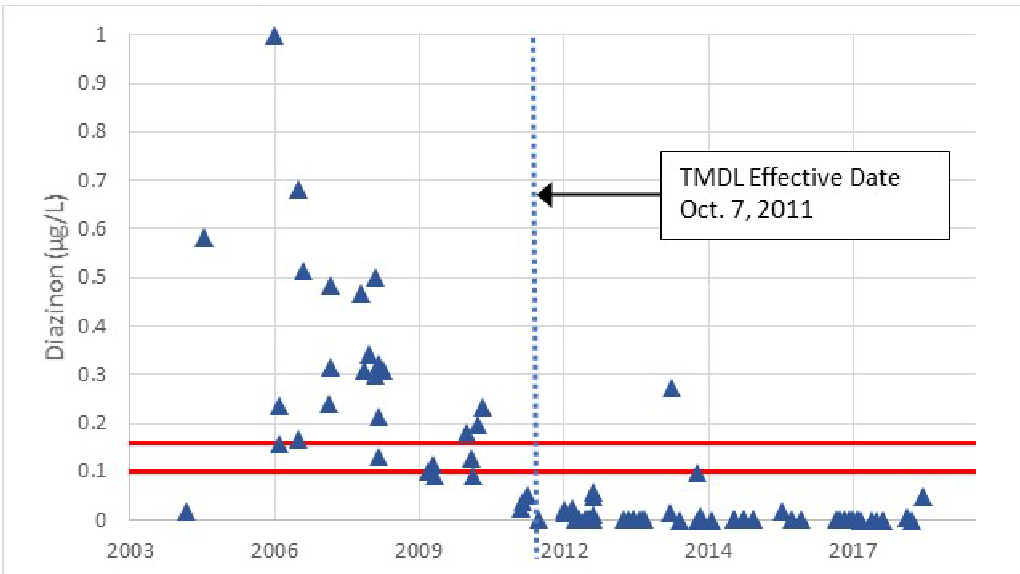

Figure 6-4. Graph of diazinon concentrations for all Salinas Reclamation Canal monitoring sites.

Note: Red horizontal lines represent diazinon criteria of 0.16 µg/L (acute) and 0.1 µg/L (chronic). Not shown are concentrations of 1.16 µg/L (9/13/2004) and 3.16 µg/L (8/23/2006) for 309JON and 1.68 µg/L (3/22/2007) for 309ALG.

Diazinon use in Monterey County has been declining rapidly since 2007. Pesticide use reporting provided by CDPR indicates that peak diazinon use in Monterey County occurred in 2004, where 171,840 pounds of diazinon was used. The most recent year of pesticide use reporting for diazinon is 2017, where 107 pounds of diazinon was used. Figure 6-5 depicts the total amount of diazinon used each year in Monterey County from 1991 to 2018 and its' rapid decline since 2004.

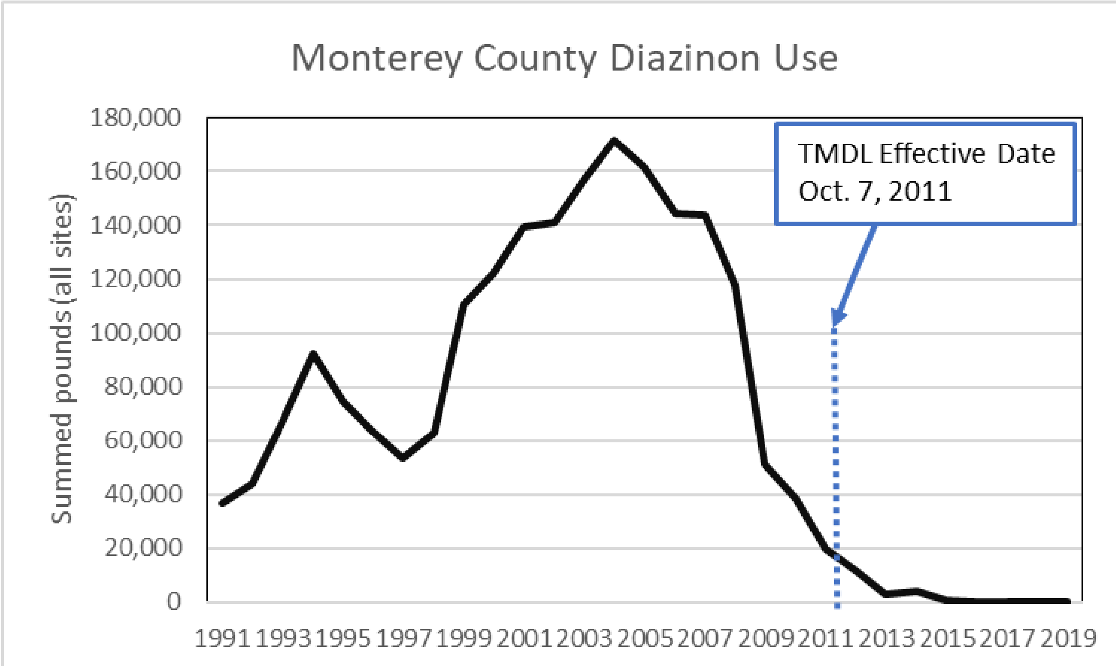

Figure 6-5. Graph of Monterey County diazinon use (1991 to 2017).

6.3 Summary of Organophosphate Pesticides Data

This section summarizes the organophosphate pesticide data provided through the monitoring programs presented in Section 6.1 above. Table 6-16, Table 6-17, and Table 6-18 are tabulations of chlorpyrifos, diazinon, and malathion water quality monitoring results respectively. Staff has summarized the data for each waterbody and respective water quality monitoring sites, along with staff's determination of water quality impairments. To determine waterbody impairment due to excessive levels of chlorpyrifos, diazinon, or malathion, staff compared the monitoring results to the exceedance frequencies defined by the Listing Policy as shown in Table 6-2.

A summary of waterbody impairments for all organophosphate pesticides is provided as Table 6-19.

Table 6-16. Summary of monitoring programs, monitoring sites, exceedances, and chlorpyrifos impaired waterbodies.

Waterbody	Program/Site Code	Count of acute samples	Acute criteria exceeded [1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded [1]	Chronic criteria exceeded %	Chlorpyrifos impaired
Moro Cojo Slough	CMP/306MOR	13	0	0	13	0	0	No
Moro Cojo Slough	CDPR/Monterey 48	1	0	0	1	0	0	No
Old Salinas R.	CMP/309OLD	13	0	0	13	0	0	No
Old Salinas R.	CCAMP/309OLD	2	0	0	0	NA [2]	NA	No
Old Salinas R.	CDPR/Monterey 50	9	0	0	9	0	0	No
Old Salinas R.	CDPR/309POT	39	4	**10.3**	39	7	**17.9**	**Yes**
Old Salinas R.	CCAMP/309POT	1	0	0	1	NA	NA	No
Salinas R. Lagoon	CDPR/309ST1345	33	0	0	33	0	0	No
Salinas R. Lagoon	CCAMP/309SAL00L	1	0	0	0	NA	NA	No
Salinas R. Lagoon	CCAMP/309SAL00U	1	0	0	0	NA	NA	No
Tembladero Slough	CMP/309TEH	13	4	30.8	13	4	30.8	**Yes**
Tembladero Slough	CDPR/309SMHR43	67	3	4.5	67	7	**10.4**	**Yes**
Tembladero Slough	CCAMP/309TDW	4	1	25 [3]	1	1	100 [3]	No
Tembladero Slough	CDPR/Monterey 58	11	0	0	11	1	9.1	No
Tembladero Slough	CCAMP/309TEM	1	0	0	1	0	0	No
Merritt Ditch	CMP/309MER	13	1	7.7 [3]	13	1	7.7 [3]	No
Alisal Slough	CMP/309ASB	13	0	0	13	0	0	No
Alisal Creek	CCAMP/309HRT	1	0	0	1	0	0	No
Alisal Creek	CDPR/309SLHR83	53	18	34	53	21	39.6	**Yes**
Blanco Drain	CMP/309BLA	13	0	0	13	1	7.7 [3]	No
Blanco Drain	CCAMP/309BLA	1	0	0	0	NA	NA	No
Blanco Drain	CDPR/Monterey 9	7	1	14.3 [3]	7	1	14.3 [3]	No
Salinas Reclamation Canal (Lower)	CMP/309JON	13	3	23.1	13	3	23.1	**Yes**
Salinas Reclamation Canal (Lower)	CCAMP/309ALD	1	0	0	1	0	0	No
Salinas Reclamation Canal (Lower)	CDPR/309JON	29	5	**17.2**	29	5	**17.2**	Yes

Waterbody	Program/Site Code	Count of acute samples	Acute criteria exceeded [1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded [1]	Chronic criteria exceeded %	Chlorpyrifos impaired
Salinas Reclamation Canal (Upper)	CMP/309ALG	13	2	15.4	13	2	15.4	**Yes**
Salinas Reclamation Canal (Upper)	CDPR/309SLRC66	46	18	**39.1**	46	18	**39.1**	Yes
Salinas River	CMP/309SSP	6	1	16.7 [3]	6	1	16.7 [3]	No
Salinas River	CMP/309SAC	4	0	0	4	0	0	No
Salinas River	CDPR/309SAC	1	0	0	1	0	0	No
Salinas River	CMP/309SAG	3	0	0	3	0	0	No
Salinas River	CDPR/Monterey 13	27	0	0	27	0	0	No
Salinas River	CCAMP/309DAV	5	0	0	1	0	0	No
Espinosa Slough	CMP/309ESP	13	1	7.7 [3]	13	1	7.7 [3]	No
Espinosa Slough	CDPR/Monterey 15	1	0	0	1	0	0	No
Gabilan Creek	CMP/309GAB	2	0	0	2	1	50 [3]	No
Gabilan Creek	CDPR/Monterey 16	1	0	0	1	0	0	No
Gabilan Creek	CDPR/309ST0509	1	0	0	1	0	0	No
Natividad Creek	CMP/309NAD	8	2	25	8	2	25	**Yes**
Natividad Creek	CDPR/309NC3799	2	1	50 [3]	2	1	50 [3]	No
Santa Rita Creek	CMP/309RTA	4	0	0	4	0	0	No
Quail Creek	CMP/309QUI	11	6	54.5	11	6	54.5	**Yes**
Quail Creek	CDPR/309SLQL69	72	40	**55.6**	72	46	**63.9**	Yes
Chualar Creek	CMP/309CCD	7	1	14.3 [3]	7	2	28.6	**Yes**
Chualar Creek	CDPR/309CHUCRR	68	42	**61.8**	68	44	**64.7**	Yes

[1] Chlorpyrifos criteria of 0.025 µg/L (acute) and 0.015 µg/L (chronic).

[2] NA (not assessed) indicates that an evaluation of chronic criteria exceedance is not assessable because the laboratory method detection limit is greater than the chronic exceedance criteria.

[3] Exceedance count is less than two, the minimum number of exceedances required to determine impairment in accordance with the Listing Policy, regardless of the calculated exceedance frequency.

Table 6-17. Summary of monitoring programs, monitoring sites, exceedances, and diazinon impaired waterbodies.

Waterbody	Program/Site Code	Count of acute samples	Acute criteria exceeded [1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded [1]	Chronic criteria exceeded %	Diazinon impaired
Moro Cojo Slough	CMP/306MOR	13	0	0	13	0	0	No
Moro Cojo Slough	CDPR/Monterey 48	1	0	0	1	0	0	No
Old Salinas R.	CMP/309OLD	13	1	7.7 [2]	13	2	15.4	**Yes**
Old Salinas R.	CCAMP/309OLD	2	0	0	2	0	0	No
Old Salinas R.	CDPR/Monterey 50	5	0	0	5	1	20 [2]	No
Old Salinas R.	CDPR/309POT	41	6	**14.6**	41	11	**26.8**	Yes
Old Salinas R.	CCAMP/309POT	1	0	0	1	0	0	No
Salinas R. Lagoon	CDPR/309ST1345	31	2	6.5	31	3	**9.7**	Yes
Salinas R. Lagoon	CCAMP/309SAL00L	1	0	0	1	0	0	No
Salinas R. Lagoon	CCAMP/309SAL00U	1	0	0	1	0	0	No
Tembladero Slough	CMP/309TEH	13	3	23.1	13	5	38.5	**Yes**
Tembladero Slough	CDPR/309SMHR43	62	15	24.2	62	19	30.6	**Yes**
Tembladero Slough	CCAMP/309TDW	4	0	0	4	0	0	No
Tembladero Slough	CDPR/Monterey 58	7	1	14.3 [2]	7	4	**57.1**	**Yes**
Tembladero Slough	CCAMP/309TEM	1	0	0	1	0	0	No
Merritt Ditch	CMP/309MER	13	2	15.4	13	3	23.1	**Yes**
Alisal Slough	CMP/309ASB	13	2	15.4	13	3	23.1	**Yes**
Alisal Creek	CCAMP/309HRT	1	0	0	1	0	0	No
Alisal Creek	CDPR/309SLHR83	48	9	18.75	48	12	25	**Yes**
Blanco Drain	CMP/309BLA	13	1	7.7 [2]	13	3	23.1	**Yes**
Blanco Drain	CCAMP/309BLA	1	0	0	1	0	0	No
Blanco Drain	CDPR/Monterey 9	18	6	**33.3**	18	8	**44.4**	**Yes**
Salinas Reclamation Canal (Lower)	CMP/309JON	13	6	46.2	13	6	46.2	Note 1
Salinas Reclamation Canal (Lower)	CCAMP/309ALD	1	0	0	1	0	0	No
Salinas Reclamation Canal (Lower)	CDPR/309JON	23	2	8.7	23	2	8.7	Note 1

Waterbody	Program/Site Code	Count of acute samples	Acute criteria exceeded [1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded [1]	Chronic criteria exceeded %	Diazinon impaired
Salinas Reclamation Canal (Upper)	CMP/309ALG	13	4	30.8	13	5	38.5	Note 1
Salinas Reclamation Canal (Upper)	CDPR/309SLRC66	58	34	58.6	58	37	63.8	Note 1
Salinas River	CMP/309SSP	6	1 [2]	16.7	6	1 [2]	16.7	No
Salinas River	CMP/309SAC	4	0	0	4	0	0	No
Salinas River	CDPR/309SAC	1	0	0	1	0	0	No
Salinas River	CMP/309SAG	3	0	0	3	0	0	No
Salinas River	CDPR/Monterey 13	20	0	0	20	0	0	No
Salinas River	CCAMP/309DAV	5	0	0	5	0	0	No
Espinosa Slough	CMP/309ESP	13	6	46.2	13	6	46.2	**Yes**
Espinosa Slough	CDPR/Monterey 15	1	0	0	1	0	0	No
Gabilan Creek	CMP/309GAB	2	0	0	2	0	0	No
Gabilan Creek	CDPR/Monterey 16	1	0	0	1	0	0	No
Gabilan Creek	CDPR/309ST0509	1	0	0	1	0	0	No
Natividad Creek	CMP/309NAD	8	5	62.5	8	6	75.0	**Yes**
Natividad Creek	CDPR/309NC3799	2	0	0	2	0	0	No
Santa Rita Creek	CMP/309RTA	4	0	0	4	0	0	No
Quail Creek	CMP/309QUI	11	5	45.5	11	5	45.5	**Yes**
Quail Creek	CDPR/309SLQL69	68	19	**27.9**	68	24	**35.3**	**Yes**
Chualar Creek	CMP/309CCD	7	0	0	7	1 [2]	14.3	No
Chualar Creek	CDPR/309CHUCRR	67	26	**38.8**	67	35	**52.2**	**Yes**

[1] Diazinon criteria of 0.16 µg/L (acute) and 0.1 µg/L (chronic).
[2] Exceedance count is less than two, the minimum number of exceedances required to determine impairment in accordance with the Listing Policy, regardless of the calculated exceedance frequency.
Note 1: Exceedance of diazinon criteria for this site occurred prior to October 2011 and since this time no exceedances have occurred. As such, staff is recommending to de-list the Salinas Reclamation Canal as presented in Section 6.2.

Table 6-18. Summary of monitoring programs, monitoring sites, exceedances, and malathion impaired waterbodies.

Waterbody	Program/Site Code	Count of acute samples	Acute criteria exceeded [1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded [1]	Chronic criteria exceeded %	Malathion impaired
Moro Cojo Slough	CMP/306MOR	13	0	0	0	0	0	No
Moro Cojo Slough	CDPR/Monterey 48	1	0	0	1	0	0	No
Old Salinas R.	CMP/309OLD	13	0	0	13	1	7.7 [3]	No
Old Salinas R.	CCAMP/309OLD	2	0	0	2	0	0	No
Old Salinas R	CDPR/Monterey 50	9	0	0	9	0	0	No
Old Salinas R	CDPR/309POT	39	1	2.6 [3]	36	1	2.8 [3]	No
Old Salinas R.	CCAMP/309POT	1	1	100 [3]	1	1	100 [3]	No
Salinas R. Lagoon	CDPR/309ST1345	33	0	0	6	0	0	No
Salinas R. Lagoon	CCAMP/309SAL00L	1	0	0	1	0	0	No
Salinas R. Lagoon	CCAMP/309SAL00U	1	0	0	1	0	0	No
Tembladero Slough	CMP/309TEH	13	1	7.7 [3]	13	4	30.8	**Yes**
Tembladero Slough	CDPR/309SMHR43	67	3	4.5	67	11	**16.4**	**Yes**
Tembladero Slough	CCAMP/309TDW	4	0	0	2	0	0	No
Tembladero Slough	CDPR/Monterey 58	11	0	0	11	1	9.1 [3]	No
Tembladero Slough	CCAMP/309TEM	1	0	0	1	0	0	No
Merritt Ditch	CMP/309MER	13	3	23.1	13	4	30.8	**Yes**
Alisal Slough	CMP/309ASB	13	1	7.7 [3]	13	3	23.1	**Yes**
Alisal Creek	CCAMP/309HRT	1	0	0	1	0	0	No
Alisal Creek	CDPR/309SLHR83	53	14	**26.4**	53	23	**43.4**	**Yes**
Blanco Drain	CMP/309BLA	13	0	0	13	2	15.4	**Yes**
Blanco Drain	CCAMP/309BLA	1	0	0	1	0	0	No
Blanco Drain	CDPR/Monterey 9	22	0	0	6	0	0	No
Salinas Reclamation Canal (Lower)	CMP/309JON	13	0	0	13	3	23.1	**Yes**
Salinas Reclamation Canal (Lower)	CCAMP/309ALD	2	0	0	2	0	0	No
Salinas Reclamation Canal (Lower)	CDPR/309JON	29	1	3.4 [3]	26	5	**19.2**	**Yes**

Waterbody	Program/Site Code	Count of acute samples	Acute criteria exceeded [1]	Acute criteria exceeded %	Count of chronic samples	Chronic criteria exceeded [1]	Chronic criteria exceeded %	Malathion impaired
Salinas Reclamation Canal (Upper)	CMP/309ALG	13	1	7.7 [3]	13	2	15.4	**Yes**
Salinas Reclamation Canal (Upper)	CDPR/309SLRC66	61	7	**11.5**	46	16	**34.8**	**Yes**
Salinas River	CMP/309SSP	6	0	0	6	0	0	No
Salinas River	CMP/309SAC	4	0	0	4	0	0	No
Salinas River	CDPR/309SAC	1	0	0	1	0	0	No
Salinas River	CMP/309SAG	3	0	0	3	1	33.3 [3]	No
Salinas River	CDPR/Monterey 13	17	1	3.7 [3]	24	1	4.2 [3]	No
Salinas River	CCAMP/309DAV	5	0	0	3	0	0	No
Espinosa Slough	CMP/309ESP	13	0	0	13	3	23.1	**Yes**
Espinosa Slough	CDPR/Monterey 15	1	0	0	1	0	0	No
Gabilan Creek	CMP/309GAB	2	0	0	2	1	50 [3]	No
Gabilan Creek	CDPR/Monterey 16	1	0	0	1	0	0	No
Gabilan Creek	CDPR/309ST0509	1	0	0	1	0	0	No
Natividad Creek	CMP/309NAD	8	2	25	8	3	37.5	**Yes**
Natividad Creek	CDPR/309NC3799	2	0	0	2	0	0	No
Santa Rita Creek	CMP/309RTA	4	1	25 [3]	4	2	50	**Yes**
Quail Creek	CMP/309QUI	11	0	0	11	0	0	No
Quail Creek	CDPR/309SLQL69	72	3	4.2	56	12	**21.4**	**Yes**
Chualar Creek	CMP/309CCD	7	0	0	0	0	0	No
Chualar Creek	CDPR/309CHUCCR	72	2	2.8	59	8	**13.6**	**Yes**

[1] Malathion criteria of 0.17 µg/L (acute) and 0.028 µg/L (chronic).

[2] NA (not assessed) indicates that an evaluation of chronic criteria exceedance is not assessable because the laboratory method detection limit is greater than the chronic exceedance criteria.

[3] Exceedance count is less than two, the minimum number of exceedances required to determine impairment in accordance with the Listing Policy, regardless of the calculated exceedance frequency.

Table 6-19. Organophosphate pesticide impaired waterbodies.

Waterbody	Chlorpyrifos impaired	Diazinon impaired	Malathion impaired
Moro Cojo Slough	No	No	No
Old Salinas River	Yes	Yes	No
Salinas River Lagoon	No [1]	Yes [2]	No
Tembladero Slough	Yes	Yes	Yes
Merritt Ditch	No	Yes	Yes [2]
Alisal Slough	No	Yes	Yes [2]
Alisal Creek	Yes [2]	Yes [2]	Yes [2]
Blanco Drain	No [3]	Yes	Yes [2]
Salinas Reclamation Canal (Lower)	Yes	Note 1	Yes
Salinas Reclamation Canal (Upper)	Yes	Note 1	Yes
Salinas River	No [1]	No [1]	No
Espinosa Slough	No	Yes	Yes
Gabilan Creek	No	No	No
Natividad Creek	Yes [2]	Yes	Yes [2]
Santa Rita Creek	No	No	Yes [2]
Quail Creek	Yes	Yes	Yes
Chualar Creek	Yes	Yes	Yes

[1] Waterbody is on the current 303(d) List, however exceedance frequencies and sample sizes indicate the waterbody meets the Listing Policy requirements for de-listing. As such, staff will recommend de-listing this waterbody. TMDLs and allocations are assigned herein as these waterbodies await future delisting approval by USEPA.

[2] Waterbody is not included on the current 303(d) List, but it has been identified as a new impairment. TMDLs and allocations are assigned herein.

[3] Waterbody is on the current 303(d) List (the 2018 303(d) List) and current data indicates the waterbody is not impaired. However, the exceedance frequency and sample size are insufficient and do not meet the Listing Policy requirements for staff to recommend de-listing at this time. TMDLs and allocations are assigned herein.

Note 1: Exceedance of diazinon criteria for this waterbody occurred prior to October 2011. Staff recommended de-listing the Salinas Reclamation Canal as presented in Section 6.2. TMDLs and allocations are assigned herein as these waterbodies await future delisting approval by USEPA.

6.4 Temporal Trends Organophosphate Pesticides

Staff calculated temporal trends by computing the Kendall's T correlation coefficient (Kendall's tau) for each organophosphate pesticide. For this analysis, staff used CMP monitoring results (2006 to 2018) for stations within the lower Salinas River watershed (17 monitoring stations). Staff used CMP data because it utilized the same analytical method for all samples and the method detection limit for all samples was sufficient to assess exceedances of each organophosphate pesticide evaluation criteria. See Section 6.1.1 for CMP monitoring results. Kendall's tau is a nonparametric correlation coefficient that measures the monotonic association between two variables (Helsel 2012), for example concentration over time. The Kendall's tau correlation for each organophosphate pesticide concentration versus time (in years) was performed with the *cenken*() function in the NADA package for R (Lee 2013). The *cenken*() function also returns the significance of the tau statistic as a P-value between 0 and 1. Trends can be significantly increasing or significantly decreasing. Time series with non-significant Kendall's tau correlations are neither significantly increasing nor significantly decreasing.

Temporal trends of concentration versus time were calculated for chlorpyrifos, diazinon, and malathion. P-values of 0.10 or less were considered statistically significant. The analysis identified significant decreasing trends in chlorpyrifos and diazinon concentrations, while malathion concentrations significantly increased over time.

Table 6-20. Trend statistics for CMP monitoring site concentrations of chlorpyrifos, diazinon, and malathion.

Analyte Name (µg/L)	Slope (conc./yr)	Intercept	tau	P-value	N (samples)	Significant Trend
Chlorpyrifos	-0.006	12.736	-0.107	0.028	162	Decreasing
Diazinon	-0.054	108.464	-0.421	<0.001	162	Decreasing
Malathion	0.009	-17.654	0.078	0.099	162	Increasing

Figure 6-6, Figure 6-7, and Figure 6-8 show time series plots for chlorpyrifos, diazinon, and malathion, respectively. The plots also show the computed Akritas-Theil-Sen nonparametric trend line in red, which estimates the median of slopes of all lines through pairs of censored points.

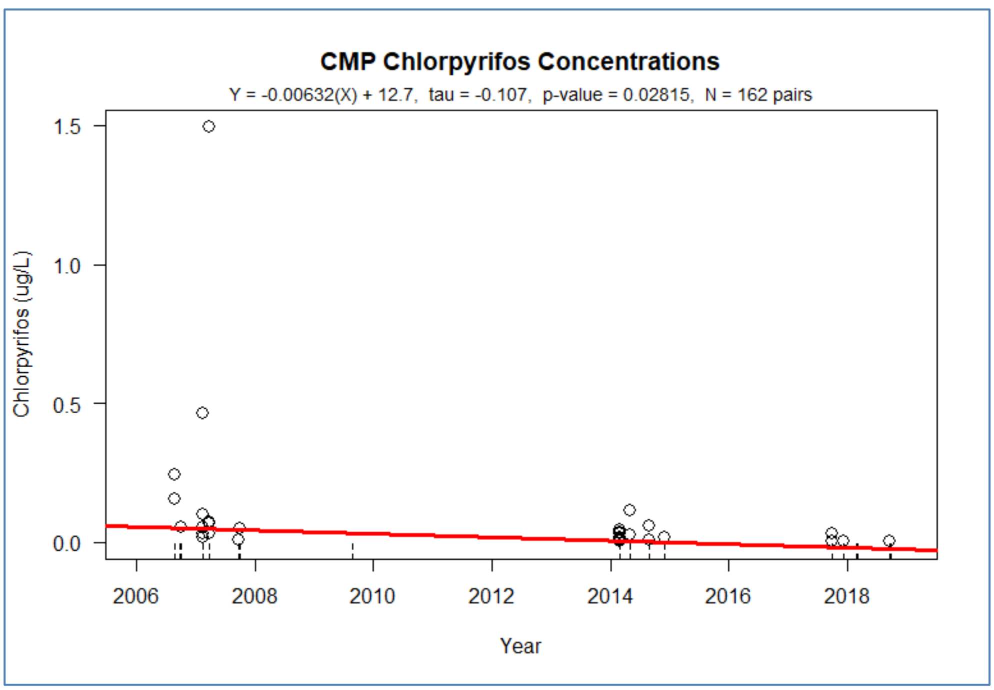

Figure 6-6. Time series graph of chlorpyrifos concentrations (µg/L) from 17 CMP monitoring sites in the project area.

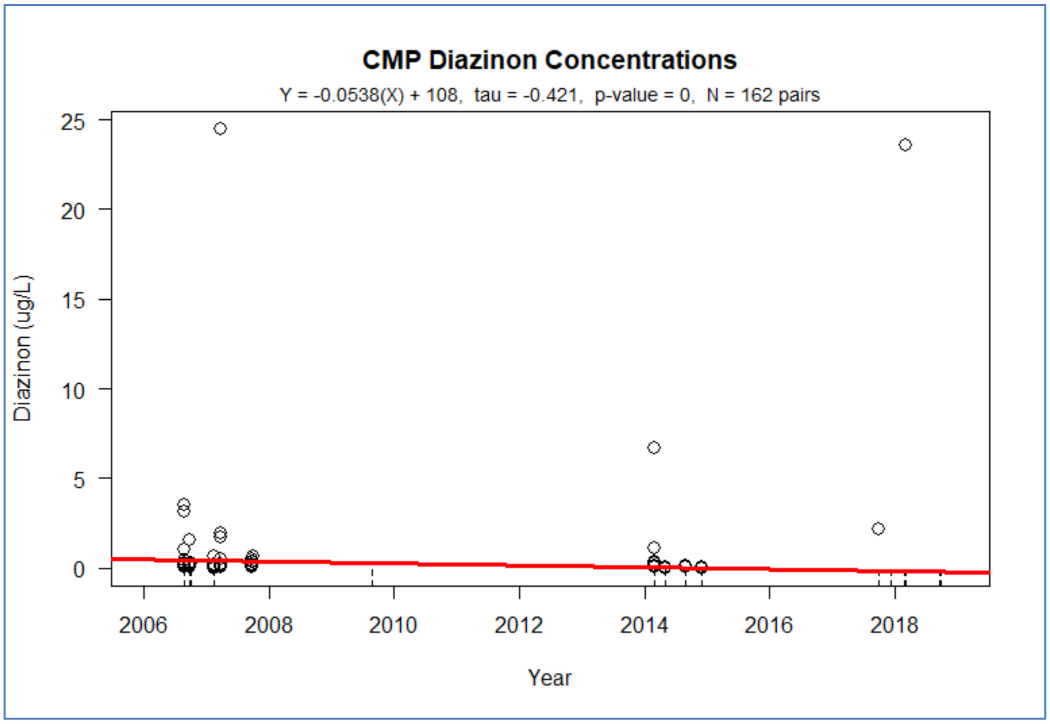

Figure 6-7. Time series graph of diazinon concentrations (µg/L) from 17 CMP monitoring sites in the project area.
Note: The p-value is less than 0.001.

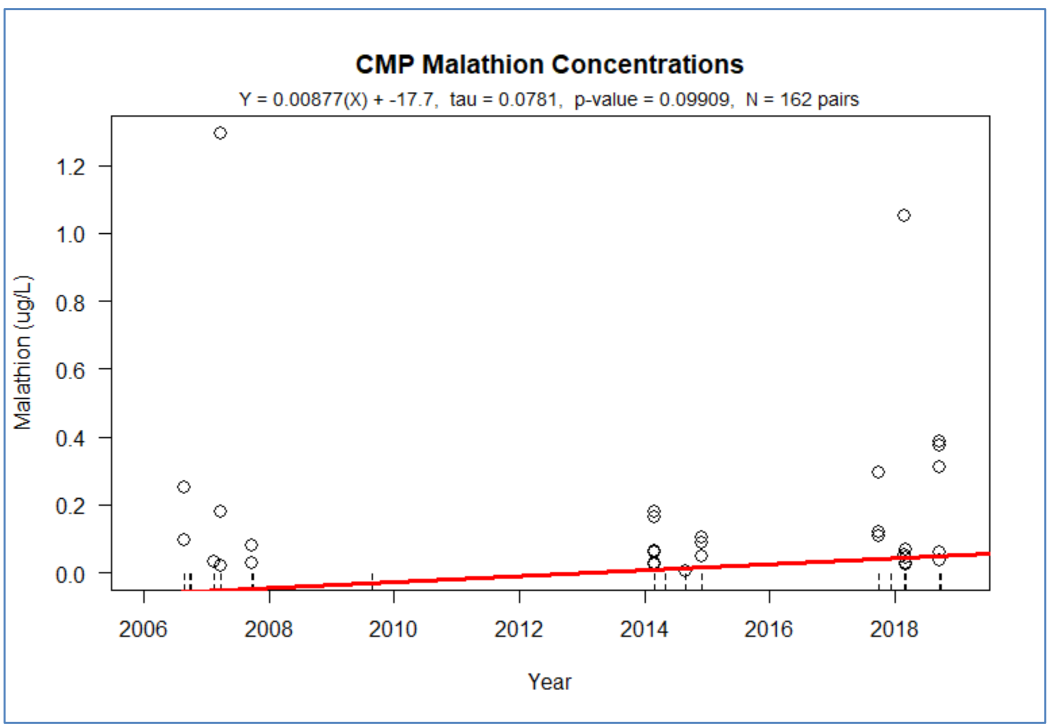

Figure 6-8. Time series graph of malathion concentrations (µg/L) from 17 CMP monitoring sites in the project area.

6.5 Toxicity

This section describes the results of water column toxicity (toxicity) testing for monitoring sites within the lower Salinas River watershed. Toxicity testing was conducted using the invertebrate test species *Ceriodaphnia dubia* (water flea), *Chironomus dilutes* (midge fly larva), *Hyalella azteca* (an amphipod crustacean), and *Americamysis bahia* (mysid shrimp).

Where the salinity of ambient waters exceeded the tolerance of the standard freshwater test species (*C. dubia* and *C. dilutes*), the alternative salinity-tolerant species *H. azteca* or *A. bahia* were used for toxicity tests. In general, most tests were conducted as 6 to 10-day tests for mortality (i.e., chronic bioassay), however a few 96-hour tests (i.e., acute bioassay) are included in the result summaries presented herein.

The toxicity test endpoints for each species is survival, as measured in water samples as well as in non-toxic control samples. A statistical test is then applied to determine significant differences between test organisms in the sample water and in control water (clean) samples.

Detailed data analyses of toxicity sublethal effects, as measured by growth or reproduction endpoints, are not included in this water quality assessment because all waterbodies in the project area are impaired due to significant toxic effects to the survival endpoints (see Table 6-29) and consequently, the sublethal endpoints (growth and reproduction) are also impaired. Staff reviewed available toxicity sublethal effects data and confirmed that all waterbodies exhibiting toxicity impairment due to the significant mortality also exhibit significant sublethal effects (growth and/or reproduction).

Toxicity monitoring was performed by the Cooperative Monitoring Program (CMP) from 2005 to 2019, through several monitoring projects coordinated by the Central Coast Ambient Monitoring Program (CCAMP) from 2005 to 2019, and by the California Department of Pesticide Regulation (CDPR) in September 2014. Figure 6-9 is a map of the toxicity monitoring sites. Note that many of these site locations are the same as the organophosphate pesticide monitoring site locations and many toxicity samples coincide with pesticide monitoring samples. Table 6-21, Table 6-23,
Table 6-25, and Table 6-27 describe the monitoring sites, programs, and time period for each of the invertebrate test species.

A summary of toxicity test results for each of the four test species, along with a determination of water quality impairment is contained in Table 6-22, Table 6-24, Table 6-26, and Table 6-28.

To determine waterbody impairment due to significant toxicity, staff compared these results to the exceedance frequencies shown previously in Table 6-2.

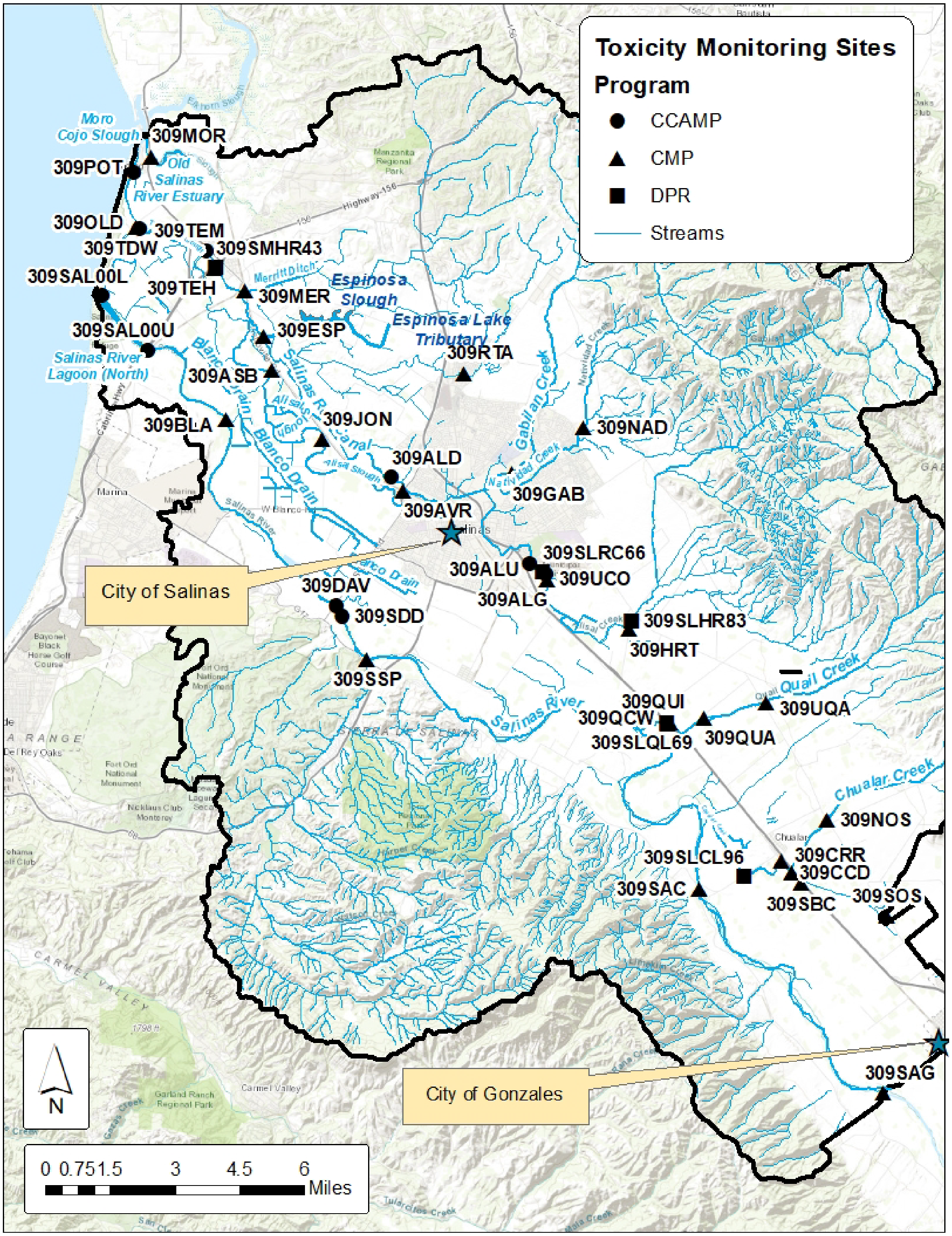

Figure 6-9. Map of toxicity monitoring sites.

Table 6-21. Toxicity monitoring sites, descriptions, programs, and time period (*Ceriodaphnia dubia*).

Site Description	Site Code	Program	Date Begin	Date End
Moro Cojo Slough @ Hwy 1	309MOR	CMP	3/30/2011	3/30/2011
Old Salinas River @ Monterey Dunes Way	309OLD	CMP	1/27/2008	1/18/2019
Tembladero Slough @ Haro	309TEH	CMP	7/26/2005	12/3/2019
Tembladero Slough @ Monterey Dunes Way	309TDW	CCAMP	2/23/2010	12/5/2018
Tembladero Slough @ Preston Rd	309TEM	CCAMP	9/5/2012	12/5/2018
Merritt Ditch upstream from Hwy 183	309MER	CMP	7/26/2005	12/3/2019
Alisal Slough @ White Barn	309ASB	CMP	7/27/2005	12/3/2019
Alisal Creek @ Hartnell Rd dogleg	309HRT	CMP	1/25/2008	1/17/2018
Blanco Drain below Pump	309BLA	CMP	7/27/2005	12/3/2019
Salinas Reclamation Canal @ San Jon Rd	309JON	CMP	7/27/2005	12/3/2019
Salinas Reclamation Canal @ Boranda Rd	309ALD	CCAMP	9/27/2011	12/5/2018
Salinas Reclamation Canal @ Victor Rd	309AVR	CMP	1/26/2008	9/30/2008
Salinas Reclamation Canal @ Airport Rd	309ALU	CCAMP	2/28/2012	12/5/2018
Salinas Reclamation Canal u/s City Outfall	309UCO	CCAMP	9/27/2011	3/24/2012
Salinas Reclamation Canal @ La Guardia	309ALG	CMP	7/27/2005	12/2/2019
Salinas River @ Davis Rd	309DAV	CCAMP	3/25/2009	12/5/2018
Salinas River near Davis Rd d/s of City Outfall	309SDD	CCAMP	9/27/2011	3/24/2012
Salinas River @ Spreckels Gage	309SSP	CMP	7/27/2005	12/3/2019
Salinas River @ Chualar River Rd	309SAC	CMP	7/27/2005	9/18/2019
Salinas River @ Gonzales River Rd Bridge	309SAG	CMP	2/23/2006	9/18/2019
Espinosa Slough upstream of Alisal Slough	309ESP	CMP	7/26/2005	12/3/2019
Gabilan Creek @ Independence Rd and East Boranda Rd	309GAB	CMP	7/27/2005	12/2/2019
Natividad Creek upstream from Salinas Reclamation Canal	309NAD	CMP	7/27/2005	12/2/2019
Santa Rita Creek @ Santa Rita Creek Park	309RTA	CMP	2/28/2012	12/2/2019

Site Description	Site Code	Program	Date Begin	Date End
Quail Creek @ Old Stage Rd	309UQA	CMP	1/25/2008	10/2/2008
Quail Creek @ Potter Rd	309QUA	CMP	1/25/2008	10/2/2008
Quail Creek @ Hwy 101	309QUI	CMP	7/27/2005	12/2/2019
Quail Creek west of Hwy 101 @ RR tracks	309QCW	CMP	1/25/2008	10/2/2008
Chualar Creek @ Old Stage Rd (north branch)	309NOS	CMP	1/25/2008	2/24/2008
Chualar Creek @ Chualar River Rd	309CRR	CMP	1/25/2008	3/27/2012
Chualar Creek @ Old Stage Rd (south branch)	309SOS	CMP	1/25/2008	10/2/2008
Chualar Creek west side of Hwy 101 (south branch)	309SBC	CMP	1/25/2008	10/2/2008
Chualar Creek west of Highway 101	309CCD	CMP	3/26/2013	12/2/2019

Table 6-22. Summary of toxicity results (*Ceriodaphnia dubia*, survival).

Waterbody	Site Code	Count of samples	Count of significant toxicity	Percent of significant toxicity	Toxicity impaired
Moro Cojo Slough	309MOR	1	1	100	TBD
Old Salinas River	309OLD	15	6	40	Yes
Tembladero Slough	309TEH	50	16	32	Yes
Tembladero Slough	309TDW	4	2	50	Yes
Tembladero Slough	309TEM	4	0	0	No
Merritt Ditch	309MER	49	12	24.5	Yes
Alisal Slough	309ASB	18	3	16.7	Yes
Alisal Creek	309HRT	5	3	60	Yes
Blanco Drain	309BLA	41	3	7.3	No
Salinas Reclamation Canal (Lower)	309JON	50	22	44	Yes
Salinas Reclamation Canal (Lower)	309ALD	17	3	17.6	Yes
Salinas Reclamation Canal (Lower)	309AVR	3	2	66.7	Yes
Salinas Reclamation Canal (Upper)	309ALU	4	0	0	No
Salinas Reclamation Canal (Upper)	309UCO	3	1	33.3	No
Salinas Reclamation Canal (Upper)	309ALG	47	26	55.3	Yes
Salinas River	309DAV	7	0	0	No

Waterbody	Site Code	Count of samples	Count of significant toxicity	Percent of significant toxicity	Toxicity impaired
Salinas River	309SDD	3	1	33.3	No
Salinas River	309SSP	27	5	18.5	Yes
Salinas River	309SAC	26	2	7.7	Yes
Salinas River	309SAG	23	2	8.7	Yes
Espinosa Slough	309ESP	44	13	29.5	Yes
Gabilan Creek	309GAB	19	7	36.8	Yes
Natividad Creek	309NAD	39	22	56.4	Yes
Santa Rita Creek	309RTA	13	5	38.5	Yes
Quail Creek	309UQA	3	3	100	Yes
Quail Creek	309QUA	3	3	100	Yes
Quail Creek	309QUI	37	21	56.8	Yes
Quail Creek	309QCW	3	3	100	Yes
Chualar Creek	309NOS	2	2	100	Yes
Chualar Creek	309CRR	10	10	100	Yes
Chualar Creek	309SOS	3	2	66.7	Yes
Chualar Creek	309SBC	3	3	100	Yes
Chualar Creek	309CCD	25	7	28	Yes

TBD: To be determined. Additional information is necessary because a minimum of two samples are required to assess impairment.

Based on the information shown above in Table 6-22, staff has concluded that all waterbodies in the project area are impaired due to toxicity to *Ceriodaphnia dubia* except for Moro Cojo Slough and Blanco Drain. Specifically, the following waterbodies and stations are impaired due to significant toxic effects to *C. dubia:* the Old Salinas River (309OLD), Tembladero Slough (309TEH and 309TDW), Merritt Ditch (309MER), Alisal Slough (309ASB), Alisal Creek (309HRT), lower Salinas Reclamation Canal (309JON, 309ALD, and 309AVR), upper Salinas Reclamation Canal (309ALG), Salinas River (309SSP, 309SAC, 309SAG), Espinosa Slough (309ESP), Gabilan Creek (309GAB), Natividad Creek (309NAD), Santa Rita Creek (309RTA), Quail Creek (309UQA, 309QUA, 309QUI, and 309QCW), and Chualar Creek (309NOS, 309CRR, 309SOS, 309SBC, and 309CCD). Moro Coho Slough has only one sample and two or more samples are required to assess impairment.

Table 6-23. Toxicity monitoring sites, descriptions, programs, and time period (*Hyalella azteca*).

Site Description	Site Code	Program	Date Begin	Date End
Moro Cojo Slough @ Hwy 1	309MOR	CMP	4/12/2005	12/3/2019
Old Salinas River @ Monterey Dunes Way	309OLD	CMP	4/11/2005	12/3/2019
Old Salinas River @ Potrero Rd	309POT	CCAMP	8/24/2016	8/24/2016
Salinas River Estuary Lower near Old Salinas River Flap Gate	309SAL00L	CCAMP	8/23/2016	8/23/2016
Salinas River Estuary Upper near RR bridge	309SAL00U	CCAMP	8/23/2016	8/23/2016
Tembladero Slough @ Haro	309TEH	CCAMP	4/12/2005	9/16/2019
Tembladero Slough @ Monterey Dunes Way	309TDW	CCAMP	2/28/2012	12/5/2018
Tembladero Slough @ Preston Rd	309TEM	CCAMP	1/17/2018	12/5/2018
Merritt Ditch upstream from Hwy 183	309MER	CMP	4/12/2005	8/26/2009
Alisal Slough @ White Barn	309ASB	CMP	4/11/2005	9/17/2019
Alisal Creek @ Hartnell Rd dogleg	309HRT	CCAMP	10/18/2017	9/16/2019
Blanco Drain below Pump	309BLA	CMP	4/13/2005	8/30/2016
Salinas Reclamation Canal @ San Jon Rd	309JON	CCAMP	4/11/2005	9/16/2019
Salinas Reclamation Canal @ Boranda Rd	309ALD	CCAMP	10/18/2017	12/5/2018
Salinas Reclamation Canal @ Airport Rd	309ALU	CCAMP	8/15/2018	12/5/2018
Salinas Reclamation Canal @ La Guardia	309ALG	CMP	4/13/2005	4/13/2005
Salinas River @ Davis Rd	309DAV	CCAMP	4/18/2017	9/16/2019
Salinas River @ Spreckels Gage	309SSP	CMP	4/14/2005	4/14/2005
Salinas River @ Chualar River Rd	309SAC	CCAMP	4/14/2005	8/15/2018
Espinosa Slough upstream of Alisal Slough	309ESP	CMP	4/12/2005	8/26/2015
Gabilan Creek @ Independence Rd and East Boranda Rd	309GAB	CMP	4/13/2005	4/13/2005
Natividad Creek upstream from Salinas Reclamation Canal	309NAD	CMP	4/13/2005	4/13/2005
Santa Rita Creek @ Santa Rita Creek Park	309RTA	CCAMP	12/5/2018	12/5/2018
Quail Creek @ Hwy 101	309QUI	CMP	4/14/2005	4/14/2005

Table 6-24. Summary of toxicity results (*Hyalella azteca*, survival).

Waterbody	Site Code	Count of samples	Count of significant toxicity	Percent of significant toxicity	Toxicity impaired
Moro Cojo Slough	309MOR	14	5	35.7	Yes
Old Salinas River	309OLD	34	21	61.8	Yes
Old Salinas River	309POT	1	0	0	TBD
Salinas R. Lagoon	309SAL00L	1	0	0	TBD
Salinas R. Lagoon	309SAL00U	1	0	0	TBD
Tembladero Slough	309TEH	6	2	33.3	Yes
Tembladero Slough	309TDW	4	1	25	No
Tembladero Slough	309TEM	3	2	66.7	Yes
Merritt Ditch	309MER	2	2	100	Yes
Alisal Slough	309ASB	32	3	9.4	Yes
Alisal Creek	309HRT	5	5	100	Yes
Blanco Drain	309BLA	12	0	0	No
Salinas Reclamation Canal (Lower)	309JON	4	2	50	Yes
Salinas Reclamation Canal (Lower)	309ALD	4	1	25	No
Salinas Reclamation Canal (Upper)	309ALU	2	2	100	Yes
Salinas Reclamation Canal (Upper)	309ALG	1	1	100	TBD
Salinas River	309DAV	6	0	0	No
Salinas River	309SSP	1	0	0	TBD
Salinas River	309SAC	2	0	0	No
Espinosa Slough	309ESP	5	3	60	Yes
Gabilan Creek	309GAB	1	1	100	TBD
Natividad Creek	309NAD	1	1	100	TBD
Santa Rita Creek	309RTA	1	1	100	TBD
Quail Creek	309QUI	1	1	100	TBD

TBD: To be determined. Additional information is necessary because a minimum of two samples are required to assess impairment.

Based on the information shown above in Table 6-24, staff has concluded impairments due to toxicity to *Hyalella azteca* for Moro Cojo Slough (309MOR), Old Salinas River (309OLD), Tembladero Slough (309TEH and 309TEM), Merritt Ditch (309MER), Alisal Slough (309ASB), Alisal Creek (309HRT), lower Salinas Reclamation Canal (309JON), upper Salinas Reclamation Canal (309ALU), and Espinosa Slough (309ESP). Many stations have only one sample and two or more samples are required to assess impairment.

Table 6-25. Toxicity monitoring sites, descriptions, programs, and time period (*Chironomus dilutes*).

Site Description	Site Code	Program	Date Begin	Date End
Old Salinas River @ Monterey Dunes Way	309OLD	CMP	1/11/2017	1/18/2019
Old Salinas River @ Potrero Rd	309POT	CCAMP	8/24/2016	8/24/2016
Salinas River Estuary Lower near Old Salinas River Flap Gate	309SAL00L	CCAMP	8/23/2016	8/23/2016
Salinas River Estuary Upper near RR bridge	309SAL00U	CCAMP	8/23/2016	8/23/2016
Tembladero Slough @ Haro	309TEH	CMP	1/11/2017	12/3/2019
Tembladero Slough @ Haro	309SMHR43	CDPR	9/16/2014	9/16/2014
Tembladero Slough @ Monterey Dunes Way	309TDW	CCAMP	8/15/2018	12/5/2018
Tembladero Slough @ Preston Rd	309TEM	CCAMP	1/17/2018	12/5/2018
Merritt Ditch upstream from Hwy 183	309MER	CMP	1/11/2017	12/3/2019
Alisal Slough @ White Barn	309ASB	CMP	3/1/2018	12/3/2019
Alisal Creek @ Hartnell Rd dogleg	309HRT	CCAMP	10/18/2017	9/16/2019
Alisal Creek @ Hartnell Rd	309SLHR83	CDPR	9/16/2014	9/16/2014
Blanco Drain below Pump	309BLA	CMP	1/25/2017	12/3/2019
Salinas Reclamation Canal @ San Jon Rd	309JON	CMP	1/25/2017	12/3/2019
Salinas Reclamation Canal @ Boranda Rd	309ALD	CCAMP	10/18/2017	12/5/2018
Salinas Reclamation Canal @ Airport Rd	309ALU	CCAMP	8/15/2018	12/5/2018
Rec Ditch III near Airport Blvd	309SLRC66	CDPR	9/16/2014	9/16/2014
Salinas Reclamation Canal @ La Guardia	309ALG	CMP	1/12/2017	12/2/2019
Salinas River @ Davis Rd	309DAV	CCAMP	4/18/2017	9/16/2019
Salinas River @ Spreckels Gage	309SSP	CMP	4/26/2017	12/3/2019
Salinas River @ Chualar River Rd	309SAC	CMP	1/13/2017	9/18/2019
Salinas River @ Gonzales River Rd Bridge	309SAG	CMP	1/13/2017	9/18/2019
Espinosa Slough upstream of Alisal Slough	309ESP	CMP	1/11/2017	12/3/2019
Gabilan Creek @ Independence Rd and East Boranda Rd	309GAB	CMP	1/12/2017	12/2/2019
Natividad Creek upstream from Salinas Reclamation Canal	309NAD	CMP	1/12/2017	12/2/2019

Site Description	Site Code	Program	Date Begin	Date End
Santa Rita Creek @ Santa Rita Creek Park	309RTA	CMP	7/31/2017	12/2/2019
Quail Creek @ Hwy 101	309QUI	CMP	1/13/2017	12/2/2019
Quail Creek @ SR-101	309SLQL69	CDPR	9/16/2014	9/16/2014
Chualar Creek west of Highway 101	309CCD	CMP	1/25/2017	12/2/2019
Chualar Creek @ Chualar River Rd	309SLCL96	CDPR	9/16/2014	9/16/2014

Table 6-26. Summary of toxicity results (*Chironomus dilutes,* survival).

Waterbody	Site Code	Count of samples	Count of significant toxicity	Percent of significant toxicity	Toxicity impaired
Old Salinas River	309OLD	4	1	25	No
Old Salinas River	309POT	1	0	0	TBD
Salinas R. Lagoon	309SAL00L	1	0	0	TBD
Salinas R. Lagoon	309SAL00U	1	0	0	TBD
Tembladero Slough	309TEH	16	5	31.3	Yes
Tembladero Slough	309SMHR43	1	0	0	TBD
Tembladero Slough	309TDW	3	2	66.7	Yes
Tembladero Slough	309TEM	3	1	33.3	No
Merritt Ditch	309MER	12	7	58.3	Yes
Alisal Slough	309ASB	3	3	100	Yes
Alisal Creek	309HRT	6	5	83.3	Yes
Alisal Creek	309SLHR83	1	1	100	TBD
Blanco Drain	309BLA	12	2	16.7	Yes
Salinas Reclamation Canal (Lower)	309JON	15	11	73.3	Yes
Salinas Reclamation Canal (Lower)	309ALD	4	2	50	Yes
Salinas Reclamation Canal (Upper)	309ALU	3	3	100	Yes
Salinas Reclamation Canal (Upper)	309SLRC66	1	1	100	TBD
Salinas Reclamation Canal (Upper)	309ALG	12	10	83.3	Yes
Salinas River	309DAV	5	0	0	No
Salinas River	309SSP	10	3	30	Yes
Salinas River	309SAC	6	1	16.7	No
Salinas River	309SAG	6	1	16.7	No
Espinosa Slough	309ESP	12	5	41.7	Yes

Waterbody	Site Code	Count of samples	Count of significant toxicity	Percent of significant toxicity	Toxicity impaired
Gabilan Creek	309GAB	7	5	71.4	Yes
Natividad Creek	309NAD	9	8	88.9	Yes
Santa Rita Creek	309RTA	10	7	70	Yes
Quail Creek	309QUI	8	6	75	Yes
Quail Creek	309SLQL69	1	1	100	TBD
Chualar Creek	309CCD	12	9	75	Yes
Chualar Creek	309SLCL96	1	1	100	TBD

TBD: To be determined. Additional information is necessary because a minimum of two samples are required to assess impairment.

Based on the information shown above in Table 6-26, staff has concluded impairments due to toxicity to *Chironomus dilutes* for Tembladero Slough (309TEH and 309TDW), Merritt Ditch (309MER), Alisal Slough (309ASB), Alisal Creek (309HRT), Blanco Drain (309BLA), lower Salinas Reclamation Canal (309JON and 309ALD), upper Salinas Reclamation Canal (309ALG), Salinas River (309SSP), Espinosa Slough (309ESP), Gabilan Creek (309GAB), Natividad Creek (309NAD), Santa Rita Creek (309RTA), Quail Creek (309QUI, and Chualar Creek (309CCD). Many stations have only one sample and two or more samples are required to assess impairment.

Table 6-27. Toxicity monitoring sites, descriptions, programs, and time period (*Americamysis bahia*).

Site Description	Site Code	Program	Date Begin	Date End
Moro Cojo Slough @ Hwy 1	309MOR	CMP	7/26/2005	9/17/2019
Old Salinas River @ Monterey Dunes Way	309OLD	CMP	8/26/2009	9/28/2011

Table 6-28. Summary of toxicity results (*Americamysis bahia*, survival).

Waterbody	Site Code	Count of samples	Count of significant toxicity	Percent of significant toxicity	Toxicity impaired
Moro Cojo Slough	309MOR	35	3	8.6	Yes
Old Salinas River	309OLD	2	0	0	No

Based on the information shown above in Table 6-28, staff has concluded impairments due to toxicity to *Americamysis bahia* for the Moro Cojo Slough (309MOR).

Table 6-29 below provides a summary of toxicity impairments (survival endpoint) for all waterbodies and test species referenced in this section.

Table 6-29. Summary of waterbody impairments due to toxicity (survival endpoint) for all test species.

Waterbody	Significant toxicity impairment (*C. dubia*)	Significant toxicity impairment (*H. azteca*)	Significant toxicity impairment (*C. dilutes*)	Significant toxicity impairment (*A. bahia*)	Waterbody toxicity impaired
Moro Cojo Slough	No	Yes	NT	Yes	Yes
Old Salinas River	Yes	Yes	No	No	Yes
Salinas River Lagoon	NT	No	No	NT	Yes [1]
Tembladero Slough	Yes	Yes	Yes	NT	Yes
Merritt Ditch	Yes	Yes	Yes	NT	Yes
Alisal Slough	Yes	Yes	Yes	NT	Yes
Alisal Creek	Yes	Yes	Yes	NT	Yes
Blanco Drain	No	No	Yes	NT	Yes
Salinas Reclamation Canal (Lower)	Yes	Yes	Yes	NT	Yes
Salinas Reclamation Canal (Upper)	Yes	Yes	Yes	NT	Yes
Salinas River	Yes	No	Yes	NT	Yes
Espinosa Slough	Yes	Yes	Yes	NT	Yes
Gabilan Creek	Yes	No	Yes	NT	Yes
Natividad Creek	Yes	No	Yes	NT	Yes
Santa Rita Creek	Yes	No	Yes	NT	Yes [2]
Quail Creek	Yes	No	Yes	NT	Yes
Chualar Creek	Yes	No	Yes	NT	Yes

[1] Waterbody is on the current 303(d) List (the 2018 303(d) List), but analysis of the data herein does not confirm impairment. Current impairment is based on data collected in 2008 and 2009, but not included in this assessment.

[2] Waterbody is not included on the current (2018) 303(d) List, but it has been identified as a new impairment.

NT: Not tested

As presented in this section staff has concluded that all waterbodies within the lower Salinas River watershed exhibit significant toxicity to one or more test species using the survival endpoint.

7 WATER QUALITY NUMERIC TARGETS

This section describes the numeric targets used to develop the TMDLs. Numeric targets are water quality targets used to ascertain when and where water quality objectives are achieved, and hence, when beneficial uses are protected. Recall that the pesticide and toxicity water quality objectives are narrative objectives. Numeric targets are used to interpret the narrative objectives.

7.1 Organophosphate Pesticide Numeric Targets

Staff reviewed various criteria/screening values that could be used as numeric target values. Staff selected water column numeric target values for chlorpyrifos, diazinon, and malathion as a direct measure of water quality conditions for the protection of aquatic life that are consistent with the pesticide and toxicity objectives described in Section 5.2.

In 2000, CDFW published freshwater water quality criteria for diazinon and chlorpyrifos (CDFW, 2000) using USEPA methodology (USEPA, 1985). Using this data set, CDFW recalculated the diazinon criteria excluding questionable *Grammarus fasciatus* data and revised water quality criteria for diazinon (CDFW, 2004). In addition, CVRWQCB developed freshwater invertebrate toxicity criteria for malathion through a contract with UC Davis (Faria et al., 2010). The UC Davis study developed acute and chronic malathion criteria based on a new methodology for deriving freshwater water quality criteria for the protection of aquatic life (TenBrook, et al. 2009). Staff selected the CDFW and the CVRWQCB water quality criteria as numeric targets for these TMDLs. Concentration units are parts per billion (ppb) which are equivalent to micrograms per liter (ug/L).

The individual OP pesticide numeric targets are presented in Table 7-1.

Table 7-1. Water column numeric targets for organophosphate pesticides.

Compound	CMC [A] **(ppb)**	CCC [B] **(ppb)**	**Reference**
Chlorpyrifos [C]	0.025	0.015	CDFW, 2000
Diazinon [C]	0.16	0.10	CDFW, 2000
Malathion [C]	0.17	0.028	Faria et. al., 2010

[A]. CMC – Criterion Maximum Concentration or acute (1- hour average). Not to be exceeded more than once in a three year period

[B]. CCC – Criterion Continuous Concentration or chronic (4-day (96-hour) average). Not to be exceeded more than once in a three year period

[C]. A toxicity ratio is used to account for the additive nature of these compounds. The ratio calculation is provided in Section 7.2 below.

These water column numeric targets for organophosphate pesticides are consistent with the Basin Plan narrative water quality objective which states, in part:

> "No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life."

7.2 Additive Toxicity Numeric Target Chlorpyrifos, Diazinon, and Malathion

Chlorpyrifos, diazinon, and malathion have the same mechanism of toxic action and exhibit additive toxicity to aquatic invertebrates when they co-occur (Bailey et al., 1997; CDFW, 2000). Mixtures of compounds acting through the same mechanism suggest there is no concentration below which a compound will no longer contribute to the overall toxicity of the mixture (Deneer et al., 1988). Therefore, the total potential toxicity of co-occurring chlorpyrifos, diazinon, and malathion needs to be assessed, even when one or more of their individual concentrations would otherwise be below thresholds of concern. Technical guidance developed by staff of the Central Valley Regional Water Quality Control Board (CVRWQCB) ("Policy for Application of Water Quality Objectives" and policy on "Pesticide Discharges from Nonpoint Sources") include formulas for addressing additive toxicity. Additive toxicity can be evaluated by the following formula from *Basin Plan Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for Diazinon and Chlorpyrifos Runoff into the Sacramento and Feather Rivers* (CVRWQCB, 2007). The additive toxicity numeric target, when two or more organophosphate pesticides are present in the water column, is defined as the sum (S) of the concentration of chlorpyrifos divided by the numeric target for chlorpyrifos plus the concentration of diazinon divided by the numeric target for diazinon plus the concentration of malathion divided by the numeric target for malathion is equal to or less than one (S≤1). Figure 7-1 depicts the equation for the additive toxicity numeric target.

The numeric target for OP pesticide additive toxicity is S ≤ 1, calculated using the formula depicted in Figure 7-1.

$$\frac{\text{C Chlorpyrifos}}{\text{NT Chlorpyrifos}} + \frac{\text{C Diazinon}}{\text{NT Diazinon}} + \frac{\text{C Malathion}}{\text{NT Malathion}} = S;\ \ S \leq 1$$

Where:
C = the concentration of a pesticide measured in the receiving water.
NT = the numeric target for each pesticide present.
S = the sum; a sum exceeding one (1.0) indicates that beneficial uses may be adversely affected.

Figure 7-1. Equation for additive toxicity numeric target (S≤1).

These water column numeric targets for the additive toxicity of organophosphate pesticides are consistent with the Basin Plan narrative water quality objective which states, in part:

> "No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life."

7.3 Toxicity Numeric Target

Numeric targets for toxicity include the organophosphate pesticides numeric targets contained in the previous section, as well as numeric targets for toxicity testing as described herein. Any invertebrate species and acceptable test methods (as defined by regulatory Orders or ambient monitoring study designs) shall be used to assess whether the toxicity numeric target is achieved. Assessments will be conducted with receiving water(s) sampled at key indicator sites, which will be defined in proper sampling plans with quality assurance and quality controls consistent with California Surface Water Ambient Monitoring Program (SWAMP) protocols.

Toxicity to invertebrates shall be tested using chronic or acute toxicity tests. It is recommended (not required) that toxicity determinations be based on a comparison of the test organisms' response to the receiving water sample compared to the control using the Test of Significant Toxicity, also referred to as the TST statistical approach (USEPA 2010; Denton et al., 2010). If a sample is declared "fail" (i.e., toxic), then the target is not met and additional receiving water sample(s) should be collected and evaluated to determine the pattern of toxicity and whether a toxicity identification evaluation, also referred to as a TIE, needs to be conducted to determine the causative toxicant(s). Other toxicity test methods, where determined appropriate for use, may be used to determine attainment of the numeric target. Using these methods, a significant toxicity is determined for samples where: 1) the statistical test confirms significant differences in test organism when compared to the control sample, and 2) a test organism performance is more than 20% lower in the sample than in the control sample.

The toxicity numeric targets for this TMDL are stated as the following:

No significant toxic effect to the survival or sublethal (i.e., growth, reproduction, etc.) test endpoint.

This toxicity numeric target is consistent with the Basin Plan narrative water quality objective which states, in part:

"All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, toxicity

bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board."

8 Source Analysis

Chlorpyrifos, diazinon, and malathion are man-made pesticides used in the lower Salinas River watershed for both agricultural and non-agricultural purposes. Through its' pesticide use reporting (PUR) program, CDPR reports the amount of pesticides applied for agricultural uses (crops) and for non-agricultural uses (research, non-field commodity fumigation, structural, etc.). Under the PUR program, all agricultural pesticide use must be reported monthly to county agricultural commissioners, who then report the data to CDPR. It should be noted that home-and-garden pesticide use, and most industrial and institutional pesticide uses, are not reported as part of the program. The following sections present CDPR PUR data[4] for agricultural and non-agricultural uses of chlorpyrifos, diazinon, and malathion.

8.1 Agricultural Sources (CDPR Pesticide Use Reporting)

The agricultural application of chlorpyrifos, diazinon, and malathion are provided in annual CDPR PUR summaries for Monterey County. This data is also reported annually in greater detail using public land survey sections (PLSS), which is approximately one square mile in area. Note that annual application is quantified as pounds of active ingredient per year.

The annual agricultural application of chlorpyrifos, diazinon, and malathion for Monterey County from 1991 to 2018 is shown in Table 8-1. Chlorpyrifos and diazinon use declined significantly over the 27-year period. The peak agricultural use of chlorpyrifos was 138,016 pounds in 2001, declining to just 139 pounds in 2019. At its' height, diazinon use was 171,840 pounds in 2004, declining to around 75 pounds in 2018 and 2019. There was a decline in malathion use over the 27-year period, from a high of 141,148 pounds in 2009 to 33,725 pounds in 2019, however the most recent malathion application amount is much greater than that of chlorpyrifos and diazinon.

Figure 8-1, Figure 8-2, and Figure 8-3 are graphs of Monterey County agricultural application of chlorpyrifos, diazinon, and malathion, respectively.

[4] California Department of Pesticide Regulation (CDPR) Pesticide Use Reporting (PUR) database accessed via https://www.cdpr.ca.gov/docs/pur/purmain.htm and the California Pesticide Information Portal (CalPIP) https://calpip.cdpr.ca.gov/main.cfm.

Table 8-1. Monterey County agricultural application (active ingredient lbs./year)

Year	Chlorpyrifos	Diazinon	Malathion
1991	95,663	36,556	48,116
1992	76,844	44,276	65,894
1993	87,361	66,481	77,179
1994	84,856	92,080	114,670
1995	80,549	74,625	75,576
1996	75,074	63,581	86,489
1997	73,809	53,578	76,245
1998	61,461	62,701	47,864
1999	65,232	110,501	66,964
2000	54,253	121,992	81,475
2001	138,016	139,705	78,507
2002	51,335	140,978	72,700
2003	58,331	157,462	58,575
2004	60,841	171,840	88,181
2005	66,866	161,639	64,703
2006	62,446	144,305	37,607
2007	61,970	144,146	60,522
2008	69,730	117,742	74,018
2009	50,004	51,106	141,148
2010	49,813	38,347	120,901
2011	38,284	19,773	80,184
2012	24,049	11,860	61,902
2013	13,889	2,814	42,789
2014	12,358	3,979	48,830
2015	4,792	505	54,703
2016	3,222	112	43,301
2017	455	107	46,604
2018	732	75	39,379
2019	139	76	33,725

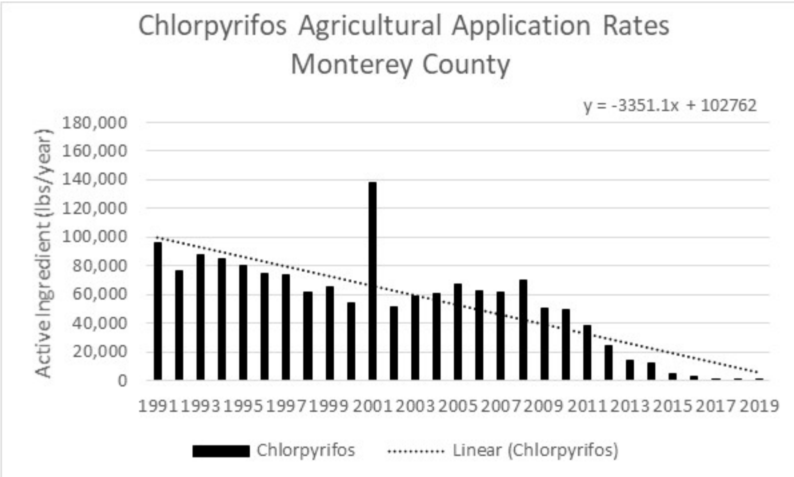

Figure 8-1. Monterey County annual agricultural application of chlorpyrifos.

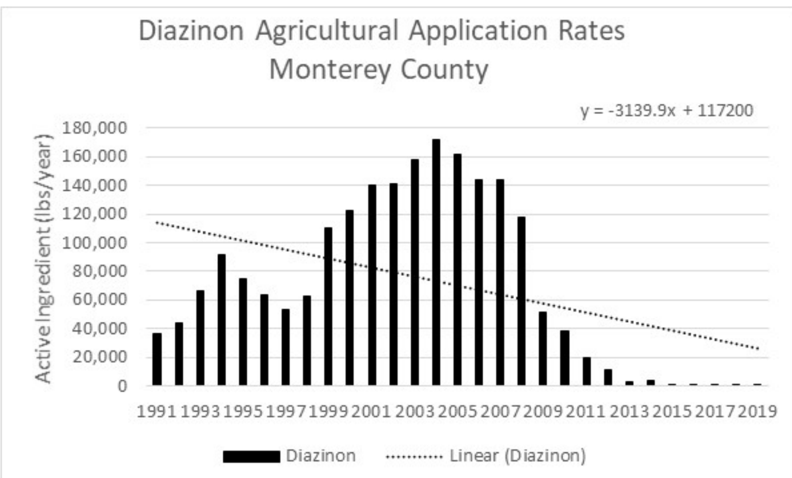

Figure 8-2. Monterey County annual agricultural application of diazinon.

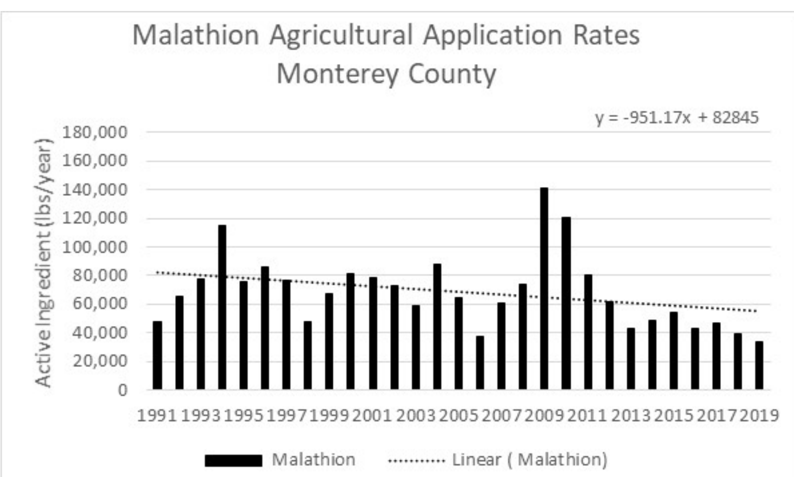

Figure 8-3. Monterey County annual agricultural application of malathion.

The CDPR PUR data also provides a county-wide accounting of the chemicals applied to specific crops (commodities), the most recent data available for this report is for 2017.

Chlorpyrifos was applied to four crops in 2017 as shown in Table 8-2, with wine grapes receiving the greatest amount (345 pounds) of the pesticide. It should be noted that nearly all wine vineyards are located south of the City of Gonzales and therefore outside the lower Salinas River watershed.

Diazinon was applied to three crops, primarily beets, as shown in Table 8-3.

Several crops were treated with malathion in 2017 and Table 8-4 shows the top 10 commodities. The top crops receiving malathion applications are leaf and head lettuce (25,962 pounds), strawberries (8,903 pounds), along with other truck crops and berries.

Table 8-2. Monterey County chlorpyrifos applications by commodity (2017).

Chemical	Commodity	Pounds
Chlorpyrifos	Grape, Wine	345
Chlorpyrifos	Nursery-Greenhouse Flower	77
Chlorpyrifos	Bean, Succulent	26
Chlorpyrifos	Cauliflower	7.5

Table 8-3. Monterey County diazinon applications by commodity (2017).

Chemical	Commodity	Pounds
Diazinon	Beet	104
Diazinon	Strawberry	3
Diazinon	Nursery-Outdoor Flower	0.5

Table 8-4. Monterey County malathion applications by commodity (2017).

Chemical	Commodity	Pounds
Malathion	Lettuce, Leaf	19,669
Malathion	Strawberry	8,903
Malathion	Lettuce, Head	6,293
Malathion	Celery	3,070
Malathion	Raspberry	1,711
Malathion	Broccoli	1,413
Malathion	Brussels Sprout	1,202
Malathion	Blackberry	942
Malathion	Peas	502
Malathion	Cauliflower	479

As stated earlier, CDPR PUR data provides pesticide application information at a finer scale than at the county-level. The application data is reported using PLSS quadrants that are approximately one square mile in area; whereby all field applications may be attributed to a PLSS quadrant within the lower Salinas River watershed.

Figure 8-4, Figure 8-5, and Figure 8-6 show 2007 and 2018 application data for chlorpyrifos, diazinon, and malathion, respectively. Staff presents the most recent application

As shown in Figure 8-4 below, chlorpyrifos was broadly applied to agricultural crops in 2007 with 30,263 pounds used in the lower Salinas River watershed. In 2007, this amount of chlorpyrifos applied within the watershed was nearly 50 percent of all chlorpyrifos applied within Monterey County (61,970 pounds). In 2018, 111 pounds were applied within the watershed, accounting for 15 percent of all chlorpyrifos applied to agricultural crops within the county (732 pounds). As shown in Figure 8-4, chlorpyrifos use was widely distribution throughout the watershed, where in 2018 the pesticide was applied at lower levels in only two distinct areas.

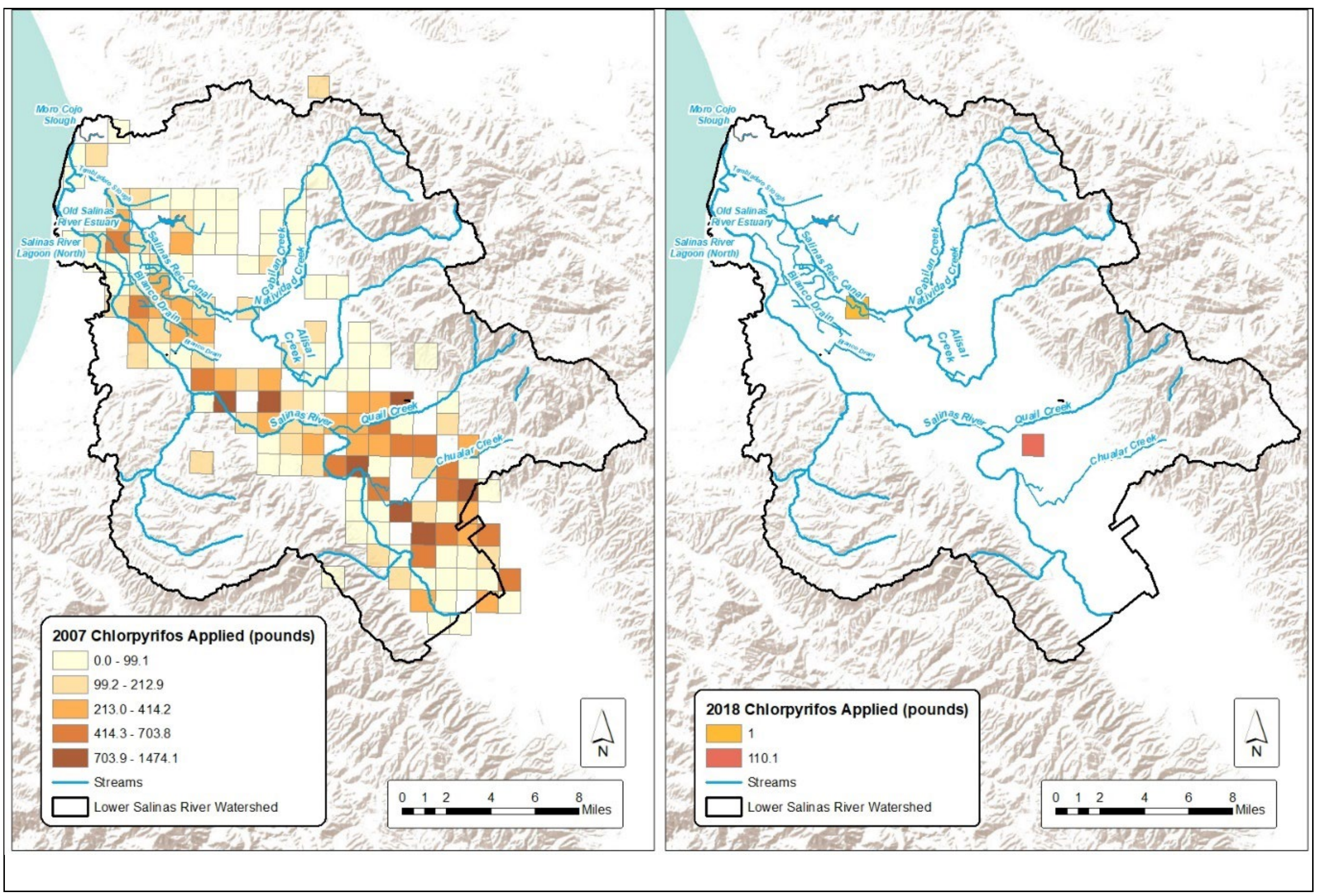

Figure 8-4. Lower Salinas River watershed chlorpyrifos agricultural application (2007 and 2018).

Diazinon was also widely applied to agricultural crops in 2007 with 86,492 pounds used in the lower Salinas River watershed (see Figure 8-5). In 2007, this amount of diazinon applied within the watershed was nearly 60 percent of all diazinon applied within Monterey County (144,058 pounds). In 2018, 7.1 pounds were applied in one distinct location within the watershed, accounting for around 9 percent of all diazinon applied to agricultural crops within the county (75 pounds).

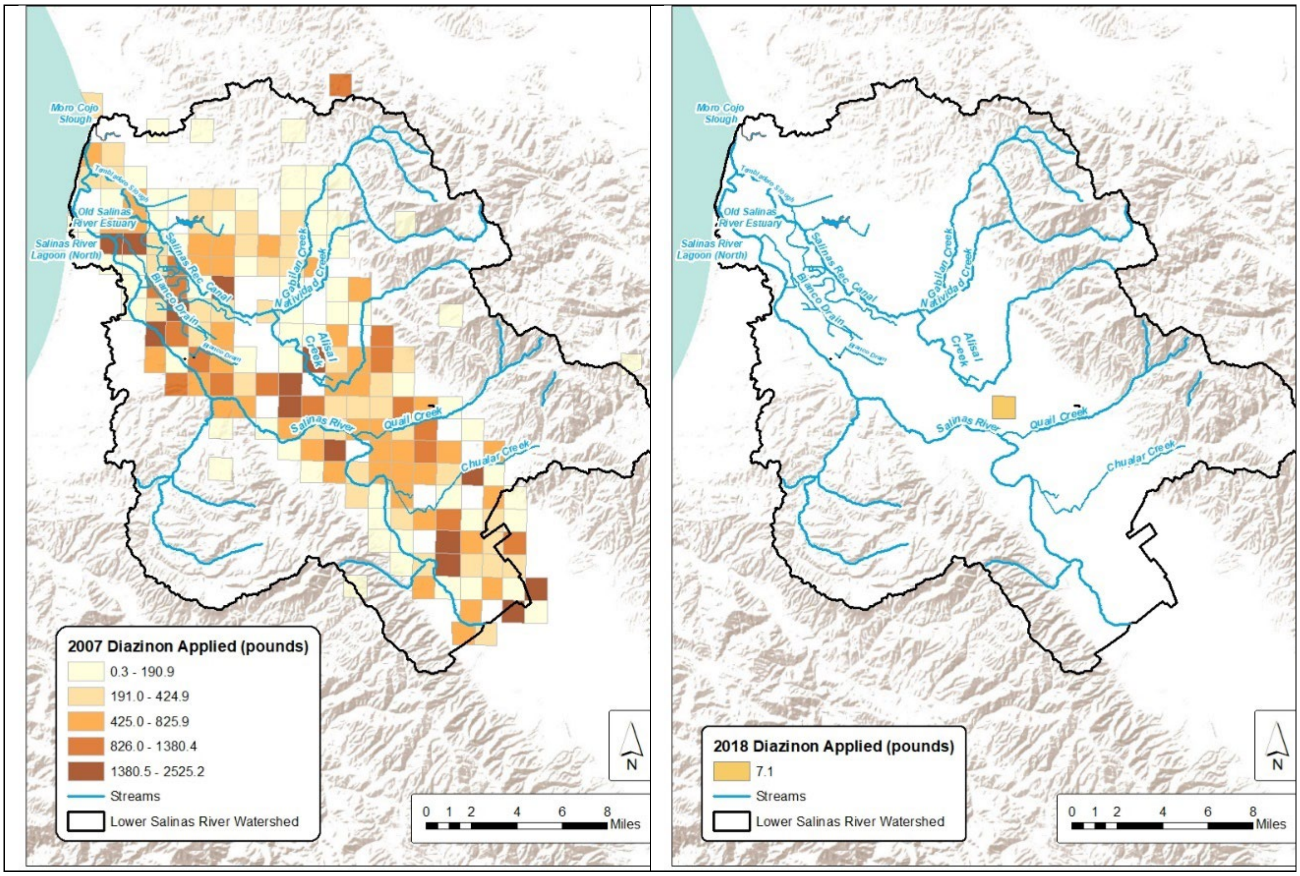

Figure 8-5. Lower Salinas River watershed diazinon agricultural application (2007 and 2018).

For malathion, the 2007 CDPR PUR data indicates that 37,896 pounds were applied within the lower Salinas River watershed, accounting for 63 percent of its' use county-wide (60,522 pounds). Looking at more recent 2018 malathion use on crops, 29,020 pounds were applied within the watershed, while 39,378 pounds were applied county-wide indicating that 74 percent of county-wide use occurred in the project area in 2018.

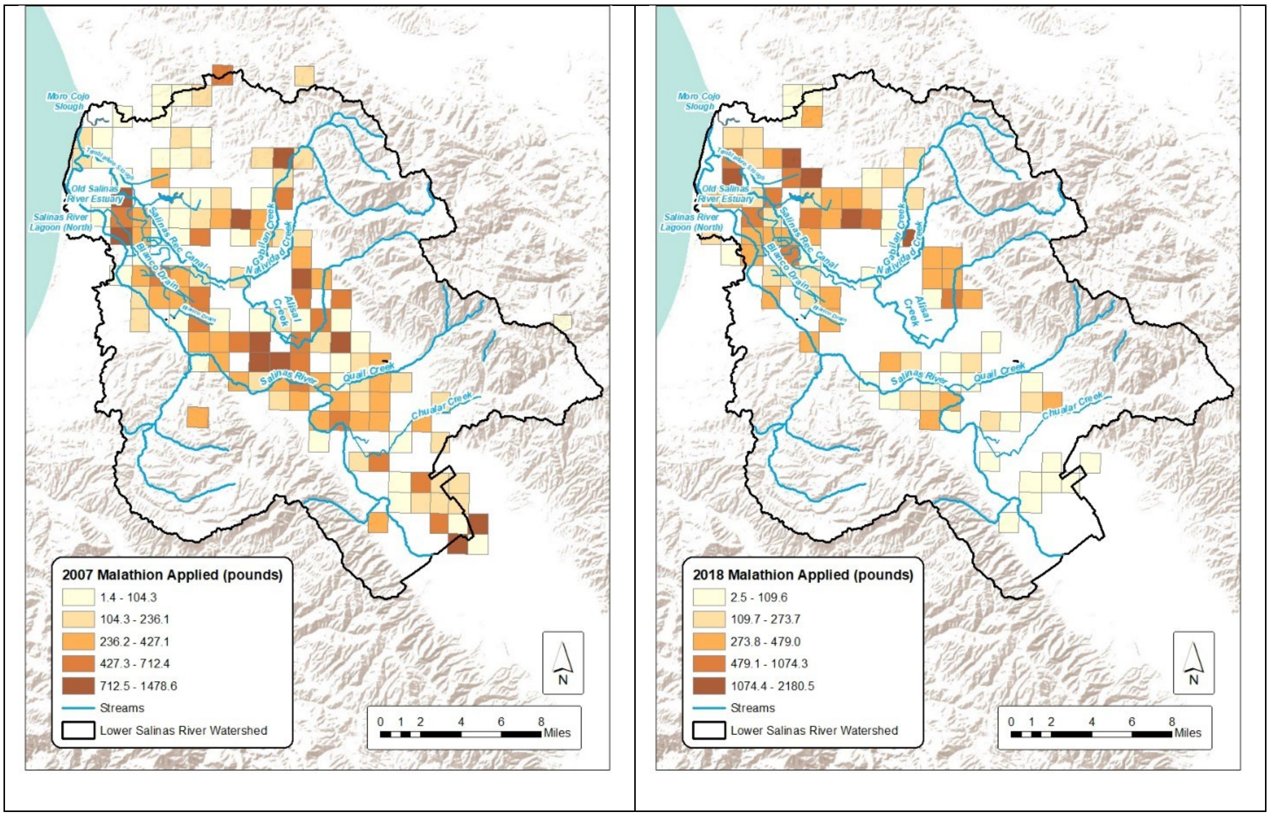

Figure 8-6. Lower Salinas River watershed malathion agricultural application (2007 and 2018).

8.2 Non-Agricultural Sources (CDPR Pesticide Use Reporting)

The CDPR PUR program requires structural pest control operators, professional gardeners, and other non-agricultural pest control operations to report all pesticide use. The usage data is reported by county and does not include specific geographic locations. This section provides a summary of the application of chlorpyrifos, diazinon, and malathion for non-agricultural uses from 2008 to 2018.

Figure 8-7 is a graph of CDPR PUR non-agricultural application of chlorpyrifos, diazinon, and malathion over an 11-year period from 2008 to 2018. Table 8-5 tabulates the data and includes the major use type for each year.

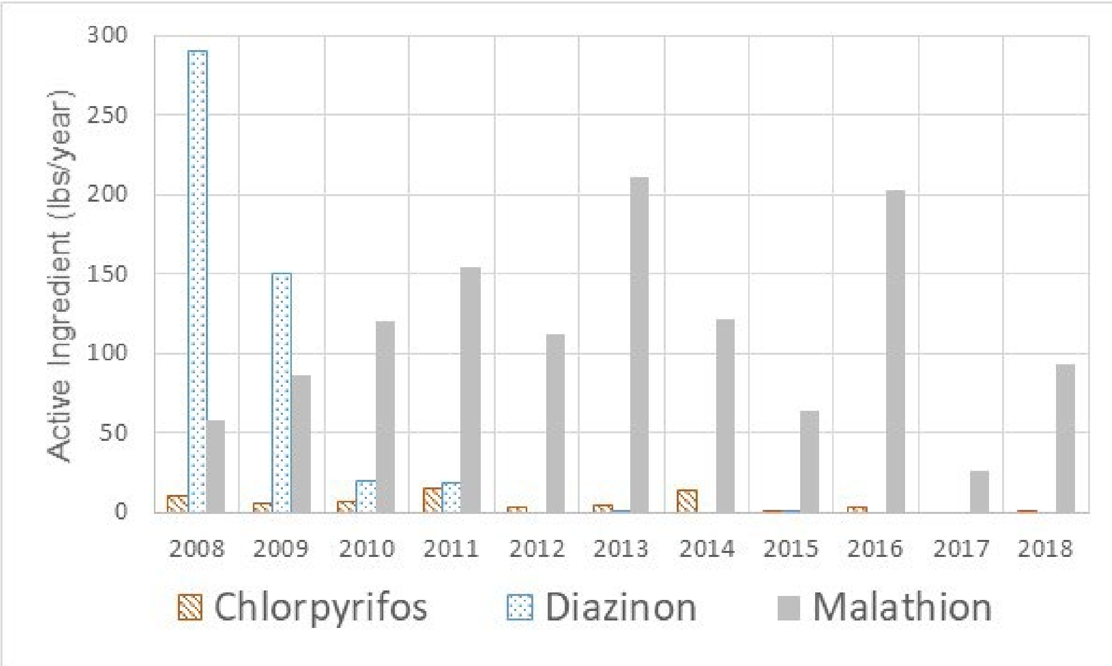

Figure 8-7. Monterey County annual non-agricultural application of chlorpyrifos, diazinon, and malathion.

The non-agricultural use of chlorpyrifos remained relatively low from 2008 to 2018, with a maximum application of 15 pounds in 2011. Less than a pound per year was reported in 2015, 2017, and 2018. Use of chlorpyrifos was primarily for research commodities.

The greatest amount of diazinon used over the period occurred in 2008 (290 pounds) and 2009 (150 pounds) within mushroom houses. Diazinon use was drastically reduced between 2012 and 2018, with several years reporting no application at all.

The non-agricultural use of malathion was relatively consistent over the 11-year period, peaking to around 200 pounds in 2013 and 2016. Malathion is used exclusively for commodity fumigation at amounts that are much greater than chlorpyrifos or diazinon.

Table 8-5. Monterey County non-agricultural application (active ingredient lbs./year).

Year	Chlorpyrifos (lbs./year)	Chlorpyrifos Use Type	Diazinon (lbs./year)	Diazinon Use Type	Malathion (lbs./year)	Malathion Use Type
2008	9.8	Research commodity	290	Mushroom houses	57.3	Commodity fumigation
2009	5.1	Research commodity	150.5	Mushroom houses	85.8	Commodity fumigation
2010	6.4	Research commodity	19.5	Mushroom houses	120	Commodity fumigation
2011	15.3	Research commodity	18.5	Mushroom houses	154.1	Commodity fumigation
2012	3.6	Greenhouse plant containers	0	NA	112.5	Commodity fumigation
2013	4.7	Research commodity	0.25	Vertebrate pest control	210.4	Commodity fumigation
2014	14	Research commodity	0	NA	122	Commodity fumigation
2015	0.9	Landscape maintenance	0.002	Structural pest control	63.6	Commodity fumigation
2016	3.6	Research commodity	0	NA	202.4	Commodity fumigation
2017	0	NA	0	NA	26.6	Commodity fumigation
2018	0.03	Structural pest control	0	NA	93.6	Commodity fumigation

NA: Not applied.

8.3 Summary of Agricultural and Non-Agricultural Sources

Staff concludes that discharges from irrigated agricultural lands (cropland) are the primary source of chlorpyrifos, diazinon, and malathion impairments, as well as conditions of toxicity, within the lower Salinas River watershed. The non-agricultural application of these pesticides (see Table 8-5) are miniscule when compared to irrigated agricultural application rates as reported in the CDPR PUR datasets. Waste discharges from irrigated agricultural lands are currently regulated under the Central Coast Water Board's General Waste Discharge Requirements for Discharges from Irrigated Lands (Order No. R3-2021-0040; the "Agricultural Order") and the associated Monitoring and Reporting Program (MRP)

8.4 Urban Storm Water: City of Salinas and County of Monterey

The various uses of chlorpyrifos, diazinon, and malathion in an urban setting include landscape applications and structural pest control (termites) where these pesticides can be transported to surface water via urban storm water conveyance systems.

Urban and residential uses of chlorpyrifos and diazinon have been significantly reduced due to USEPA restrictions and cancellations. Water quality monitoring within urban areas has demonstrated that chlorpyrifos and diazinon are rarely detected, if at all. CDPR conducted eight pesticide monitoring studies in northern and southern California urban areas from 2014 to 2020 and chlorpyrifos (n=294) and diazinon (n=155) were not detected in any of the samples collected (CDPR 2016a, CDPR 2016b, CDPR 2017, CDPR 2019a, CDPR 2019b, CDPR 2020, CDPR 2020a, CDPR 2020b).

Malathion has not received use restrictions for urban and residential use and its presence has been reported in the same CDPR urban water quality monitoring studies mentioned above. Malathion was detected in 36 of 297 water samples, with 16 samples exceeding a USEPA benchmark concentrations of either 0.035 µg/L or 0.049 µg/L, depending on the study.

Based on urban water quality monitoring conducted by CDPH, staff concludes that urban stormwater discharges of chlorpyrifos and diazinon are not causing exceedances of water quality criteria within the project area. However, staff has concluded that storm water discharges containing malathion can potentially occur at concentrations that exceed the proposed numeric targets and is proposing wasteload allocation for these sources.

The City of Salinas is subject to the National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for City of Salinas Municipal Stormwater Discharges (Order No. R3-2019-0073, NPDES No. CA0049981) (Phase I MS4 Stormwater Permit) or any future NPDES permits regulating the City's MS4 discharges. The County is subject to the General Permit for Waste Discharge Requirements for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (Water Quality (WQ) Order 2013-0001-DWQ NPDES NO. CAS000004, as amended by Order WQ 2015-0133-EXEC, Order WQ 2016-0069-EXEC, WQ Order 2017-XXXX-DWQ, Order WQ 2018-0001-EXEC, and Order WQ 2018-0007-EXEC) (Phase II Small MS4 Permit) or any future NPDES permits regulating the County's MS4 discharges.

8.5 Industrial and Construction Stormwater Facilities

Based on guidance from the State Water Board, all NPDES point sources should receive a wasteload allocation (communication from Jonathan Bishop, Chief Deputy Director and Phil Wyels, Assistant Chief Counsel, State Water Resources Control Board, August 2014). Therefore, NPDES–permitted industrial stormwater and construction stormwater entities should be considered during TMDL development. Similarly, USEPA guidance recommends disaggregating stormwater sources in the wasteload allocation of a TMDL where feasible, including disaggregating industrial stormwater discharges (USEPA, 2014).

Site-specific industrial and construction stormwater runoff data related to organophosphate pesticides in the lower Salinas River watershed is not available, so direct inferences about potential pesticide loading to surface waters from these facilities is not possible. Although staff has no evidence to indicate that industrial and construction stormwater facilities use the organophosphate pesticides addressed in this TMDL, there remains the potential for discharges to occur similar to that of municipal stormwater discharges mention above. As a result, staff is proposing wasteload allocations for these sources.

There are approximately 76 active NPDES stormwater-permitted industrial facilities and 31 active NPDES stormwater-permitted construction entities in the lower Salinas River watershed.[5] (lists contained in Appendix 1). Staff has concluded that these facilities are not expected to pose a significant risk nor significantly contribute to the observed organophosphate pesticide and toxicity water quality impairments. These types of facilities are generally expected to be currently meeting wasteload allocations identified in this report. To maintain existing water quality and prevent any further water quality degradation, these permitted industrial facilities and construction operators shall continue to implement and comply with the requirements of the statewide Industrial General Permit or the Construction General Permit, respectively. Consistent with State Water Board guidance, staff is proposing wasteload allocations for all stormwater-permitted industrial facilities and stormwater-permitted construction entities as part of this TMDL.

Industrial and construction facilities are permitted through requirements of the statewide General Permit for Stormwater Discharges Associated with Industrial Activities (Order No.97-03-DWQ, as amended by Order No. 2014-0057-DWQ, NPDES No. CAS000001) or the statewide General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009, as amended by Order No. 2012-0006-DWQ, NPDES No. CAS000002), or any subsequent Industrial or Construction General Permits.

8.6 Cannabis Operations

There are approximately 65 permitted cannabis cultivation operations within the lower Salinas River watershed. Staff has not encountered any data or information to suggest that cannabis cultivation activities use organophosphate pesticides or currently discharge chlorpyrifos, diazinon, or malathion at levels that would contribute to the current impairments. Cannabis cultivation operations are not expected to pose a significant risk or significantly contribute to the observed organophosphate pesticide and toxicity water quality impairments, and they are generally expected to be currently meeting wasteload

[5] Information publicly available from the State Water Resource Control Board's Storm Water Multiple Applications & Report Tracking System (SMARTS). Accessed December 10, 2021. https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.jsp

allocations identified in this report. To maintain existing water quality and prevent any potential water quality degradation, cannabis cultivation operations shall continue to implement and comply with the requirements of the cannabis general order.

Although staff has not encountered data to suggest cannabis cultivation operations contribute to existing organophosphate pesticide and toxicity impairments, confirmation is necessary to conclude that these operations are meeting proposed wasteload allocations. As a result, staff is proposing load allocations for cannabis cultivation operations. More information will be obtained during the implementation phase of these TMDLs to further assess potential discharges to surface waters and identify any actions needed to reduce pesticide loading or toxicity conditions.

Owners, operators, and landowners of commercial cannabis operations are permitted through requirements of the General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Dischargers of Waste Associated with Cannabis Cultivation Activities (Order No. WQ 2019-0001-DWQ) (Cannabis General Order), the associated Monitoring and Reporting Program (MRP), and any future permits regulating the discharge of waste from commercial cannabis operations

8.7 Permitted Facilities (Fertilizers and Pesticides)

Staff has identified eight facilities that handle fertilizers and/or pesticides in the lower Salinas River watershed. These facilities are regulated under waste discharge requirements (WDRs) and their associated orders (permits) as tabulated in Table 8-6. Three of the facilities covered under the Central Coast Water Boards General Waste Discharge Requirements for Fertilizer/Pesticide Handling (currently Order R3-2005-0001) and the remaining five facilities are regulated under individual WDRs.

Table 8-6. Permitted Facilities (Fertilizer/Pesticide Handling).

Facility Name	Facility City	Order Type	Order No.	WDID
Associated Tagline Chemicals	Salinas	Individual WDR	00-094	3 272083001
Converted Organics of California	Gonzales	General WDR (Fertilizer/Pesticide Handling)	R3-2005-0001	3 270405299
Helena Chemical Company - Salinas	Salinas	General WDR (Fertilizer/Pesticide Handling)	R3-2005-0001	3 270613509
Dune Co of Salinas	Chualar	Individual WDR	01-050	3 272080002
Nutrien Salinas Facility (Former Crop Production Service)	Salinas	Individual WDR	00-030	3 272073002
Performance Agriculture - Salinas	Salinas	General WDR (Fertilizer/Pesticide Handling)	R3-2005-0001	3 271016575

Facility Name	Facility City	Order Type	Order No.	WDID
Wilbur-Ellis Co. Salinas SS	Salinas	Individual WDR	01-051	3 272074001
Wilbur-Ellis Co. Salinas JP	Salinas	Individual WDR	92-006	3 272079002

These fertilizer and pesticide handling facilities store, formulate, or handle bulk pesticides or fertilizers and can produce wastes including product spills, leaks, residues, and rinse water. If discharged or otherwise handled improperly, these wastes can enter surface waters and groundwater. Compliance with the existing General WDR and individual WDRs will ensure that discharges of waste does not occur. It is generally expected that these facilities are currently meeting wasteload allocations identified in this report. To maintain existing water quality and prevent any potential water quality degradation, fertilizer and pesticide handling facilities shall continue to implement and comply with their respective waste discharge requirements. Staff is proposing load allocations for these fertilizer and pesticide handling facilities to ensure that any potential discharges do not contribute to organophosphate pesticide and toxicity impairments in the lower Salinas River watershed.

8.8 Natural Background Sources

USEPA requires states to assign an allocation to natural background sources of pollutant stressors and identification of sources of the pollutants for which allocations are assigned.

USEPA describes background levels as representing pollutant loading from natural geomorphological processes, such as weathering.

Staff concludes that chlorpyrifos, diazinon and malathion are not natural pollutants; therefore, there are no background levels. Because natural background sources of these chemicals do not exist, staff has assigned an allocation to background equal to zero.

8.9 Conclusions from Source Analysis

Staff concludes that discharges of chlorpyrifos, diazinon, and malathion from irrigated agricultural lands are the primary source of organophosphate pesticide and toxicity impairments withing the lower Salinas River watershed. Staff has concluded that municipal separate storm sewer system (MS4) discharges may be a potentially minor source of malathion impairments within the lower Salinas River watershed.

9 Loading Capacity, TMDLs, and Allocations

TMDLs are “[t]he sum of the individual wasteload allocations (WLAs) for point sources, load allocations (LAs) for nonpoint sources, and natural background.” Because organophosphate pesticides are man-made chemicals, “natural” background conditions are not considered in this TMDL Project. TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure" in accordance with Code of Federal Regulations, Title 40, §130.2[i]. Staff proposes concentration-based TMDLs in accordance with this provision of the Clean Water Act.

9.1 Loading Capacities and TMDLs

The proposed TMDLs are equal to the loading capacity. The loading capacity for water bodies within the Lower Salinas River watershed is the amount of chlorpyrifos, diazinon, and malathion, as individual compounds, that can be assimilated without exceeding the water quality objectives. In addition, because chlorpyrifos, diazinon, and malathion share the same mechanism of toxic action and exhibit additive toxicity to aquatic invertebrates when they co-occur, the loading capacity must also be defined in terms of additive toxicity. Therefore, the loading capacity is defined under these two conditions.

9.1.1 Total Maximum Daily Loads for Individual OP Pesticides

The loading capacity, or TMDL, for chlorpyrifos, diazinon, and malathion, when either is present individually, meaning in the absence of each other, is a water column concentration-based TMDL that is applicable to each day of all seasons. The TMDLs for chlorpyrifos, diazinon, and malathion are the same as the numeric targets as indicated in

Table 9-1, Table 9-2, and Table 9-3, respectively.

Table 9-1. Concentration-based TMDLs for chlorpyrifos.

Waterbodies Assigned TMDLs	CMC[A] (ppb)	CCC[B] (ppb)
Moro Coho Slough	0.025	0.015
Old Salinas River	0.025	0.015
Salinas River Lagoon	0.025	0.015
Tembladero Slough	0.025	0.015
Merritt Ditch	0.025	0.015
Alisal Slough	0.025	0.015
Alisal Creek	0.025	0.015
Blanco Drain	0.025	0.015
Salinas Reclamation Canal (Lower)	0.025	0.015
Salinas Reclamation Canal (Upper)	0.025	0.015
Salinas River	0.025	0.015
Espinosa Slough	0.025	0.015
Gabilan Creek	0.025	0.015
Natividad Creek	0.025	0.015
Santa Rita Creek	0.025	0.015
Quail Creek	0.025	0.015
Chualar Creek	0.025	0.015

[A] CMC – Criterion Maximum Concentration or acute (1- hour average). Not to be exceeded more than once in a three-year period.

[B] CCC – Criterion Continuous Concentration or chronic (4-day (96-hour) average). Not to be exceeded more than once in a three-year period.

Table 9-2. Concentration-based TMDLs for diazinon.

Waterbodies Assigned TMDLs	CMC[A] (ppb)	CCC[B] (ppb)
Moro Cojo Slough	0.16	0.10
Old Salinas River	0.16	0.10
Salinas River Lagoon	0.16	0.10
Tembladero Slough	0.16	0.10
Merritt Ditch	0.16	0.10
Alisal Slough	0.16	0.10
Alisal Creek	0.16	0.10
Blanco Drain	0.16	0.10
Salinas Reclamation Canal (Lower)	0.16	0.10
Salinas Reclamation Canal (Upper)	0.16	0.10
Salinas River	0.16	0.10
Espinosa Slough	0.16	0.10
Gabilan Creek	0.16	0.10
Natividad Creek	0.16	0.10
Santa Rita Creek	0.16	0.10
Quail Creek	0.16	0.10
Chualar Creek	0.16	0.10

[A] CMC – Criterion Maximum Concentration or acute (1- hour average). Not to be exceeded more than once in a three-year period.

[B] CCC – Criterion Continuous Concentration or chronic (4-day (96-hour) average). Not to be exceeded more than once in a three year period.

Table 9-3. Concentration-based TMDLs for malathion.

Waterbodies Assigned TMDLs	CMC[A] (ppb)	CCC[B] (ppb)
Moro Cojo Slough	0.17	0.028
Old Salinas River	0.17	0.028
Salinas River Lagoon	0.17	0.028
Tembladero Slough	0.17	0.028
Merritt Ditch	0.17	0.028
Alisal Slough	0.17	0.028
Alisal Creek	0.17	0.028
Blanco Drain	0.17	0.028
Salinas Reclamation Canal (Lower)	0.17	0.028
Salinas Reclamation Canal (Upper)	0.17	0.028
Salinas River	0.17	0.028
Espinosa Slough	0.17	0.028
Gabilan Creek	0.17	0.028
Natividad Creek	0.17	0.028
Santa Rita Creek	0.17	0.028
Quail Creek	0.17	0.028
Chualar Creek	0.17	0.028

[A] CMC – Criterion Maximum Concentration or acute (1- hour average). Not to be exceeded more than once in a three-year period

[B] CCC – Criterion Continuous Concentration or chronic (4-day (96-hour) average). Not to be exceeded more than once in a three-year period

9.1.2 Total Maximum Daily Loads for Additive Toxicity of OP Pesticides

Chlorpyrifos, diazinon and malathion can co-occur within waterbodies of the lower Salinas River watershed. Therefore, the additive toxicity of these chemicals are expressed in this TMDL Project. The additive toxicity TMDLs are the same as the numeric targets presented in Section 7.3.

The additive toxicity TMDLs, when two or more organophosphate pesticides are present in the water column, is expressed as the concentration of chlorpyrifos divided by the numeric target for chlorpyrifos plus the concentration of diazinon divided by the numeric target for diazinon plus the concentration of malathion divided by the numeric target for malathion is equal to or less than one. This expression for additive toxicity is shown in Figure 9-1 and Table 9-4 lists the waterbodies that are assigned these additive toxicity TMDLs.

$$\frac{\text{C Chlorpyrifos}}{\text{NT Chlorpyrifos}} + \frac{\text{C Diazinon}}{\text{NT Diazinon}} + \frac{\text{C Malathion}}{\text{NT Malathion}} = S;\ \ S \leq 1$$

Where:
C = the concentration of a pesticide measured in the receiving water.
NT = the numeric target for each pesticide present.
S = the sum; a sum exceeding one (1.0) indicates that beneficial uses may be adversely affected.

Figure 9-1. Equation for additive toxicity TMDLs (S≤1).

Table 9-4. Total maximum daily loads for additive toxicity of diazinon, chlorpyrifos, and malathion.

Waterbodies assigned TMDLs	Additive toxicity TMDLs
Moro Cojo Slough	S≤1
Old Salinas River	S≤1
Salinas River Lagoon	S≤1
Tembladero Slough	S≤1
Merritt Ditch	S≤1
Alisal Slough	S≤1
Alisal Creek	S≤1
Blanco Drain	S≤1
Salinas Reclamation Canal (Lower)	S≤1
Salinas Reclamation Canal (Upper)	S≤1
Salinas River	S≤1
Espinosa Slough	S≤1
Gabilan Creek	S≤1
Natividad Creek	S≤1
Santa Rita Creek	S≤1
Quail Creek	S≤1
Chualar Creek	S≤1

These water column TMDLs for the additive toxicity of organophosphate pesticides are consistent with the Basin Plan narrative water quality objective which states, in part:

> "No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life."

The additive toxicity loading capacity is consistent with the narrative toxicity water quality objective, which states in part *"All waters shall be maintained free of toxic substances in* *concentrations which are toxic to, or which produce detrimental physiological responses in human, plant, animal, or aquatic life."*

9.2 Linkage Analysis

The goal of the linkage analysis is to establish a link between pollutant loads and desired water quality. This, in turn, ensures that the loading capacity specified in the TMDLs will result in attaining the desired water quality. For these TMDLs, this link is established because the load allocations are equal to the acute and chronic numeric targets derived as water quality criteria by the California Department of Fish and Wildlife and University of California, Davis (CDFW, 2000, CDFW, 2004, TenBrook, et al., 2009, Faria et al., 2010) and USEPA (USEPA 1985). Therefore, reductions in chlorpyrifos, diazinon, and malathion loading to the extent allocated will result in achieving the water quality standards for pesticides and toxicity.

9.3 Allocations

TMDLs determine a pollutant reduction target and allocate load reductions necessary to achieve that target to point and nonpoint sources of the pollutant. Point source discharges, such as urban stormwater, are regulated with NPDES permits and receive wasteload allocations, while irrigated agricultural discharges are considered nonpoint sources and receive load allocations.

Table 9-5 and Table 9-6 represent the wasteload and load allocations, respectively, that are assigned to responsible parties (dischargers subject to these TMDLs through waste discharge requirements (WDRs) or waivers of WDRs adopted by the State or Regional Water Board). These allocations are equal to the TMDLs and are assigned as receiving water allocations.

Table 9-5. Wasteload Allocations

Responsible Party	Permit/Order	Source	Allocation
City of Salinas	Phase I MS4 Stormwater Permit (currently Order No. R3-2019-0073, NPDES No. CA0049981	Municipal stormwater	As contained in the following TMDL tables: Table 9-1 Table 9-2 Table 9-3 Table 9-4
County of Monterey	State Water Board Phase II MS4 General Stormwater Permit (Order No. 2013-0001 DWQ)	Municipal stormwater	As contained in the following TMDL tables: Table 9-1 Table 9-2 Table 9-3 Table 9-4
Industrial General Permit enrollees	Industrial General Permit (Order No. 2009-0009	Industrial stormwater	As contained in the following

Responsible Party	Permit/Order	Source	Allocation
	amended by Order No. 2014-0057-DWQ, NPDES No. CAS000001)		TMDL tables: Table 9-1 Table 9-2 Table 9-3 Table 9-4
Construction General Permit enrollees	Construction General Permit (Order No. 2012-0006-DWQ, NPDES No. CAS000002)	Construction stormwater	As contained in the following TMDL tables: Table 9-1 Table 9-2 Table 9-3 Table 9-4

Table 9-6. Load Allocations

Responsible Party	Permit/Order	Source	Allocation
Owners/operators of irrigated agricultural lands	General Waste Discharge Requirements for Discharges From Irrigated Lands (Order R3-2021-0040)	Irrigated agriculture, nurseries, greenhouses	As contained in the following TMDL tables: Table 9-1 Table 9-2 Table 9-3 Table 9-4
Owners/operators of cannabis cultivation facilities	General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Dischargers of Waste Associated with Cannabis Cultivation Activities (Order WQ 2019-0001-DWQ)	Cannabis cultivation, nurseries, greenhouses	As contained in the following TMDL tables: Table 9-1 Table 9-2 Table 9-3 Table 9-4
Handlers of Fertilizer or Pesticides Subject to WDRs	General Waste Discharge Requirements for Fertilizer/Pesticide Handling (Order R3-2005-0001) and Individual Waste Discharge Requirements (Orders)	Fertilizer/pesticide handling facilities	As contained in the following TMDL tables: Table 9-1 Table 9-2 Table 9-3 Table 9-4

All receiving water samples collected within the applicable averaging period (i.e., 1-hour CMC and 4-day CCC) will be used to determine compliance with the allocations for chlorpyrifos, diazinon, and malathion. Prior to performing any averaging calculations, only chlorpyrifos, diazinon, and malathion laboratory results from the same receiving water sample will be used in calculating the sum (S) to determine additive toxicity, as described in the TMDL and allocations. For purposes of calculating the sum (S), analytical results that are reported as “non-detectable” concentrations are considered to be zero if the method detection limit is below the chronic criteria.

Dischargers must determine compliance by demonstrating their discharges do not cause or contribute exceedances of allocations within receiving waters.

9.4 Margin of Safety

This TMDL uses an implicit margin of safety. The margin of safety for this TMDL is implicit in the water column numeric targets selected for chlorpyrifos, diazinon, and malathion. Since these are concentration-based TMDLs the TMDL is the same as the loading capacity for each compound.

The assigned TMDL assumes no significant reductions in chlorpyrifos, diazinon or malathion loading due to removal from the water column by degradation and/or adsorption to sediment particles and subsequent sediment deposition. Since these processes are likely to take place, this assumption contributes to the implicit margin of safety in the proposed allocation methodology.

Staff used pesticide water quality criteria methodologies for chlorpyrifos, diazinon, and malathion developed by the California Department of Fish and Game (CDFG, 2000: CDFG, 2004) and University of California, Davis (Faria, et. al., 2010) which follow USEPA protocols (USEPA 1985) to establish the loading capacity. Therefore, the loading capacity has the same conservative assumptions used in those procedures.

9.5 Critical Conditions, Seasonal Variation

A critical condition is the combination of environmental factors resulting in the water quality standard being achieved by a narrow margin, for example, a minor change in one of the environmental factors could result in exceedance of the water quality standard. Such a phenomenon could be significant if the TMDL were expressed in terms of load, and the allowed load was determined on achieving the water quality standard by a narrow margin. However, this TMDL is expressed as a concentration, which is equal to the desired water quality condition. Consequently, there are no critical conditions.

The TMDL includes individual and additive toxicity numeric targets to address critical conditions where chlorpyrifos, or diazinon, or malathion are present.

Exceedance of water quality objectives occurs during all seasons. Additionally, the TMDL and allocations are expressed in terms of concentration equal to the desired water quality condition, which is applicable to all seasons and flow-regimes. Therefore, TMDLs and allocations developed on the basis of seasonal variation is not appropriate.

9.6 Load Duration Curves and Load Reduction Estimates

As mentioned previously, staff is proposing concentration based TMDLs in accordance with 40 CFR 122.45(f) of the Clean Water Act. However, USEPA recommends supplementing a concentration based TMDL with a daily load expression, as referenced below:

> *"For TMDLs that are expressed as a concentration of a pollutant,* a *possible approach would be to use a table and/or graph to express the TMDL as daily loads for a range of possible daily stream flows. The in-stream water quality criterion multiplied by daily stream flow and the appropriate conversion factor would translate the applicable criterion into a daily target"* (USEPA, 2007).

Consistent with this USEPA guidance, staff performed a load duration curve analysis to estimate existing loads and the assimilative capacity for chlorpyrifos, diazinon, and malathion. Load duration curves allow for the calculation of flow-based daily load expressions over a range of flow conditions and provide data from which to estimate load reductions. This analysis was conducted for the Salinas Reclamation Canal due to the colocation of USGS flow gage (11152650) and water quality monitoring site (309JON) at San Jon Road. In addition, staff used water quality data available for monitoring site 309ALD (Salinas Reclamation Canal at Boronda Road), which is approximately one and three-quarters mile upstream of the San Jon Road monitoring location. Water quality samples for these two sites were collected from August 2006 to September 2018 and the USGS average daily flow data covers the period from June 2002 to January 2020. Load duration curve analysis for other sites in the lower Salinas River watershed were not conducted due to extensive flow alterations (pumps used for dewatering and hydrologic control) and a lack of flow gage stations.

The flow duration curve, as depicted in **Error! Not a valid bookmark self-reference.**, represents the fraction of flow observations that exceed a given flow. The observed flow values are first ranked from highest to lowest and for each observation the percentage of observations exceeding that flow is calculated. For example, the highest measured flow is found at an exceedance frequency of 0 percent while the lowest measured flow occurs at an exceedance frequency of 100 percent, indicating that flow has equaled or exceeded this value 100 percent of the time. The median flow occurs at a flow exceedance frequency of 50 percent. Flow duration curves can be subjectively divided into hydrologic flow regime classes to facilitate the application of load duration curves and to evaluate pollutant loading conditions. For the purposes of this evaluation, the hydrologic flow regimes have been divided into high flow conditions of 708 cubic feet per second (cfs) to 23.2 cfs (0-10% exceedance), moderate flow conditions of 23.2 cfs to 2.9 cfs (10-40% exceedance), and low flow conditions of 2.9 cfs to 0.1 cfs (40-100%) as shown in **Error! Not a valid bookmark self-reference.**.

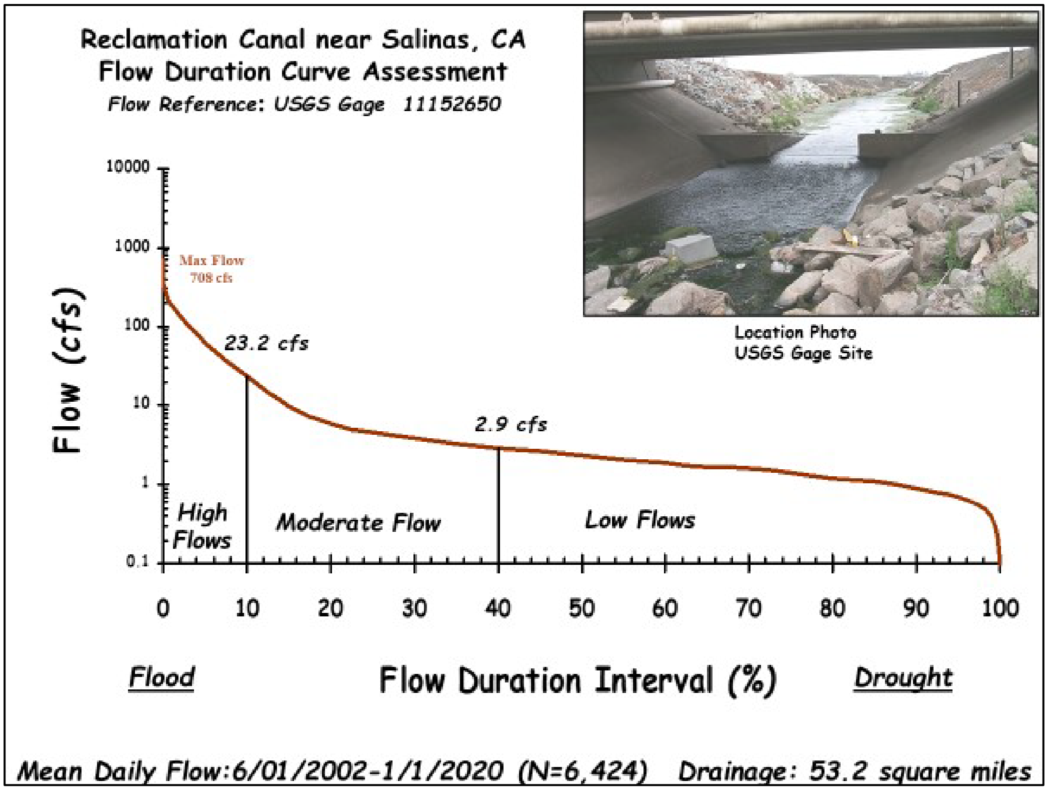

Figure 9-2. Flow duration curve for Salinas Reclamation Canal.

Load duration curves are based on flow duration curves and display the allowable loading capacity (based on the relevant water quality criterion) across the continuum of flow percentiles. In lieu of flow, the y-axis is expressed in terms of OP pesticide load in grams per day (g/day). As shown in Figure 9-3, the load duration curve for chlorpyrifos represents the chronic water quality criterion for chlorpyrifos (0.015 µg/L) in terms of a load capacity curve by multiplying the daily observed flow by the applicable water quality criterion and a conversion factor, then plotting the resulting curve (brown line). For example, the loading capacity for chlorpyrifos is:

Loading capacity (grams/day) = 0.015 µg/L (chronic criteria) * Q (cfs) * 2.447 (unit conversion factor)

The load duration method essentially uses an entire stream flow record to provide insight into the flow conditions under which exceedances of the water quality objective occur. Exceedances that occur under low flow conditions are generally attributed to loads delivered directly to the stream such as irrigation return flow or some other form of direct discharge. Exceedances that occur under high flow conditions are typically attributed to loads that are delivered to the stream in stormwater runoff. Exceedances occurring during moderate flows can be attributed to a combination of stormwater runoff and direct discharges.

To represent observed loads, each pollutant data point from monitoring data is converted to a daily load by multiplying the concentration by the corresponding average daily flow on the day the sample was taken. The load is then plotted on the load duration curve graph (blue diamond). Points plotting above the curve represent exceedances of the water quality criteria (i.e., the allowable load, or total maximum daily load) and those plotting below the curve do not exceed the allowable load.

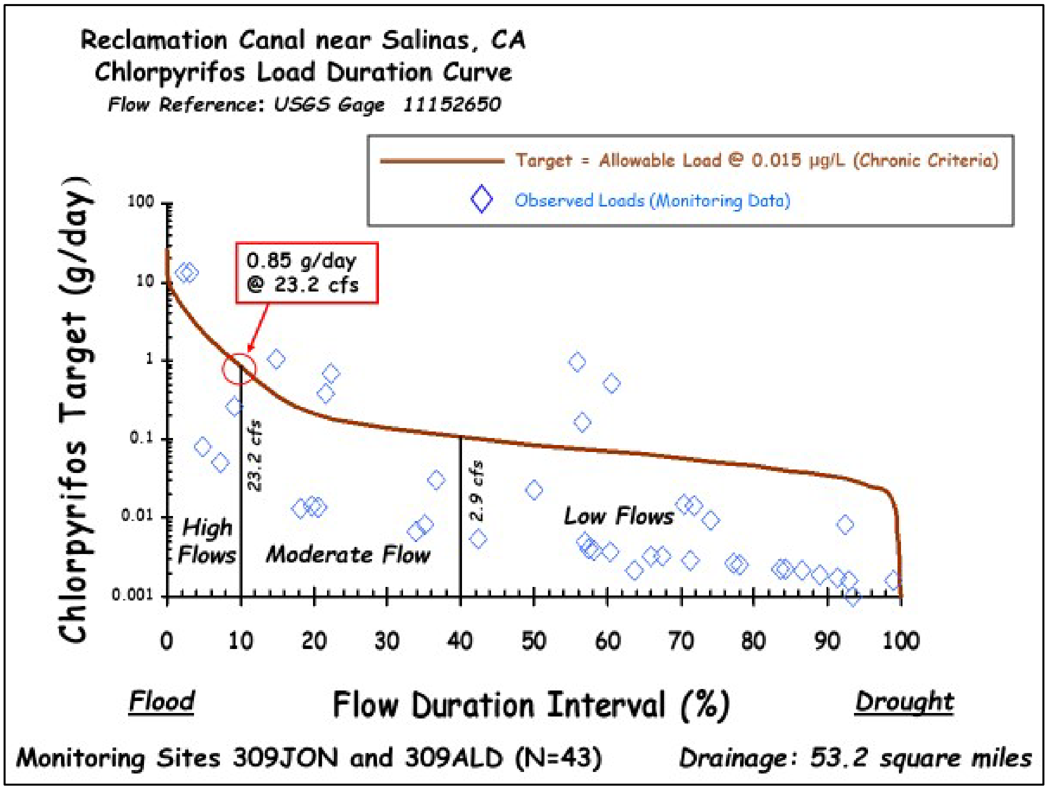

Figure 9-3. Chlorpyrifos load duration curve for Salinas Reclamation Canal.

Staff used guidance from USEPA (2007b) to develop load duration curves that assess existing loads and flow-based assimilative capacity. Existing loads are conservatively calculated as the 90th percentile of measured chlorpyrifos, diazinon, and malathion concentrations under each hydrologic flow regime class multiplied by the flow within the middle of each class. The 90th percentile of measured loads is a more conservative estimate than using the median. For example, in calculating the existing loading under high flow conditions (flow exceedance of 0-10%), the 5% exceedance flow is multiplied by the 90% percentile of pesticide concentrations. The same method was used for the moderate flow regime (10-40% flow exceedance class) using loads at the 25% flow exceedance interval and for the low flow regime (40-100%) using the 70% flow exceedance interval. A sample flow duration curve schematic is provided in Figure 9-4, showing the derivation of existing load, flow-based assimilative capacity, and percent reduction goals.

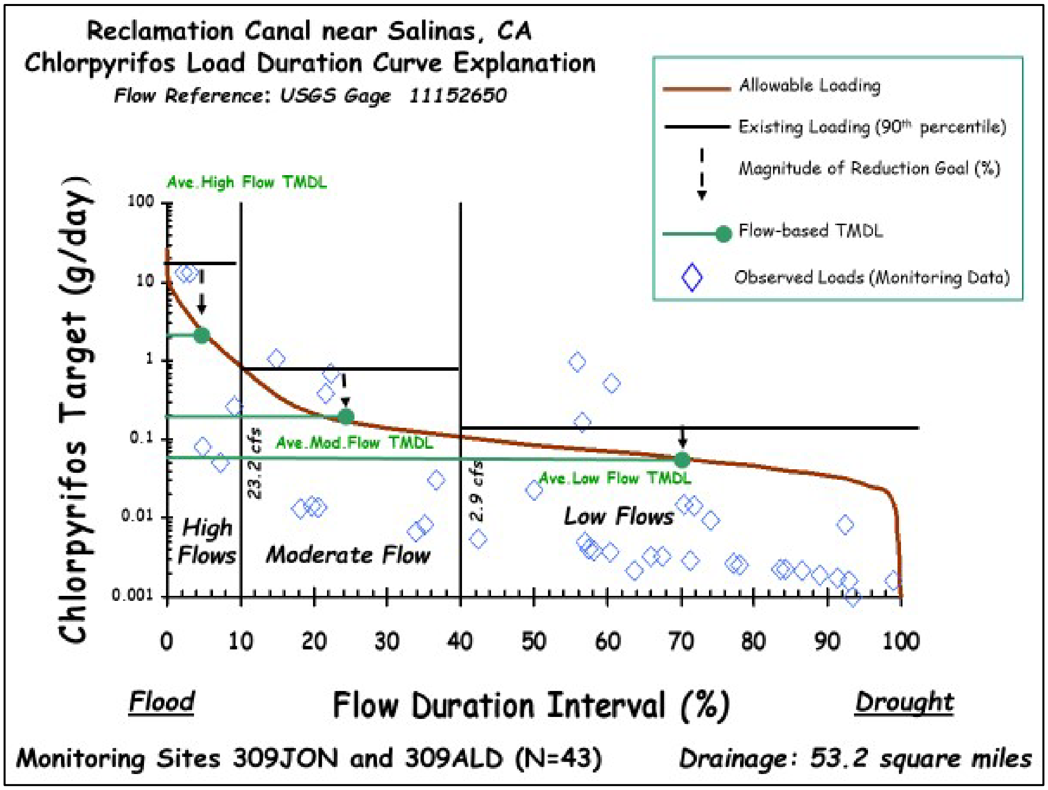

Figure 9-4. Derivation of existing load, flow-based assimilative capacity, and percent reduction goals.

Table 9-7. Chlorpyrifos estimated existing loads, allowable loads, and % load reduction goals for the Salinas Reclamation Canal.

Reference flow (exceedance % in flow regime)	Existing load for chlorpyrifos: 90th percentile of chlorpyrifos loads within flow range (g/day)	Allowable load for the reference flow percentile (g/day)	% Load reduction chlorpyrifos
High (0-10%)	13.04	2.28	82.53
Moderate (10-40%)	0.75	0.16	78.08
Low (40-100%)	0.05	0.06	NA

Note: NA indicates not applicable because existing estimated loads are below allowable loads.

Load duration curves for diazinon and malathion are shown in Figure 9-5 and Figure 9-6, respectively. Diazinon and malathion estimated existing loads, allowable loads, and percent load reduction goals for the Salinas Reclamation Canal are represented in Table 9-8 and Table 9-9.

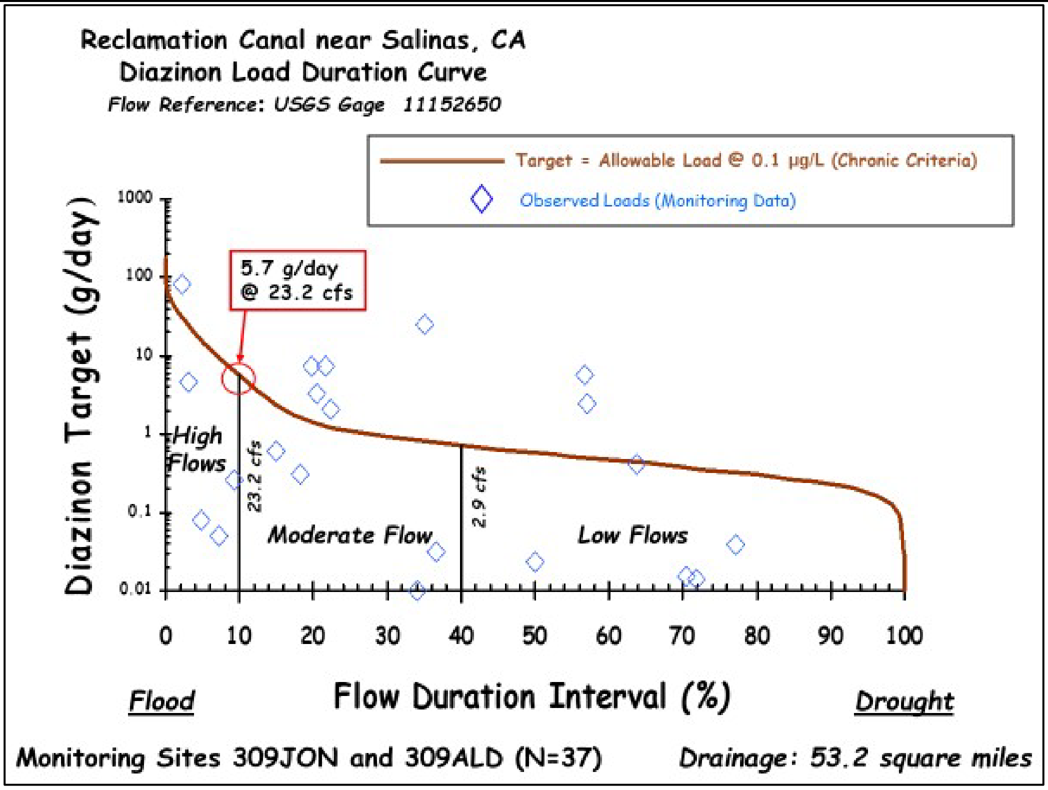

Figure 9-5. Diazinon load duration curve for Salinas Reclamation Canal.

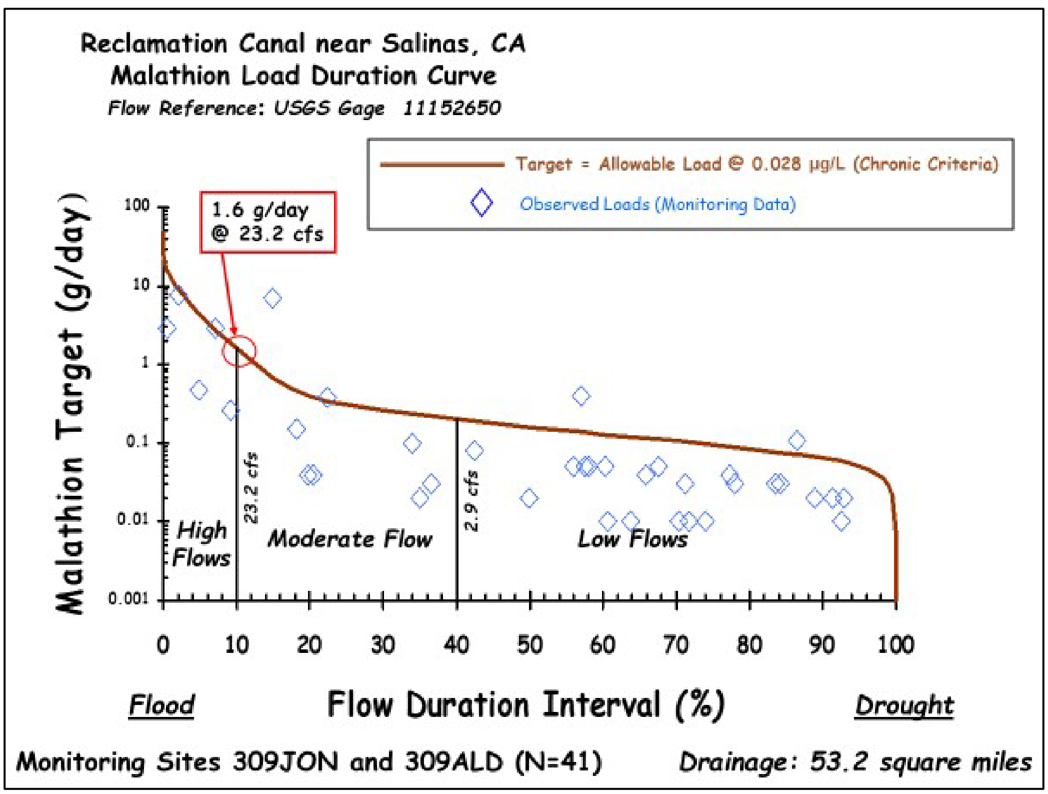

Figure 9-6. Malathion load duration curve for Salinas Reclamation Canal.

Table 9-8. Diazinon estimated existing loads, allowable loads, and % load reduction goals for the Salinas Reclamation Canal.

Reference flow (exceedance % in flow regime)	Existing load for diazinon: 90th percentile of diazinon loads within flow range (g/day)	Allowable load for the reference flow percentile (g/day)	% Load reduction diazinon
High (0-10%)	51.77	15.18	70.67
Moderate (10-40%)	11.07	1.09	90.14
Low (40-100%)	0.34	0.38	NA

Note: NA indicates not applicable because existing estimated loads are below allowable loads.

Table 9-9. Malathion estimated existing loads, allowable loads, and % load reduction goals for the Salinas Reclamation Canal.

Reference flow (exceedance % in flow regime)	Existing load for malathion: 90th percentile of malathion loads within flow range (g/day)	Allowable load for the reference flow percentile (g/day)	% Load reduction malathion
High (0-10%)	5.77	4.25	26.28
Moderate (10-40%)	2.37	0.31	87.11
Low (40-100%)	0.06	0.11	NA

Note: NA indicates not applicable because existing estimated loads are below allowable loads.

The load duration analysis for the Salinas Reclamation Canal indicates that load reductions are necessary at the high and moderate flow regimes for all OP pesticides. Load reductions within the low flow regime, using the 90^{th} percentile of measured concentrations, are marginally lower than the allowable loads and indicated as not applicable. However, exceedances of allowable loads within the low flow regime do occur and reductions may be necessary.

10 Implementation Plan: Recommended Actions to Correct the 303(d) Impairments

Implementation of this TMDL Project will necessitate an interagency approach to comprehensively address water quality impairments. Because pesticide use and water quality controls are regulated differently for agricultural and urban land use practices, this TMDL Project will incorporate different implementation plans for each. For example, the Central Coast Water Board regulates agricultural discharges through the Agricultural Order and urban discharges are regulated through municipal stormwater permits.

The framework for the interagency approach is provided in the 2019 Implementation Plan developed by the California Department of Pesticide Regulation and the State Water Resources Control Board (California Environmental Protection Agency: CalEPA, 2019) (Implementation Plan). The Implementation Plan formalizes the responsibilities and actions that implement the Management Agency Agreement (MAA) between the State Water Resources Control Board and the Department of Pesticide Regulations California Pesticide (SWRCB and CDPR, 2019). The purpose of both the Implementation Plan and the MAA is to coordinate the complementary authorities held by each agency to protect water quality from the potential adverse effects resulting from pesticide use.

The Implementation Plan describes how CDPR and the Water Boards will work in cooperation to address: (i) pesticide use that may cause potential adverse impacts to water, which is regulated by DPR, and; (ii) discharges of pesticides that cause water quality impacts, which are regulated by the Water Boards. The Implementation Plan outlines the following coordination elements:

- Interagency communication and collaboration;
- Compliance and enforcement roles;
- Processes for identifying and responding to pesticide water quality issues; and,
- Formal and informal procedures to resolve pesticide water quality issues.

Central Coast Water Board staff and CDPR staff have collaborated on pesticide-related water quality issues in the lower Salinas River watershed, including the identification of specific pesticides and related water quality issues, as well as the coordination of surface water monitoring and reporting. This coordinated effort will continue and may include the evaluation of new pesticide active ingredients and products as a part of DPR's registration process, if necessary.

10.1 Irrigated Lands Program

Discharges from irrigated agricultural lands are considered nonpoint sources of pollution, which are therefore not subject to federal NPDES permits, but regulated pursuant to waste discharge requirements. Waste discharges from irrigated agricultural lands are currently regulated under the Central Coast Water Board's General Waste Discharge Requirements for Discharges from Irrigated Lands (Order No. R3-2021-0040; the "Agricultural Order") and the associated Monitoring and Reporting Program (MRP) (Agricultural Order, Attachment B). The Agricultural Order currently does not include these TMDLs because they have not yet been adopted but when the Agricultural Order is modified in the future, the intent is to include these TMDLs to ensure the Agricultural Order implements these TMDLs in the lower Salinas River watershed. Through the modified Agricultural Order or any successor waste discharge requirements, owners and operators of irrigated agricultural lands would be required to comply with waste discharge requirements terms and conditions established to: 1) meet load allocations, 2) achieve the TMDLs according to the TMDL attainment schedule, and 3) help rectify the impairments addressed in this TMDL Project. The current Agricultural Order regulates:

(1) discharges of waste from commercial irrigated lands, including, but not limited to, land planted to row, vineyard, field and tree crops where water is applied for producing commercial crops;

(1) discharges of waste from commercial nurseries, nursery stock production, and greenhouse operations with soil floors that do not have point source-type discharges and are not currently operating under individual waste discharge requirements; and

(2) discharges of waste from lands that are planted to commercial crops that are not yet marketable, such as vineyards and tree crops.

The Agricultural Order requires owners and operators of irrigated lands to do the following:

A. Comply with load allocations[6] and achieve applicable TMDLs. The Agricultural Order incorporates applicable load allocations as surface receiving water limits for owners and operators of irrigated lands in TMDL project areas.

B. Conduct surface receiving water quality monitoring and reporting to evaluate the impact of irrigated agricultural waste discharges on receiving waters, the condition of existing perennial, intermittent, and ephemeral streams and wetland areas, and compliance with applicable load allocations, as well as to assist in the identification of specific sources of water quality problems.

C. Identify and implement follow-up actions including outreach, education, additional monitoring and reporting, and management practices to abate sources of water quality impacts and meet interim milestones and load allocations.

D. Potentially complete ranch-level surface discharge monitoring and reporting in areas where water quality issues persist or applicable load allocations are not met by their TMDL compliance dates.

E. Report on irrigation system type, discharge type, slope, impermeable surfaces (i.e., plastic covered surfaces that do not allow fluid to pass through, including polyethylene mulch and hoop houses), and presence and location of any waterbodies on or adjacent to irrigated lands.

F. Manage stormwater discharge intensity and volume from fields with 50 to 100 percent coverage of impermeable surfaces or with greater than or equal to one-half (0.5) acre of impermeable surfaces so as not to exceed stormwater discharges from the equivalent permeable field area.

[6] The Order establishes surface receiving water limits for owners and operators of irrigated lands in TMDL project areas that are equivalent to the applicable load allocations.

G. Implement, assess, and report on all management practices related to sediment, erosion, irrigation, stormwater, roads, agricultural drainage pumps, and impermeable surfaces, and maintain records of all management practices used to reduce erosion and sediment loading.

H. Avoid disturbance (i.e., removal, degradation, or destruction) of existing, naturally occurring, and established native riparian vegetative cover and report on average width and length of riparian area.

Agricultural monitoring and reporting programs for organophosphate pesticides and toxicity in a watershed must be adequate to determine progress toward achieving load allocations. When the Agricultural Order is modified to include these TMDLs, the existing monitoring and reporting requirements of the Agricultural Order must be re-evaluated to determine whether they adequately demonstrate attainment of water quality standards. If the requirements of the Agricultural Order are inadequate, then the associated Monitoring and Reporting Program will need to be updated through the development of follow-up implementation work plans as required in the Agricultural Order. Follow-up implementation planning must consider the level of water quality impairment identified through surface receiving water monitoring. Where necessary, planning must identify follow-up actions to restore degraded areas to meet load allocations and identify additional surface receiving water monitoring locations for pollutant source identification and abatement.

10.2 Municipal Stormwater Programs

The two MS4s in the watershed, operated by the City of Salinas and Monterey County, are required to implement and comply with TMDLs incorporated into the permits regulating the discharges from those MS4s. Both MS4s must develop implementation plans to attain wasteload allocations in the receiving waters into which they discharge.

10.2.1 City of Salinas

The City of Salinas is subject to the National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for City of Salinas Municipal Stormwater Discharges (Order No. R3-2019-0073, NPDES No. CA0049981) (Phase I MS4 Stormwater Permit) or any future NPDES permits regulating the City's MS4 discharges. This MS4 Permit requires the City to comply with applicable water quality-based effluent limitations and associated compliance schedules that implement the wasteload allocations assigned to the City in approved TMDL Projects. Within one year of approval of these TMDLs by the Office of Administrative Law (OAL), the City must prepare a plan to address the TMDL wasteload allocations assigned to the City. The MS4 Permit requires the City's plan, referred to as a Pollutant Load Reduction Plan, to address all waterbody-pollutant combinations identified in the MS4 Permit for which the City has not yet demonstrated wasteload allocation attainment. As such, the City will be required to update its Pollutant Load Reduction Plan to incorporate its assigned wasteload allocations for organophosphate pesticides and toxicity in the lower Salinas River watershed. In addition, if and when this Permit is reissued, it will formally incorporate the TMDL wasteload allocations and TMDL attainment schedule, which the City will be required to meet.

10.2.2 Monterey County

The County is subject to the General Permit for Waste Discharge Requirements for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (Water Quality (WQ) Order 2013-0001-DWQ NPDES NO. CAS000004, as amended by Order WQ 2015-0133-EXEC, Order WQ 2016-0069-EXEC, WQ Order 2017-XXXX-DWQ, Order WQ 2018-0001-EXEC, and Order WQ 2018-0007-EXEC) (Phase II Small MS4 Permit) or any future NPDES permits regulating the County's MS4 discharges. After adoption of these TMDLs, this General Permit requires the County to develop, submit, and begin implementation of a Wasteload Allocation Attainment Program that identifies actions the County will take to attain its wasteload allocations within one year of OAL approval of these TMDLs, or within one year of General Permit renewal, whichever comes first. The following permit requirements related to TMDL attainment may change in subsequent permit reissuances and the County will be required to implement revisions at that time.

The Wasteload Allocation Attainment Program shall include:

1. A detailed description of the strategy the MS4 permittee will use to guide Best Management Plan (BMP) selection, assessment, and implementation to ensure that BMPs implemented will be effective at abating pollutant sources, reducing pollutant discharges, and achieving wasteload allocations according to the TMDL schedule.
2. Identification of sources of the impairment within the MS4 permittee's jurisdiction, including specific information on various source locations and their magnitude within the jurisdiction.
3. Prioritization of sources within the MS4 permittee's jurisdiction, based on suspected contribution to the impairment, ability to control the source, and other pertinent factors.
4. Identification of BMPs that will address the sources of impairing pollutants and reduce the discharge of impairing pollutants.
5. Prioritization of BMPs, based on suspected effectiveness at abating sources and reducing impairing pollutant discharges, as well as other pertinent factors.
6. Identification of BMPs the MS4 permittee will implement, including a detailed implementation schedule. For each BMP, identify milestones the MS4 permittee will use for tracking implementation, measurable goals the MS4 permittee will use to assess implementation efforts, and measures and targets the MS4 permittee will use to assess effectiveness. The Wasteload Allocation Attainment Program shall include expected BMP implementation for future implementation years, with the understanding that future BMP implementation plans may change as new information is obtained.
7. A quantifiable numeric analysis that uses published BMP pollutant removal estimates, performance estimates, modeling, best professional judgment, and/or other available tools to demonstrate that the BMP selected for implementation will likely achieve the MS4's wasteload allocation by the schedule identified in the

TMDL Project. This analysis will most likely incorporate modeling efforts. The MS4 permittee shall conduct repeat numeric analyses as the BMP implementation plans evolve and information on BMP effectiveness is generated. Once the MS4 permittee has water quality data from its monitoring program, the MS4 permittee shall incorporate water quality data into the numeric analyses to validate BMP implementation plans.

8. A detailed description, including a schedule, of a monitoring program the MS4 permittee will implement to assess discharge and receiving water quality, BMP effectiveness, and progress towards any interim targets and ultimate attainment of the MS4s' wasteload allocation. The monitoring program shall be designed to validate BMP implementation efforts and quantitatively demonstrate attainment of interim targets and wasteload allocations.
9. If the approved TMDL Project does not explicitly include interim targets, the MS4 permittee shall establish interim targets (and dates when stormwater discharge conditions will be evaluated) that are equally spaced in time over the TMDL attainment schedule and represent measurable, continually decreasing MS4 discharge concentrations or other appropriate interim measures of pollution reduction and progress towards the wasteload allocation. At least one interim target and date must occur during the first five years commencing on January 1, 2019. The MS4 permittee shall achieve its interim targets by the date specified in the Wasteload Allocation Attainment Program. If the MS4 does not achieve its interim target by the date specified, the MS4 permittee shall develop and implement more effective BMPs that it can quantitatively demonstrate will achieve the next interim target.
10. A detailed description of how the MS4 permittee will assess BMP and program effectiveness. The description shall incorporate the assessment methods described in the California Stormwater Quality Association (CASQA) Municipal Storm Water Program Effectiveness Assessment Guide.
11. A detailed description of how the MS4 permittee will modify the program to improve upon BMPs determined to be ineffective during the effectiveness assessment.
12. A detailed description of information the MS4 permittee will include in annual reports to demonstrate adequate progress towards attainment of wasteload allocations according to the TMDL schedule.
13. A detailed description of how the MS4 permittee will collaborate with other agencies, stakeholders, and the public to develop and implement the Wasteload Allocation Attainment Program.
14. Any other items identified by Integrated Report fact sheets, TMDL Project Reports, TMDL Resolutions, or that are currently being implemented by the MS4 permittee to control its contribution to the impairment.

Non-stormwater discharges consist of all discharges from an MS4 that do not originate from precipitation events. The stormwater permits pertaining to the City and County effectively prohibit non-stormwater discharges through an MS4 into waters of the United States. Certain categories of non-stormwater discharges are conditionally exempt from the prohibition of non-stormwater discharge, as specified at 40 Code of Federal

Regulations part 122.26(d)(2)(iv)(B)(1). Non-stormwater discharges that are regulated by a separate NPDES permit are not subject to the non-stormwater discharge prohibition.

10.3 Industrial and Construction Stormwater Permits

Industrial facilities and construction operators are expected to meet the proposed wasteload allocations through their existing permits after such time when these TMDLs have been incorporated into those permits. To maintain existing water quality and prevent any further water quality degradation, these permitted industrial facilities and construction operators shall continue to implement and comply with the requirements of the statewide General Permit for Stormwater Discharges Associated with Industrial Activities (Order No.97-03-DWQ, as amended by Order No. 2014-0057-DWQ, NPDES No. CAS000001) or the statewide General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009, as amended by Order No. 2012-0006-DWQ, NPDES No. CAS000002), or any subsequent Industrial or Construction General Permits.

The Industrial General Permit regulates industrial stormwater discharges from industrial facilities in California. Industrial facilities such as manufacturers, landfills, mines, steam generating electricity facilities, hazardous waste facilities, transportation facilities with vehicle maintenance, large sewage and wastewater plants, recycling facilities, oil and gas facilities, and agricultural processing facilities are typically required to obtain Industrial General Permit coverage. Except for non-stormwater discharges authorized in Section IV of the Industrial General Permit, discharges of liquids or materials other than stormwater, either directly or indirectly, to waters of the United States are prohibited unless authorized by another NPDES permit. Unauthorized (unpermitted) non-stormwater discharges must be either eliminated or the discharger must seek authorization under a separate NPDES permit or waste discharge requirements.

Dischargers whose projects disturb one or more acres of soil are required to enroll under the Construction General Permit. The Construction General Permit requires the development of a Storm Water Pollution Prevention Plan (SWPPP) by a Qualified SWPPP Developer. The SWPPP development includes site assessment and sediment and erosion control BMP selection.

10.4 Cannabis Order

Owners, operators, and landowners of commercial cannabis operations will implement the TMDLs by complying with the General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Dischargers of Waste Associated with Cannabis Cultivation Activities (Order No. WQ 2019-0001-DWQ) (Cannabis General Order), the associated Monitoring and Reporting Program (MRP), and any future permits regulating the discharge of waste from commercial cannabis operations. In the future, the Cannabis General Order may be modified by the State Water Board to explicitly include these TMDLs and any requirements or prohibitions necessary for TMDL achievement at enrolled cannabis cultivation sites.

There are currently 65 commercial cannabis cultivators in the lower Salinas River watershed enrolled in the Cannabis General Order.

The Cannabis General Order specifically requires owners, operators, and landowners of commercial cannabis cultivation operations (dischargers) to comply with the following general requirements and prohibitions:

- Prior to commencing any cannabis cultivation activities, including cannabis cultivation land development or alteration, the cannabis cultivator shall comply with all applicable federal, state, and local laws, regulations, and permitting requirements, as applicable. (Cannabis General Order, Attachment A, Section 1, Term 1.)
- The cannabis cultivator shall comply with all water quality objectives/standards, policies, and implementation plans adopted or approved pursuant to the Porter-Cologne Water Quality Control Act (Water Code, division 7), section 13000 et seq. or federal Clean Water Act section 303 (33 U.S.C. section 1313). (Cannabis General Order, Attachment A, section 1, requirement 14.)
- Cannabis cultivators shall not discharge waste in a manner that creates or threatens to create a condition of pollution or nuisance, as defined by Water Code section 13050. (Cannabis General Order, Attachment A, section 1, requirement 25.)
- Except as allowed and authorized by the Cannabis General Order, cannabis cultivators shall not discharge: irrigation runoff, tailwater, sediment, plant waste, or chemicals to surface water or via surface runoff; waste classified as hazardous (California Code of Regulations, title 23, section 2521(a)) or defined as a designated waste (Water Code section 13173); or waste in violation of, or in a manner inconsistent with, the appropriate Water Quality Control Plan(s). (Cannabis General Order, Attachment A, section 1, requirement 26.)
- Cannabis cultivators shall not mix, prepare, over apply, or dispose of agricultural chemicals/products (e.g., fertilizers, pesticides, and other chemicals as defined in the applicable water quality control plan) in any location where they could enter the riparian setback or waters of the state. The use of agricultural chemicals inconsistently with product labeling, storage instructions, or CDPR requirements for pesticide applications is prohibited. Disposal of unused product and containers shall be consistent with labels. (Cannabis General Order, Attachment A, section 2, requirement 103.)
- Cannabis cultivators shall establish and use a separate storage area for pesticides and fertilizers, and another storage area for petroleum or other liquid chemicals (including diesel, gasoline, oils, etc.). All such storage areas shall comply with the riparian setback Requirements, be in a secured location in compliance with label instructions, outside areas of known slope instability, and be protected from accidental ignition, weather, and wildlife. All storage areas shall have appropriate secondary containment structures, as necessary, to protect water quality and prevent spillage, mixing, discharge, or seepage. Storage tanks and containers must be of suitable material and construction to be compatible with the substances stored and conditions of storage, such as pressure and

temperature. (Cannabis General Order, Attachment A, section 2, requirement 105.)

- Cannabis cultivators shall not apply agricultural chemicals within 48 hours of any weather pattern that is forecast to have a 50 percent or greater chance of precipitation of 0.25 inches or greater per 24 hours. (Cannabis General Order, Attachment A, section 2, requirement 110.)
- Cannabis cultivators shall not apply restricted materials, including restricted pesticides, or allow restricted materials to be stored at the cannabis cultivation site. (Cannabis General Order, Attachment A, section 2, requirement 114).
- Cannabis cultivators shall implement integrated pest management strategies where possible to reduce the need and use of pesticides and the potential for discharges to waters of the state.[7] (Cannabis General Order, Attachment A, section 2, requirement 115).

10.5 Fertilizer and Pesticide Handling Facilities

Owners, operators, and landowners of fertilizer and pesticide handling facilities will implement the TMDLs by achieving the TMDL load allocations and complying with the General Waste Discharge Requirements for Fertilizer and Pesticide Handling Facilities in the Central Coast Region (Order No. R3-2005-0001; the “Fertilizer/Pesticide General Order”) and individual waste discharge requirements.

The Fertilizer/Pesticide General Order specifically requires enrolled owners, operators, and landowners of fertilizer and pesticide handling facilities (dischargers) to comply with the following general prohibitions and requirements:

- Discharge, overflow, bypass, leakage, seepage, and over-spray of any waste, rinse water, or contaminated site runoff water to drainageways and adjacent properties are prohibited. (Fertilizer/Pesticide General Order, section B.2.)
- Discharge of wastes, dry or liquid fertilizer, pesticides, or other chemicals to unpaved surfaces or paved surfaces with cracks or holes that may adversely affect surface or groundwater quality is prohibited. (Fertilizer/Pesticide General Order, section B.4.)
- Empty pesticide containers shall be disposed of only at a disposal site approved by the Regional Board to receive these wastes. Opened and non-waterproof containers shall be properly stored and protected to prevent spillage, overtopping, and leakage which could impact surface or ground water quality. Fertilizer/Pesticide General Order, section C.1.)
- Fertilizer and pesticide waste shall be discharged to a regulated waste disposal site approved by the Board to receive hazardous or toxic waste, or recycled or treated onsite provided the Discharger demonstrates by analysis that the waste is non-hazardous and non-toxic. Fertilizer/Pesticide General Order, section C.2.)

[7] https://www.epa.gov/safepestcontrol/integrated-pest-management-ipm-principles

- Surface drainage shall be intercepted and diverted away from areas where the water may be contaminated by wastes or spilled fertilizer or pesticides. Fertilizer/Pesticide General Order, section C.5.)
- All storm drainage contaminated as a result of operations at this facility shall be contained and properly disposed. Fertilizer/Pesticide General Order, section C.6.)
- Collected and stored rinsewater containing pesticide or fertilizer residues shall be disposed of in accordance with the law and in a manner approved by the Executive Officer. Fertilizer/Pesticide General Order, section C.7.)

10.6 Cost Estimate

As required in the Porter-Cologne Water Quality Act, section 13141, the cost of implementing any agricultural water quality control program must be estimated and potential sources of funding identified prior to implementing a regional water quality control plan.

10.6.1 Irrigated Agriculture Implementation Costs

The provisions contained in the existing Agricultural Order are sufficient to attain water quality standards in the project area. The Central Coast Water Board is not proposing any new activity, but merely finding that ongoing activities and regulatory requirements are sufficient. Irrigated agriculture implementation costs are contained in the Agricultural Order (Order R3-2021-0040), Attachment A.

10.6.2 MS4 Implementation Costs

The provisions contained in the existing Phase I MS4 Stormwater Permit for the City of Salinas (currently Order No. R3-2019-0073, NPDES No. CA0049981) and the existing State Water Board Phase II MS4 General Stormwater Permit for Monterey County (currently Order No. 2013-0001 DWQ) are sufficient to implement the TMDL.

To verify successful implementation of the TMDLs, staff is proposing minor revisions to the existing Phase I MS4 Stormwater monitoring and reporting program for the City of Salinas that would include collection of water samples and analysis for malathion at four stormwater outfall locations. Staff is proposing a one-time, year one, first flush sample frequency at the four existing monitoring sites in a manner consistent with the existing monitoring program for organics. Because these samples will be collected as part of the existing monitoring and reporting program, anticipated costs would be associated with laboratory analysis of the samples. At a cost of $500 per sample at each of the four sites, at total cost of $2,000 would be incurred.

10.6.3 Construction and Industrial Stormwater Implementation Costs

Additional implementation costs are not anticipated; the existing Industrial General Permit (Order No. 2009-0009 amended by Order No. 2014-0057-DWQ, NPDES No. CAS000001) and Construction General Permit (Order No. 2012-0006-DWQ, NPDES No. CAS000002) are adequate to meet allocations.

10.6.1 Cannabis Cultivation Implementation Costs

The provisions contained in the existing General Waste Discharge Requirements and Waiver of Waste Discharge Requirements for Dischargers of Waste Associated with Cannabis Cultivation Activities (Order WQ 2019-0001-DWQ) are sufficient to attain water quality standards in the project area. The Central Coast Water Board is not proposing any new activity, but merely finding that ongoing activities and regulatory requirements are sufficient to implement the TMDLs.

10.6.1 Fertilizer and Pesticide Handling Facilities Implementation Costs

The provisions contained in the existing General Waste Discharge Requirements for Fertilizer/Pesticide Handling (Order R3-2005-0001) and Individual Waste Discharge Requirements (Individual Orders) are sufficient to attain water quality standards in the project area. The Central Coast Water Board is not approving any new activity, but merely finding that ongoing activities and regulatory requirements are sufficient to implement the TMDL.

10.7 Funding Sources

In accordance with section 13141 of the Porter Cologne Act, prior to implementation of any agricultural water quality control program the Water Board is required to identify potential sources of funding. Accordingly, in this section, staff provides some examples of funding sources available to both point source and nonpoint source entities. Potential sources of financing to TMDL implementing parties include the following sections.

10.7.1 Federal Clean Water Act - 319(h) Grant Program

The State Water Board, Division of Financial Assistance administers the federal Clean Water Act section 319(h) grant program, which is referred to as the 319(h) program. The 319(h) program annually funds grants addressing nonpoint sources of pollution and is focused on controlling activities that impair beneficial uses. Project proposals that implement TMDLs and those that address problems in impaired waters are favored in the selection process. There is also a focus on implementing management activities that lead to reduction and/or prevention of pollutants that threaten or impair surface waters.

10.7.2 Stormwater Grant Program Proposition 1 (2014 Water Bond)

Proposition 1 (Assembly Bill 1471, Rendon) authorized billions of dollars for water projects including surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection. The State Water Board will administer Proposition 1 funds for five programs. Stakeholders specifically interested in ecosystem and watershed restoration and protection aspects of Prop 1, should consider the Ocean Protection Council (OPC), State Coastal Conservancy, Wildlife Conservation Board, and Department of Fish and Wildlife administered funds.

10.7.3 Other Sources of Funding for Growers and Landowners

The local Resource Conservation District offices can provide access to and/or facilitate a landowner’s application for federal cost-share assistance through various local, state and federal funding programs. For certain projects the RCD may also be able to apply for other grant funds on behalf of a cooperating landowner, grower or rancher. More information is available from the Monterey County Resource Conservation District.

10.8 Timeline and Milestones

The discharge of organophosphate pesticides and presence of toxicity conditions within waterbodies of the lower Salinas River watershed affect a broad spectrum of beneficial uses and are, therefore, serious water quality problems. As such, implementation should occur at an accelerated pace to achieve the allocations and TMDLs in the shortest time-frame feasible.

The target date to achieve numeric targets, allocations, and TMDLs for chlorpyrifos and diazinon and the additive toxicity of chlorpyrifos and diazinon is 2025. This date is consistent with the chlorpyrifos and diazinon TMDLs that were adopted by the Central Coast Water Board in 2011 (see Central Coast Water Board Resolution No. R3-2011-0005) and current water quality trends as described in Section 6.4 indicate that these allocations are nearly achieved.

Water quality trends for malathion indicate a significant increase in concentrations (see Section 6.4) from 2006 to 2018 and crop application of malathion has been persistent within the TMDL Project area. In addition, all waterbodies within the lower Salinas River watershed exhibit significant toxicity to one or more test species using the survival endpoint (see Section 6.5). As such, staff anticipates a longer timeframe will be necessary to attain malathion TMDLs allocations. Staff is proposing a target date of 2032 to achieve the malathion, the additive toxicity of malathion in the presence of chlorpyrifos or diazinon, and the toxicity numeric targets, TMDLs, and allocations. This 2032 target date is consistent with the TMDL compliance dates set forth in the current Agricultural Order (see Agricultural Order, Table C-3.5). Attainment of the toxicity numeric targets will be sufficient to demonstrate attainment of the individual and additive toxicity organophosphate pesticide numeric targets, TMDLs, and allocations.

10.8.1 Determination of Progress Toward and Attainment of Wasteload Allocations

The City of Salinas, the County of Monterey, and industrial and construction stormwater permittees are assigned wasteload allocations for chlorpyrifos, diazinon, and malathion. Wasteload allocations will be achieved through a combination of implementation of management practices that are prescribed in their existing permits (orders). To allow for flexibility, Central Coast Water Board staff will assess progress towards and attainment of wasteload allocations and numeric targets using one or a combination of the following:

1. Attaining the wasteload allocations and numeric targets in receiving waters.

2. Demonstrating compliance as part of existing permit conditions that measure organophosphate pesticide concentrations and toxicity at their point of discharge, if any.
3. Any other effluent limitations and conditions that are consistent with the assumptions and requirements of the wasteload allocations and numeric targets.
4. MS4 entities may be deemed in compliance with wasteload allocations and numeric targets through implementation and assessment of pollutant loading reduction projects, capable of achieving the wasteload allocations and numeric targets identified in this TMDL in combination with water quality monitoring for a balanced approach to determining program effectiveness.

10.8.2 Determination of Progress Toward and Attainment of Load Allocations

Demonstration of compliance with the load allocations is consistent with compliance of the Agricultural Order, the Cannabis Order, and General and Individual Orders for Fertilizer/Pesticide Handling facilities. Load allocations and numeric targets will be achieved through a combination of implementation of management practices and strategies to reduce the discharge of chlorpyrifos, diazinon, and malathion along with water quality monitoring. Flexibility to allow owners and operators of irrigated lands, cannabis facilities, and fertilizer and pesticide handling facilities to demonstrate progress toward and attainment of load allocations and numeric targets is a consideration; additionally, staff is aware that not all implementing parties are necessarily contributing to or causing surface water impairments.

To allow for flexibility, Central Coast Water Board staff will assess progress towards and attainment of load allocations and numeric targets using one or a combination of the following:

1. Attaining the load allocations and numeric targets in receiving waters.
2. Implementing management practices to achieve the load allocations and numeric targets identified in this TMDL.
3. Monitoring of non-stormwater points of discharge into receiving waters.
4. Providing sufficient evidence to demonstrate that the dischargers are and will continue to be in compliance with the load allocations and numeric targets set forth in this TMDL. Such evidence could include documentation that the owner or operator is not causing waste to be discharged to impaired waterbodies. This evidence shall be submitted to the Executive Officer.

10.9 Monitoring and Reporting

The TMDL monitoring and reporting recommendations are designed to provide feedback and to verify that water quality standards are achieved in the watershed. This means that impaired waters are restored to healthy conditions and delisted from the 303(d) List. TMDL monitoring provides feedback and fills gaps in our understanding of the extent of pollution in the lower Salinas River watershed and helps refine the source analysis as necessary.

Staff recognizes that TMDL implementation and monitoring will occur over the next several years. Therefore, staff recommends that monitoring and implementation programs include adaptive management and an iterative process to review monitoring data and adjust planning and implementation strategies accordingly.

The CMP and the City of Salinas's stormwater monitoring program are two major annual monitoring and reporting programs in the watershed that will provide information on ambient and discharge water quality for TMDL implementation. In addition, CCAMP extensively monitors the watershed on a five-year cycle. These programs provide the foundation of monitoring data that will be used evaluate the effectiveness of TMDL implementation.

10.9.1 Irrigated Lands Program Monitoring and Reporting

The CMP currently conducts monitoring for organophosphate pesticides and toxicity in the watershed. Staff has concluded that the existing CMP monitoring locations and frequency is adequate and should not be reduced below 4 times in a year with toxicity testing, every 4 years, for determining if year-round targets are achieved.

10.9.2 City of Salinas Monitoring and Reporting Program

The City's MRP is designed to meet their stormwater permit monitoring requirements and to inform stormwater managers of appropriate urban land use management. The City's MRP is comprised of three parts: urban outfall monitoring, receiving water monitoring, and background monitoring. The monitoring data collected from these parts help characterize urban runoff and receiving water quality and assess the effectiveness of the City's stormwater program.

Staff reviewed the City's MRP and their MRP Quality Assurance Plan and concludes that the current urban outfall monitoring program is not adequate for meeting the needs of the TMDL because malathion is not included. As outlined in Section 8.4, malathion discharges may occur at concentrations that exceed the allocations and numeric targets.

To verify successful implementation of the TMDL, staff is proposing minor revisions to the existing Phase I MS4 Stormwater monitoring and reporting program for the City of Salinas that would include collection of water samples and analysis for malathion at four stormwater outfall locations. Staff is proposing a one-time, year one, first flush sample frequency at the four existing monitoring sites in a manner consistent with the existing monitoring program for organics. The City's MRP contains receiving water toxicity testing provisions that are adequate for evaluating progress towards meeting the TMDL numeric targets.

10.9.3 CCAMP Monitoring

CCAMP monitors the Salinas River hydrologic unit as part of its regional ambient monitoring program. This program rotates on an annual basis through five major geographic parts of the region including Santa Barbara, Santa Lucia, Pajaro, Salinas, and Santa Maria. Every five years, CCAMP conducts monthly monitoring throughout the lower Salinas River watershed and analyzes conventional pollutants including pesticides and toxicity. Staff recommends a minimum of two (2) samples per rotation for each of the impaired waterbodies identified in this TMDL Project.

11 PUBLIC PARTICIPATION (IN PROGRESS)

Program staff held stakeholder meetings during the development of the TMDL. The following is a summary of TMDL meetings and informational items: ·

- February 21, 2021 – Kick-off meeting in the City of Salinas
- April 21, 2021 – CEQA scoping meeting and project update via remote
- March 11 to April 26, 2022 - Public Comment Period
- March XX, 2022 – Public outreach meeting
- June XX, 2022 – Board hearing

Staff developed an email distribution list to communicate with approximately 250 stakeholders. The distribution list built upon an existing TMDL distribution list of interested parties in the watershed and was augmented through outreach to disadvantaged community service providers, and tribal representatives.

To engage Tribes in the TMDL Project planning process, staff contacted the California Native American Heritage Commission for a list of tribes with traditional lands or cultural places in Monterey County. Representatives of these tribes were individually notified at the start of the public process for this TMDL Project. In addition to individually contacting tribal representatives, staff notified representatives of organizations that assist DACs in the lower Salinas River watershed about the turbidity TMDL Project.

Public outreach and public involvement are a part of TMDL development and the basin planning process. Over the past few years, staff of the Central Coast Water Board has implemented a process to inform and engage interested persons about this TMDL project.

We provided regular TMDL updates and solicited public feedback via our stakeholder email subscription list consisting of 250 stakeholders representing a wide range of interests. We periodically posted interim TMDL progress reports on the Central Coast Water Board's website with the intent of sharing our progress with stakeholders as we moved forward with TMDL development. We conducted a public workshop in the City of Salinas on February 21, 2020 and a remote public workshop and California Environmental Quality Act (CEQA) scoping meeting on April 21, 2021.

Individuals and entities Central Coast Water Board staff engaged with during public workshops, CEQA scoping meetings, or during TMDL development included representatives of the following:

- City of Salinas staff.
- County of Monterey staff.

- Tribal representatives within Monterey County.
- Underrepresented communities within Monterey County.
- Representatives of Monterey County Farm Bureau.
- Representatives from California Department of Fish and Wildlife.
- Representatives of the agricultural community.
- Other individuals interested in water quality of the lower Salinas River watershed.

Central Coast Water Board staff's efforts to inform and involve the public included a public comment period. The staff report, resolution, basin plan amendment, and TMDL report were made available for a 45-day public comment period commencing on March 11, 2022. This provided interested parties an opportunity to provide comment prior to any Central Coast Water Board hearing regarding these TMDLs. Staff solicited public comments from a wide range of stakeholders including owners/operators of agricultural operations, representatives of the agricultural industry, representatives of environmental groups, academic researchers and resource professionals, representatives of local, state, and federal agencies, representatives of municipal wastewater treatment facilities, representatives of city and county stormwater programs, representatives of NPDES–permitted facilities, tribal representatives, representatives of environmental justice and disadvantaged communities, and other individuals and groups interested in water quality within the lower Salinas River watershed.

To engage Tribes in the TMDL Project planning process, staff contacted the California Native American Heritage Commission for a list of tribes with traditional lands or cultural places in Monterey County. Representatives of these tribes were individually notified at the start of the public process for the TMDL Project. In addition to individually contacting tribal representatives, staff notified representatives of organizations that assist DACs and SDACs in the lower Salinas River watershed about the TMDL Project.

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13 APPENDIX A – INDUSTRIAL AND CONSTRUCTION STORMWATER PERMITS (SEPARATE ATTACHMENT)

Separate attachment